



Recognizing Smart Home Energy Management Systems

ENERGY STAR® Products Partner Meeting

September 6, 2018

3:30 p.m.

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Agenda

- ENERGY STAR and Smart Home Energy Management Systems (SHEMS)
 - Abigail Daken and Taylor Jantz-Sell - U.S. EPA ENERGY STAR
- Operation of Smart Home Systems – Insights from Alarm.com
 - Gustaf Lonaeus - Alarm.com
- Smart Home Systems and Utility Programs – Data, Savings, and Challenges
 - Lara Bonn – Efficiency Vermont
 - Brad Piper - Lockheed Martin
- Next Steps and Working Groups



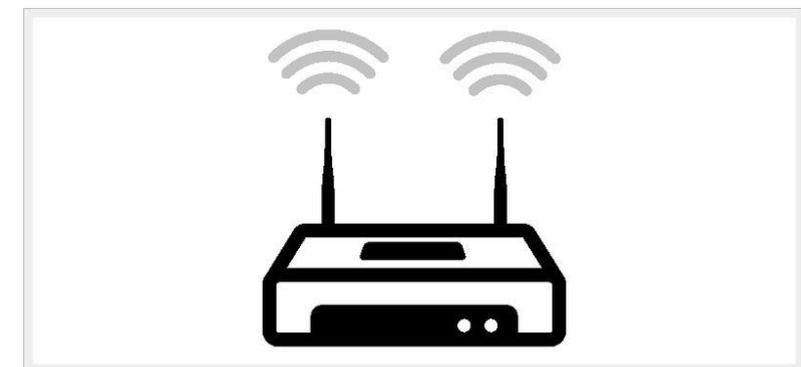
Why ENERGY STAR?



- 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 SHERMS energy savings
- Offering a uniform national platform allows for smoother, more coordinated, deployment of incentive programs
- ENERGY STAR SHERMS can be a win for the companies that offer them, for the consumers that want them, and for the environment

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





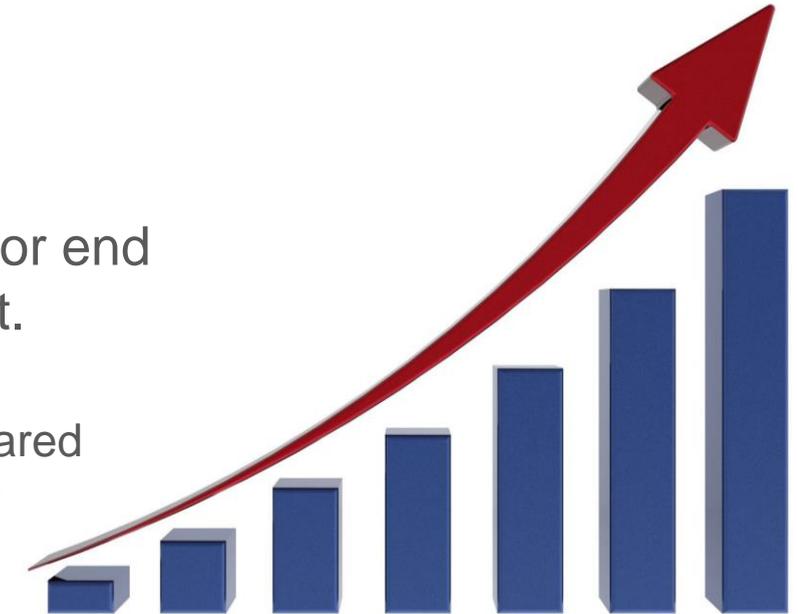
EPA's ENERGY STAR Smart Home Strategy: Bring Energy Savings Along for the Ride

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 push 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 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)
- **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.)



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A Quick Note on Security

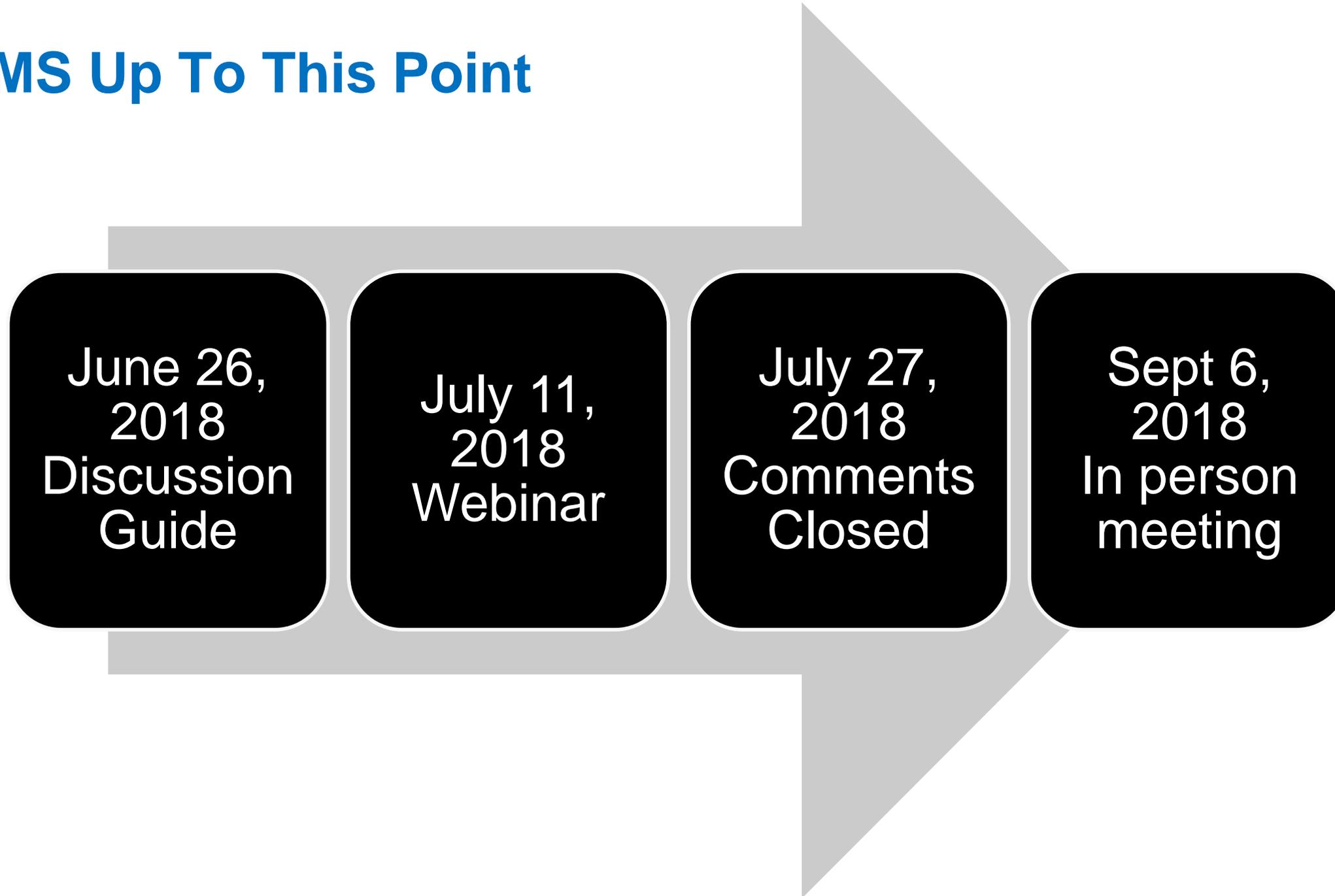
EPA understands there can be security risks associated with smart products and systems. Recognizing that this is not our area of expertise, we do not intend to take the lead on developing security standards in the smart home market. To the extent that sound security standards arise, EPA may point to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



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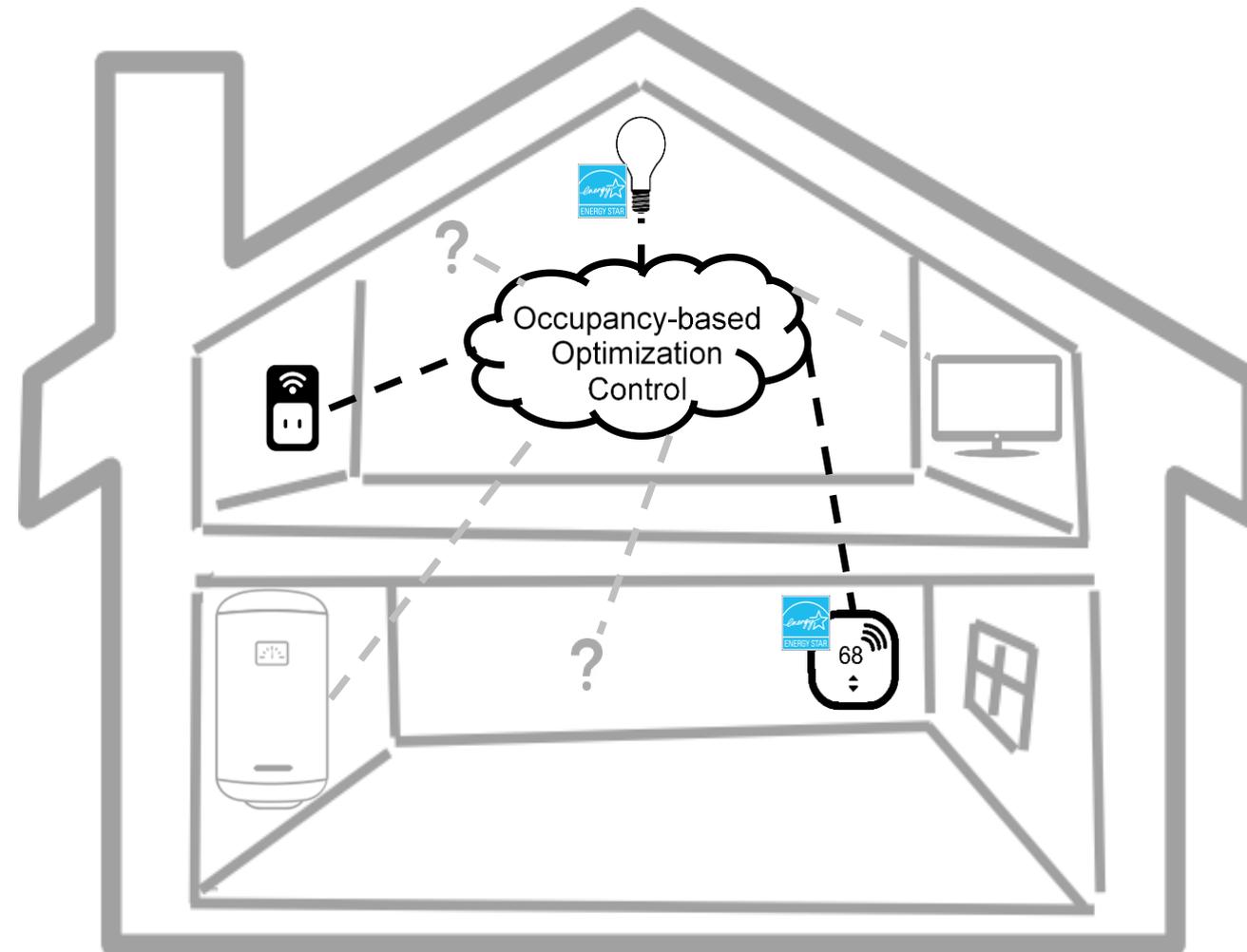


SHEMS Up To This Point



ENERGY STAR Smart Home Energy Management Systems Concept

- Hardware + Occupancy Info + Automated Services = Energy Savings



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 (alarm pad, geofencing, remote sensors or sensors 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



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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.



Potential Evaluation Method

- 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.



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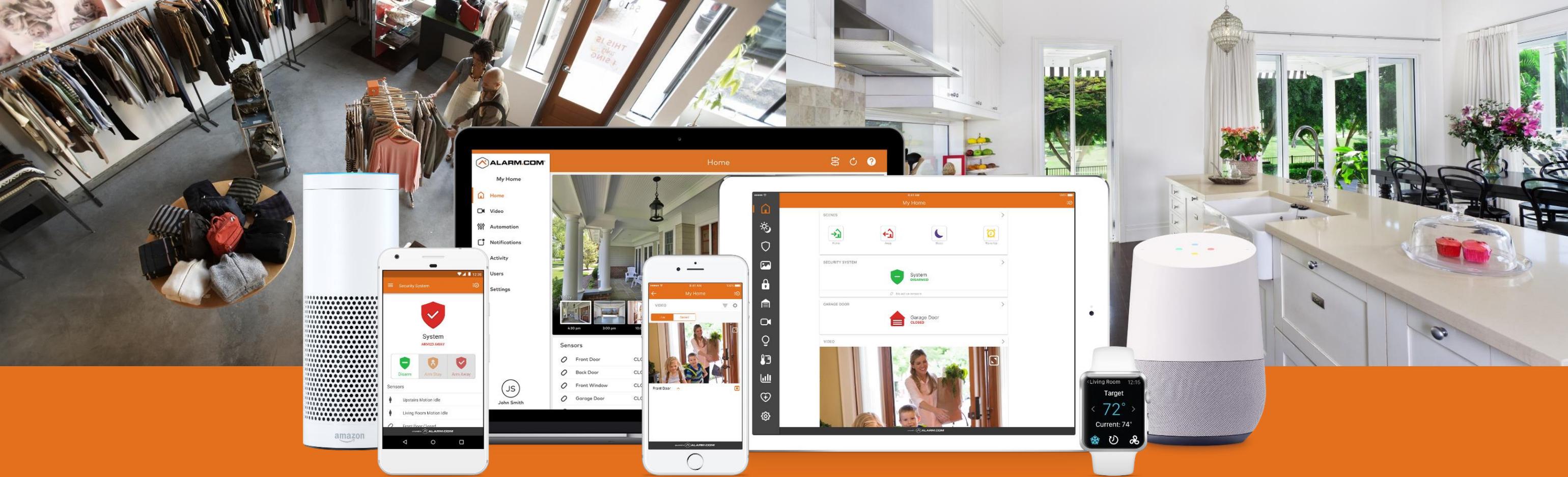
Key Topics/Questions to Keep in Mind

1. What kind of data is available, relevant, and reasonable to collect and analyze for this purpose?
2. What strategies can save energy during an unoccupied hour? Do we know which ones are the best?
3. What information would utilities need to be ready to adopt such a program? How can we get that information (pilots, data agreements, etc.)
4. How do we deal with promising opportunities that exist in some homes, but not most, e.g., electric water heaters, electric vehicle supply equipment, etc.?
5. Which products would stakeholders want to know are connected to the system? E.g., is there value in knowing about dog feeders or battery operated cameras?



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Smart Home Session – Alarm.com Overview

Gustaf Lonaeus

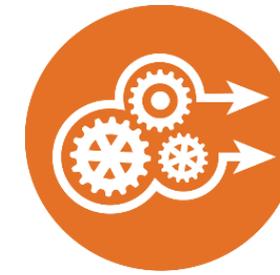




5
Million
Subscribers



Tens of
Millions
Connected
Devices



Over 30
Billion
Data
Points
In the last year alone

Largest Platform for Intelligently Connected Properties

powered by  **ALARM.COM**[®]

Metrics as of March 15, 2017

Alarm.com Installers

7,000 Authorized
Providers

SECURITY DEALERS – CPI, Frontpoint, Brinks, ADT

BUILDERS – DR Horton, Toll Brothers

RENTAL PROPERTIES – HomeAway, Invitation Homes

HVAC DEALERS – Mass Save

End to End Partner Support Tools & Services



INSTALLATION &
TROUBLESHOOTING



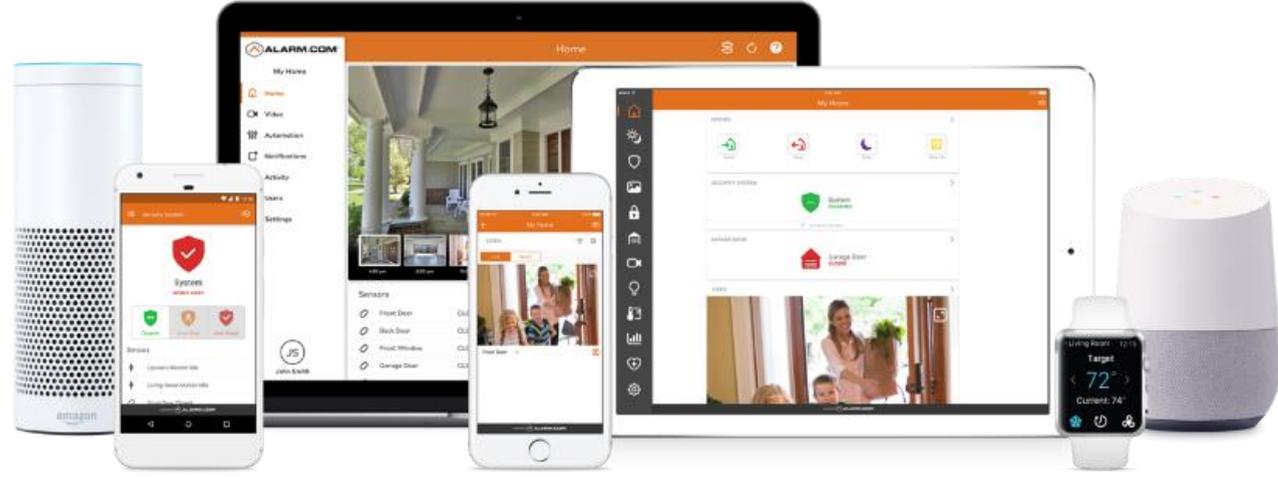
BUSINESS
MANAGEMENT



UPGRADE &
SALES TOOLS



Unified Experience



iOS WATCH tv Google Play
android amazon fireTV amazon echo

Intelligent Solutions



Internet of Things Ecosystem



Advanced Cloud Platform

powered by  **ALARM.COM**

Partner Ecosystem — EnergyStar Devices Blue



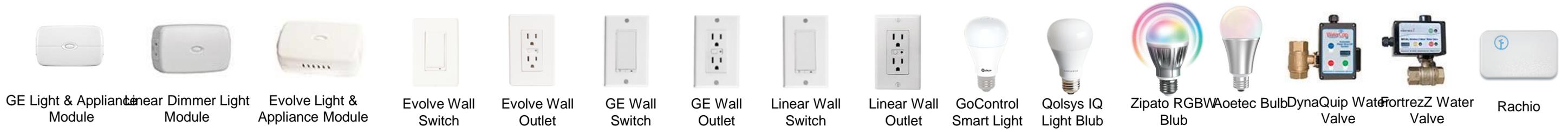
Panel Lineup



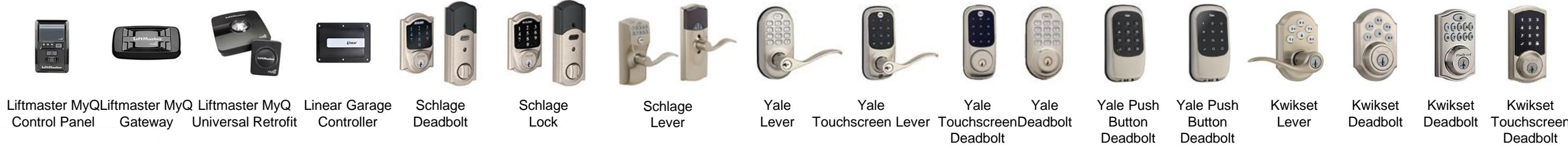
Energy



Lighting & Water



Locks & Access



Video & Apps





Suite of Services

Energy Saving Features

Thermostat schedules and rules

- Sensor left open set backs
- Geolocation driven rules
- Extreme weather setbacks

Switch, light, and large load schedules & sensor triggered rules

Energy data viewing via Green Button, CT clamps





- Alarm.com subsidiary provides Demand Response to more than 30 utilities leveraging devices from over 14 platforms
- Thermostats installed as part of security solution are available for DR
- Standard process for Alarm.com customers to enroll, review and participate in DR programs



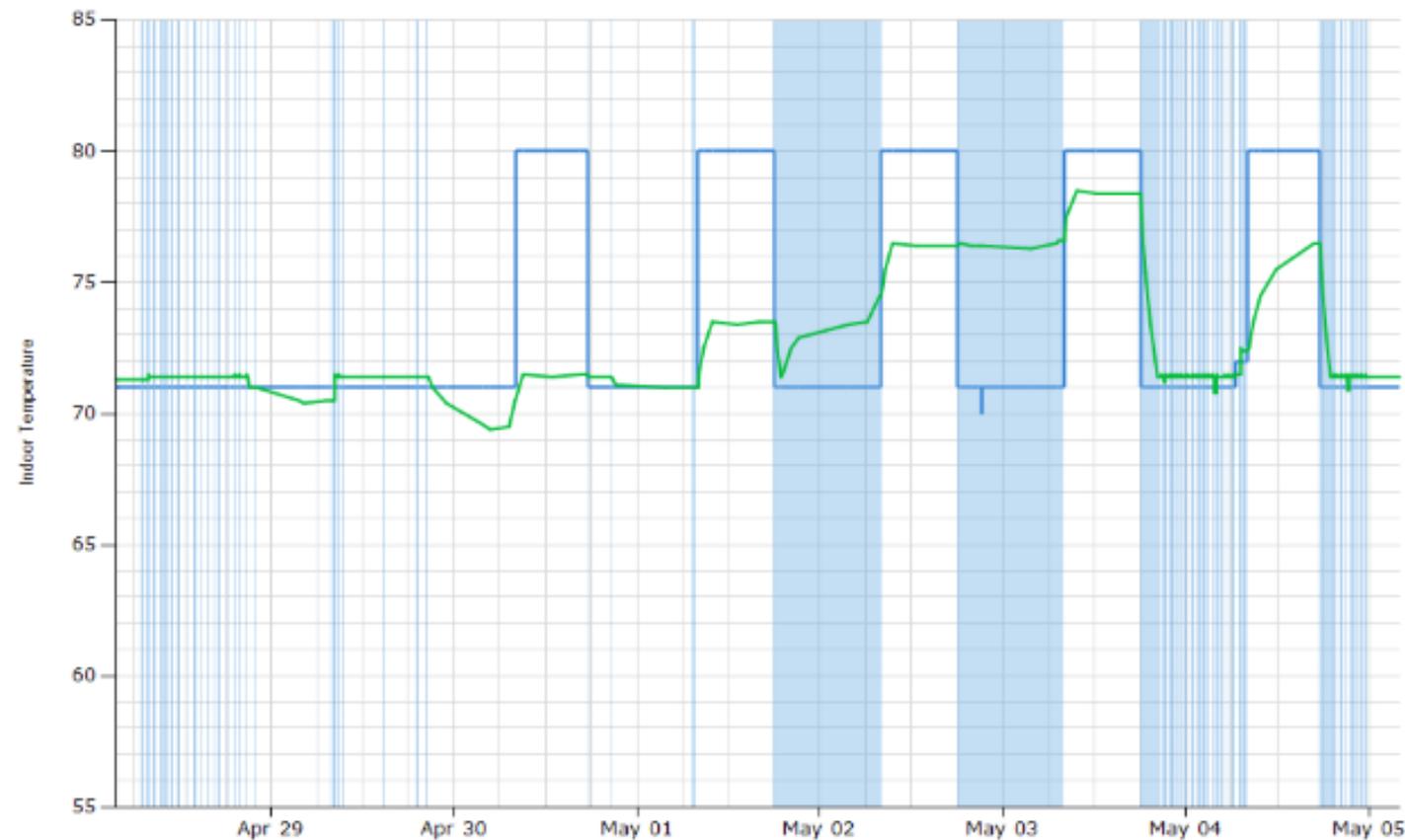
DER and Bring Your Own
Thermostat[®] solutions for the modern utility

Data-Driven Features

Data from Apartment Building, Tysons Corner

■ Indoor Temperature

■ Run Time



May 1
7 p.m. First hot day of the year. Building-wide air conditioning failure.

May 2
9:24 a.m. Alarm.com detects system failure, before residents are uncomfortable.

May 3
11:06 a.m. Customers uncomfortable throughout night. Property managers notify customers there is a system failure and repairs will be made.

May 3
12:30 p.m. System repaired.

41m 28s

26.5%

1d 19h 33m

72.9°F

66.3°F

Average Cool Cycle Runtime

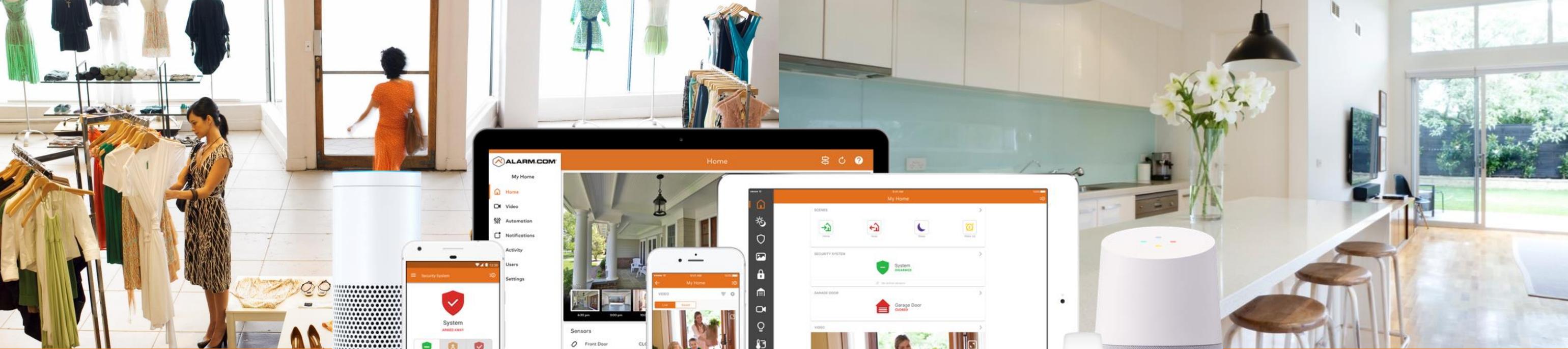
Period Cool Runtime

Total Cool Runtime

Average Indoor Temperature

Average Outdoor Temperature

Had facilities acted on information at this point, problem could have been resolved more than 24 hours earlier, before residents became uncomfortable.



Thank You!





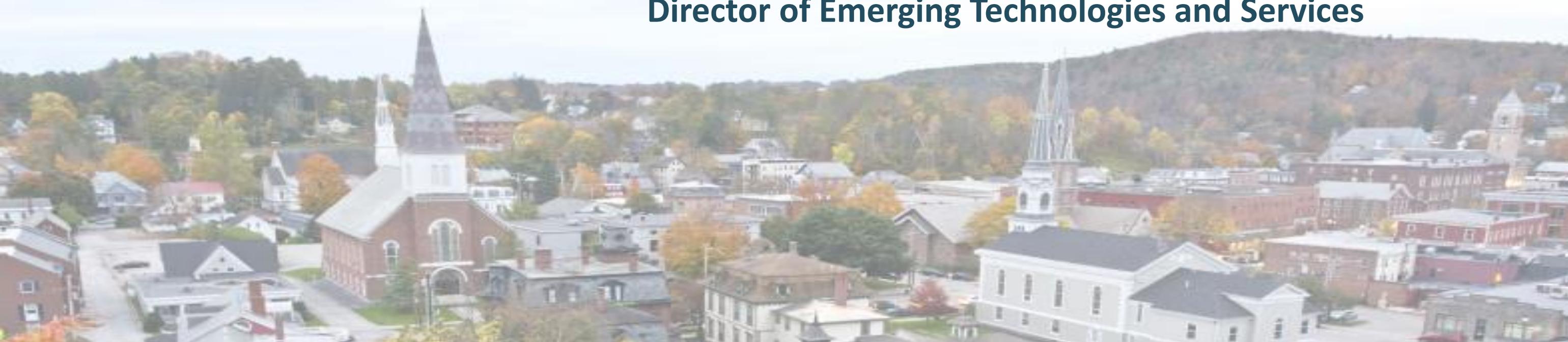
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 - Brad Piper - Lockheed Martin
- SHEMS Next Steps and Working Groups

Smart Space – Vermont Perspective

Lara N. Bonn

Director of Emerging Technologies and Services

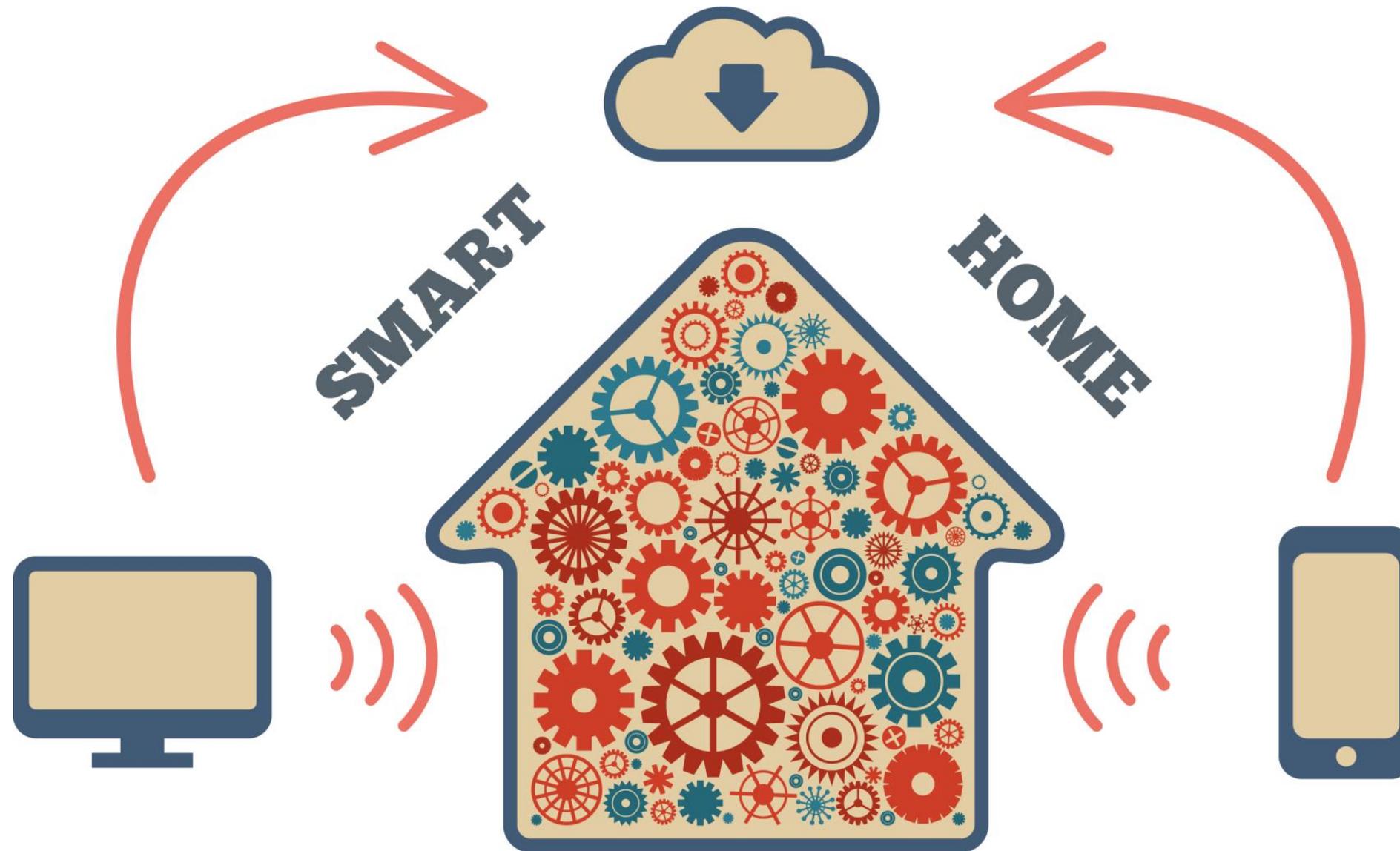


Who is Efficiency Vermont?

- Statewide energy efficiency utility
- Sustainable energy solutions for all Vermonters
 - Education
 - Services
 - Rebates and financing

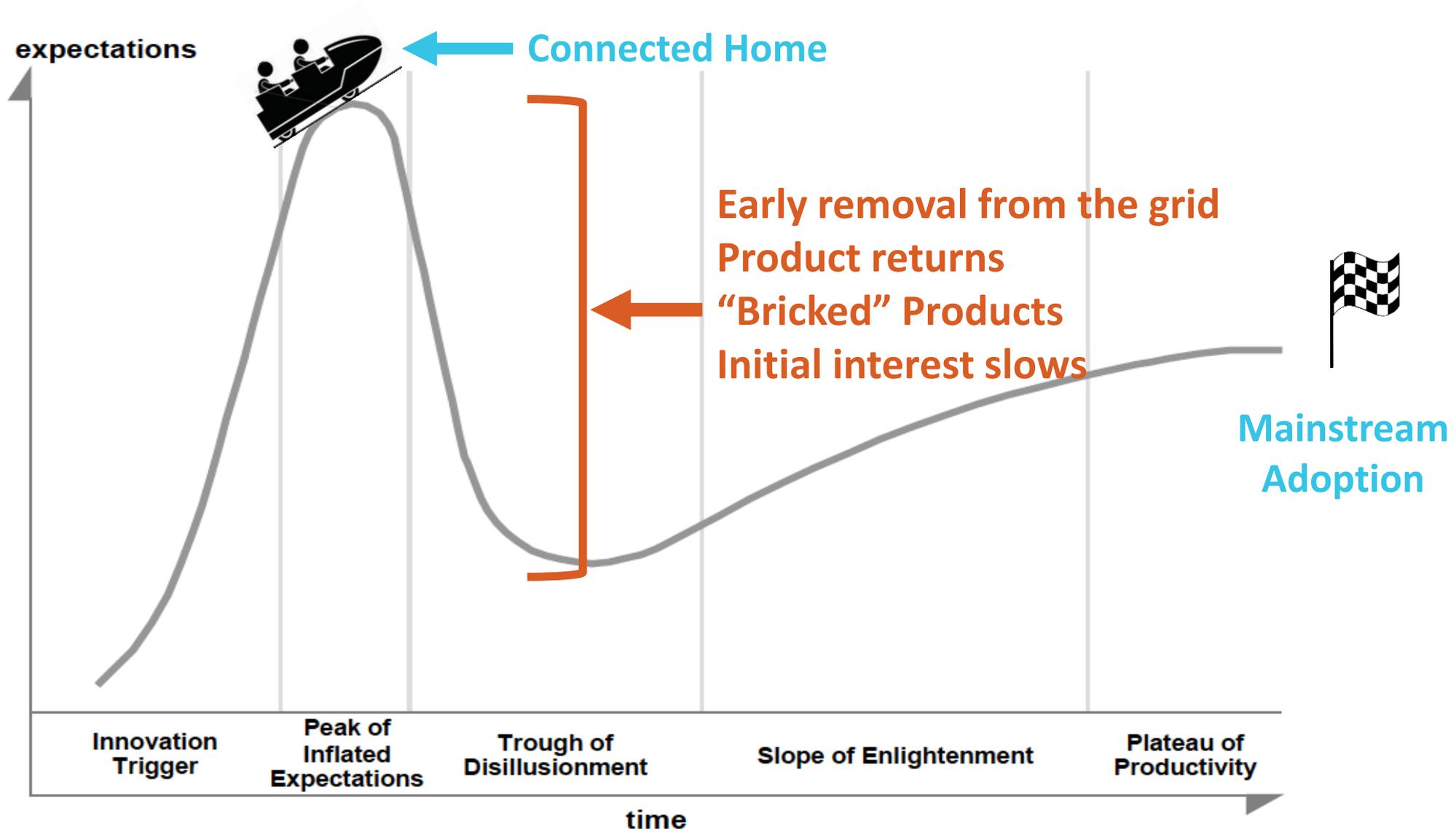


Savings in the future – Control





Smart or Bust



How to Get There from Here

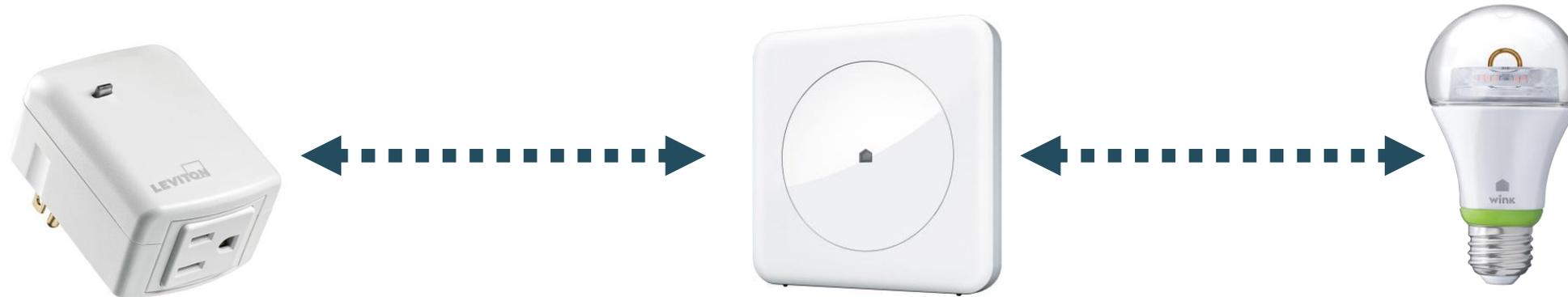
- Study products and their interactive effects:
 - Product Costs
 - Vendor Stability
 - Common Communication Standards
- Assess participants' experience
- Partner with new market actors for greater system impact



2015 Efficiency Vermont's Study – Objective

Begin to map, define, and measure the interactions of smart hubs & their connected devices in a DIY scenario

- Map the baseline energy use of smart lighting using light loggers
- Catalogue consumer use of smart outlets



Find the Full Report Here:

www.encyvermont.com/news-blog/whitepapers

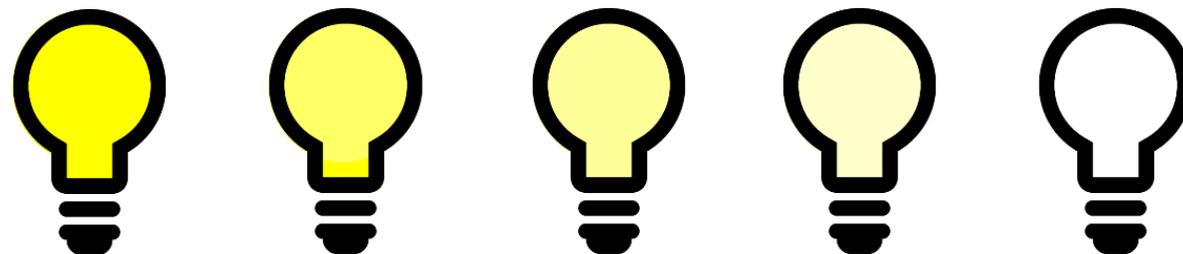
2015 Results: Dimming & HOU Opportunity

Smart bulbs make dimming possible where none had existed before

- In the average home: 10% bulbs on dimmers

Participants dimmed bulbs 38% of the time

- Additional energy-saving opportunity beyond Hours of Use (HOU) alone
- HOUs reduction potential



Smart T-stat Pilots & Program

- 2014/2015 Multi-year Nest Pilot
 - Results:
- 2016 – Launched smart t-stat rebate
- 2017 – ENERGY STAR only rebate
- July 2018 – Launched Enhanced Services Pilot (i.e. Seasonal Savings with Nest)



Efficiency Vermont – STAT Pilot

- 2018 Pilot
- Considering Commercial/SMB program

Thank you!

Lara N. Bonn

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Home Energy Management (HEMS) Validation Pilots

NYSERDA HEMS Pilot NGRID Smart Lighting Study

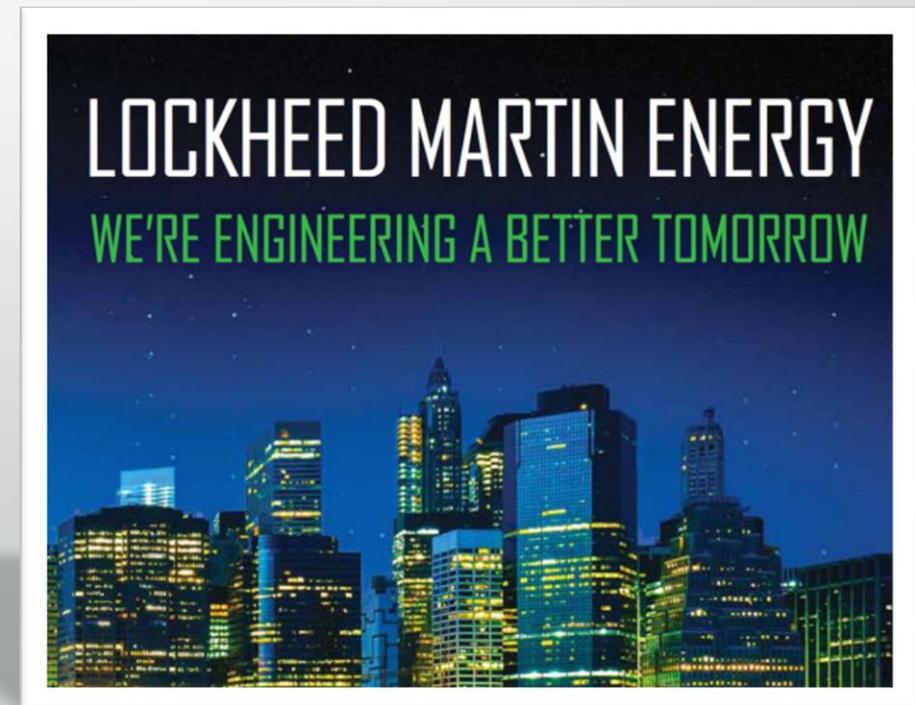


Brad Piper
Project Manager



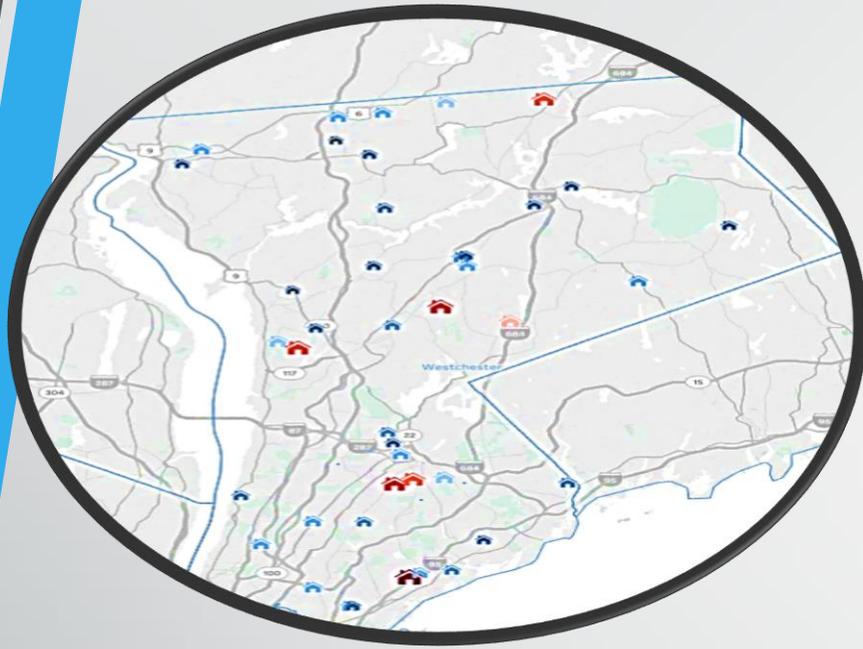
LM ENERGY'S HEMS HISTORY

- **Multiple Working Group Contributions (2010-)**
- **First Retail Program Incentive on HEMS (2011-12)**
- **Conducted Non-traditional Smart Home Manufacturer Survey For NYSERDA (2015)**
- **NYSERDA HEMS Validation Pilot (2016-2017)**
- **National Grid MA&RI Smart Lighting Study (2017-2018)**



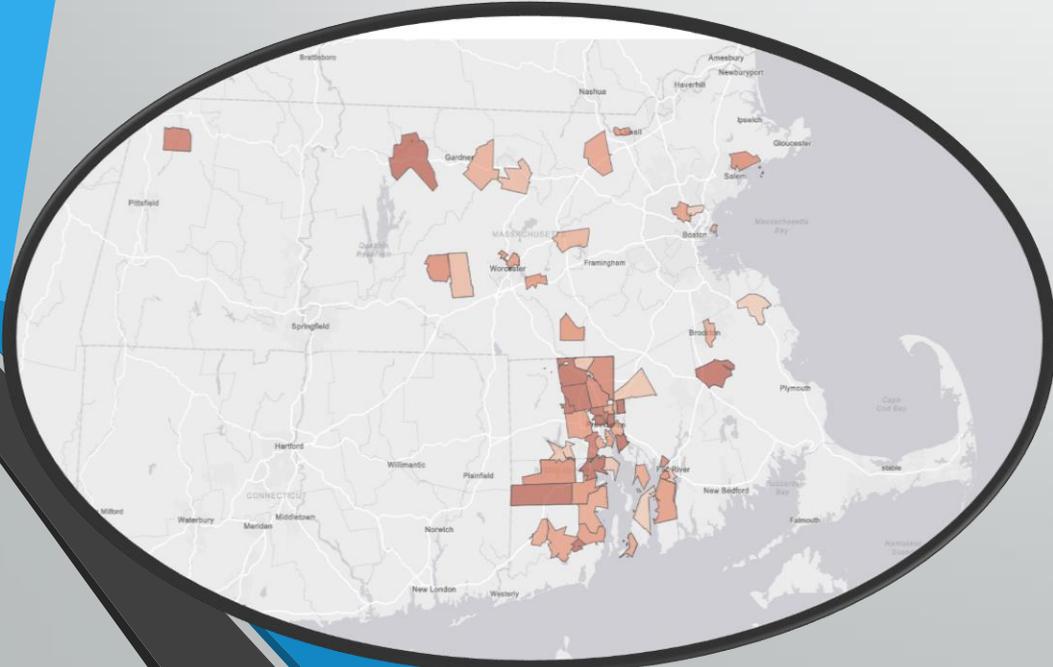


PILOT OVERVIEW'S



NYSERDA

- 50 homes Between Albany and Westchester Counties
- Whole Home Power Monitor, Smart Switches, Outlets, Lamps and Thermostats; Room Level and Whole Home Level Occupancy Sensors
- Test and Evaluate Baseload Simulation Validation Methodology
- **Completed**



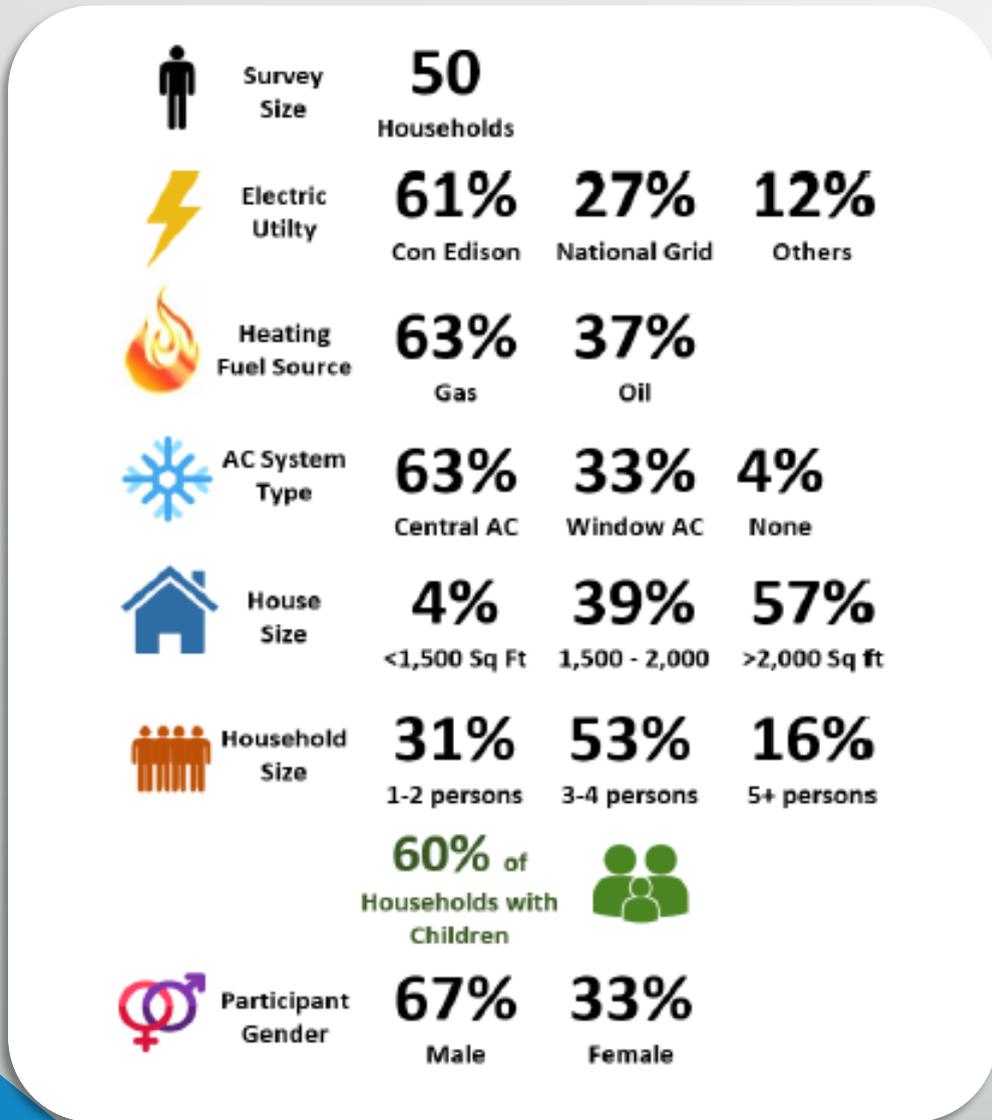
NGRID

- 85 Homes Between MA and RI
- Connected Lamps, Light level (lux) sensors; Room Level and Whole Home Level Occupancy Sensors
- Test and Evaluate Baseload Simulation Validation Methodology
- In Home and Electronic System Trainings
- 12 Month Observation Period
- **In Progress**

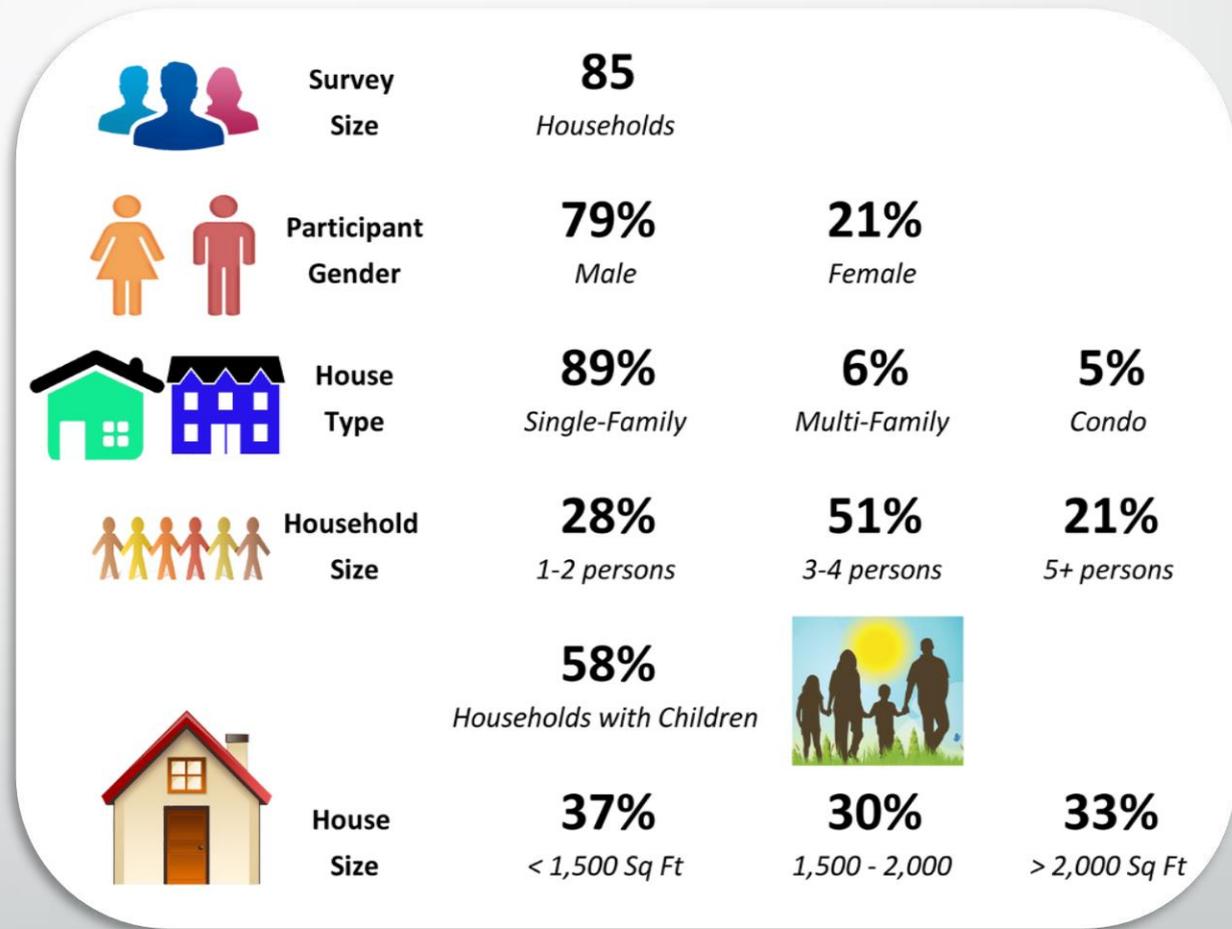


PILOT DEMOGRAPHICS

NYSERDA



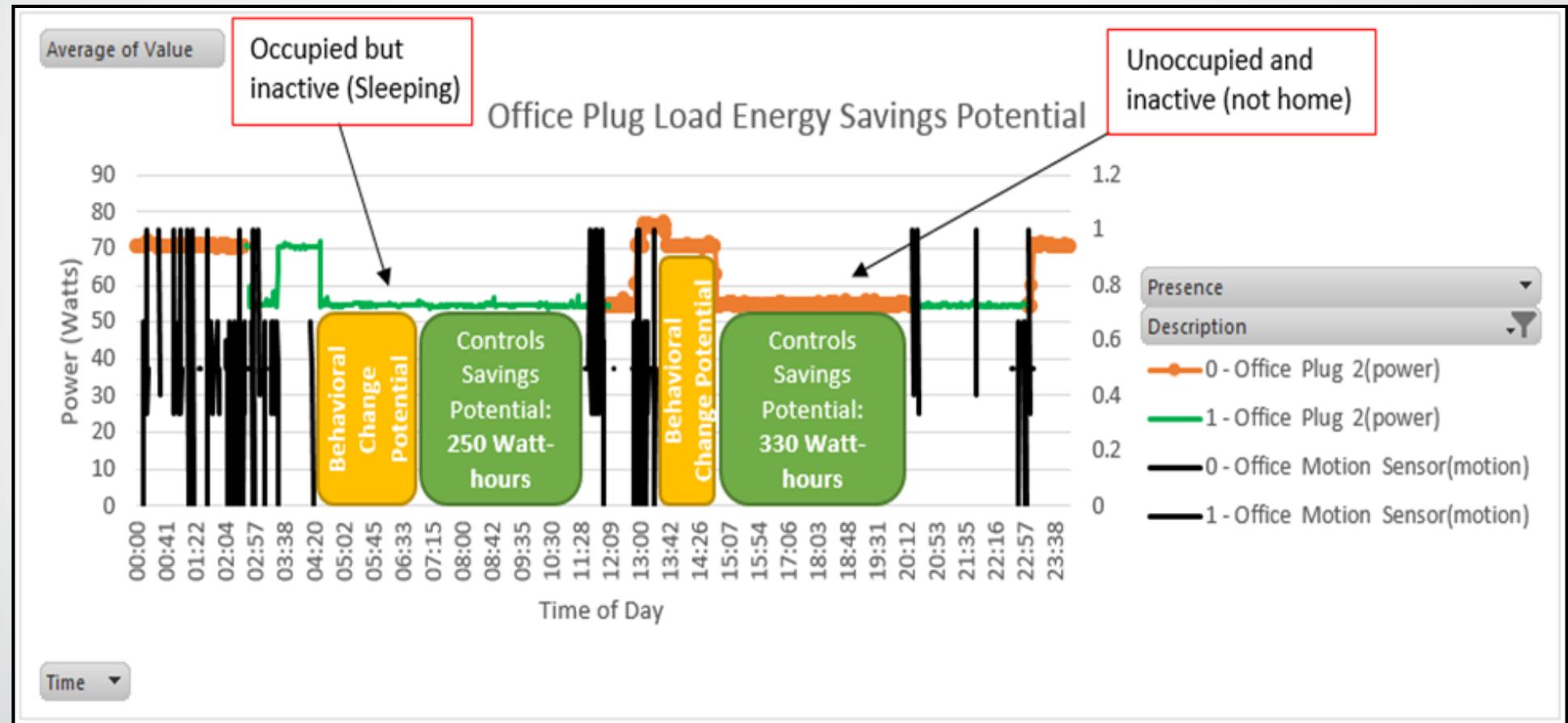
NGRID





DATA COLLECTION & MANAGEMENT

- Collection
- Storage
- Sorting and Syncing Multiple Data Streams
- Calculations





NYSERDA FINDINGS

Potential Whole Home and Individual Savings

Smart Device	Electricity Savings (kWh/year)	Heating Fuel Savings (Therms/year)	Cost Savings (\$/year)	Assumptions
Smart Thermostat	688	52	\$174	No existing setback controls
Smart Outlets	341		\$58	15-minute occupied delay
Smart Lamps or Switches	212		\$36	Controls only
Total HEMS Savings	1,241	52	\$268	



Brad Piper
Project Manager
Lockheed Martin Energy
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Key Topics/Questions to Keep in Mind

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5. Which products would stakeholders want to know are connected to the system? E.g., is there value in knowing about dog feeders or battery operated cameras?



From NEEP

Check out
their other
great
resources!

Smart Product	Energy savings	Demand response	Load shifting	DER integration
Smart Thermostat	Hot	Warm	Warm	Warm
Smart Water Heater	Hot	Warm	Hot	Hot
Smart Appliances: Inflexible timing (refrigerators, stoves, ovens, small appliances)	Warm	Warm	Warm	Warm
Smart Appliances: Flexible timing (clothes dryers, clothes washers, dishwashers)	Warm	Warm	Warm	Warm
Smart TV	Warm	Warm	Warm	Warm
Smart plug, outlet, or switch	Warm	Warm	Warm	Warm
Smart Hub	Warm	Warm	Warm	Warm
In-Home Display	Warm	Warm	Warm	Warm
Energy Portal	Warm	Warm	Warm	Warm
Smart Home Platform	Warm	Warm	Warm	Warm
Smart Lighting	Warm	Warm	Warm	Warm

Hot
Warm



EPA's Next Steps and Opportunities for Engagement

- Establish working groups
 - drop your card or write down a contact
 - email to all stakeholders after the meeting
- EPA to formulate a Draft 1 specification based on discussions, public comments, and follow-up
- Follow along at www.energystar.gov/SHEMS

Intention of Working Groups

- EPA anticipates each working group to be a diverse combination of invested stakeholders
 - Manufacturers,
 - Energy Efficiency Program Sponsors,
 - Service Providers,
 - Researchers, etc.
- Members are not limited to those in this room right now
- EPA appreciates your time investment and expertise to deliver a program with a strong foundation. At least 2X a month Sept-Dec 2018 (then reassess)
- Goal: to resolve pending questions/decisions which will inform a Draft 1 specification and beyond





Working Groups' Focus Areas

1. Utility pilots / data needs

- What utility pilots or data are needed for utilities to support a SHERMS program?

2. Miscellaneous energy loads

- How important is managing MELS with occupancy information and what strategies would lead to the most energy savings?

3. Occupancy detection methods

- Which occupancy detection methods (or features) would be sufficient for this type of program?

4. What counts as an “away” hour

- What is a simple and practical way to characterize an hour with effective energy optimization?



Contact Information

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