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

Draft 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.

Note: EPA has added the requirement above to signal to partners its intent to engage with them periodically to work towards the next version of the specification and gather feedback.

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. While flexibility is preserved in terms of the elements an individual customer opts to purchase, partner will not pro-actively offer and market similar packages that fall short of the ENERGY STAR specification. The ENERGY STAR certified SHEMS package must be marketed distinctly from other packages such as security, entertainment, or wellness.

Note: Stakeholders requested that EPA clarify this commitment, citing examples of related packages that are currently on the market.

The intent behind this partner commitment is to ask service providers that opt to partner with the ENERGY STAR program and leverage the ENERGY STAR label for SHEMS to prioritize the ENERGY STAR offering over similar non-conforming offerings. The approach EPA has taken with the ENERGY STAR SHEMS specification allows absolute flexibility in terms of which elements of the package the customer opts to purchase or not, but we are asking ENERGY STAR partners not to pro-actively offer and market competing packages that fall short of the ENERGY STAR specification (e.g. a package with an ENERGY STAR thermostat and lighting or a smart plug but not both). Given the care that was taken to limit the prescribed elements of the specification, we anticipate that service providers interested in participating in the program that have existing SHEMS offerings will simply adapt them to add any missing device (i.e. there is no restriction on the range of additional devices that may be included). We believe this approach is reasonable as an expectation of our partnership as it avoids undermining the objectives of the ENERGY STAR SHEMS specification while preserving consumer choice.

EPA has clarified the commitment language consistent with this explanation. We recognize not every scenario can be anticipated and encourage partners to consult with EPA on a case by case basis as questions arise.

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**
Final Draft Version 1.0

7 This document specifies the eligibility requirements for the **Final Draft Version 1.0** ENERGY STAR
8 Smart Home Energy Management Systems (SHEMS) program. SHEMS packages shall meet all of the
9 identified criteria to earn the ENERGY STAR.

1 INTRODUCTION

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

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

23
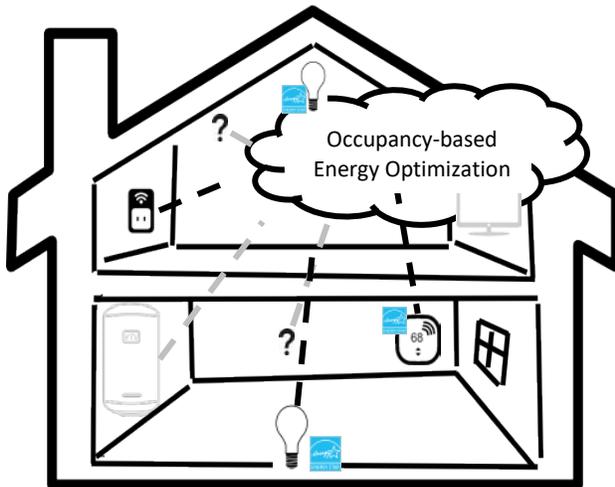
Figure 1: Simple illustration of the basic elements of an ENERGY STAR Smart Home Energy Management System Package

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.

24

2 DEFINITIONS

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

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

35   **Note:** EPA has made minor clarifications to the section above in response to stakeholder requests for
36   clarity regarding the separate marketing and sale of devices in the SHEMS package. In addition, section
37   1.1 7) of the SHEMS Partner Commitments is more instructive on this matter.

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

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

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

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

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

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

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

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

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

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

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

73   f) Smart Power Strip: A multi outlet device (similar to a traditional power strip 120V or 240V) placed
74   between a household power outlet and more than one device's power plugs. The smart power
75   strip's multiple outlets can be controlled individually or in a group by a wireless remote or app with
76   external communication using Wi-Fi, Bluetooth, or other wireless communication protocols. Smart

77			power strips incorporate either automated energy savings based on user interaction, or the ability
78			to set timed events, or other trigger technologies such as Geo Fencing or IFTTT. Smart power
79			strips included in ENERGY STAR SHEMS packages must have the ability to monitor and report
80			energy use data from each outlet or the group of outlets per section 4.3B).

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

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

92 i) ENERGY STAR Certified Light Meeting Connected Criteria (Smart Light): A lamp, luminaire, or
93 retrofit kit certified to the latest ENERGY STAR specification as meeting the optional connected
94 criteria.

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

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

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

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

112 G) Automated Actions:

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

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

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

127   to take the action.

128 H) <u>Demand Response (DR)</u>: Changes in electric usage by demand-side resources from their normal
129   consumption patterns in response to changes in the price of electricity over time, or to event signals
130   designed to induce lower electricity demand at times of high wholesale market prices or when system
131   reliability is jeopardized[1].

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

135 J) <u>Interface Specification</u>: A document or collection of documents that contains detailed technical
136   information to facilitate access to relevant data and product capabilities over a communications
137   interface

138 K) <u>States or modes</u>:

139   a) <u>Idle state</u>: A state which the device enters automatically when the device:

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

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

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

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

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

151   • included in the Smart Electric Power Alliance Catalog of Standards,[3] and/or

152   • included in the NIST Smart Grid Framework Tables 4.1 and 4.2, and/or

153   • adopted by the American National Standards Institute (ANSI) or another well-established
154   international standards organization such as the International Organization for
155   Standardization (ISO), International Electrotechnical Commission (IEC), International
156   Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE)
157   or Internet Engineering Task Force (IETF).

158 **Note:** In response to stakeholder suggestions, EPA has made minor revisions to the definitions of
159 Transient Occupancy Device, Home Energy Sub Metering System, and Time of Use (TOU) Pricing. Per
160 stakeholder request, the correction to the definition of Home Energy Sub Metering System now includes
161 non-invasive disaggregation devices.

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[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/

162 EPA has also proposed two new definitions. A definition of compatible is included in order to provide
163 additional clarity about the capabilities service providers are expected to deliver in order to include
164 encouraged devices in the ENERGY STAR listing for the certified SHEMS package. The definition of
165 SHEMS-specific hub is included in order to provide clarity regarding the devices for which standby power
166 must be measured and reported per section 4.3B)b).

167 **3 SCOPE**

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

172 B) <u>Excluded Products</u>: SHEMS that are unable to collect the required data for the Method to Determine
173   Field Performance.

174 C) <u>Diagrams</u>

175   **Figure 2: Illustration of SHEMS Package**

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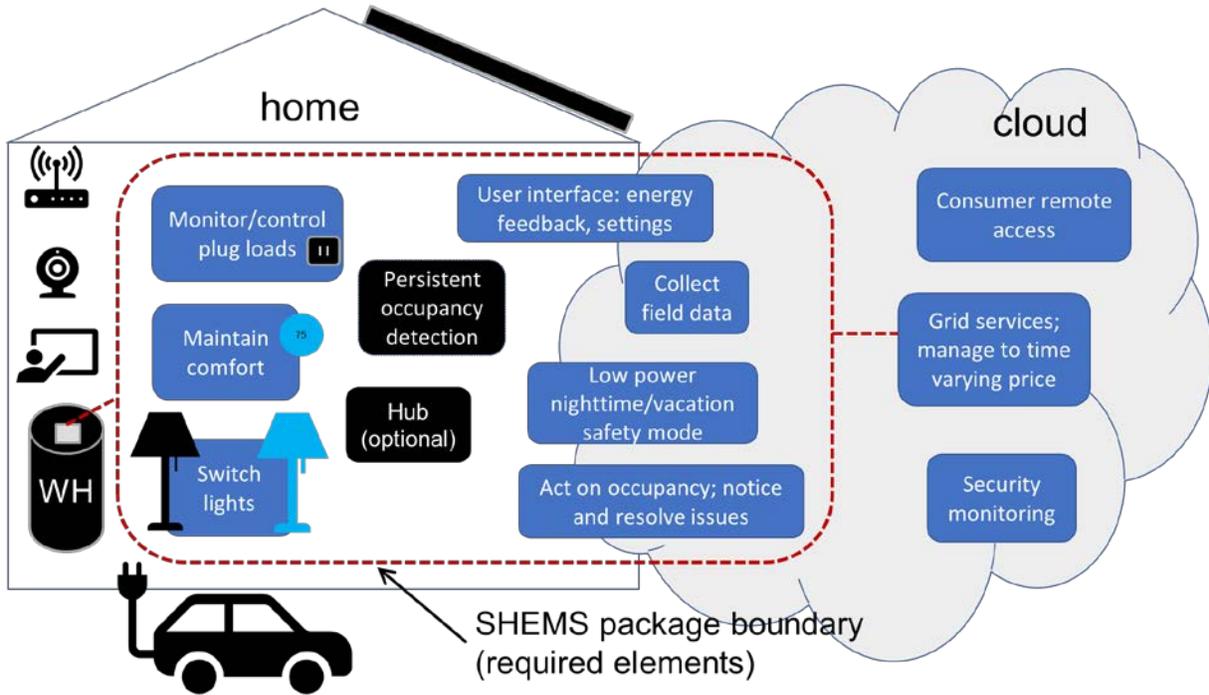

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182 **Note:** EPA has made minor edits to the graphic above to clarify that supporting water heater control and
183 managing to time varying utility prices are required capabilities but the devices are not a part of the
184 minimum package and are not expected to be used in all installations.

185

186   **Figure 3: Illustration of installations of various packages in a platform**
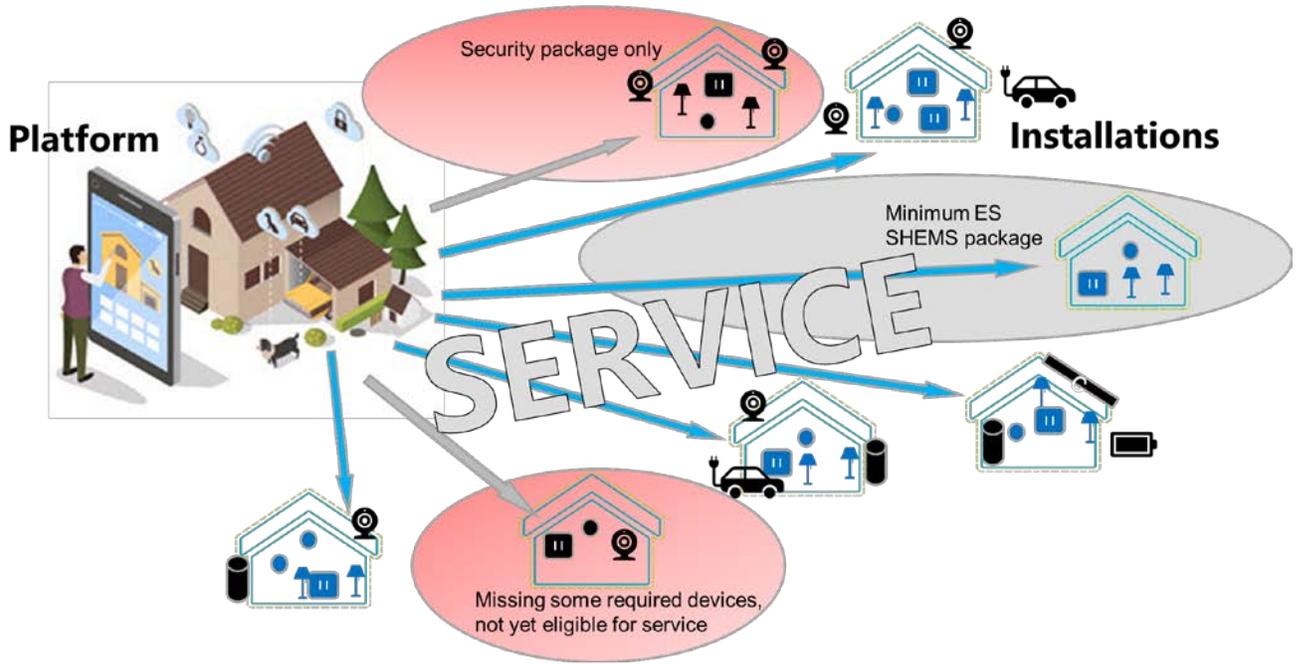
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4 ELIGIBILITY CRITERIA

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

198   **4.1 Required Base Services:** The SHEMS shall perform the following services:

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

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

202   a) By including persistent occupancy detection. This may be provided by:

203   • at least one persistent device with constant wired power (or that does not typically rely on
204   batteries for power, e.g. energy harvesting); or

205   • at least two solely battery-powered persistent devices.

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

209   b)   Service providers shall encourage all installations to locate a persistent occupancy device in a
210   high traffic area of the home.

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211 **Note:** In response to a stakeholder recommendation, EPA is requiring service providers to recommend to
212 their customers that persistent occupancy devices be installed in high-traffic areas of the home for best
213 results.

214 In response to stakeholder questions, EPA has also clarified the requirements for persistent occupancy
215 devices in order to include devices using energy harvesting, which may not access constant wired power
216 but do not typically rely on batteries as the sole power source. EPA also updated the formatting to
217 improve readability.

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218   c)   detect and communicate occupancy to the SHEMS package;

219   d)   synthesize occupancy information for the installation; and

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

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

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

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

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

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234 **Note:** EPA has made a minor revision above to clarify that machine learning is not required for
235 implementing control algorithms to automatically modify device operation.

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

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243 **Note:** In response to stakeholder requests for clarification, EPA has slightly modified the requirement
244 above to clarify that the SHEMS user interface is expected to provide access to energy consumption data
245 for all devices reporting energy or power to the SHEMS.

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

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

250 G) Provide a vacation or nighttime safety mode to automate lighting load to operate one or multiple lights
251   minimally while away, using no more than 0.03 kWh per day while the feature is activated.

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

254 **Note:** EPA has clarified that the service shall be capable of controlling (as well as recognizing and
255 identifying by type) the required and encouraged devices certified in the package.

256 **4.2 Additional Required Platform Capabilities**

257 A) Ability to connect to and control at least one water heater controller or connected water heater which
258 is currently available on the market.

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

265 **Note:** EPA has included the sentence above encouraging partners to be open to supporting development
266 of services to support load building functionality and advanced variable rate structures other than TOU
267 pricing in response to a stakeholder comment suggesting that EPA indicate an intention to move toward
268 such capabilities as they develop in the market.

269 **4.3 Connected Device Requirements**

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

273 a) At least one ENERGY STAR certified smart thermostat;

274 b) At least two lighting load control devices, consisting of:

275 • Two ENERGY STAR certified smart lights; or
276 • One ENERGY STAR certified smart light and one smart light switch capable of
277 measuring lighting load.

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

279 • One smart power strip;
280 • One or more smart plugs; or
281 • Home energy sub metering system.

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

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

286 a) Lighting Load and Plug Load Management Devices: Smart light switches, smart plugs, smart
287 power strips, or sub metering devices included in a SHEMS package shall have the ability to
288 communicate energy consumption of their respective loads to the SHEMS, e.g. through
289 compliance with CTA-2047[4] or other means as applicable.

290 **Note:** EPA has added a reference to CTA-2047 in the item above in order to encourage best practices
291 and standardized communication.

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

292   b) <u>Idle and Standby Power Requirements:</u>

293

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[5]	Network connected idle power shall be reported	Instructions in section 5F).

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

299   • ENERGY STAR certified connected thermostat: ≤ 3.0 watts average standby power.[6]

300   • ENERGY STAR certified lamp meeting connected criteria: ≤ 0.5 watts standby power.

301   • ENERGY STAR certified luminaire, including ventilating fans with light kits: ≤ 0.5 watts
302   standby power for luminaires meeting connected criteria; ≤ 1.0 watts standby power for
303   luminaires meeting connected criteria and having energy saving features such as integral
304   motion sensors or occupancy sensors. Power supplies for multiple luminaires may draw
305   up to 1.5 watts in standby mode.

306   • ENERGY STAR certified ceiling fan light kit: reported separately in the list of certified
307   products.

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

312   • Connected water heater controller or ENERGY STAR Certified Connected Water Heater.
313   • *ENERGY STAR certified EV Supply Equipment
314   • Automated window attachments certified by the Attachments Energy Rating Council
315   (AERC) for Energy Performance (EP) – Automation at aercenergyrating.org
316   • *ENERGY STAR certified room air conditioner
317   • *ENERGY STAR certified refrigerators
318   • *ENERGY STAR certified freezers
319   • *ENERGY STAR certified clothes washers
320   • *ENERGY STAR certified clothes dryers
321   • *Additional ENERGY STAR certified light bulbs and fixtures
322   • *ENERGY STAR certified pool pumps
323   • *Other (as developed) ENERGY STAR certified products
324   • Battery storage

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[5] 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.

[6] 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.

| 325 | • Solar inverters |
| 326 | |

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

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

330 **4.4 Grid Service Criteria**

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

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

339 C) <u>Capabilities Reporting</u>:

340   a) List DR protocols supported by the SHEMS.

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

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

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

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

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

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

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

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

353   g) Whether any device in the SHEMS complies with the 2016 California Energy Commission Title
354   24, Part 6 Joint Appendix 5.

355 **4.5 Field Performance:**

356 To maintain certification and facilitate evaluation, service providers shall demonstrate SHEMS
357 performance in the field by reporting aggregated statistical data every six months to the ENERGY STAR
358 program according to the ENERGY STAR SHEMS Method to Determine Field Performance.
359

360 The platform must be capable of collecting certain data from each installation. This includes but may not
361 be limited to:
362 • Each installation shall have a unique ID independent of its evolution over time;
363 • Start and end date of service;
364 • Information about devices attached to the platform, including the total number, how many lighting
365   and thermostats are ENERGY STAR certified, and the number of smart outlets connected;
366 • Whether the requirements for persistent occupancy devices in section 4.1B) continue to be met;
367 • The number of away hours each week of each trigger type named in section 4.1C);

368 *Note:* Field data will be submitted to an EPA contractor. EPA will only have access to anonymized data,
369 will only share aggregated and anonymized general information publicly, and will refrain from sharing

370 non-anonymized data publicly without the partner's explicit agreement. Further, EPA will neither collect
371 nor share any customer-specific data.

372 **Note:** In response to stakeholder concerns, EPA has clarified that it will not share non-anonymized data
373 publicly without the partner's explicit agreement.

374 EPA has also added an item indicating that the platform must be capable of identifying whether a given
375 installation meets the requirements for persistent occupancy devices to determine if that installation
376 should be included in the population for analysis identified in the Method to Determine Field Performance.

377 5 TEST REQUIREMENTS:

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

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

383 C) Significant Digits and Rounding:
384   a) All calculations shall be carried out with directly measured (unrounded) values.

385   b) Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
386   website shall be rounded to the nearest significant digit as expressed in the corresponding
387   specification limit.

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

389 **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

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

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

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

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

| 397 | | (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. |

(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.

Note: EPA has included a tentative effective date above. Once the specification is finalized, it will take a few weeks to set up the infrastructure to certify packages, for instance training and recognizing Certification Bodies (CBs). At that point, SHEMS service providers will be able to submit their packages for certification.

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

436   note that the ENERGY STAR certification is not automatically granted for the life of a SHEMS package.

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

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

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

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

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

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

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

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

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

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

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

480   **Note:** EPA received a request to require idle state testing instead of standby. EPA is concerned about
481   potential variability in test results among devices which may have several different idle states and has not
482   included such a requirement in this version of the specification. However, EPA has included an intent to
483   monitor idle power in addition to standby power in considering future revisions.

484   EPA also made minor edits to the language used in item I) per stakeholder feedback.