



Establishing Common Understanding for Home Energy Management Systems (HEMS) in Efficiency Programs

As put forward by the HEMS Working Group, 7/29/2015

Table of contents

- Introduction
- I. Reporting Requirements
- II. Functionality requirements
- III. Data Policies
 - 1. Required Installation Date
 - 2. Required Measurement Data
 - 3. Data delivery and storage
- IV. Other information

Introduction

This document is designed help establish some common criteria and understanding for Home Energy Management Systems (HEMS) and Technologies being integrated into efficiency programs. Specifically, what we put forward is meant to assist program administrators, who are providing program funding towards HEMS, and HEMS vendors, who are receiving payment for their products, to be able to start discussions and reach agreements more easily, ultimately increasing HEMS adoption.

While the criteria is presented as “required” or “optional,” we want to be clear that these are guidelines to help establish common expectations and as such are all subject to discussion. We understand that as new products and technologies come along, they might not meet all of the “required” metrics; this document is not intended to exclude those products, but for HEMS vendors to understand what types of information are important to program administrator. Some of these requirements are specific to Connected Thermostats as that is the most common HEM technology or system to be employed via efficiency programs. We have also added “If Applicable” to several requirements, realizing that depending on the nature of the device, what we have asked for may not apply.

We hope that this can be helpful to ease negotiations between HEMS vendors and efficiency program administrators. This is a living document, and any suggestions or revisions are welcome. Please contact Claire Miziolek, cmiziolek@neep.org with any questions.



I. Reporting Requirements

Vendor must provide the following information, *as applicable*, before a program begins. Details on how to provide the information and if the information is optional are listed when appropriate.

1. Device Identifier
 - a. Make
 - b. Model
 - c. Release date (optional)
 - d. Version no. (optional)
 - e. Firmware rev. (optional)

2. General information
 - a. Physical characteristics (size, weight, etc.)
 - b. Replaceable battery? (yes or no)
 - c. Requires external power (i.e. has a plug)? (yes or no)
 - d. Self-installed or professional installer recommended by manufacturer?
 - e. *Requires C-wire? (yes or no) (thermostat specific)*

3. Communication capabilities
 - a. List all compatible protocols: WiFi, ZigBee, Z-Wave, Bluetooth, RF, cellular, Home Plug, Ethernet, etc.
 - b. List all home automation standards: SEP 1.1, 2.0, Thread, etc.
 - c. List any demand response (DR) capabilities: OpenADR, CEA-2045, etc.
 - i. Include description of how the device responds to a utility signal, what signals the device can respond to, and what the expected wait time would be.
 - ii. Products with DR capabilities may be eligible for additional rebates
 - d. List any 3rd-party services the device can integrate with for enhanced programming (EcoFactor, Opower, Iris, IFTTT, etc.)
 - i. Products with enhanced programming may be eligible for additional rebates
 - e. Does device offer API for data collection or customized service integration?

4. Controls offered:
 - a. Thermostat Controls
 - i. Is the product ENERGY STAR Certified? (The ENERGY STAR Connected Thermostat specification is currently under revision)
 - ii. Optional questions:
 1. What type of schedules can this device support?
 2. Number of periods per day supported
 3. Auto-learning capabilities and description of those
 4. Offers web application for remote monitoring/control? (yes, no)
 5. Offers mobile app for remote monitoring/control? (yes, no)
 6. Can support "geo-fencing" to trigger on proximity of registered cell phones to the home (e.g. turn on when ½ mile from home)? (yes, no)
What is the distance from home that determines home or away? Is that



distance configurable? What happens if the user is home but somehow did not trip the trigger on their way home?

7. Can support “hold”? (yes, no)
 8. Can support “away”? (yes, no)
 9. Can support “vacation”? (yes, no)
 10. Has occupancy sensor? (yes, no)
 11. What other brands or products can this thermostat work with?
- b. Non-Thermostat controls:
- i. What types of control are available?
 - ii. Any auto-learning capabilities and description of those
 - iii. Can it support “geo-fencing” to trigger on proximity of registered cell phones to the home (e.g. turn on when ½ mile from home)? (yes, no) What control is tied to geo-fencing?
 - iv. Has occupancy sensor? (yes, no) What control is tied to occupancy sensor?
 - v. Is there a mobile app for remote control?
 - vi. Are there physical controls in the house that can be used in place of the app if you are home?
 - vii. What other brands or products can this device control?

II. Functionality Requirements

In order for a device to be included in a program, program administrators are requesting the following:

1. HEMS must have some way for a customer to access energy use information (a “user interface”) and/or control the system, including an override/off capability. The user interface may be embedded, autonomous, or distributed¹ and should be reasonably intuitive as determined by program administrator.
2. If a Home Energy Management Technology is replacing an existing device in a home, it:
 - o must retain basic functioning capability, regardless of link status (i.e. can still act as a thermostat or light bulb even if not internet-connected)
 - o should operate at least as well as their conventional alternative (i.e. thermostat must have temperature stability, smart bulb must have quality lighting, etc)
3. HEMS communication pathways must secure customer data and adequately protect customer privacy consistent with the expectations of regulators.

Strong Suggestions

4. HEMS and technologies should support open, nonproprietary, communication standards to achieve interoperability with multiple products and manufacturers.
5. HEMS Vendors should be willing to collect customer permission to share data with the program administrator when the system is in place because of the efficiency program support. Devices that are already installed prior to household being approached to participate in the program do

¹ As outlined in the Characterization and Potential of Home Energy Management Technology, Prepared for PG&E, January 2015



not require vendors to enroll them, but program administrators would ask vendors to help customers opt-in to participation in the program.

6. HEMS should offer basic Demand Response Capabilities: Allows remote connection with utilities, who, with authorization, can adjust settings during peak demand periods. This includes bi-directional wireless communication.

III. Data Policies

The following describes the data that efficiency programs require from any participating technologies/vendors. The format, timing, and any optional information is demarcated when appropriate.

1. *Required Installation data for HEMS devices installed as part of an efficiency program (in this case, the vendor would be responsible for gaining permission from customer to share data with program administrator and opting into the program):*
 - a. Customer identification information, including physical address, owner of device (if different from utility bill customer), household contact email address, utility name, and utility account number. *We understand not all of this information is currently collected, however if the vendor is collecting this information, we require it be shared with the program administrator.*
 - b. Device Identification number
 - c. Date of installation (connection)
 - d. All connected equipment (brand, model)
 - e. Communications protocol (if not obvious)
2. *Measurement data:*
 - a. Time and date stamp
 - i. Required
 - b. Device “mode” (label for on/off/low/high/rinsing/heat/cool/fan, etc. that can be used for reporting functions) *if applicable*
 - i. Required
 - c. Data on how device acts with external occupancy/proximity data OR if device directly detects occupancy/proximity and acts upon it to reduce home energy consumption (to determine if the user is out of the space) *(if applicable)*
 - i. Not required, but could be worth a larger incentive if products reduced energy consumption and associated data is provided
 - d. Humidity (if applicable)
 - i. Not required, but could be worth a larger incentive if provided
 - e. Light level (if applicable) – can be on/off or in engineering units
 - i. Not required, but could be worth a larger incentive if provided
 - f. (thermostat) Space Temperature
 - i. Required
 - g. (thermostat) Setpoints (heat/cool)
 - i. Required
 - h. (thermostat) Fan (on, off)
 - i. Required



- i. (thermostat) Programmed (yes, no)
 - i. Not required, but could be worth a larger incentive if provided
 - j. (thermostat) Online/offline
 - i. Not required, but could be worth a larger incentive if provided
 - k. (thermostat) HVAC performance data for remote diagnostics
 - i. Not required, but could be worth a larger incentive if provided
 - l. (other device controls) Energy consumption over measurement period, instantaneous power
 - i. Not required, but could be worth a larger incentive if provided
3. *Data delivery and storage*
- a. All Installation data gathered at “installation” event, provided upon device installation.
 - b. All Measurement data gathered by the device:
 - i. Interval data (actual intervals to be determined by the program administrator) or agreed change of state including for all measured data (including local time/date stamp for each reading)
 - ii. Must be provided daily at a minimum
 - iii. Must be provided for the duration of the contract period (period specified in contract, and any options to renew contract).
 - c. How data will be delivered from service provider:
 - i. Delivered to efficiency program through web services/web portal in real time or in bulk weekly, must allow periodic download via csv files.
 - ii. API (real time access or bulk)
 - iii. CSV (bulk) where data is automatically pushed to virtual platform and program administrators can access that information at their discretion.
 - d. Where data is to be delivered and accessed:
 - i. Each Program Administrator to establish via their designated data service provider

IV. Other Requirements

HEMS vendor should also provide the following to the program administrator:

1. Access to previous pilot studies, lab tests, or evaluations for savings achieved
2. Cost/retail price
3. Information about the education that is provided to the customer