ENERGY STAR® Smart Home Energy Management Systems Discussion Guide

Stakeholder Webinar and Discussion
July 11, 2018

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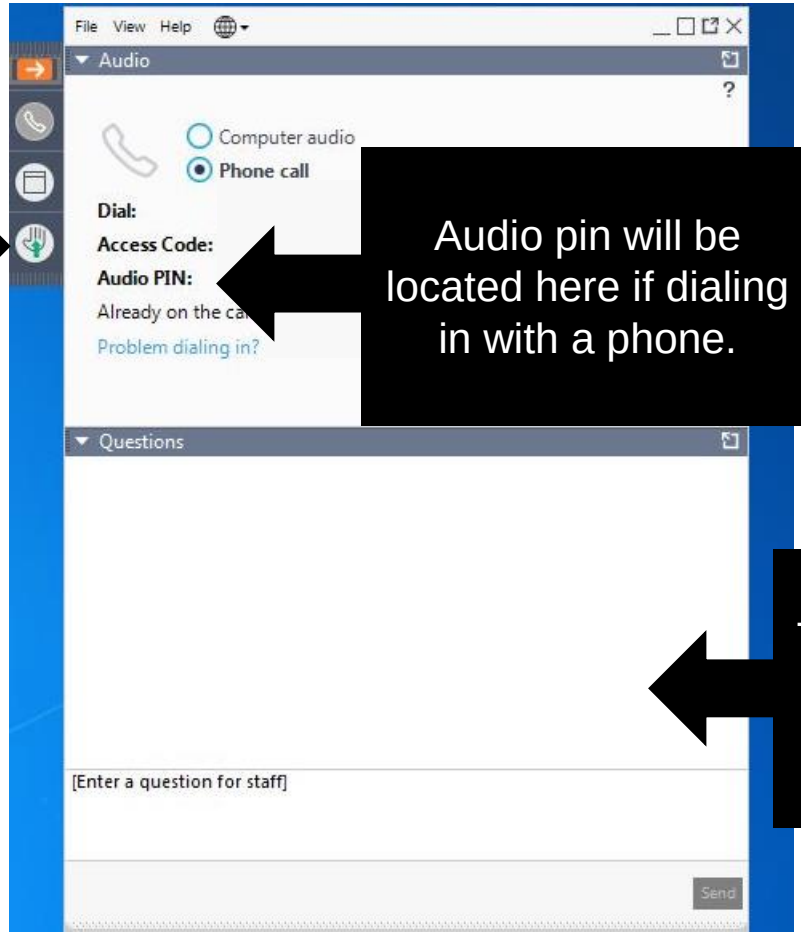

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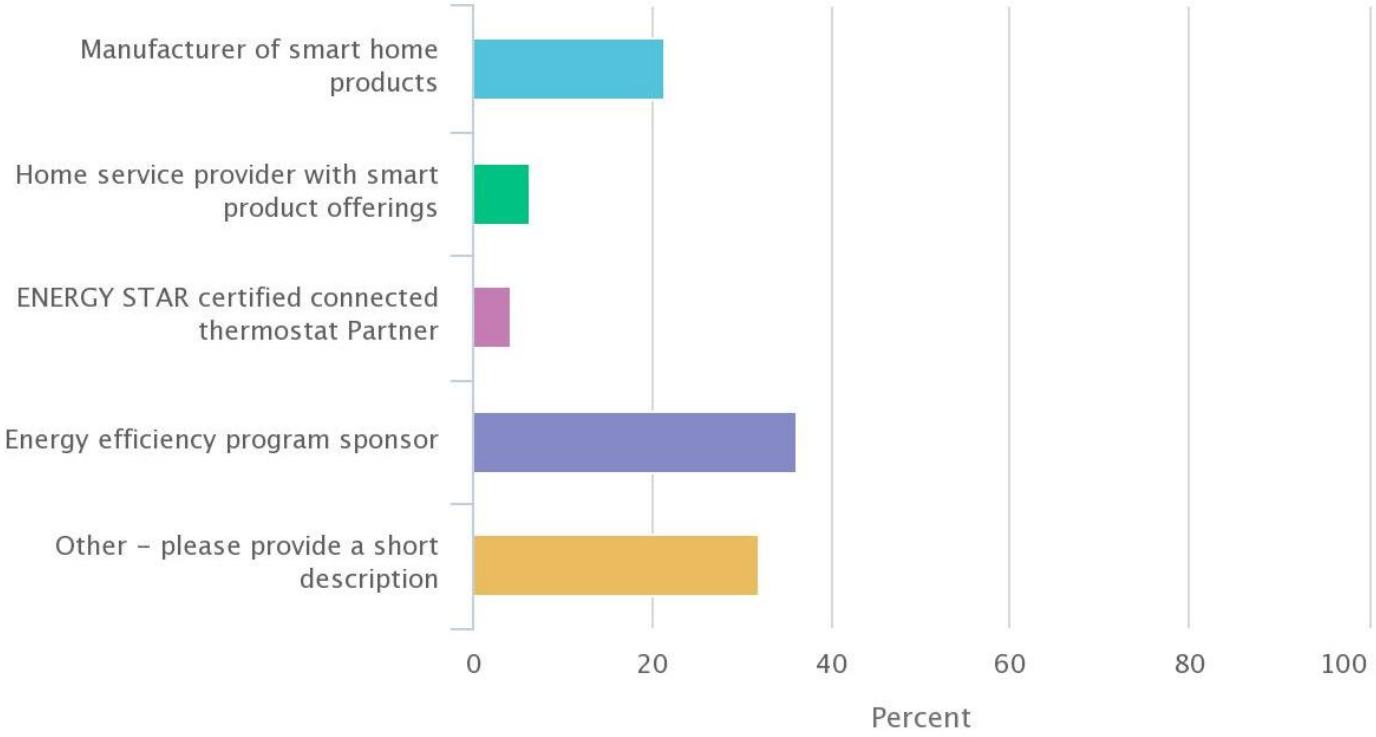
  - Type questions into the Questions section of the webinar panel as well
- These slides and all other materials related to SHEMS will be available at:

www.energystar.gov/SHEMS

Poll Question #1 – Audience Demographics

- How would you most accurately classify your association with smart home energy management systems?
  - Webinar polling results below (single select):



Agenda

- ENERGY STAR program overview
- Connected criteria in ENERGY STAR Specifications
- Why a smart home energy management systems (SHEMS) specification? Why now?
- EPA's concept for SHEMS
  - What is included
  - What would participation mean
  - Discussion/Feedback Requests
- Next Steps

What is ENERGY STAR®?

ENERGY STAR is the simple choice for energy efficiency

For more than 20 years, EPA's ENERGY STAR program has been America's resource for saving energy and protecting the environment.

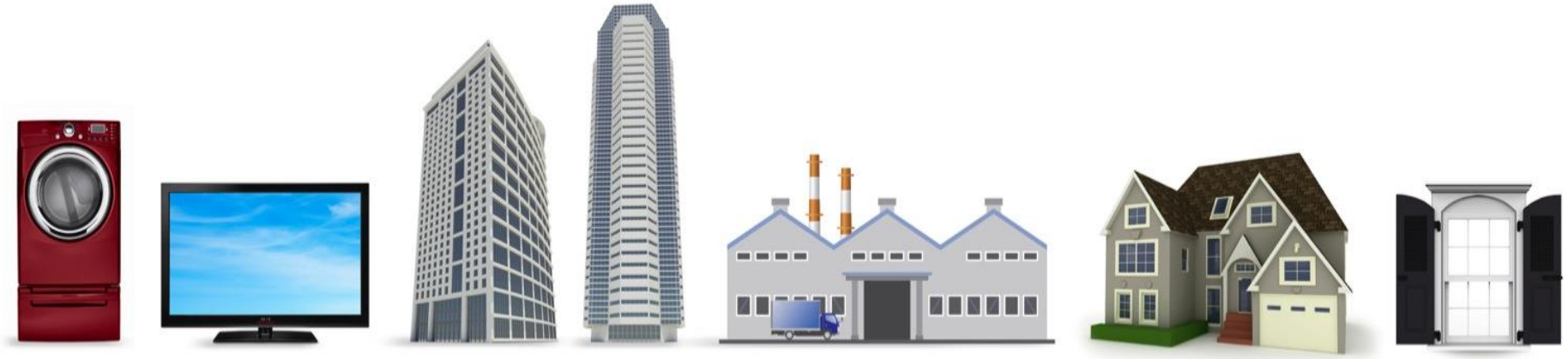
ENERGY STAR certified products:

- Save energy
- Save money
- Save the environment

The ENERGY STAR Brand

EPA's ENERGY STAR identifies the most energy-efficient products, buildings, plants, and new homes – all based on the latest government-backed standards.

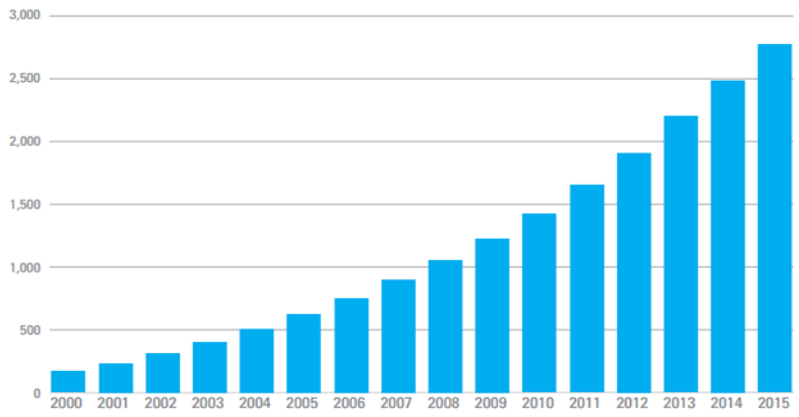
Today, every ENERGY STAR label is verified by a rigorous third-party certification process.



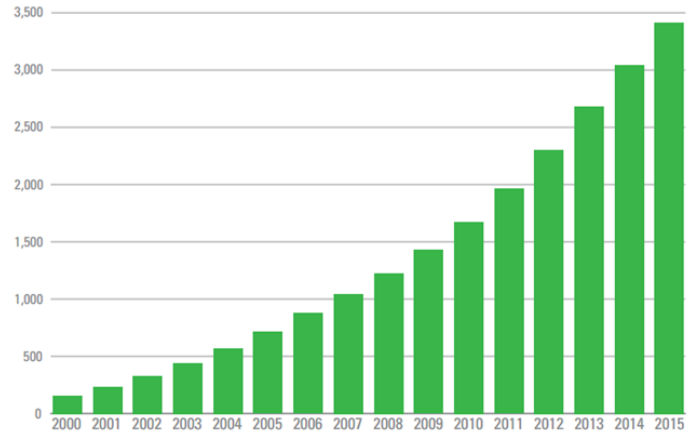
Program Impacts

- 25 years of partnerships
- Vast network of partners (nearly 20,000)
- Large savings over the last 2 decades:
  - Saved Americans $362 billion on their utility bills
  - Avoided more than 2.5 billion metric tons of greenhouse gas emissions

GHG Emissions Savings

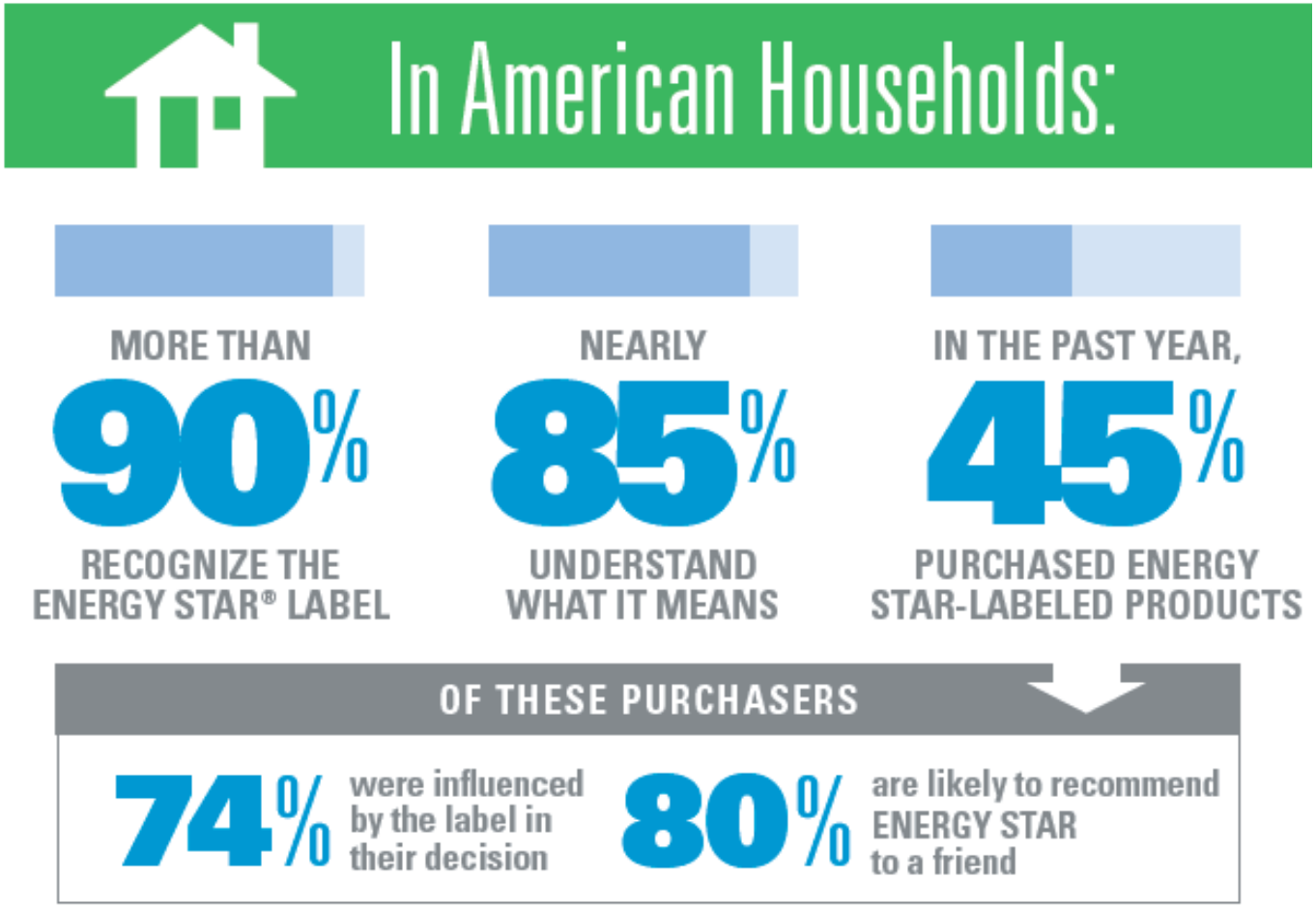


Energy Savings




Every single day,
consumers choose
ENERGY STAR
products more than
800,000 times

Brand Preference and Loyalty



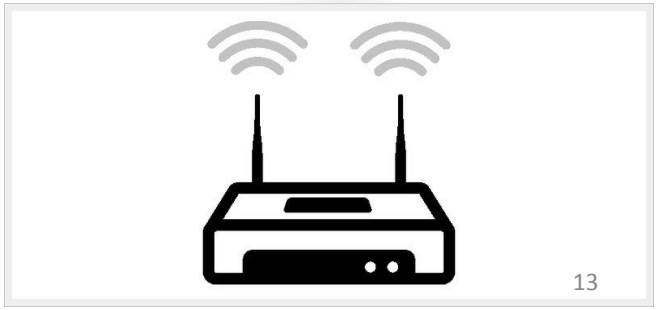
U.S. EPA 2017

ENERGY STAR's Unique Position to Address Connected Functions

- ENERGY STAR optional criteria leverage the national platform that utilities can rely on and consumers look for, bringing together interested partners and stakeholders.
- ENERGY STAR criteria provide consistent definitions and approaches, a consistent set of starter functionality, an emphasis on open standards, test methods for DR functionality.
- ENERGY STAR is a trusted resource that can help consumers find these connected products and identify the benefits they offer.

ENERGY STAR and the Smart Home: Looking Back

- 2011 → present: optional "connected" criteria in product specifications (**11** product types)
  - Interoperability, use of open standards
  - Energy use reporting
  - Demand Response
  - Standby power limits
- Smart Thermostats (not optional) - data reporting to service provider is key to demonstrating savings
- ENERGY STAR specifications for many natively networked products, such as consumer electronics and IT equipment handled differently



ENERGY STAR Connected Criteria

	Connected Thermostats	Refrigerators & Freezers	Clothes Washers	Clothes Dryers	Room A/C	Dish-washers	EVSE	Lighting	Pool Pumps	Ice Makers
Energy Consumption Reporting		✓	✓	✓	✓	✓		✓	✓	✓*
Operational Status Reporting		✓	✓	✓	✓	✓		✓	✓	✓*
Remote Management		✓	✓	✓	✓	✓		✓	✓	✓*
Demand Response	✓	✓	✓	✓	✓	✓	✓		✓	✓
Open Access	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DR override by Consumers	✓	✓	✓	✓	✓	✓	✓		✓	✓
Connected Capability not Optional	✓									
Capabilities or DR Summary	✓						✓			✓

*Products that meet the Smart Grid Interoperability Panel (SGIP) standards are understood to have incorporated energy consumption reporting, operational status reporting and remote management into the foundation of their connectivity.

ENERGY STAR + Connected: The Consumer is Key

- New functionality to enable immediate energy savings and convenience such as:
  - receiving a message that your refrigerator door didn't close;
  - receiving a message there is a performance issue with your clothes washer and enabling a service center to make an initial assessment of the problem remotely and come prepared with necessary parts;
  - being able to turn on the room AC before returning home;
  - learning how much energy you might save from lowering your room AC's setting a few degrees
- Demand Response: Encourage manufacturers to offer products with future-oriented load flexibility while ensuring the consumer is considered (e.g. over-rides allowed)

Why Smart Home Energy Management Systems and Why Now?

- With consumer interest in smart home products booming, now is the time to build in energy savings:
  - Shipments of smart devices/systems in the U.S. expected to grow from 22 to 96 million (from 2016, over following ten years)
  - Service providers are easing barriers for adoption, proving a central point for end users and an relationship that allows for ongoing evaluation and improvement.
- Connectivity among a system of products represents an opportunity for savings and enhanced customer experience
  - Better user experience of energy saving modes
  - Shared occupancy information
  - Co-optimization of related systems (e.g. lighting and window shades)
- Shared occupancy information is a foundational low hanging fruit for energy savings in these systems
  - additional opportunities exist for sharing information and energy management through connected and coordinated systems (e.g. demand response, load shifting, distributed energy resources balancing solar PV, battery storage, EV charging, etc.)

Why ENERGY STAR?

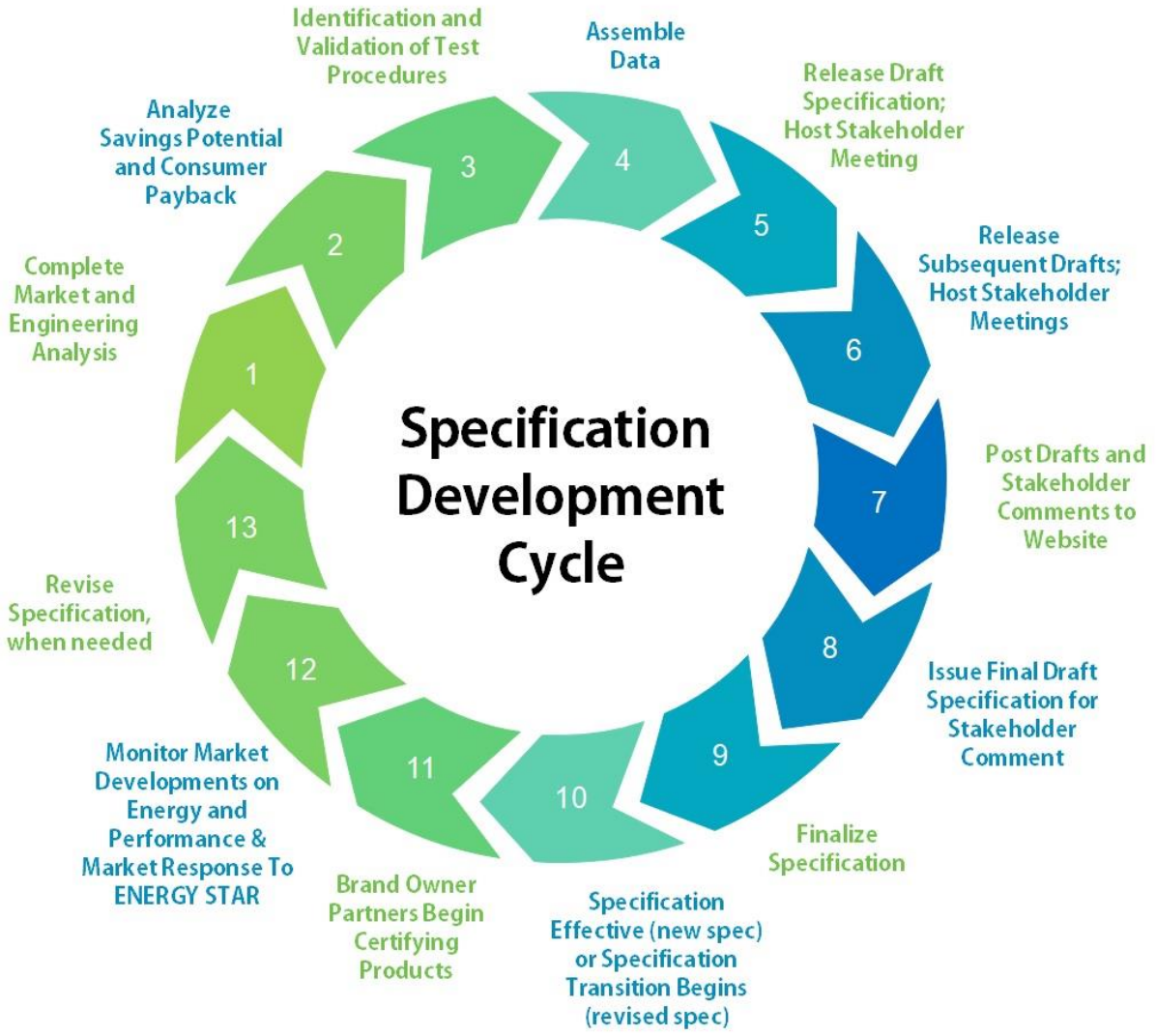
- Consumers and utilities are interested in this space, but also bewildered
- ENERGY STAR is a known and trusted label, backed by impartial, publicly available specifications and test methods
- Part of EPA's brand promise is to make difficult decisions about energy savings simple, as with automated SHEMS energy savings
- Offering a uniform national platform allows for smoother, more coordinated, deployment of incentive programs
- ENERGY STAR SHEMS can be a win for the companies that offer them, for the consumers that want them, and for the environment

A Note about Process

- The success of ENERGY STAR comes from working closely with stakeholders
- All documents are publicly available and EPA invites broad stakeholder participation

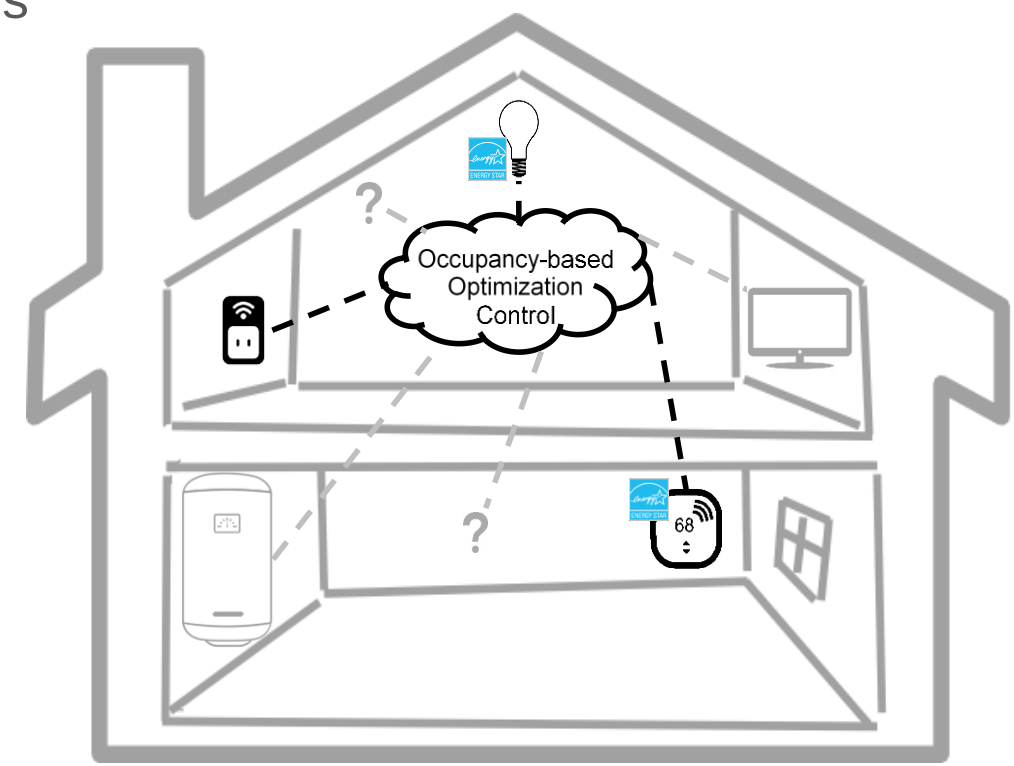
Important Process Elements

- Consistency
- Transparency
- Inclusiveness
- Responsiveness
- Clarity


Specification Development Cycle
1
Complete Market and Engineering Analysis
2
Analyze Savings Potential and Consumer Payback
3
Identification and Validation of Test Procedures
4
Assemble Data
5
Release Draft Specification; Host Stakeholder Meeting
6
Release Subsequent Drafts; Host Stakeholder Meetings
7
Post Drafts and Stakeholder Comments to Website
8
Issue Final Draft Specification for Stakeholder Comment
9
Finalize Specification
10
Specification Effective (new spec) or Specification Transition Begins (revised spec)
11
Brand Owner Partners Begin Certifying Products
12
Monitor Market Developments on Energy and Performance & Market Response To ENERGY STAR
13
Revise Specification, when needed

ENERGY STAR Smart Home Energy Management Systems Concept

- Hardware + Occupancy Info + Automated Services = Energy Savings



ENERGY STAR Smart Home Energy Management Systems (SHEMS) Discussion Guide Overview

  - **Scope**: What is a SHEMS that could potentially be recognized?
  - **Qualification Criteria**: What would it take to be recognized?
  - **Evaluation**: How would accomplishments be verified?
  - **Definitions** (do not plan to spend time on this now, but are open to questions/comments)

- Open questions about each section will be presented with the section

Scope: Potential ENERGY STAR SHEMS

- Proposed elements of a basic package:
  1) ENERGY STAR certified smart thermostat,
  2) ENERGY STAR certified lighting,
  3) Devices and/or capabilities that address energy used by miscellaneous electrical loads (MELs),
  4) The ability to detect occupancy (remote sensors or built into other devices)
  5) Energy optimization algorithms and ability to collect data about optimization
- Add-ons for additional savings, e.g., water heater controller, pool pump controller, connected ESTAR Room AC, automated shades, EV charger, etc.

How Might this Work?

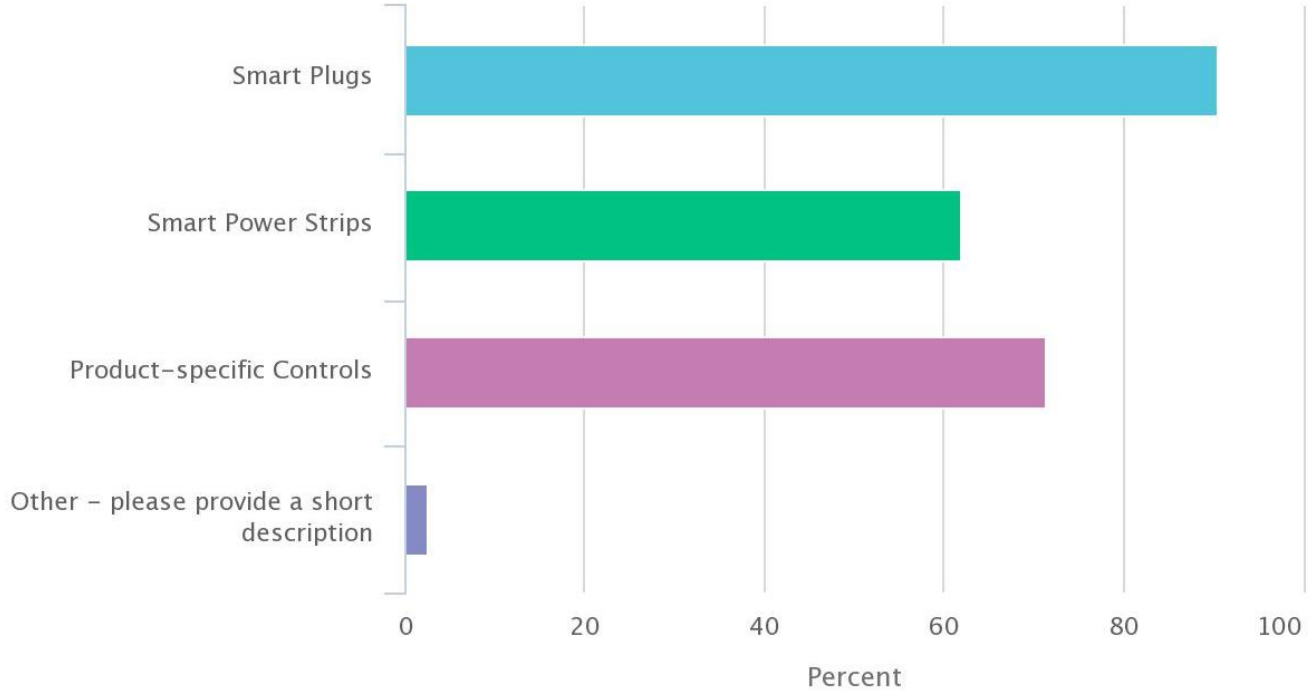
- Service provider has a package that meets the key criteria
- Shares details for meeting key criteria with EPA
    1) Hardware models included in package, potentially with interchangeable options
    2) Methods of sensing occupancy
    3) Energy optimization strategies based on occupancy
- Compiles and submits to EPA summarized data based on a defined sample (biannual) for verification of actualized savings

Questions about Scope

1) Which products or product capabilities should be included in the basic package?
2) What devices and/or capabilities should be included to address miscellaneous energy loads (MELs)?

Poll Question #2 – Addressing MELs

- What devices and/or capabilities should be included to address miscellaneous energy loads (MELs)?
  - Webinar polling results below (multiple select):



Questions about Scope continued

3) Which products or capabilities should be expressly included in scope or encouraged beyond the basic package?

4) Are there any specific products or product capabilities that should be expressly excluded from scope?

Potential Qualification Criteria

- Metrics and criteria that recognize packages in the marketplace that successfully optimize product/system performance using occupancy information to save energy.
- Detail how short term and long term away modes are defined and controlled
- Describe how software integrates with hardware (e.g., bi-annual report to summarize meta-data to demonstrate optimized hours and opt out frequency)
  - Energy savings without sacrificing end-users' comfort or goals

Thoughts on Data Reporting

- Populations of installations to be analyzed: all customers with every basic element of package connected to platform
- For the population, report statistics such as

1) Average number ENERGY STAR certified smart thermostats per installation,
2) Average number of ENERGY STAR certified connected lighting products (bulbs or fixtures) per installation,
3) Average number of MEL control devices per installation,
4) Average number and characterization of other add-on hardware,
5) Decile bins and mean hours subject to optimization per installation (ideally capture the range, i.e., deep optimization vs. shallow), and
6) Average number of user override or opt out events per installation.

Questions about Qualification Criteria

1) Are there hallmarks of optimization strategies for short term, long term, and partially occupied spaces that have been used or piloted that could provide a general framework for this specification?
2) What strategies are effective to address MELs?
3) What is the range of power use of smart switches when they are supplying power independent of what is plugged in?

Questions about Qualification Criteria continued

4) What is the range of power use of smart plugs when they are not supplying power?

5) Are other measures needed to address this concern?

6) What other data and statistical measures would be helpful to analyze savings potentials realized by the population?

Potential Evaluation Methodology

- Typically, ENERGY STAR products are tested in labs to yield energy consumption performance.
- In this case, behavioral interactions with users are critical to achieve savings and, therefore, EPA anticipates relying on field data.
- Similar to the method used for ENERGY STAR Smart Thermostats, data could be submitted twice a year to demonstrate continuing product savings.

Questions about Evaluation Methodology

1) Is it practical to report data from the entire population? Alternately, EPA could define a procedure to produce a random sample and require analysis of that.

2) Is there a way to characterize energy savings from optimized unoccupied hours in terms of how deep the energy savings are (e.g., short term away optimization versus long term vacation modes, periods with pets at home, etc.)?

Questions about Evaluation Methodology continued

3) There are a wide range of ways to determine occupancy, some which require user interaction (e.g., geo-fencing, arming an alarm panel) and some which do not. Do data show a difference in frequency of use, depth of energy savings, or total time optimized based on the type of occupancy detection?

4) How would EPA determine, based on a description of product capability, whether a particular system can respond to occupancy?

Advantages & Disadvantages

+ Open occupancy sensing, allows for experimentation, flexibility, multi-level optimization e.g. geo-fencing layers
+ Flexible optimization strategies allows for experimentation, flexibility, differentiation, customer options
+ Expandability allows for flexibility, whole home integration, differentiation, plethora of partnership opportunities, including DER and DR
+ Inclusion of ENERGY STAR smart thermostat guarantees savings

- Optimized away hours may vary in how much energy they save
- Does not necessarily credit products that include other potential system savings opportunities
- Others?

Benefits of partnering with ENERGY STAR

- Leveraging ENERGY STAR marketing, promotions and education resources
- Access to utility incentive programs
- Use of the brand to differentiate products and services
- Preferential purchasing by Federal programs

Next Steps and Engagement

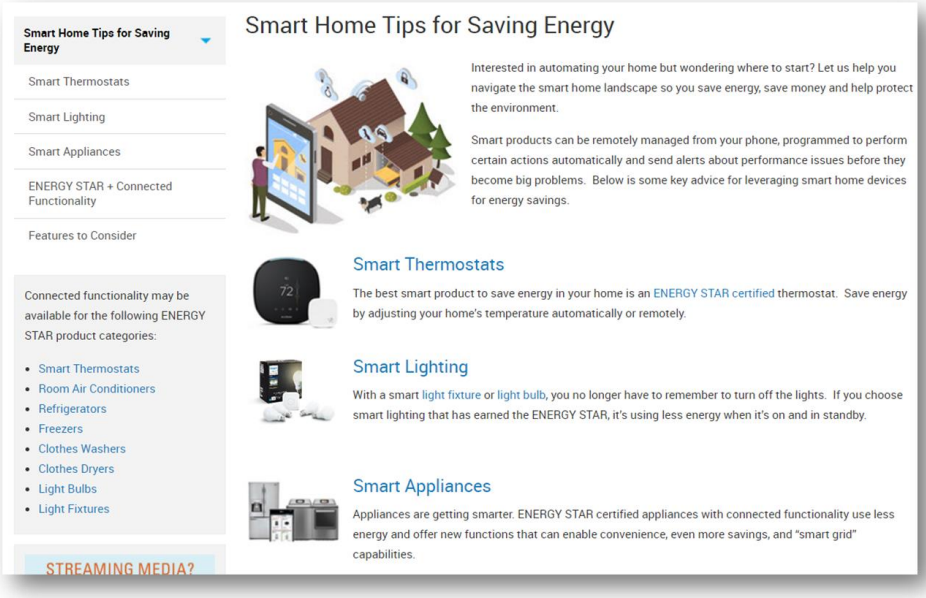
- Comments on the Discussion Guide are due **July 27, 2018**
  - Please send all comments to SmartHomeSystems@energystar.gov
- All comments will be posted to the ENERGY STAR product development webpage for Smart Home Energy Management Systems, unless the submitter requests otherwise

ENERGY STAR Products Partner Meeting

- In-person discussion at the ENERGY STAR Partner Meeting, Phoenix AZ, Sept 5-6, 2018 www.energystar.gov/partnermeeting

Consumer Education and Market Engagement

- energystar.gov/smarthome
  - Tips to save energy with smart home products & links to certified products
  - Small now, planned to grow
- Engage with smart home product providers
  - Track market developments
  - Spread energy saving ideas
- Lead and facilitate stakeholder discussions, workshops/groups



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