



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

## Eligibility Criteria Draft Version 1.1

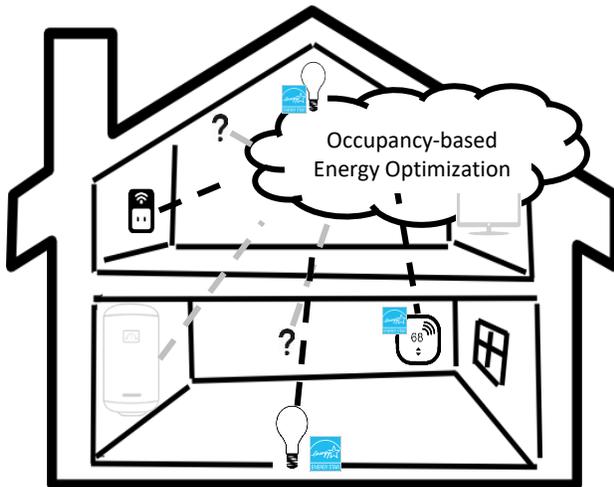
7 This document specifies the eligibility requirements for the **Version 1.1** ENERGY STAR Smart Home  
8 Energy Management Systems (SHEMS) program. SHEMS packages shall meet all of the identified  
9 criteria to earn the ENERGY STAR.

### 10 **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

### 25 **2 DEFINITIONS**

26 A) Smart Home Energy Management System (SHEMS) Package: 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 a) Service: A combination of software, algorithms, and user interfaces that is useful to the building,  
36 its occupants, and other parties. A SHEMS service refers specifically to the service offered as  
37 part of a SHEMS package which provides for occupancy-based energy optimization strategies.
- 38 b) Platform: A service offering encompassing multiple packages intended to serve consumer's  
39 interests such as security, health, safety etc. For instance, Company X offers a platform through  
40 which a consumer could select a variety of packages.
- 41 c) Installation: An individual instance of a platform consisting of one or more packages as used in a  
42 single dwelling.
- 43 d) Smart Home Service Provider: The company that owns the brand which consumers see when  
44 they interact with their SHEMS package and is able to provide package data and analysis of field  
45 data to EPA for the ENERGY STAR program.

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

- 47 a) Sensor: A device that detects or measures a physical property and records, indicates,  
48 communicates, or otherwise responds to it. Sensors may be embedded in other devices.
- 49 b) Hub: A dedicated device which provides network connectivity, protocol translation, and, in some  
50 cases, additional instruction between products included in a SHEMS package. For instance, an  
51 alarm panel or gateway may serve as a hub. This can be anything that would not reasonably be  
52 expected to be in a home other than to support the SHEMS and possibly other functions of a  
53 platform. Thus, a Wi-Fi router or router/modem combination whose primary function is to provide  
54 internet service to the dwelling would not be considered a hub. Smart home systems do not  
55 necessarily need to include a hub. Hubs can be wired, wireless, or a combination.
- 56 (1) SHEMS-specific hub: A hub which is necessary for the operation of the SHEMS.
- 57 c) Persistent Occupancy Device: A device that detects room, space or dwelling level occupancy and  
58 is always present in the home. This could be a sensor integrated into another product or a  
59 standalone sensor (e.g. a passive infrared sensor) or mechanism that can detect and  
60 communicate dwelling or space occupancy (e.g. alarm control pad). Door sensors which only  
61 report when a door opens and closes do not qualify as persistent occupancy devices.
- 62 d) Transient Occupancy Device: A device that detects room, space or dwelling level occupancy that  
63 is not always present in home. This could be a sensor integrated into a portable product (such as  
64 a smart phone using Geo Fencing) or a standalone device like a garage door remote.
- 65 e) Smart Plug: A household voltage (120V or 240V) wall outlet or device which is placed between a  
66 standard outlet and a device's power plug or incorporated into the outlet itself and can be  
67 controlled by a wireless remote or app using Wi-Fi, Bluetooth, or other wireless communications  
68 protocols. Most advanced smart plugs offer the ability for preset timed events, surge protection,  
69 and current draw feedback.
- 70 f) Smart Power Strip: A multi outlet device (similar to a traditional power strip 120V or 240V) placed  
71 between a household power outlet and more than one device's power plugs. The smart power  
72 strip's multiple outlets can be controlled individually or in a group by a wireless remote or app with  
73 external communication using Wi-Fi, Bluetooth, or other wireless communication protocols. Smart  
74 power strips incorporate either automated energy savings based on user interaction, or the ability  
75 to set timed events, or other trigger technologies such as Geo Fencing or IFTTT. Smart power  
76 strips included in ENERGY STAR SHEMS packages must have the ability to monitor and report  
77 energy use data from each outlet or the group of outlets per section 4.3B).

- 78 g) Home Energy Sub Metering System: A system that can measure or estimate energy usage at the  
79 circuit breaker panel, offering the ability to monitor energy usage for individual circuits and/or end  
80 uses, including by disaggregation, to account for their actual energy usage. This may include  
81 smart fuse boxes and systems that use current transducer clamps or similar means to non-  
82 invasively measure power in household circuits.
- 83 h) Connected Thermostat (CT): A device that controls heating, ventilation, and air-conditioning  
84 (HVAC) equipment to regulate the temperature of the room or space in which it is installed and  
85 has the ability to communicate with sources external to the HVAC system. For connection, the CT  
86 device may rely on a Wi-Fi home area network and an internet connection that is independent of  
87 and not part of the CT Device. An ENERGY STAR Certified Connected Thermostat meets the  
88 requirements in the [current Connected Thermostats specification](#).
- 89 i) ENERGY STAR Certified Light Meeting Connected Criteria (Smart Lighting Product): A [lamp](#),  
90 [luminaire](#), [retrofit kit](#), or other lighting product certified to the latest applicable ENERGY STAR  
91 specification as meeting the optional connected criteria.

92 **Note:** EPA is proposing to update the definition of ENERGY STAR certified smart lighting product to  
93 recognize that connected criteria for additional lighting product categories may be developed in the future  
94 and would be appropriate for inclusion in an ENERGY STAR SHEMS.

- 95 j) Lighting Load Control Device: A device with the dedicated purpose of controlling lighting based  
96 on user interaction or sensor input, e.g. smart light switch, motion sensor, remote.
- 97 C) Compatible: The SHEMS is compatible with a certain device when it is able to provide all of the  
98 Required Base Services in relation to that device, including automatic recognition of the device once  
99 connected to the network, control, and, if applicable, energy data reporting (for devices reporting  
100 power to the SHEMS). These services must all be available to the user within the SHEMS user  
101 interface without requiring the user to enable with a third-party service such as IFTTT.
- 102 D) Plug Load: Plug loads are a category of equipment that is usually plugged into an outlet. This term  
103 generally excludes loads that are attributed to major end uses (HVAC, lighting, water heating, etc.)
- 104 E) Occupancy-Based Optimization: Using information on occupancy to serve consumers' desires with  
105 the least energy possible, for instance by reducing idle power or reducing the amount of time energy-  
106 using devices are on. Optimization algorithms may also use predictive information about when  
107 occupancy is likely to change, based on machine learning.
- 108 F) Occupancy Sensing: A method (or methods) to detect whether a space has a person and/or animal in  
109 it, and potentially how many. Occupancy may be sensed on a room by room basis or for an entire  
110 dwelling, and may be sensed using dedicated sensors, sensors in a product with a different primary  
111 purpose (thermostat, light fixture), system-based techniques such as geofencing or the arming of an  
112 alarm panel, or a combination of these techniques. It may include information about how long the  
113 home has been or will be unoccupied which may affect optimization.
- 114 G) Automated Actions:
- 115 a) Explicitly generated (by a hard trigger): Actions for devices initiated by a user through an  
116 intentional input, e.g. setting up a schedule (home, away, vacation, sleep), rule, or action through  
117 an app e.g. setting up geofencing to control devices, commanding a voice assistant, arming a  
118 security system, or actively pressing a button on a device in home. (For the purpose of this  
119 specification this excludes action on a suggested event).
- 120 b) Implicitly generated (by a soft trigger): Actions for devices initiated by the service based on  
121 occupancy and possibly other information, without explicit user input. This can be a machine  
122 learning scenario where a service detects new patterns and adjusts a users' schedule or simply  
123 that the service detects that the home is vacant and triggers energy saving actions on behalf of  
124 the users. This can also include a notification to the user that they can override but if ignored the  
125 service would carry out the action, unlike a suggested action where a user must grant permission  
126 for the service to take the action.

- 127 c) Suggested (by service-suggested trigger): Actions for devices that are suggested by the service  
128 based on occupancy and other information, where the service requires a user to confirm in order  
129 to take the action.
- 130 H) Demand Response (DR): Changes in electric usage by demand-side resources from their normal  
131 consumption patterns in response to changes in the price of electricity over time, or to event signals  
132 designed to induce lower electricity demand at times of high wholesale market prices or when system  
133 reliability is jeopardized<sup>1</sup>.
- 134 I) Time of Use Pricing (TOU): as identified by the Rocky Mountain Institute,<sup>2</sup> TOU refers to a time-based  
135 electricity rate program that differentiates prices by time of day, where both the prices and time  
136 periods are predetermined and constant.
- 137 J) Interface Specification: A document or collection of documents that contains detailed technical  
138 information to facilitate access to relevant data and product capabilities over a communications  
139 interface.
- 140 K) States or modes:
- 141 a) Idle state: A state which the device enters automatically when the device:
- 142 (1) is installed and interconnected in accordance with provided instructions,  
143 (2) experiences no direct or remote user interaction (e.g., smart phone app, web interface,  
144 occupancy detection), and  
145 (3) sufficient time has elapsed to allow the device to enter a low power state, as applicable. For  
146 example, the screen has dimmed or turned off automatically.
- 147 b) Standby State: The lowest power state which cannot be switched off (influenced) by the user and  
148 that may persist for an indefinite time when the device is connected to the main electricity supply  
149 and used in accordance with the manufacturer's instructions. The device may require user  
150 interaction, such as toggling a power button, in order to enter a standby state.
- 151 L) Open Standards: Communication with entities outside the SHEMS that use, for all communication  
152 layers, standards including but not limited to those:
- 153 • included in the Smart Electric Power Alliance Catalog of Standards,<sup>3</sup> and/or  
154 • included in the NIST Smart Grid Framework Tables 4.1 and 4.2, and/or  
155 • adopted by the American National Standards Institute (ANSI) or another well-established  
156 international standards organization such as the International Organization for  
157 Standardization (ISO), International Electrotechnical Commission (IEC), International  
158 Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE) or  
159 Internet Engineering Task Force (IETF).

### 160 3 SCOPE

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

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<sup>1</sup> Modified slightly from Federal Energy Regulatory Commission, <https://www.ferc.gov/industries/electric/industryact/demand-response/dr-potential.asp>

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

<sup>3</sup> <https://sepapower.org/knowledge/catalog-of-standards/catalog-of-standards-complete-list-of-entries/>

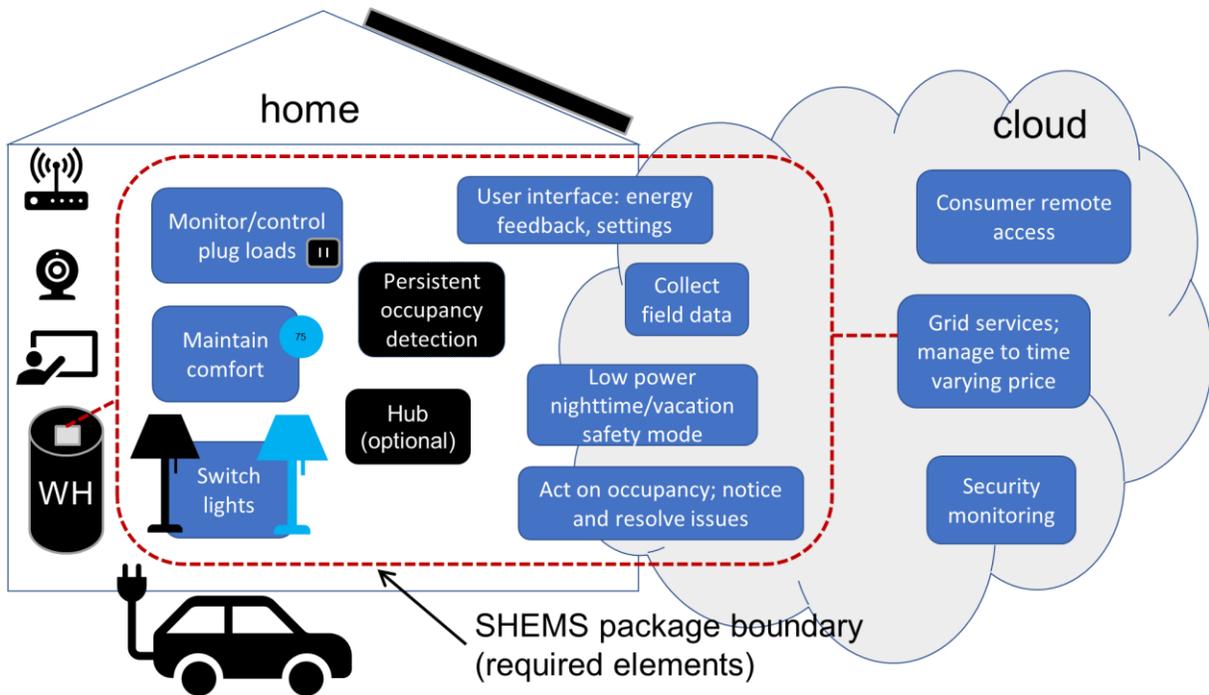
165 B) Excluded Products: SHEMS that are unable to collect the required data for the Method to Determine  
166 Field Performance.

167 C) Diagrams:

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**Figure 2: Illustration of SHEMS Package**

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

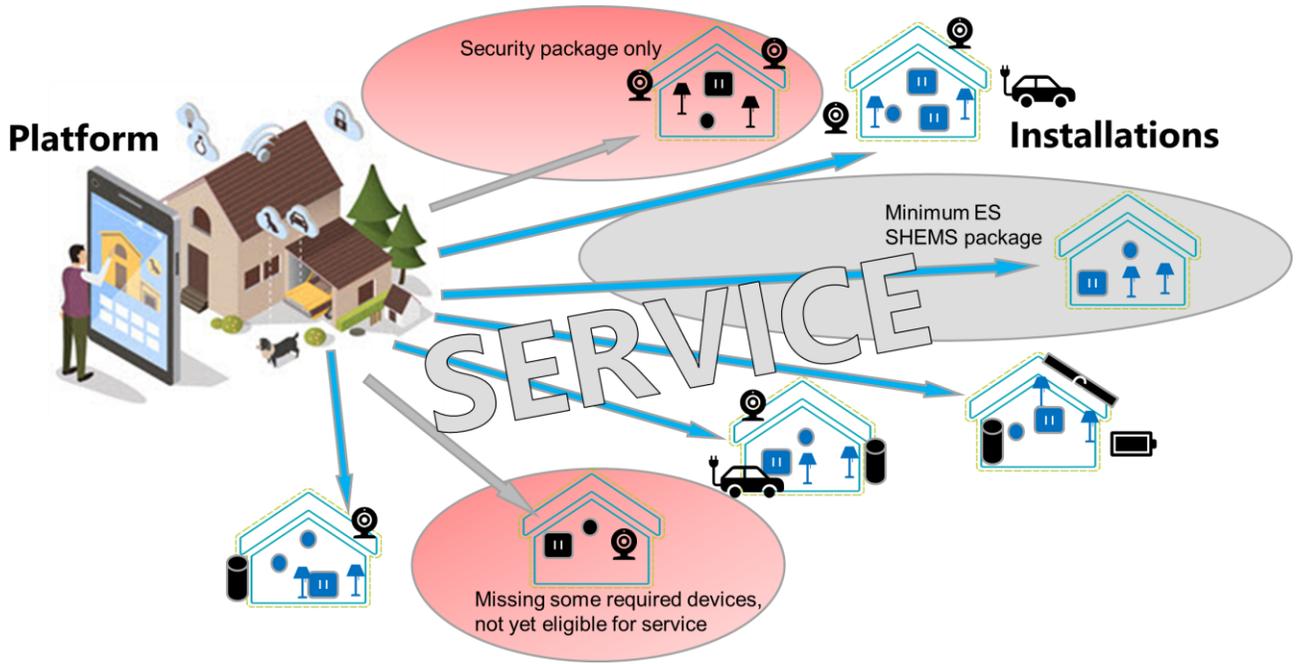


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Figure 3: Illustration of installations of various packages in a platform



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## 4 ELIGIBILITY CRITERIA

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

188 **4.1 Required Base Services:** The SHERMS shall perform the following services:

- 189 A) Provide a remote consumer interface (e.g. application, website, display) that allows end users to  
 190 control all the devices connected to the SHERMS package from outside the dwelling.
- 191 B) Receive and utilize a minimum set of occupancy data, specifically:
- 192 a) include persistent occupancy detection. This may be provided by:
- 193 • at least one persistent device with constant wired power (or that does not typically rely on  
 194 batteries for power, e.g. energy harvesting); or
  - 195 • at least two solely battery-powered persistent devices.

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

- 199 b) encourage all installations to locate a persistent occupancy device in a high traffic area of the  
200 home;
- 201 c) detect and communicate occupancy to the SHEMS package;
- 202 d) synthesize occupancy information for the installation; and
- 203 e) send commands to devices connected to the SHEMS package, including but not limited to:  
204 reduce lighting loads to the levels specified in 4.1(G), turn off any smart power strips or plugs,  
205 and turn off or change modes of other devices connected to the SHEMS.
- 206 C) By default, produce energy-saving device control actions through hard, soft, and suggested triggers,  
207 specifically by (at least one action through each method below):
- 208 a) facilitating user-established rules and schedules (hard trigger). An energy saving default schedule  
209 is a recommended feature;
- 210 b) implementing control algorithms to automatically modify the operation of the devices in the  
211 package to save energy while maintaining positive user experience based on occupancy  
212 information and possibly machine learning of user behavior, i.e. patterns, preferences and user  
213 input (soft trigger); and
- 214 c) identifying and suggesting energy savings events or actions to promote energy savings while  
215 maintaining positive user experience based on occupancy information and possibly machine  
216 learning of user behavior, i.e. patterns, preferences and user input (service-suggested trigger).
- 217 D) Allow the end user to access information relevant to their energy consumption, including the energy  
218 consumption or average power of all devices reporting energy or power to the SHEMS, which the  
219 SHEMS user interface shall be capable of collecting and displaying across time intervals no greater  
220 than one day. Estimated energy use based on device settings is permitted. *Examples include but are  
221 not limited to: real-time energy use data by device, package, platform or dwelling (including meter  
222 data); daily, weekly, monthly or annual energy performance, comparison with previous periods or  
223 similar dwellings, etc.*
- 224 E) Allow users to configure system preferences, provide feedback, and to adjust how responsive the  
225 system is to detected occupancy.
- 226 F) Provide a resolution and user notification process for when occupancy detection is not working  
227 properly; e.g. notifications through email, SMS and or on main access portal until resolved.
- 228 G) Provide a vacation, nighttime safety, leave a light on, nightlight, or similarly identified mode to  
229 automate lighting load to operate one or multiple lights minimally at night or while away, using no  
230 more than 0.03 kWh per day while the feature is activated. This feature must be available to the user  
231 but need not be enabled by default and should not be a part of a default vacation mode if that setting  
232 does not operate lights.
- 233 *Note: service providers may ensure that lighting energy does not exceed 0.03 kWh per day either by  
234 collecting lighting energy consumption data from connected devices or by limiting runtime based on  
235 the rated wattage of a given bulb.*

236 **Note:** EPA is clarifying the vacation lighting mode requirement to ensure that service providers are aware  
237 of the intended flexibility for this requirement. While a feature that operates lighting must be available, it  
238 does not need to be enabled by default and service providers have flexibility in how they identify this  
239 feature. EPA has also added the permanent note above regarding appropriate methods of limiting lighting  
240 load to 0.03 kWh per day.

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

#### 243 4.2 Additional Required Platform Capabilities

- 244 A) Ability to connect to and control at least one water heater controller or ENERGY STAR connected  
245 water heater which is currently available on the market. The connection shall include communicating

246 data sufficient to enable occupancy-based adjustment of water heater operation to the water heater  
247 or water heater controller. Users shall be able to establish a connection through interaction only with  
248 the water heater controller service and the SHEMS service, e.g. without the use of IFTTT.

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

#### 255 4.3 Connected Device Requirements

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

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

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

- 261 • Two ENERGY STAR certified smart lighting products<sup>4</sup>; or
- 262 • One ENERGY STAR certified smart lighting product and one lighting load control device
- 263 capable of measuring lighting load; or
- 264 • Two lighting load control devices capable of measuring lighting load. Service providers
- 265 using this option are strongly encouraged to select lighting load control devices
- 266 compatible with ENERGY STAR certified dimmable lighting.

267 **Note:** Over the past year, EPA has observed that many smart home service providers have a strong  
268 preference for connected light switches. Furthermore, systems including two dimming connected switches  
269 that meet the standby power limit of 0.5 watts will have comparable or lower standby power relative to a  
270 system leveraging connected bulbs, especially for circuits controlling multiple bulbs. Thus, EPA is  
271 proposing to recognize systems relying solely on lighting load control devices, and is encouraging that the  
272 be compatible with ENERGY STAR certified dimmable lighting. This additional flexibility is expected to  
273 broaden the relevance of the ENERGY STAR SHEMS program to service providers and consumers  
274 without compromising the energy performance of a certified system. EPA is seeking feedback on whether  
275 this proposal successfully addresses the lighting related barriers to participating in the SHEMS program.

276 EPA has also added a footnote as a reminder that ENERGY STAR smart lighting products include  
277 luminaires and retrofit kits in addition to lamps.

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 lighting load control devices, smart plugs, smart power strips,  
285 submetering devices, and SHEMS-specific hubs or control panels marketed with the certified SHEMS  
286 package shall comply.

287 a) Lighting Load and Plug Load Management Devices: Lighting load control devices, smart plugs,  
288 smart power strips, or sub metering devices included in a SHEMS package shall have the ability  
289 to communicate energy consumption of their respective loads to the SHEMS, e.g. through

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<sup>4</sup> 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.

290 compliance with CTA-2047<sup>5</sup> or other means as applicable.

291 b) Idle and Standby Power Requirements:

292 **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 <sup>6</sup>	Network connected idle power shall be reported	Instructions in section 5F).

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

- 298 • ENERGY STAR certified [connected thermostat](#): ≤ 3.0 watts average standby power.<sup>7</sup>
- 299 • ENERGY STAR [certified lamp](#) meeting connected criteria: ≤ 0.5 watts standby power.
- 300 • ENERGY STAR [certified luminaire](#), including ventilating fans with light kits: ≤ 0.5 watts  
301 standby power for luminaires meeting connected criteria; ≤ 1.0 watts standby power for  
302 luminaires meeting connected criteria and having energy saving features such as integral  
303 motion sensors or occupancy sensors. Power supplies for multiple luminaires may draw  
304 up to 1.5 watts in standby mode.
- 305 • ENERGY STAR [certified ceiling fan light kit](#): reported separately in the list of certified  
306 products.

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

- 311 • Connected water heater controller or ENERGY STAR Certified Connected Water Heater.
- 312 • \*ENERGY STAR certified EV Supply Equipment
- 313 • Automated window attachments certified by the Attachments Energy Rating Council  
314 (AERC) for Energy Performance (EP) – Automation at [aercenergyrating.org](http://aercenergyrating.org)
- 315 • \*ENERGY STAR certified room air conditioner
- 316 • \*ENERGY STAR certified refrigerators
- 317 • \*ENERGY STAR certified freezers
- 318 • \*ENERGY STAR certified clothes washers
- 319 • \*ENERGY STAR certified clothes dryers
- 320 • \*Additional ENERGY STAR certified light bulbs and fixtures

<sup>5</sup> ANSI/CTA-2047: CE Energy Usage Information. August 2014.

<sup>6</sup> 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.

<sup>7</sup> 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.

- 321 • \*ENERGY STAR certified pool pumps
- 322 • \*Other (as developed) ENERGY STAR certified products
- 323 • Battery storage
- 324 • Solar inverters

325  
326 \*product must meet optional ENERGY STAR connected criteria where applicable.

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

#### 329 4.4 Grid Service Criteria

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

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

338 C) Capabilities Reporting:

339 a) List DR protocols supported by the SHEMS.

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

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

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

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

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

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

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

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

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

#### 354 4.5 Field Performance

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

358  
359 The platform must be capable of collecting certain data from each installation. This includes but may not  
360 be limited to:

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

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

## 371 5 TEST REQUIREMENTS

- 372 A) Assure that the application associated with the package delivers the required service capabilities with  
 373 a representative package containing the required minimum devices;
- 374 B) Software updates: Software and firmware updates may not adversely affect product savings.  
 375 Software or firmware changes that alter the principle that savings rest upon, or which are expected to  
 376 reduce savings, require recertification of the SHEMS.
- 377 C) Significant Digits and Rounding:  
 378 a) All calculations shall be carried out with directly measured (unrounded) values.  
 379 b) Directly measured or calculated values that are submitted for reporting on the ENERGY STAR  
 380 website shall be rounded to the nearest significant digit as expressed in the corresponding  
 381 specification limit.
- 382 D) Test Methods: the following methods shall be used to demonstrate ENERGY STAR certification.

383 **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

- 384 E) Implementation of IEC 62301 for non-ENERGY STAR Device Testing  
 385 *Note: This test is not applicable to devices that are powered solely by batteries or are otherwise not*  
 386 *powered by a direct source.*
- 387 a) Configure and provision the Device’s connected functionality, including enrollment for applicable  
 388 services and updating to latest version of firmware.
- 389 b) Test Conduct – Measure energy consumption at the power input to the Device using the sampling  
 390 method, section 5.3.2 of IEC 62301, Edition 2.0 2011-01.
- 391 (1) Verify ability to control the device over the communication link and operate the device  
 392 according to its intended function. For example, turn a smart light switch on and then off, or  
 393 operate a smart plug with a lamp plugged in.
- 394 (2) Set the device to its lowest power state, then close all apps and web interfaces.

- 395 (3) Wait five minutes, while taking appropriate measures to allow the device to enter into and  
396 remain in standby mode for the duration of the test, e.g.
- 397 • No additional device-user interactions,  
398 • Ensure occupancy sensing devices do not detect occupancy,  
399 • Ensure apps and-or web remote interfaces remain closed.  
400 • Separately measure and record average energy consumption over a five-minute period.
- 401 (4) Check measurement stability in accordance with IEC 62301, Edition 2.0 2011-01, section  
402 5.3.2.
- 403 (5) If stability criteria are not satisfied, repeat the test, starting from step 2. b, with the test period  
404 extended in five-minute increments (i.e. 10m, 15m, 20m...) as necessary to establish  
405 requisite measurement stability.
- 406 (6) Once stable, repeat the test over two additional test periods, starting from step 2. b.
- 407 (7) Record energy consumption as the average over the second and third test periods.
- 408 F) Configuration and testing of hub for network idle energy consumption:  
409 a) Follow included instructions to connect all required devices for SHERMS to the hub;  
410 b) The following procedure shall be used for measuring the idle power:
- 411 (1) Reset the power meter (if necessary).  
412 (2) Begin recording elapsed time.  
413 (3) After 5 minutes have elapsed, set the meter to begin accumulating true power values at a  
414 rate of greater than or equal to 1 Hz (1 reading per second).  
415 (4) Accumulate power values for 5 minutes and record the average (arithmetic mean) value  
416 observed during the 5-minute period.  
417 (5) Record measurements in the test report.

## 418 **6 EFFECTIVE DATE**

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

## 422 **7 CONSIDERATIONS FOR FUTURE REVISIONS**

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

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

- 428 A) EPA intends to use field data and feedback from service providers and other stakeholders to develop  
429 a performance level, to enable a more stringent performance requirement and delivered energy  
430 savings.
- 431 B) EPA will continue to monitor technology development and consider reduction of device standby and  
432 idle power to better reflect best practices.
- 433 C) If occupancy detection methodology or any other key factors indicates substantial variance among  
434 certified packages, EPA may consider including requirements to ensure ENERGY STAR SHERMS

- 435 packages effectively use occupancy detection methods that are proven to deliver more energy  
436 savings.
- 437 D) EPA will continue to monitor the development of open communications standards for passing  
438 information between devices or the cloud that are relevant to energy performance. When  
439 opportunities arise, EPA will encourage their use through requirements in future revisions.
- 440 E) EPA will monitor the market for helpful specific device control strategies or algorithms to reference,  
441 e.g. to support time of use pricing models.
- 442 F) EPA will explore the services of distributing Demand Response signals (including prices) and of  
443 collecting energy reporting data as these are also key to reaching our energy, cost, and climate goals.  
444 Future specifications may have additional capability requirements for these services. Energy  
445 Reporting is the principle that all (communicating) devices should keep track of their own energy use  
446 (via measurement or estimation) and be able to report that data to the local network. Specifically,  
447 part of the future vision this specification builds towards includes open standards for DR  
448 communications. Unlike for other capabilities, such standards exist for DR communications, and EPA  
449 anticipates a future version will require their use.
- 450 G) EPA will assess if other services or devices are of sufficient relevance to our energy goals to also  
451 bring into consideration for this specification.
- 452 H) EPA is aware of several specific standards that it intends to consider referencing in the specification.  
453 IEEE 2030.5 specifies communicating standards for Distributed Energy Resources (DERs) and would  
454 be relevant should EPA address connected DERs such as connected inverters more explicitly in  
455 future specifications. Home Performance eXtensible Markup Language (HPXML) is a data  
456 interchange standard for home performance, including information about the physical structure and  
457 the appliances and systems in the structure, including such items as the number of ENERGY STAR  
458 certified light fixtures. Its intent is to make home energy raters' jobs easier, by facilitating entry of such  
459 information into disparate modeling and tracking systems. In addition, it can be used to feed  
460 information to realty databases. There are several ways that SHERMS service providers might interact  
461 with HPXML. EPA believes they bear investigation and intends to explore this after Version 1.0 is  
462 complete. For more information on HPXML, see <http://www.hpxmlonline.com/overview/>.
- 463 I) Since most systems and devices popular in operation today rely on Wi-Fi connection and cloud  
464 integration for basic functionality, EPA seeks solutions to maintain limited functions which have health  
465 and safety impacts when connection is lost and easily recover connectivity among devices when it is  
466 re-established.
- 467 J) EPA is interested in standardizing the frequency and accuracy with which device-level energy data is  
468 reported to SHERMS and is further interested in identifying and encouraging best practices for  
469 representing this data to users.