Smart Home Energy Management Systems
Past, Present, and Future

October 18, 2019
Session Survey Instructions

At the end of each session, you will be given 5 minutes to complete the session survey.

• Complete the survey using the mobile app or paper versions
• Provide the paper surveys to the room moderator or to the BetterBuiltNW table
• We appreciate your feedback
Complete the Session Survey

Smart Home Energy Management Systems: Past, Present, and Future

- Emily Kemper
Agenda

• The Smart Home Market and overall product categories
• Smart Home Products and Services
• Challenges and Benefits in incorporating smart home products in programs
• The path forward for contractors and builders
Smart Home Market and Product Categories
Connected Technology Market

Consumers want smart home products

• 26 million households now own at least one smart home device
• The Smart Home Market is expected to reach $55 billion by 2022
• 84% of Americans expect to be able to control something in their homes via smart devices in a year
• 25% of Americans currently control some home function with a smart phone or tablet
• 10% have installed an advanced thermostat
• 82% of those with smart home technology report that they’re satisfied with it

Smart Home Market Penetration
Smart Home Energy Management and the promise of more savings

Home energy management solutions

Information-based Functionality
- Dashboards
- In-home Displays
- Energy Monitors

Control-based Functionality
- Smart Thermostats & HVAC Controls
- Smart Plug Loads & Appliances
- Smart Water Heat

More Behavior -> Less Behavior
Less Savings -> More Savings

Smart Home Energy Management and the promise of more savings
### Smart home products relative to savings opportunity

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Category</th>
<th>Short Definition</th>
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<td>Smart Home Platform</td>
<td>Software platform that enables multiple different hardware devices to operate as a home automation system</td>
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<td>Smart Thermostat</td>
<td>HVAC Wi-Fi enabled control utilizing remote or rule-based mechanisms</td>
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<td>Cloud based analytics platform that analyzes large volumes of data collected from existing smart hardware</td>
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What Products can save energy?

- These product categories are “ready for prime time” and *most likely* to save energy →
- However, the only category which has shown energy savings *through evaluations thus far* is *smart thermostats*
- **Our best opportunity** for incorporating smart technologies in homes seamlessly is *through new construction approaches*
  - Primarily because the incremental cost is lowest in new home builds
ENERGY STAR SHEMS

- On September 3, the EPA released the ENERGY STAR SHEMS Version 1.0 Program Requirements
  - It is a “combination of a service and devices that are designed to work together to deliver occupancy-based optimization of energy use and that meets all of the device and service requirements outlined in the Eligibility Criteria”
ENERGY STAR SHEMS

What’s a SHEMS?

Platform

Security package only

Installations

Minimum ES SHEMS package

Missing some required devices, not yet eligible for service

Home Energy Monitor

Smart Water Heater Controls

Smart Plug / Outlet

Smart Lighting

Smart Power Strip

2 devices minimum

Optional, for now

Smart Home

2 devices minimum
Smart Home Products and Services
What is a smart thermostat? What is a Wifi thermostat?

<table>
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<th>Characteristics</th>
<th>Programmable thermostats</th>
<th>Wi-Fi thermostats</th>
<th>Smart thermostats</th>
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<td>Retains basic thermostat capability, regardless of link status</td>
<td>Can collect temperatures, HVAC run-times and HVAC performance information from field systems</td>
<td>Wi-Fi-enabled</td>
<td>Proximity sensing allows a user to accept and act upon external data (like the location of a smart phone).</td>
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<td>Temperature stability</td>
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<td>Online dashboard and/or mobile app connected to the user account</td>
<td>Occupancy sensing directly detects and acts upon internal sensors (inside the thermostat).</td>
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<td>Programmable for schedules and setbacks</td>
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<td>Intuitive user interface (UI) that may include touchscreen or buttons</td>
<td><em>&quot;Learning,&quot; optimization, or adaptive control; algorithms that learn user behavior or track usage to improve performance</em></td>
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<td>Basic demand response capabilities: allows remote connection with utilities, who, with authorization, can adjust thermostat settings during peak demand periods (optional).</td>
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Brief history of thermostats

1885 - The flapper damper
1906 - First programmable
1960 - Honeywell T-87
1986 - Chronotherm
2009 - ecobee
2011 - Nest
2014 - ecobee3
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Smart thermostats are part of the Control-based functionality category, which means they have more potential to save energy.
ENERGY STAR Certified Smart Thermostats

Minimum criteria + performance data = certification

ENERGY STAR Program Requirements for Connected Thermostats Version 1.0

Heating & Cooling control features include:

- Additional home temperature sensor
- Additional occupancy sensor
- External temperature detection
- Geofencing
- Humidity sensing
- Occupancy sensor on device
Smart Thermostats – Major Vendors

- Nest
- ecobee
- Honeywell
- Emerson
Smart & WiFi Thermostats – Other Vendors

- Zen Ecosystems
- EcoFactor
- Other Honeywell Controls
- Bosch
- ThinkEco WiFi SmartAC
- Other Emerson Controls
Smart controls for unitary HVAC (DHPs, room ACs)

- Ambi Climate
- Cielo Breezi
- Sensibo
- Tado
- Honeywell D6 Pro
- Momit
Smart Plugs / Outlets & Advanced Power Strips

- Kasa Smart Plug
- Belkin Insight Switch
- iDevice Switch
- Aeotec Smart Switch 6
- Embertec
- TrickleStar

BetterBuilt™
Smart Water Heater Controls

- Carina
- CTA-2045 Port
- Aquanta
Home Energy Monitoring and Management Systems

- Emporia Vue
- Curb
- Sense
- NREL's foresee
Other Smart Home Offerings & Platforms

**Smart & WiFi Thermostats:** Some companies offer HVAC optimization via a software platform that can control WiFi-connected thermostats in large volumes

- Examples: EnergyHub

**Smart Home Platforms:** a few companies are attempting “single app” solutions to control multiple devices

- Examples: Powerley, Kirio, Alarm.com

Honorable mention: Bidgely, which provides insights on energy consumption, but doesn’t enable control
Challenges and Benefits to Smart Home Products
Challenges: Smart Home Bundles, up until recently, have been difficult to incentivize in energy programs

- Many utilities can’t figure out the benefit to their businesses
- No clear leader in energy management platforms
- Interoperability issues have made it challenging to develop a “turnkey” consumer experience
- Up until recently, the lack of nationally recognized standards for products meant no basis for energy savings
Ultimately, we need to remember the customer

Create a “turnkey” customer experience…

…because, if consumers aren’t happy, we hear about it first
Opportunities: We have started to get past many of our biggest barriers in the past 6-12 months. What can we do in the future?

Connect the Smart Grid to the smart home, to leverage utility investments in AMI

Focus on the customer experience: make it simple to add new products that they want

More companies are releasing ecosystems of products, as the tech companies “battle” for consumer attention

Use the new ENERGY STAR SHEMS Specification to address energy savings, so we can finally offer incentives
Benefits to Customers

- Convenience
- Comfort & Health
- Control
- Security & Safety
- Energy Savings
The Path Forward for Contractors and Builders
What would an ideal smart home solution look like now?

• Now we have the ENERGY STAR SHEMS Program requirements, this bundle of products makes a lot of sense.
Smart home packages offerings are different for new construction vs. existing home retrofits or renovations

Residential New Construction

- Incremental cost is smaller
- Products can be low-voltage wired into the house as it's built, as opposed to plug loads added later
- System can be “harmonized” in a smart home “ecosystem” from day 1
Existing home “smart retrofits” are a bit more challenging

- Incremental cost is larger, due to installation costs
- Products are usually added as plug loads
- System often relies on hubs or 3rd party platforms (aka smart speakers) for harmony, if it exists
What does the future look like?

The Home IS the smart energy management system

Energy Storage

Smart Water Heater Controls

EV Charging

Home Energy Monitor

Distributed Generation (PV)

Smart Thermostat

Smart Plug

Security

Smart Lighting

Convenience

Health & Safety

The Home IS the smart energy management system
Our Path Forward

Smart Home products are here to stay, so we should make them work for us and for homeowners
Thank you!

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Director, Residential Solutions

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