ENERGY STAR® Program Requirements Product Specification for Smart Home Energy Management Systems

Partner Commitments

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the provision and labeling of ENERGY STAR Smart Home Energy Management System (SHEMS) packages. The ENERGY STAR Partner must adhere to the following partner commitments:

1.1 Providing a Certified Smart Home Energy Management System Package

1. Partner must be a smart home service provider.

2. Comply with current ENERGY STAR Smart Home Energy Management System Eligibility Criteria, which define performance requirements and test procedures. A list of eligible devices and services and their corresponding Eligibility Criteria can be found at www.energystar.gov/specifications.

   Maintain regular contact with EPA to share program insights and market developments and to work toward the development of a performance metric and future specification versions.

3. Prior to associating the ENERGY STAR name or mark with any SHEMS package, obtain written certification of ENERGY STAR certification from a Certification Body recognized by EPA for Smart Home Energy Management Systems. As part of this certification process, SHEMS packages must be evaluated by a certification body recognized by EPA to perform SHEMS package testing. A list of EPA-recognized Certification Bodies can be found at www.energystar.gov/testingandverification.

4. A new SHEMS package is defined as having either significantly different hardware or software features relative to an existing package. SHEMS receiving software updates are not considered new packages.

5. Partner will prioritize the ENERGY STAR SHEMS offering over similar non-conforming offerings. This means that the partner will not pro-actively offer and market similar packages to end users that fall short of the ENERGY STAR specification, though individual consumers may opt to purchase and/or connect whichever elements they wish. The ENERGY STAR certified SHEMS package must be marketed distinctly from other packages such as security, entertainment, or wellness.

6. Partner shall clearly indicate in all marketing and advertising that the devices included in the SHEMS package, as identified in the Eligibility Criteria, are necessary to qualify as ENERGY STAR (given that devices may be sold separately from the service.) E.g. “ENERGY STAR certification is contingent on installation with specified devices.”

1.2 Using the ENERGY STAR Name and Marks

1. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Identity Guidelines are available at www.energystar.gov/logouse.

2. Use the ENERGY STAR name and marks only in association with certified packages, where the service and associated devices have been certified together. The Partner may not refer to itself

as an ENERGY STAR Partner unless at least one SHEMS package is certified and offered to consumers in the U.S. and/or ENERGY STAR partner countries.

3. Provide clear and consistent labeling of ENERGY STAR package.
   3.1. Electronic ENERGY STAR certification marks of at least 76x78 pixels in cyan, black or white shall be on the home screen, the main menu screen, or another place where users would be expected to come across it in routine use of the service's user interface, (e.g. no more than three clicks from main screen) including a mobile app or web portal (if they exist).
   3.2. The ENERGY STAR mark shall be clearly displayed in association with the SHEMS package in the partner's literature (i.e., user manuals, spec sheets, etc.) and on the partner's Internet site where information about the ENERGY STAR certified package is accessed or the package is marketed.
   3.3. The ENERGY STAR mark shall not be physically applied to packaging unless all the devices in the package are ENERGY STAR certified.
   3.4. ENERGY STAR marks shall not be applied to included devices, including physical marks on the device, physical marks on a box containing multiple devices, or electronic marks in a device-specific user interface, unless the device is separately certified to an ENERGY STAR specification.

4. ENERGY STAR labeling of a package that is associated with a broader platform, such as a home security system, shall clearly indicate which package is certified. Neither physical nor electronic labels shall be associated with the broader platform, and product literature shall state: *"This [insert platform (e.g., security system, home automation system)] includes an ENERGY STAR Certified Smart Home Energy Management System Package. Only the energy management system package is certified as ENERGY STAR."*

1.3 Providing Information to EPA

1. Provide aggregate savings data and associated statistics to EPA every 6 months in accordance with the ENERGY STAR Smart Home Energy Management Systems Method to Determine Field Performance. Submitted data shall be representative of savings for the system's U.S. installed base and must demonstrate continued compliance with the requirements of the specification. Only installations with the complete package installed are included for analysis. This data will also be used for program evaluation purposes:
   1.1. Every February 1 submit the ENERGY STAR SHEMS Data Reporting Template for the previous June 1 through December 31 reporting period.
   1.2. Every July 1 submit the ENERGY STAR SHEMS Data Reporting Template for the previous January 1 through May 31 reporting period.

2. EPA may, at its discretion, conduct tests on SHEMS packages that are referred to as ENERGY STAR certified. These packages, including services and required devices, may be obtained on the open market, or voluntarily supplied by Partner at the government's request.
3. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.
4. Notify EPA of a change in the designated responsible parties or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at www.energystar.gov/mesa.

1.4 Training and Consumer Education

1. Partner shall train distributors, sales staff and installation contractors on the value of the ENERGY STAR program. This training shall include, at a minimum, identification of ENERGY STAR certified products within the Partner's offerings and on the Partner's web site.

2. All consumer information documents – operating manuals, installation instructions, etc.—must be easily accessible to consumers on a public website.

1.5 Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures, and should keep EPA informed on the progress of these efforts:

- Provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR certified products, and to promote awareness of ENERGY STAR and its message.
- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.
- Purchase ENERGY STAR certified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR certified product information to employees for use when purchasing products for their homes.
- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), EPA may provide links where appropriate to the Partner website.
- Ensure the power management feature is enabled on all ENERGY STAR certified displays and computers in use in company facilities, particularly upon installation and after service is performed.
- Provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR certified products.
- Provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, and communicate Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR certified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR certified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event.
- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway.
- Join EPA's Green Power Partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel- based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities. For more information on Green Power, visit www.epa.gov/greenpower.

ENERGY STAR Program Requirements
Product Specification for Smart Home Energy Management Systems

Eligibility Criteria
Version 1.1

This document specifies the eligibility requirements for the **Version 1.1** ENERGY STAR Smart Home Energy Management Systems (SHEMS) program. SHEMS packages shall meet all of the identified criteria to earn the ENERGY STAR.

1 INTRODUCTION

The intent for this specification is to recognize smart home system packages designed to actively recognize and act on opportunities to save energy and help end users manage their energy in a way that saves them money and makes their lives easier. This includes but is not limited to 1) providing reliable occupancy detection linked to savings strategies that shut off or power down equipment when no one is home, 2) limiting standby power of connected devices, and 3) providing feedback to users about the energy impact of their settings.

The ENERGY STAR SHEMS specification is tailored to current market circumstances in terms of the smart home devices it addresses. As the market and technology continue to evolve, it is expected this program will grow to provide a national framework for complete home energy management services that work seamlessly with the grid. The intent is for the ENERGY STAR certified SHEMS package to be customizable and scalable to function with multiple device options, including devices beyond the minimum requirements in this specification.

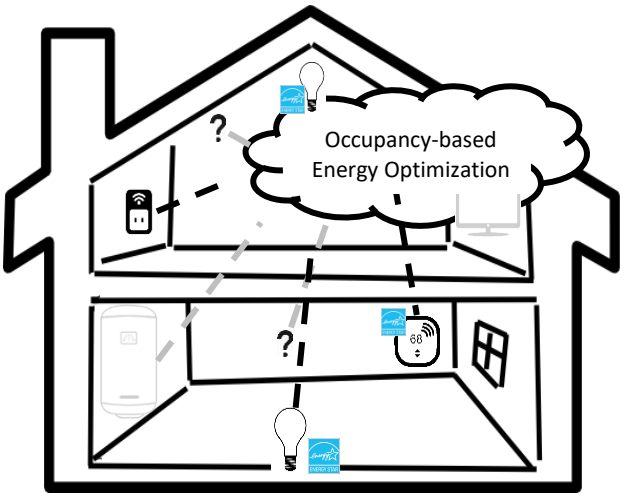


Figure 1: Simple illustration of the basic elements of an ENERGY STAR Smart Home Energy Management System Package

Required minimum devices are shown with black dotted lines, optional devices in gray, and the cloud denotes the core service capability, occupancy-based energy optimization.

2 DEFINITIONS

A) <u>Smart Home Energy Management System (SHEMS) Package</u>: For purposes of ENERGY STAR, a SHEMS package is the combination of a service and devices that are designed to work together to deliver occupancy-based optimization of energy use and that meets all of the device and service

requirements outlined in the Eligibility Criteria below. A SHEMS package may include devices with energy saving or grid services potential beyond what is required for ENERGY STAR certification (particularly those identified below as Optional Encouraged Devices). A SHEMS package must be marketed as a complete offering, i.e. certification is contingent upon using service with required devices, but individual devices may be sold separately. A SHEMS package may be a subset of a larger home automation platform that provides other services.

a) Service: A combination of software, algorithms, and user interfaces that is useful to the building, its occupants, and other parties. A SHEMS service refers specifically to the service offered as part of a SHEMS package which provides for occupancy-based energy optimization strategies.

b) Platform: A service offering encompassing multiple packages intended to serve consumer's interests such as security, health, safety etc. For instance, Company X offers a platform through which a consumer could select a variety of packages.

c) Installation: An individual instance of a platform consisting of one or more packages as used in a single dwelling.

d) Smart Home Service Provider: The company that owns the brand which consumers see when they interact with their SHEMS package and is able to provide package data and analysis of field data to EPA for the ENERGY STAR program.

B) Device: A piece of physical equipment connected to a SHEMS, including the following device types:

a) Sensor: A device that detects or measures a physical property and records, indicates, communicates, or otherwise responds to it. Sensors may be embedded in other devices.

b) Hub: A dedicated device which provides network connectivity, protocol translation, and, in some cases, additional instruction between products included in a SHEMS package. For instance, an alarm panel or gateway may serve as a hub. This can be anything that would not reasonably be expected to be in a home other than to support the SHEMS and possibly other functions of a platform. Thus, a Wi-Fi router or router/modem combination whose primary function is to provide internet service to the dwelling would not be considered a hub. Smart home systems do not necessarily need to include a hub. Hubs can be wired, wireless, or a combination.

(1) SHEMS-specific hub: A hub which is necessary for the operation of the SHEMS.

c) Persistent Occupancy Device: A device that detects room, space or dwelling level occupancy and is always present in the home. This could be a sensor integrated into another product or a standalone sensor (e.g. a passive infrared sensor) or mechanism that can detect and communicate dwelling or space occupancy (e.g. alarm control pad). Door sensors which only report when a door opens and closes do not qualify as persistent occupancy devices.

d) Transient Occupancy Device: A device that detects room, space or dwelling level occupancy that is not always present in home. This could be a sensor integrated into a portable product (such as a smart phone using Geo Fencing) or a standalone device like a garage door remote.

e) Smart Plug: A household voltage (120V or 240V) wall outlet or device which is placed between a standard outlet and a device's power plug or incorporated into the outlet itself and can be controlled by a wireless remote or app using Wi-Fi, Bluetooth, or other wireless communications protocols. Most advanced smart plugs offer the ability for preset timed events, surge protection, and current draw feedback.

f) Smart Power Strip: A multi outlet device (similar to a traditional power strip 120V or 240V) placed between a household power outlet and more than one device's power plugs. The smart power strip's multiple outlets can be controlled individually or in a group by a wireless remote or app with external communication using Wi-Fi, Bluetooth, or other wireless communication protocols. Smart power strips incorporate either automated energy savings based on user interaction, or the ability to set timed events, or other trigger technologies such as Geo Fencing or IFTTT. Smart power strips included in ENERGY STAR SHEMS packages must have the ability to monitor and report energy use data from each outlet or the group of outlets per section 4.3B).

g) Home Energy Sub Metering System: A system that can measure or estimate energy usage at the circuit breaker panel, offering the ability to monitor energy usage for individual circuits and/or end uses, including by disaggregation, to account for their actual energy usage. This may include smart fuse boxes and systems that use current transducer clamps or similar means to non-invasively measure power in household circuits.

h) Connected Thermostat (CT): A device that controls heating, ventilation, and air-conditioning (HVAC) equipment to regulate the temperature of the room or space in which it is installed and has the ability to communicate with sources external to the HVAC system. For connection, the CT device may rely on a Wi-Fi home area network and an internet connection that is independent of and not part of the CT Device. An ENERGY STAR Certified Connected Thermostat meets the requirements in the current Connected Thermostats specification.

i) ENERGY STAR Certified Light Meeting Connected Criteria (Smart Lighting Product): A lamp, luminaire, retrofit kit, or other lighting product certified to the latest applicable ENERGY STAR specification as meeting the optional connected criteria.

j) Lighting Load Control Device: A device with the dedicated purpose of controlling lighting based on user interaction or sensor input, e.g. smart light switch, motion sensor, remote.

C) Compatible: The SHEMS is compatible with a certain device when it is able to provide all of the Required Base Services in relation to that device, including automatic recognition of the device once connected to the network, control, and, if applicable, energy data reporting (for devices reporting power to the SHEMS). These services must all be available to the user within the SHEMS user interface without requiring the user to enable with a third-party service such as IFTTT.

D) Plug Load: Plug loads are a category of equipment that is usually plugged into an outlet. This term generally excludes loads that are attributed to major end uses (HVAC, lighting, water heating, etc.)

E) Occupancy-Based Optimization: Using information on occupancy to serve consumers' desires with the least energy possible, for instance by reducing idle power or reducing the amount of time energy-using devices are on. Optimization algorithms may also use predictive information about when occupancy is likely to change, based on machine learning.

F) Occupancy Sensing: A method (or methods) to detect whether a space has a person and/or animal in it, and potentially how many. Occupancy may be sensed on a room by room basis or for an entire dwelling, and may be sensed using dedicated sensors, sensors in a product with a different primary purpose (thermostat, light fixture), system-based techniques such as geofencing or the arming of an alarm panel, or a combination of these techniques. It may include information about how long the home has been or will be unoccupied which may affect optimization.

G) Automated Actions:

a) Explicitly generated (by a hard trigger): Actions for devices initiated by a user through an intentional input, e.g. setting up a schedule (home, away, vacation, sleep), rule, or action through an app e.g. setting up geofencing to control devices, commanding a voice assistant, arming a security system, or actively pressing a button on a device in home. (For the purpose of this specification this excludes action on a suggested event).

b) Implicitly generated (by a soft trigger): Actions for devices initiated by the service based on occupancy and possibly other information, without explicit user input. This can be a machine learning scenario where a service detects new patterns and adjusts a users' schedule or simply that the service detects that the home is vacant and triggers energy saving actions on behalf of the users. This can also include a notification to the user that they can override but if ignored the service would carry out the action, unlike a suggested action where a user must grant permission for the service to take the action.

c) Suggested (by service-suggested trigger): Actions for devices that are suggested by the service based on occupancy and other information, where the service requires a user to confirm in order to take the action.

H) Demand Response (DR): Changes in electric usage by demand-side resources from their normal

consumption patterns in response to changes in the price of electricity over time, or to event signals designed to induce lower electricity demand at times of high wholesale market prices or when system reliability is jeopardized[1].

I) Time of Use Pricing (TOU): as identified by the Rocky Mountain Institute,[2] TOU refers to a time-based electricity rate program that differentiates prices by time of day, where both the prices and time periods are predetermined and constant.

J) Interface Specification: A document or collection of documents that contains detailed technical information to facilitate access to relevant data and product capabilities over a communications interface.

K) States or modes:

a) Idle state: A state which the device enters automatically when the device:

(1) is installed and interconnected in accordance with provided instructions,

(2) experiences no direct or remote user interaction (e.g., smart phone app, web interface, occupancy detection), and

(3) sufficient time has elapsed to allow the device to enter a low power state, as applicable. For example, the screen has dimmed or turned off automatically.

b) Standby State: The lowest power state which cannot be switched off (influenced) by the user and that may persist for an indefinite time when the device is connected to the main electricity supply and used in accordance with the manufacturer's instructions. The device may require user interaction, such as toggling a power button, in order to enter a standby state.

L) Open Standards: Communication with entities outside the SHEMS that use, for all communication layers, standards including but not limited to those:

- included in the Smart Electric Power Alliance Catalog of Standards,[3] and/or
- included in the NIST Smart Grid Framework Tables 4.1 and 4.2, and/or
- adopted by the American National Standards Institute (ANSI) or another well-established international standards organization such as the International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE) or Internet Engineering Task Force (IETF).

3 SCOPE

A) Included Products: Only packages that meet the definition of a SHEMS package, as specified herein, are eligible for ENERGY STAR certification. A SHEMS package may be one distinct package offered by a platform that also provides other smart home services such as home automation, entertainment, home awareness, elder care, or security.

B) Excluded Products: SHEMS that are unable to collect the required data for the Method to Determine Field Performance.

C) Diagrams:

[1] Modified slightly from Federal Energy Regulatory Commission, https://www.ferc.gov/industries/electric/indus-act/demand-response/dr-potential.asp

[2] Modified slightly from Rocky Mountain Institute, "A Review of Alternative Rate Designs," 2016. https://rmi.org/insight/review-alternative-rate-designs/.

[3] https://sepapower.org/knowledge/catalog-of-standards/catalog-of-standards-complete-list-of-entries/

Figure 2: Illustration of SHEMS Package

Minimum device and function requirements are shown inside the red dotted boundary, including at least one ENERGY STAR certified thermostat and two lighting devices, one of which shall be ENERGY STAR certified. Required platform capabilities (connection to a water heater or water heater controller, grid services) do not need to be in use in every installation. Refer to section 4 for detailed information. Persistent occupancy sensing may be a stand-alone additional device or integrated into another required device.

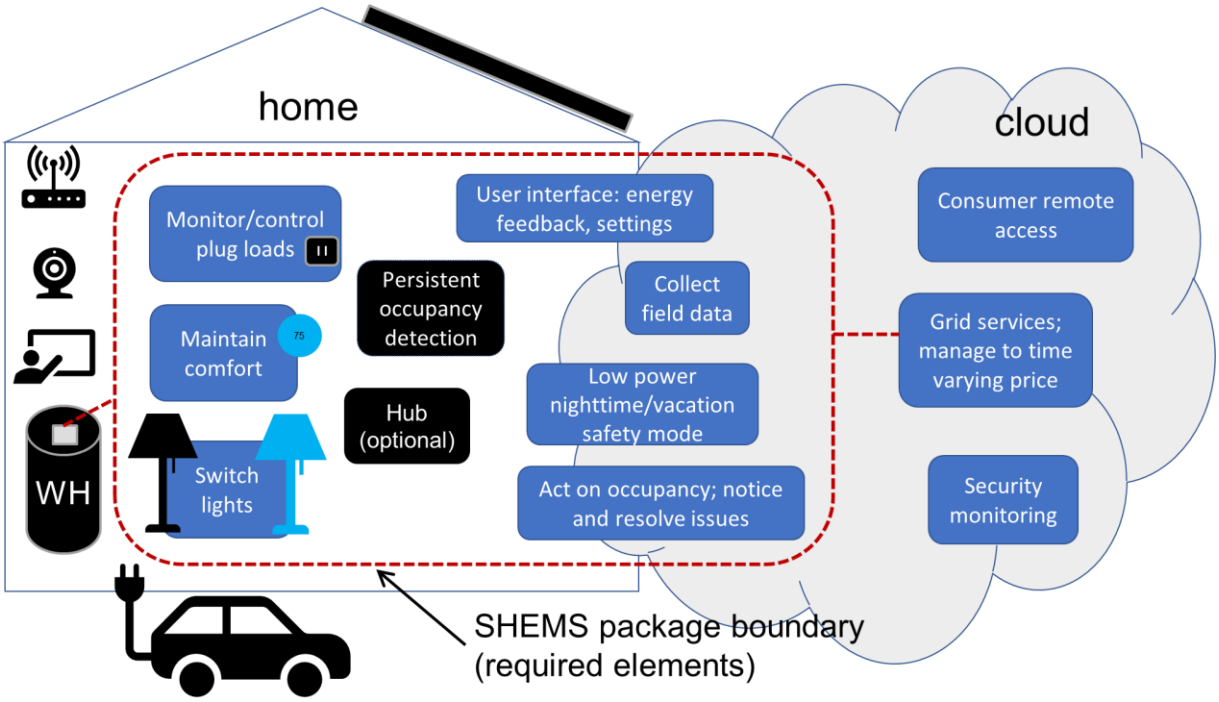
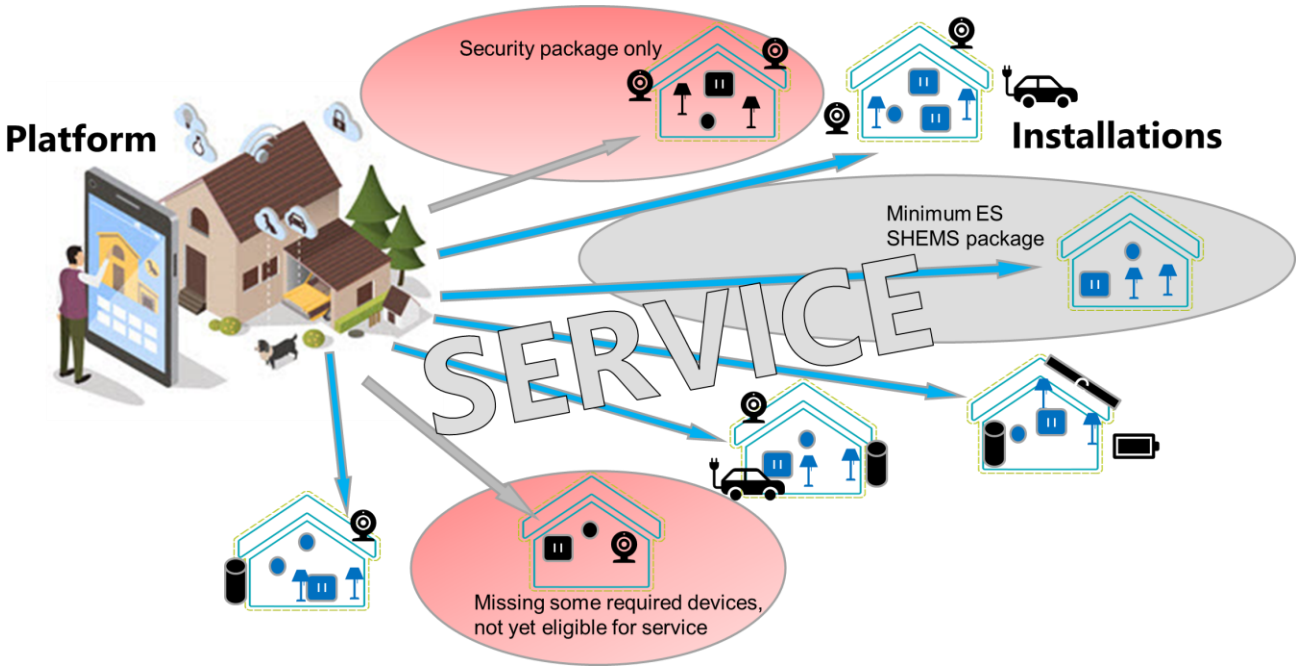


Figure 3: Illustration of installations of various packages in a platform



4 ELIGIBILITY CRITERIA

To certify as ENERGY STAR, the SHEMS packages offered by a service provider must facilitate energy management via occupancy-based optimization control of, at minimum, the connected devices as outlined below and meet the specified service capabilities and grid response criteria. In addition, field performance must be reported as detailed by the ENERGY STAR SHEMS Method to Determine Field Performance. The SHEMS shall maintain these services and capabilities through subsequent firmware and software changes. Furthermore, any SHEMS package marketed or sold by the service provider must continue to meet all requirements in the specification for the SHEMS to maintain certification. The SHEMS service provider shall maintain documentation that demonstrates compliance to these requirements.

4.1 Required Base Services: The SHEMS shall perform the following services:

A) Provide a remote consumer interface (e.g. application, website, display) that allows end users to control all the devices connected to the SHEMS package from outside the dwelling.

B) Receive and utilize a minimum set of occupancy data, specifically:

a) include persistent occupancy detection. This may be provided by:

- at least one persistent device with constant wired power (or that does not typically rely on batteries for power, e.g. energy harvesting); or
- at least two solely battery-powered persistent devices.

Note: This requirement could be met by one wired thermostat with occupancy detection, two battery-powered infrared detectors, or one bulb with presence detection screwed into a line-voltage socket.

b) encourage all installations to locate a persistent occupancy device in a high traffic area of the home;

c) detect and communicate occupancy to the SHEMS package;

d) synthesize occupancy information for the installation; and

e) send commands to devices connected to the SHEMS package, including but not limited to: reduce lighting loads to the levels specified in 4.1(G), turn off any smart power strips or plugs, and turn off or change modes of other devices connected to the SHEMS.

C) By default, produce energy-saving device control actions through hard, soft, and suggested triggers, specifically by (at least one action through each method below):

a) facilitating user-established rules and schedules (hard trigger). An energy saving default schedule is a recommended feature;

b) implementing control algorithms to automatically modify the operation of the devices in the package to save energy while maintaining positive user experience based on occupancy information and possibly machine learning of user behavior, i.e. patterns, preferences and user input (soft trigger); and

c) identifying and suggesting energy savings events or actions to promote energy savings while maintaining positive user experience based on occupancy information and possibly machine learning of user behavior, i.e. patterns, preferences and user input (service-suggested trigger).

D) Allow the end user to access information relevant to their energy consumption, including the energy consumption or average power of all devices reporting energy or power to the SHEMS, which the SHEMS user interface shall be capable of collecting and displaying across time intervals no greater than one day. Estimated energy use based on device settings is permitted. *Examples include but are not limited to: real-time energy use data by device, package, platform or dwelling (including meter data); daily, weekly, monthly or annual energy performance, comparison with previous periods or similar dwellings, etc*.

E) Allow users to configure system preferences, provide feedback, and to adjust how responsive the system is to detected occupancy.

F) Provide a resolution and user notification process for when occupancy detection is not working properly; e.g. notifications through email, SMS and or on main access portal until resolved.

G) Provide a vacation, nighttime safety, leave a light on, nightlight, or similarly identified mode to automate lighting load to operate one or multiple lights minimally at night or while away, using no more than 0.03 kWh per day while the feature is activated. This feature must be available to the user but need not be enabled by default and should not be a part of a default vacation mode if that setting does not operate lights.

Note: service providers may ensure that lighting energy does not exceed 0.03 kWh per day either by collecting lighting energy consumption data from connected devices or by limiting runtime based on the rated wattage of a given bulb.

H) Recognize, identify and control required and encouraged devices certified in the package by type (e.g. light, outlet, thermostat, etc.) once connected.

4.2 Additional Required Platform Capabilities

A) Ability to connect to and control at least one water heater controller or ENERGY STAR connected water heater which is currently available on the market. The connection shall include communicating data sufficient to enable occupancy-based adjustment of water heater operation to the water heater or water heater controller. Users shall be able to establish a connection through interaction only with the water heater controller service and the SHEMS service, e.g. without the use of IFTTT.

B) Ability to control devices based on relative or absolute time of use energy prices, determined either through user input or by integrating with utility programs, and to help users manage energy use in the home to minimize energy costs. For systems relying on user input, the user should be able to enter time of use rate information both during system configuration and at any point while connected to the service. Partners are additionally encouraged to support other advanced variable rate structures and load building functionality (the ability to increase loads during periods of low demand).

4.3 Connected Device Requirements

A) Required devices: Any package marketed as an ENERGY STAR certified SHEMS shall include the following devices. (Note: since actual installations may vary, only those installations that include the required devices will be analyzed as part of the compliant population.)

a) At least one ENERGY STAR certified smart thermostat;

b) At least two connected lighting devices, consisting of:

- Two ENERGY STAR certified smart lighting products[4]; or
- One ENERGY STAR certified smart lighting product and one lighting load control device capable of measuring lighting load; or
- Two lighting load control devices capable of measuring lighting load. Service providers using this option are strongly encouraged to select lighting load control devices compatible with ENERGY STAR certified dimmable lighting.

c) At least one of the following plug load control or monitoring offerings;

- One smart power strip;
- One or more smart plugs; or
- Home energy sub metering system.

d) any additional devices needed to fulfill the required service capabilities, such as a hub or occupancy devices.

[4] Per the definition of ENERGY STAR certified smart light, this may be a lamp, luminaire, retrofit kit, or other lighting product meeting the optional ENERGY STAR connected criteria.

B) Device-specific requirements: All lighting load control devices, smart plugs, smart power strips, submetering devices, and SHEMS-specific hubs or control panels marketed with the certified SHEMS package shall comply.

a) Lighting Load and Plug Load Management Devices: Lighting load control devices, smart plugs, smart power strips, or sub metering devices included in a SHEMS package shall have the ability to communicate energy consumption of their respective loads to the SHEMS, e.g. through compliance with CTA-2047[5] or other means as applicable.

b) Idle and Standby Power Requirements:

Table 1: Device Power Limits

Device	**Power Limit** (Idle or standby as applicable)	**Method of measurement** (as applicable)
Smart plug, smart power strip, or sub metering device	1.0 watt standby power	IEC 62301, Ed. 2.0, 2011-01, Household electrical appliances – Measurement of standby power, subject to clarifications in sections 5E).
Smart lighting control	0.5 watt standby	
SHEMS-specific Hub or control panel[6]	Network connected idle power shall be reported	Instructions in section 5F).

(1) The standby power requirements for ENERGY STAR products which may satisfy the minimum SHEMS device requirements are listed below. These products are addressed in separate specifications, so while the standby power requirements below are accurate as of the development of this specification they may change independently. Please visit the ENERGY STAR partner webpages for the relevant products to find the current requirements.

- ENERGY STAR certified connected thermostat: ≤ 3.0 watts average standby power.[7]
- ENERGY STAR certified lamp meeting connected criteria: ≤ 0.5 watts standby power.
- ENERGY STAR certified luminaire, including ventilating fans with light kits: ≤ 0.5 watts standby power for luminaires meeting connected criteria; ≤ 1.0 watts standby power for luminaires meeting connected criteria and having energy saving features such as integral motion sensors or occupancy sensors. Power supplies for multiple luminaires may draw up to 1.5 watts in standby mode.
- ENERGY STAR certified ceiling fan light kit: reported separately in the list of certified products.

C) Optional Encouraged Devices: Service providers are strongly encouraged to build their SHEMS to be capable of optimized control of the following devices, which are listed in order of priority based on their energy saving and grid services potentials. Compatibility with such products will be highlighted on the ENERGY STAR listing for the certified SHEMS. Examples include:

- Connected water heater controller or ENERGY STAR Certified Connected Water Heater.
- *ENERGY STAR certified EV Supply Equipment
- Automated window attachments certified by the Attachments Energy Rating Council (AERC) for Energy Performance (EP) – Automation at aercenergyrating.org

[5] ANSI/CTA-2047: CE Energy Usage Information. August 2014.

[6] Includes all equipment necessary to establish connectivity to the SHEMS service provider's cloud, except those that can reasonably be expected to be present in the home independently of the SHEMS service, such as Wi-Fi routers and smart phones.

[7] Includes all equipment necessary to establish connectivity to the CT service provider's cloud, except those that can reasonably be expected to be present in the home, such as Wi-Fi routers and smart phones.

- *ENERGY STAR certified room air conditioner
- *ENERGY STAR certified refrigerators
- *ENERGY STAR certified freezers
- *ENERGY STAR certified clothes washers
- *ENERGY STAR certified clothes dryers
- *Additional ENERGY STAR certified light bulbs and fixtures
- *ENERGY STAR certified pool pumps
- *Other (as developed) ENERGY STAR certified products
- Battery storage
- Solar inverters

*product must meet optional ENERGY STAR connected criteria where applicable.

Note: Inclusion of products not covered by another ENERGY STAR program in a SHEMS package does not grant such products the right to use the ENERGY STAR marks.

4.4 Grid Service Criteria

A) Grid Communications and Access: The SHEMS shall be capable of implementing a demand response event for at least one device in the package. The platform shall offer an interconnection specified by an interface specification, application programming interface (API) or similar documentation that, at a minimum, enables DR functionality. Providers are encouraged to use open standards to meet this criterion, for example by offering an OpenADR virtual end node (VEN) in their cloud or locally in the home.

B) Consumer Override: Consumers shall be able to override their SHEMS' response to any grid request. The override shall last no more than 72 hours.

C) Capabilities Reporting:

   a) List DR protocols supported by the SHEMS.

   b) Indicate if the only option for DR services is through the service provider's cloud.

D) Additional Capabilities Summary: A ≤ 250-word summary description of the SHEMS service provider's DR capabilities/services shall be submitted. In this summary, EPA recommends noting the following, as applicable:

   a) DR services that the SHEMS has the capability to participate in such as load dispatch, ancillary services, price notification and price response.

   b) Whether individual installations can be directly addressed via the interface specification, API or similar documentation, rather than the service provider managing groups as a whole.

   c) Support for locational DR, e.g. to ZIP code(s), feeder(s), or other locational groupings.

   d) Feedback about DR response: e.g. verification/M&V, override notification.

   e) Measures to limit consumer comfort impacts, if any.

   f) DR response configurability/flexibility by the consumer and/or DR program.

   g) Whether any device in the SHEMS complies with the 2016 California Energy Commission Title 24, Part 6 Joint Appendix 5.

4.5 Field Performance

To maintain certification and facilitate evaluation, service providers shall demonstrate SHEMS performance in the field by reporting aggregated statistical data every six months to the ENERGY STAR program according to the ENERGY STAR SHEMS Method to Determine Field Performance.

The platform must be capable of collecting certain data from each installation. This includes but may not be limited to:

- Each installation shall have a unique ID independent of its evolution over time;
- Start and end date of service;
- Information about devices attached to the platform, including the total number, how many lighting and thermostats are ENERGY STAR certified, and the number of smart outlets connected;
- Whether the requirements for persistent occupancy devices in section 4.1B) continue to be met;
- The number of away hours each week of each trigger type named in section 4.1C);

Note: Field data will be submitted to an EPA contractor. EPA will only have access to anonymized data, will only share aggregated and anonymized general information publicly, and will refrain from sharing non-anonymized data publicly without the partner's explicit agreement. Further, EPA will neither collect nor share any customer-specific data.

5 TEST REQUIREMENTS

A) Assure that the application associated with the package delivers the required service capabilities with a representative package containing the required minimum devices;

B) Software updates: Software and firmware updates may not adversely affect product savings. Software or firmware changes that alter the principle that savings rest upon, or which are expected to reduce savings, require recertification of the SHEMS.

C) Significant Digits and Rounding:
   a) All calculations shall be carried out with directly measured (unrounded) values.
   b) Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

D) Test Methods: the following methods shall be used to demonstrate ENERGY STAR certification.

Table 2: Test Methods for ENERGY STAR Certification

ENERGY STAR Requirement	Applies to	Test Method Reference	Sample Size
Standby State Power	Non-ENERGY STAR lighting control and plug load devices	IEC 62301, Ed. 2.0, 2011-01, Household electrical appliances – Measurement of standby power, subject to clarifications in section 5E).	One unit
Network Connected Standby or Idle State Power	SHEMS hubs	Test instructions in section 5F).	One unit
SHEMS Field Performance	SHEMS Package	ENERGY STAR SHEMS Method to Determine Field Performance, V1.0	A minimum of 30 installations

E) Implementation of IEC 62301 for non-ENERGY STAR Device Testing

Note: This test is not applicable to devices that are powered solely by batteries or are otherwise not powered by a direct source.

   a) Configure and provision the Device's connected functionality, including enrollment for applicable services and updating to latest version of firmware.

b) Test Conduct – Measure energy consumption at the power input to the Device using the sampling method, section 5.3.2 of IEC 62301, Edition 2.0 2011-01.

(1) Verify ability to control the device over the communication link and operate the device according to its intended function. For example, turn a smart light switch on and then off, or operate a smart plug with a lamp plugged in.

(2) Set the device to its lowest power state, then close all apps and web interfaces.

(3) Wait five minutes, while taking appropriate measures to allow the device to enter into and remain in standby mode for the duration of the test, e.g.

- No additional device-user interactions,
- Ensure occupancy sensing devices do not detect occupancy,
- Ensure apps and-or web remote interfaces remain closed.
- Separately measure and record average energy consumption over a five-minute period.

(4) Check measurement stability in accordance with IEC 62301, Edition 2.0 2011-01, section 5.3.2.

(5) If stability criteria are not satisfied, repeat the test, starting from step 2. b, with the test period extended in five-minute increments (i.e. 10m, 15m, 20m…) as necessary to establish requisite measurement stability.

(6) Once stable, repeat the test over two additional test periods, starting from step 2. b.

(7) Record energy consumption as the average over the second and third test periods.

F) Configuration and testing of hub for network idle energy consumption:

a) Follow included instructions to connect all required devices for SHEMS to the hub;

b) The following procedure shall be used for measuring the idle power:

(1) Reset the power meter (if necessary).

(2) Begin recording elapsed time.

(3) After 5 minutes have elapsed, set the meter to begin accumulating true power values at a rate of greater than or equal to 1 Hz (1 reading per second).

(4) Accumulate power values for 5 minutes and record the average (arithmetic mean) value observed during the 5-minute period.

(5) Record measurements in the test report.

6 EFFECTIVE DATE

The ENERGY STAR SHEMS Version 1.0 specification is effective on August 29, 2019. To certify for ENERGY STAR, a SHEMS package shall meet the ENERGY STAR specification in effect on the date it is offered to consumers.

7 CONSIDERATIONS FOR FUTURE REVISIONS

EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that the ENERGY STAR certification is not automatically granted for the life of a SHEMS package.

Topics that may be examined in ongoing work and/or in future revisions are identified below.

A) EPA intends to use field data and feedback from service providers and other stakeholders to develop a performance level, to enable a more stringent performance requirement and delivered energy savings.

B) EPA will continue to monitor technology development and consider reduction of device standby and idle power to better reflect best practices.

C) If occupancy detection methodology or any other key factors indicates substantial variance among certified packages, EPA may consider including requirements to ensure ENERGY STAR SHEMS packages effectively use occupancy detection methods that are proven to deliver more energy savings.

D) EPA will continue to monitor the development of open communications standards for passing information between devices or the cloud that are relevant to energy performance. When opportunities arise, EPA will encourage their use through requirements in future revisions.

E) EPA will monitor the market for helpful specific device control strategies or algorithms to reference, e.g. to support time of use pricing models.

F) EPA will explore the services of distributing Demand Response signals (including prices) and of collecting energy reporting data as these are also key to reaching our energy, cost, and climate goals. Future specifications may have additional capability requirements for these services. Energy Reporting is the principle that all (communicating) devices should keep track of their own energy use (via measurement or estimation) and be able to report that data to the local network. Specifically, part of the future vision this specification builds towards includes open standards for DR communications. Unlike for other capabilities, such standards exist for DR communications, and EPA anticipates a future version will require their use.

G) EPA will assess if other services or devices are of sufficient relevance to our energy goals to also bring into consideration for this specification.

H) EPA is aware of several specific standards that it intends to consider referencing in the specification. IEEE 2030.5 specifies communicating standards for Distributed Energy Resources (DERs) and would be relevant should EPA address connected DERs such as connected inverters more explicitly in future specifications. Home Performance eXtensible Markup Language (HPXML) is a data interchange standard for home performance, including information about the physical structure and the appliances and systems in the structure, including such items as the number of ENERGY STAR certified light fixtures. Its intent is to make home energy raters' jobs easier, by facilitating entry of such information into disparate modeling and tracking systems. In addition, it can be used to feed information to realty databases. There are several ways that SHEMS service providers might interact with HPXML. EPA believes they bear investigation and intends to explore this after Version 1.0 is complete. For more information on HPXML, see http://www.hpxmlonline.com/overview/.

I) Since most systems and devices popular in operation today rely on Wi-Fi connection and cloud integration for basic functionality, EPA seeks solutions to maintain limited functions which have health and safety impacts when connection is lost and easily recover connectivity among devices when it is re-established.

J) EPA is interested in standardizing the frequency and accuracy with which device-level energy data is reported to SHEMS and is further interested in identifying and encouraging best practices for representing this data to users.