Smart Home Energy Management Systems (SHEMS) 1 of 2: Building Towards a Future Vision

ENERGY STAR® Products Partner Meeting
September 11, 2019

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Introductions

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Agenda

• The ENERGY STAR Smart Home Energy Management Systems (SHEMS) Specification – What’s in Version 1 and future vision
  Abigail Daken - U.S. EPA ENERGY STAR

• Utility Interest in Smart Homes and Where ENERGY STAR SHEMS Fit In
  Essie Snell – E Source

• The Future of Smart Home Technologies
  Troy Huntley– Johnson Controls

• Questions and Discussion
SHEMS Version 1

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EPA’s ENERGY STAR Smart Home Strategy: Bring Energy Savings Along for the Ride

As the market for "smart" products and systems grows, EPA aims to help drive and optimize energy savings through their use.

- Guide energy characteristics of smart products and systems
- Explore system models and ways to work with Service Providers
- Leverage the ENERGY STAR brand and position to advance energy efficient behaviors and practices into the connected and smart home market
Why Smart Home Energy Management Systems and Why Now?

• **Device shipments growing**: 22 million (2016) to 96 million (2026)

• **Service providers are easing barriers** for adoption, proving a central point for end users and a relationship that allows for ongoing evaluation and improvement.

• Connectivity among a system of products represents an opportunity for **co-optimized savings** and **enhanced customer experience**.

• **Occupancy information is 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, as shown with smart thermostat adoption
• ENERGY STAR is a known and trusted label, backed by impartial, publicly available specifications and test methods
• Part of the ENERGY STAR 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
What’s a SHEMS?
A SHEMS is a **Package** of Devices and Services

**Hardware**

+ Occupancy Info

+ Automated Services

= Energy Savings
4. Eligibility Criteria: Five Elements

4.1 Required Base Services

4.2 Additional Platform Capabilities

4.3 Required Devices

4.4 Grid Services

4.5 Field Data Reporting
4.1 Required Base Services

• Occupancy detection
• Occupancy-based optimization
  – Implicit, explicit and suggested triggers
• Energy information for users
• Remote user access
• User notification for system failures
• User customization
• Vacation or nighttime safety mode
• Device recognition
4.2 Additional Required Platform Capabilities

- Ability to connect to a smart WH or WH controller
- Ability to optimize system for time of use electricity prices
### 4.3 Connected Device Requirements

limits for standby/idle power even for devices without a separate ENERGY STAR specification

<table>
<thead>
<tr>
<th>Thermostat (1)</th>
<th>Lighting and Lighting Control Devices (1 ENERGY STAR + 1 other)</th>
<th>Plug Load Device (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Thermostat Image" /></td>
<td><img src="image2.png" alt="Lighting Control Image" /></td>
<td><img src="image3.png" alt="Plug Load Device Image" /></td>
</tr>
</tbody>
</table>

**Note:** Products shown as examples; EPA not highlighting any brands.

- List of encouraged devices: DERs, ENERGY STAR connected appliances, etc.
4.4 Grid Service Criteria

• Capability to implement a demand response event to at least one device
• User override available; duration 72 hours or less
• DR capabilities reported, must include
  – Which DR protocols are supported
  – Is DR reliant on service provider’s cloud
4.5 Field Data Reporting

• Unlike typical ENERGY STAR products, SHEMS save energy by affecting how people use other products
• Only data from real users shows effect of complex behavioral interactions with tech
• Use statistical data
  – Even out household-to-household variation
  – Reveal the effectiveness of the SHEMS
• Every 6 months, covering a 6 month period
• According to the SHEMS Method to Demonstrate Field Performance
• Using the provided Data Template
What does EPA certify?

• Is the Service Provider’s Platform certified?
  – No – runs many other packages (e.g. security)

• Is an Individual Installation certified?
  – Not all homes that purchase the SHEMS package will set it up in accordance with the SHEMS specification
  – Installations that include all elements of the basic SHEMS are considered part of the population for field data analysis

• Are Individual Devices certified?
  – Only insofar as they have their own, separate ENERGY STAR specification, e.g. connected light bulbs and smart thermostats
SHEMS Method to Demonstrate Field Performance

- Defines the population for analysis, data reporting periods, and statistical methods for reporting the required data elements.
- Identifies required and optional data elements.
- Shows SHEMS are delivering required devices & services.
- Provides EPA data to judge program impact.
- Aids in the development of a simple, comprehensive metric for savings.
Data Elements are organized into three sections

• Program Performance *(Required)*
  – Minimal set of data elements needed to verify that installations comply with the basic SHEMS service and device requirements.

• Savings Metric Development *(Optional)*
  – Additional elements which EPA believes will allow for the development of a metric and would greatly appreciate receiving.

• SHEMS Market Evolution *(Optional)*
  – Additional elements that indicate the level of integration of SHEMS with the grid and other smart home devices, which are of keen interest to many SHEMS stakeholders.
A Quick Note on Security

EPA understands there can be security risks associated with smart products and systems. Recognizing that this is not our area of expertise, we do not intend to take the lead on developing security standards in the smart home market. To the extent that sound security standards arise, EPA may point to them in ENERGY STAR specifications as appropriate.
Version 1 is Just a Beginning

• EPA was motivated to release the SHEMS specification now largely because of where it could take us
• In our working groups over the Fall and Winter, discovered a common vision of the future SHEMS:
  Seamlessly optimize energy use, storage, and production in the home for multiple priorities of cost, environmental impact, and convenience, while providing excellent customer experience.
• EPA sees the Version 1 specification as a stepping stone to bring that future closer
Considerations for Future Revisions

- Development of an energy savings metric for SHEMS, and levels of performance for it
- Encourage interoperability and security by relying on any industry standards or best practices that develop for
  - Energy reporting, aggregation, and user communication
  - IoT security and privacy
  - DR response and communication protocols
  - Smart home set up and description
  - Occupancy detection and automatic action
- Additional devices and services with substantial energy efficiency benefits
- And more…
Roadmap from here

• First certifications expected Q2 2020: as far as we know, most Smart Home Service Providers will need to update their offerings and collect data

• Next step: energy savings metric
  – By Q1 2021, hope to have enough data to begin analysis and metric development

• Revision to Version 2 begins as metric nears completion, hopefully in 2021; likely effective 2022 or 2023
  – Other changes in Version 2 will depend on market developments
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Taylor concentrating on her other job, back in the office January 2020
Smart Home Energy Management Systems (SHEMS)

Building Toward a Future Vision

Essie Snell
Senior Manager, Customer Energy Solutions
E Source

2019 ENERGY STAR Partner Meeting
Why now?
61% of people in the US and Canada think smart homes are a good investment.
63% of people in the US say they are somewhat or very familiar with home energy management systems.
Smart home tech is finally taking off, and competition is ramping up.
ENERGY STAR can encourage vendors to keep focusing on energy
Utilities are facing unique challenges

-Declining residential lighting savings due to EISA
-Rise of integrated DSM
-Rolling out new rate structures
-Need for revenue generation
-Growing adoption of EVs and DERs and emerging duck curves
-Renewables targets and decarbonization goals
-Disintermediation risks
-Rolling out new rate structures
How do we quantify energy benefits?
Current M&V isn’t well-suited to evaluating smart home devices

Control-based measures that rely largely on automation and behavior change are challenging to evaluate

ENERGY STAR can help support, centralize, and standardize evaluation efforts
What energy savings can an ENERGY STAR–qualified SHEMS actually deliver?
### Some results from previous studies of smart home device savings

<table>
<thead>
<tr>
<th>Device</th>
<th>Energy-saving strategies</th>
<th>Energy-savings potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart thermostat</td>
<td>Schedule-setting, occupancy-sensing, geofencing, maintenance notifications, HVAC system adjustments, automation using weather data or input from home security components, education, behavioral prompts</td>
<td>5%–19% of HVAC energy consumption</td>
</tr>
<tr>
<td>Smart plug</td>
<td>Schedule-setting, occupancy-sensing, geofencing</td>
<td>8%–21% of connected load</td>
</tr>
<tr>
<td>Smart appliance</td>
<td>Education around energy use</td>
<td>3%–6% of appliance energy consumption</td>
</tr>
<tr>
<td>Smart lightbulb</td>
<td>Dimming, schedule-setting, geofencing</td>
<td>~30% savings over a non-connected lightbulb</td>
</tr>
<tr>
<td>Energy-use information</td>
<td>Education, some behavioral prompts</td>
<td>4%–15% of whole-home energy consumption</td>
</tr>
</tbody>
</table>
What about vampire loads?
What are utilities doing?
Five common utility approaches to smart home initiatives

1. Focus only on specific smart home technologies
2. Install and study smart home technologies in new-construction projects
3. Create a custom smart home system
4. Partner with third-party smart home vendors for programs
5. Use existing third-party platforms
DTE Energy’s app

- Able to claim deemed behavioral savings of 1.6% per app download
- Currently piloting Powerley’s newest app

Get the Whole Picture
The DTE Insight app and Energy Bridge take the guesswork out of home energy use. The app syncs with your home’s smart meter to show you what’s going on inside your home – what’s using the most energy and how efficiently your appliances are running. You decide if you want to conserve in the moment, or not. You can also set energy targets, get tips on how to save money, and more.

A Powerful Combo
Some things work better together. When you use the Insight app and bridge together you know exactly how much energy you’re using and when. You see your energy usage in real time so you can make on-the-spot decisions.

In addition to a fresh new look and improved navigation, you’ll enjoy these enhanced features:

Source: DTE Energy
ComEd’s IFTTTT pilot

ComEd Peak Time Savings
The IFTTT service for enabling participation in ComEd’s Peak Time Savings program. You can use this service to make changes to your smart thermostat automatically during Peak Time Savings hours and get notified when the event is starting to remind you to take action.

Sign up for a free account to get started.

Source: ComEd
Con Edison’s online resources and new smart home rate structure

www.coned.com/smarthome

Source: Con Edison
Southern Company’s Smart Neighborhood initiatives

Building cutting-edge communities

- Both single family homes and apartments
- Smart home devices
- Distributed energy resources
- Multiple partners (ORNL, Vivint, local homebuilders)
- Responsive microgrids

Source: Alabama Power
More utilities are creating marketplaces to sell smart devices
FirstEnergy’s Smartmart

SMART HOME
Keep your home running smarter, more comfortable and more energy-efficient. Our products and plans put you in control.

ELECTRIC VEHICLE CHARGER LEASE
Our Electric Vehicle Charger Lease brings you the power of a Level 2 EV charger without the huge up-front ex...

CONNECTED HOME PLAN
Our Connected Home Plan gives you the comfort, convenience and control you need from a smart thermostat. Wit...

SENGLED PULSE PAIR STARTER KIT
A dimmable LED light with the high quality audio of a JBL Bluetooth speaker. Simply twist Pulse into any sta...

Source: FirstEnergy
The new SHEMS specification can help utilities meet a variety of goals:

- Support smart home DSM programs
- Standardize and quantify energy savings (eventually)
- Increase smart device interconnectivity and reliability
- Increase manufacturer focus on home energy management
- Support DR and advanced demand management strategies
- Provide energy feedback to customers
- Support time-of-use rates
What’s next?
Gather clear data on energy benefits so utilities can promote SHEMS
Expect the ENERGY STAR specification for SHEMS to evolve over time

Data collection: Robust savings metric

TOU support: Full dynamic pricing responsiveness

Demand response: Dynamic load building, ancillary grid services, etc.

Initial minimum set of devices: Expanding range of supported or required products

Meeting current needs: Meeting evolving customer expectations
Keep up with the broader smart home market

Sources: Amazon and Google
Thank you! Questions?

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ENERGY STAR SHEMS Program
September 2019
About: Qolsys

Smart Home Energy Management Solutions Provider

Comprehensive ecosystem of partners/support

- Established network of dealer partners nationwide.
- Alarm.com: Connectivity and monitoring
- Smart home vendors: Add on products
- Consultants
- Network of single-family and multi-family builders
- ENERGY STAR
Smart Home Energy Management

*Geo fencing: How it works (Phone Bluetooth)*

*Leave Home*
- Automatically turn off smart lights, adjusts thermostat, locks doors and shuts garage door.
- Can attach 119 nodes to system.
Future of the Smart Home

**Energy Management**
- Demand response event & Time of use will be incorporated as features
- Data, AI and predictive analytics will be incorporated.

Every major electrical device will be connected, managed and monitored. HVAC, appliances, and utility meters.
- Automatically identify equipment faults
- Adapt to changing weather conditions

More outside services available to connected home.
- E.g., Remote Senior home care
- Utility home services will expand
Interoperability with all major home energy uses

- Working relationships between service providers, innovators, device manufacturers, and utilities

Automation: Solution has to be easy to use
Thank You

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