Latest Trends in Connected Lighting

December 29, 2016 (1:00 PM – 3:00 PM EDT)

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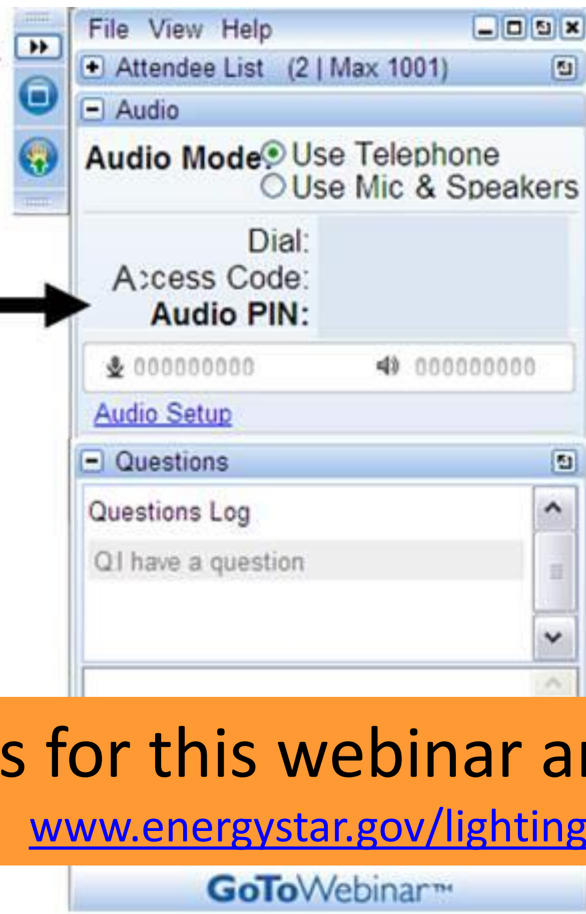

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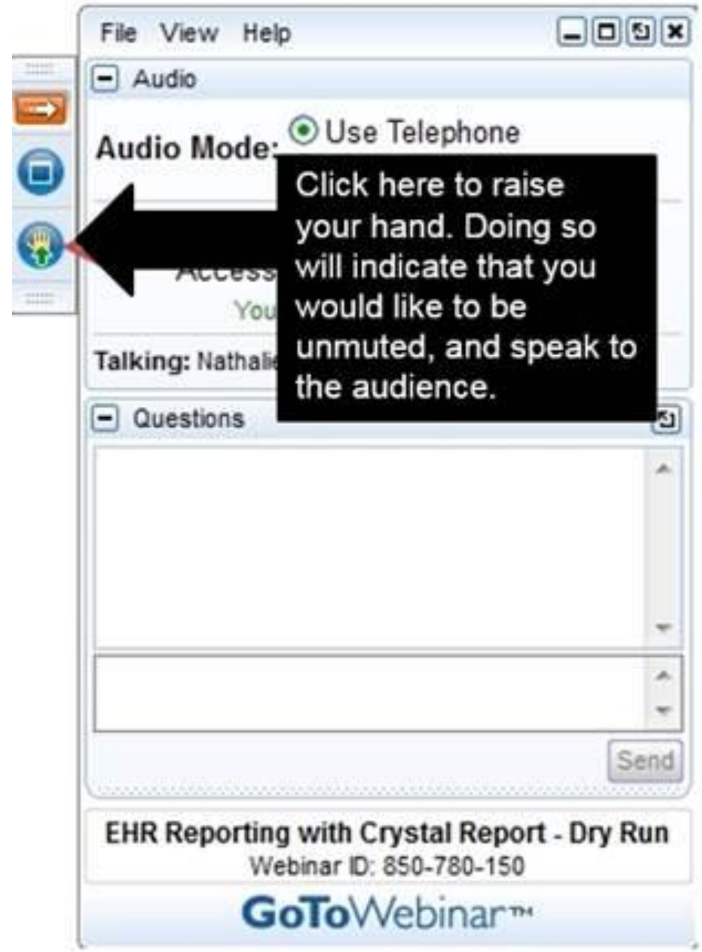
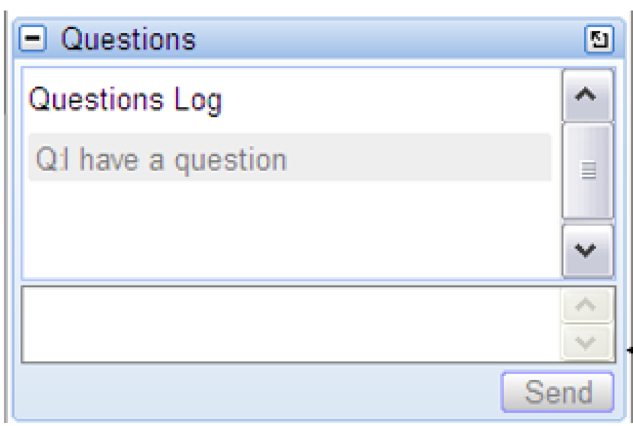
Latest Trends in Connected Lighting

Asking a Question





You can type in questions at any time

Attendee Polls

Moderators

Taylor Jantz-Sell

ENERGY STAR Lighting Program Manager

U.S. Environmental Protection Agency

Daniel Rogers

ICF Lighting Technical Lead for ENERGY STAR Product Specification Development

ICF

Introductions

Philip Smallwood

Director of LED & Lighting Research

Strategies Unlimited

Lara Bonn

Efficient Products Strategy & Planning Manager

Efficiency Vermont

Discussion

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DECEMBER 2016

Smart Lighting – New Frontier for Savings?

Lara N. Bonn

Manager, Strategy and Planning

Who is Efficiency Vermont?

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

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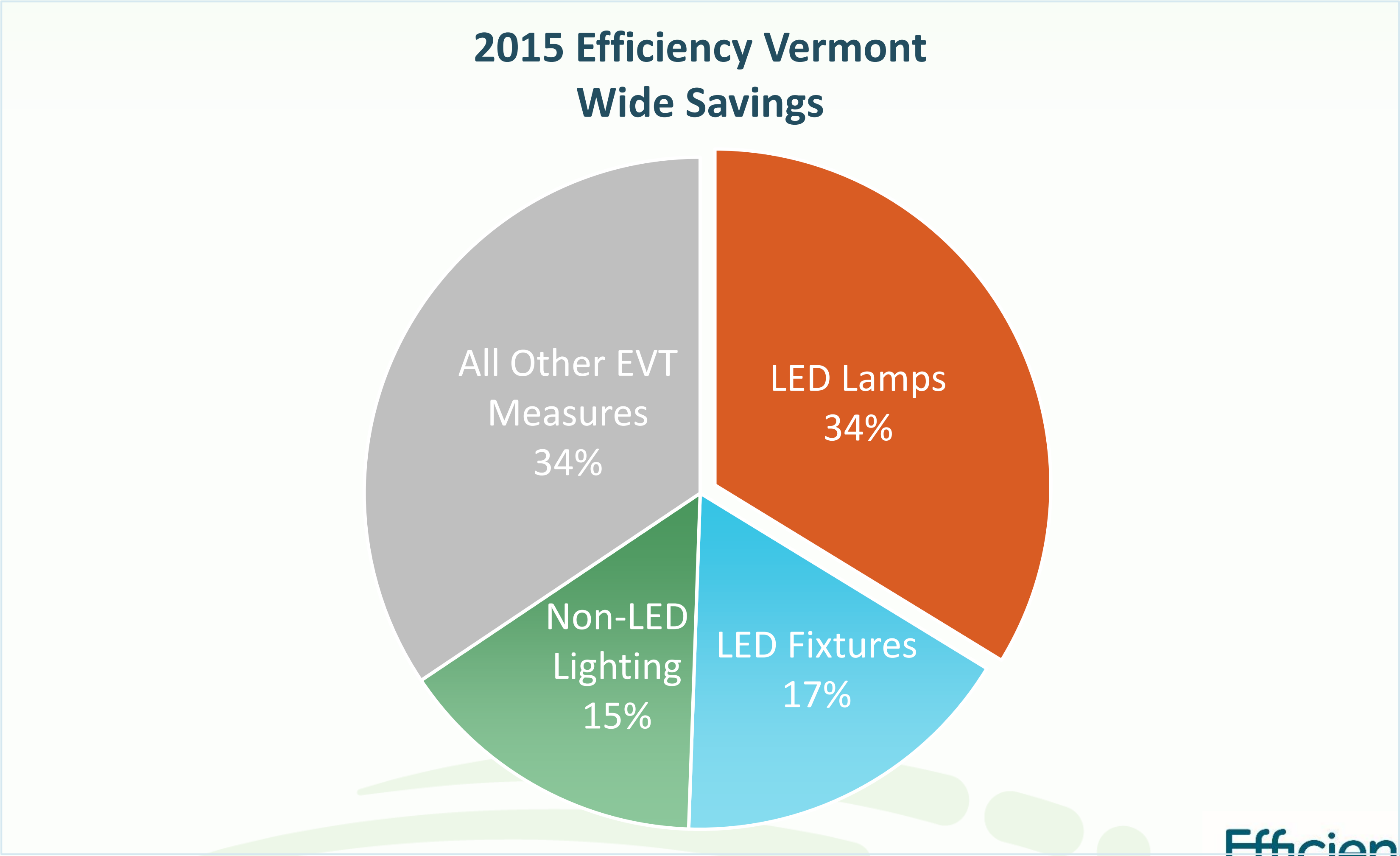
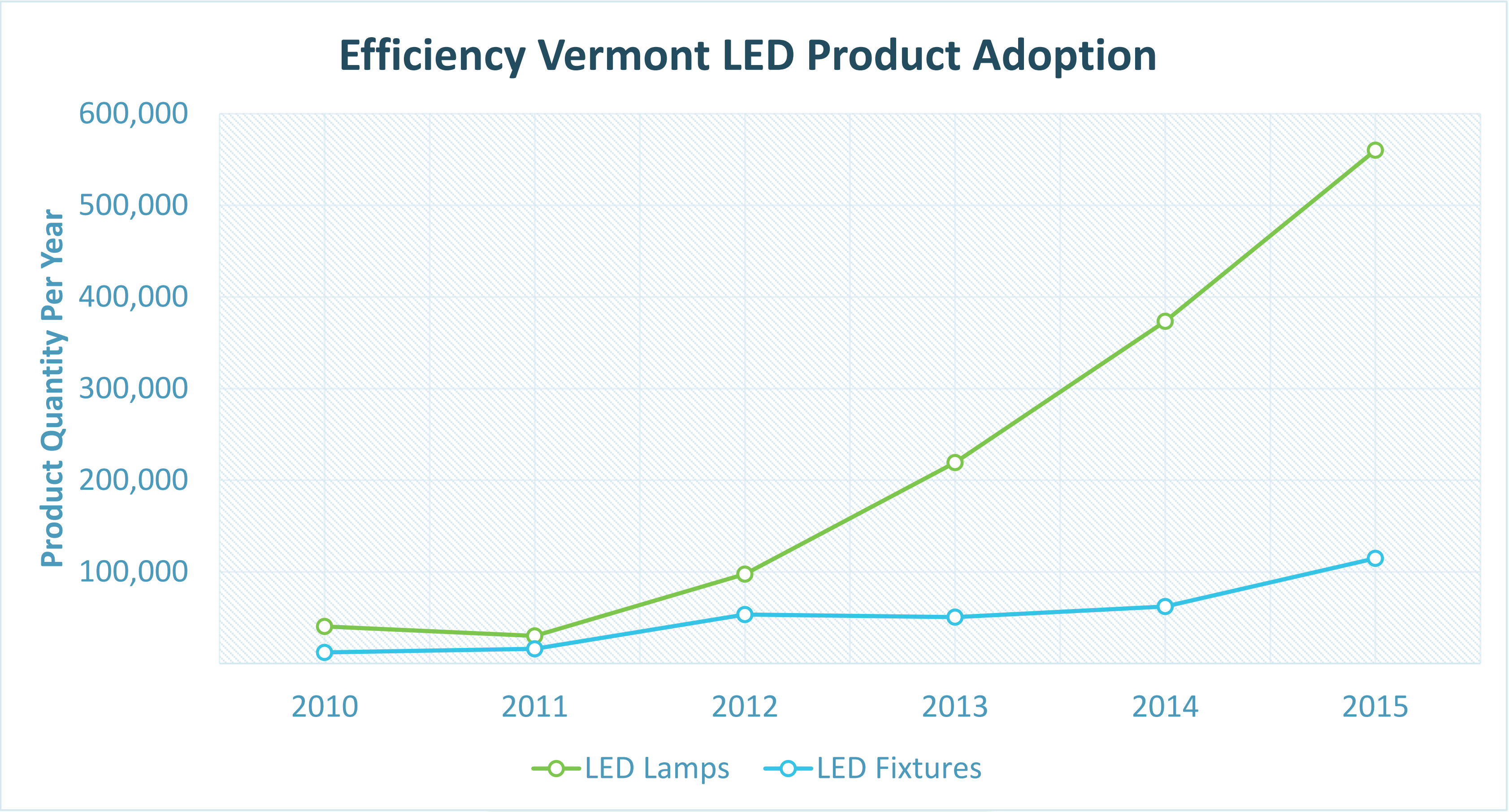
Lighting – Significant Contribution

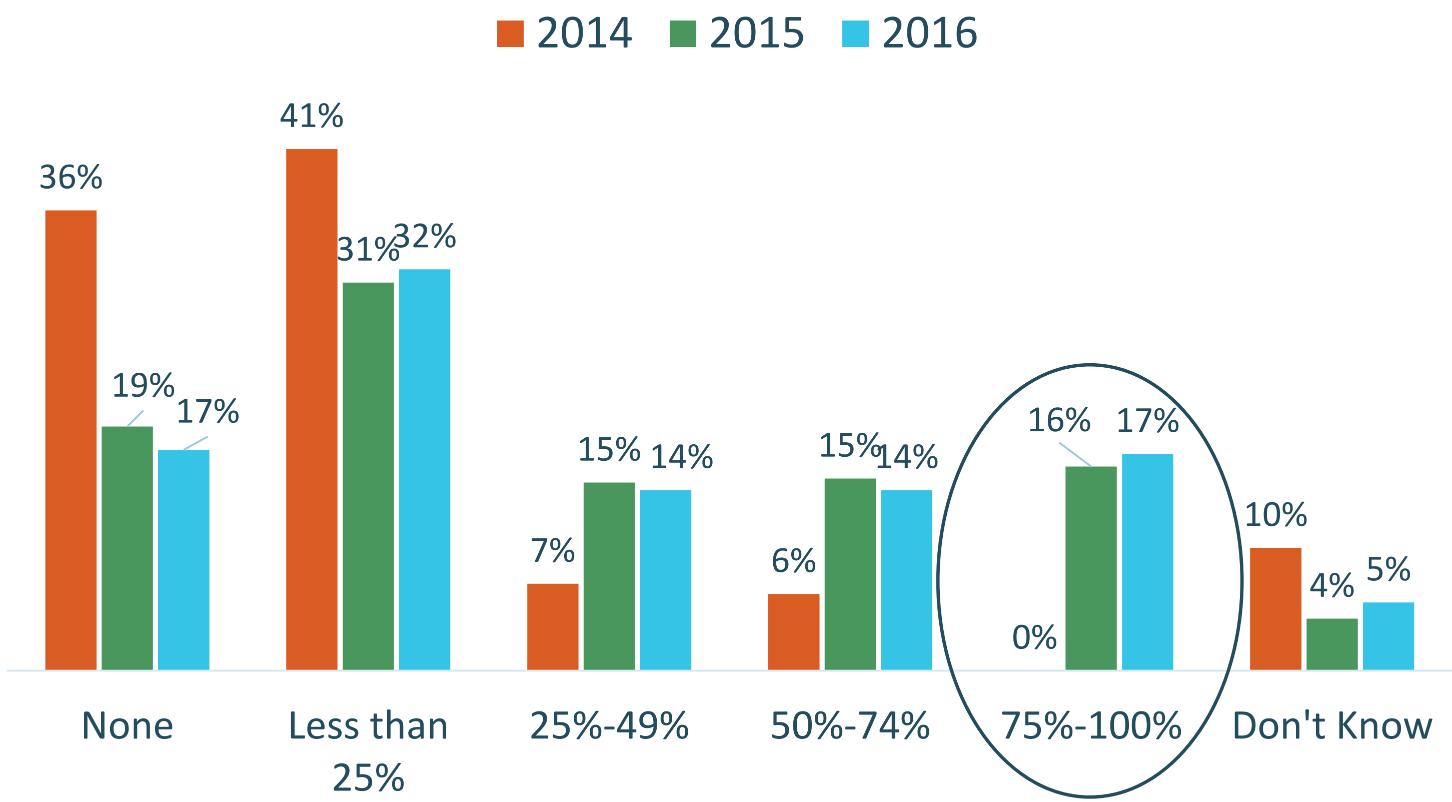


Rapid Growth in LED Lamps



Interior LED Adoption 2014-2016

Only 17% of respondents have replaced 75% or more of the light bulbs within their home with LEDs



Lighting in the Future?

- When is the market transformed?
- Decreasing savings
- Remaining lighting opportunity?

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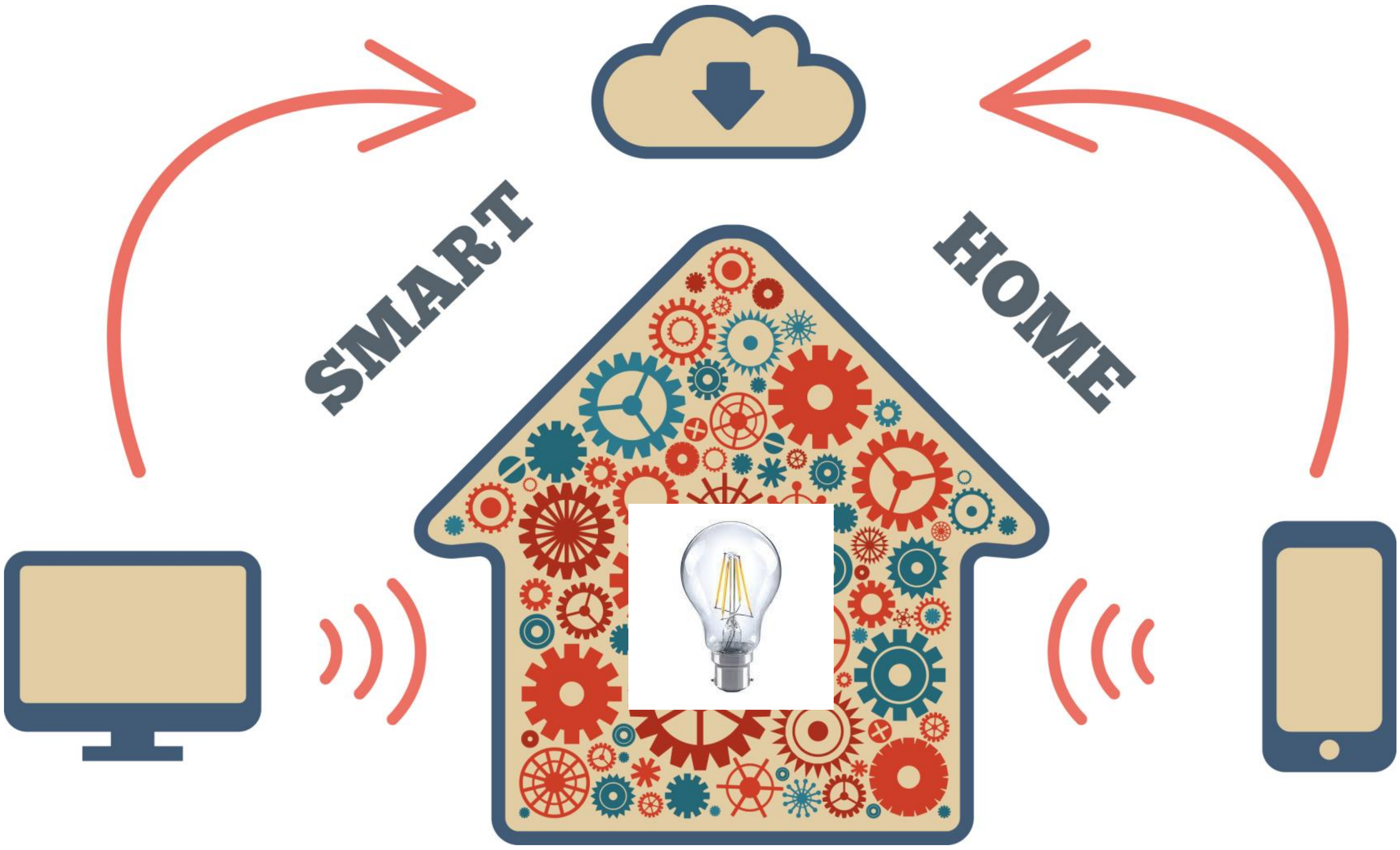
Savings in the future – Control



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How to Get There from Here

- Study products for which today's industry barriers are relatively minor:
  - Product Costs
  - Vendor Stability
  - Common Communication Standards
- Assess participants' experience

Efficiency Vermont's Study – Objective

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

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

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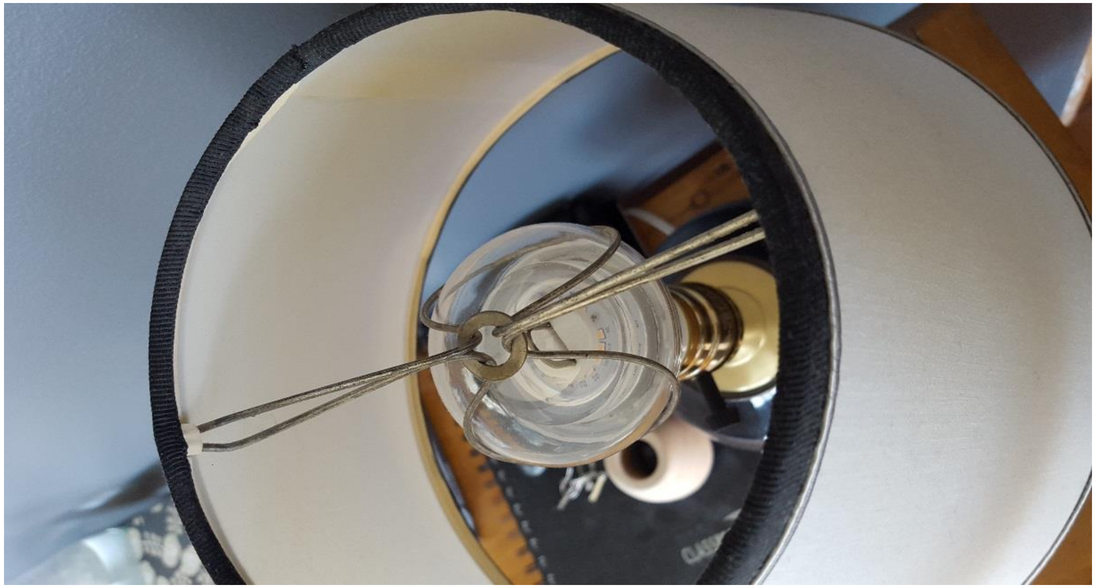
Secondary Objective

- Understand participants' "out of the box" experience with installation and use
- How do key purchase considerations play a role?

  Product Cost | Ease of Set-Up | Compatibility



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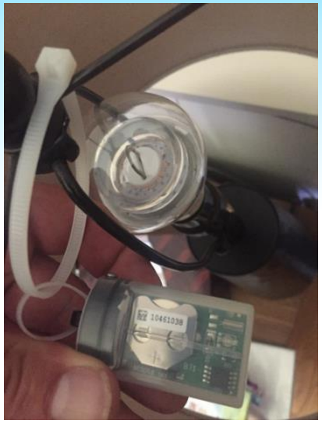
Program / Pilot Design

- **Product selection**
- **Assess DIY-nature of smart hubs & smart lighting**
- **No EEU instruction regarding set-up, or use of product**
  1. Participant attempts to install product on their own
  2. Staff verifies/adjusts install at initial visit to ensure <u>basic</u> functionality
  3. Participant uses products over 3-month period
- **Smart Outlet**
  - Record devices plugged in: 3x throughout study

Program / Pilot Design



15 study homes in Vermont

- **Light Loggers record data**
  - 5 smart LED bulbs, 5 regular LED bulbs per home

2 different smart ecosystems:

8 homes

7 homes

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Installation Experience

In an ideal setup, with major industry barriers removed…

- 47% surprised how easy it was to install
- It often took a few tries to get it right, but once they got it, it was easy
- Participants who encountered challenges were largely able to resolve them with manufacturers' support tools

Indicates viability for a retail program

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Installation Challenges

Select participants:

- Had to reset hub a few times
- Were confused by product labeling
- Experienced a firmware update issue
- Installed most of the 5 bulbs quickly, but 1 or more took a while or wouldn't connect

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The User Experience

Participants "satisfied" or "very satisfied":

- **80%** Smart Hub
- **87%** Smart Bulb
- **74%** Smart Outlet

Would you recommend?

- **80%** Smart Hub
- **87%** Smart Bulb
- **60%** Smart Outlet

Results: Dimming Opportunity

Smart bulbs make dimming possible where none had existed before

- In the average home: 10% of bulbs are on dimmer switches

Participants dimmed bulbs 38% of the time

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

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Results: Hours of Use (HOU)

Important Note: The 15 home sample-size is not statistically significant. Further study is warranted to verify these results

- Smart bulbs used **fewer** projected annual operating HOU (less than 1,000) than established baselines for non-smart lighting (1,200)
  - Up to 27%-reduction in HOU with smart bulbs

Mean Daily HOU	NRL Study Bulbs	Smart Bulbs
Kitchen	4.1	3.0
Living space	3.3	2.4
Household*	2.7	2.5

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Results: Hours of Use (HOU)

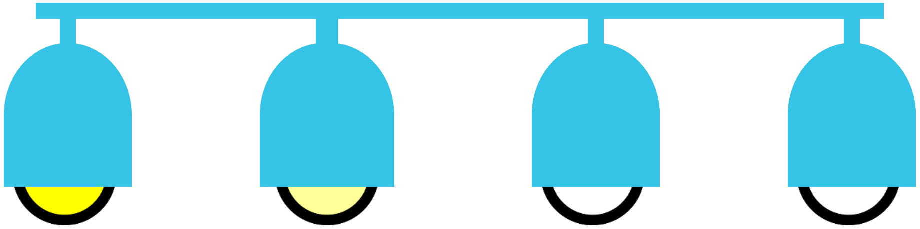
No statistically significant HOU difference in:

- **Homes that Regularly Used Automation**
  - Opportunity for efficiencies in scheduling

- **Manufacturer’s Ecosystems**
  - Program could be scaled across manufacturers assuming strict selection criteria

Unexpected Opportunity

- Remote control of single bulb in circuit



- Correcting for inopportune switch placement

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Market Readiness for EE Programs

In an ideal set-up, with major industry barriers removed…

- Installation experience – not a major blocker
- Indicates viability for a retail program

Given this price point, would you recommend?

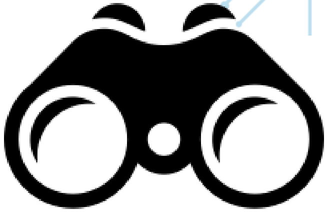
87% Smart Bulb

80% HEMS Hub

At $15 / bulb, cost not a barrier.

The Next Frontier & Next Steps!

- Promising initial results
- Big opportunity with scheduling & influence on customer behavior & design
- Big opportunity for dimming
- Potential for retail program with careful product selection
- Additional discussion & research needed
- Utilities get involved!



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Thank you!

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Find the Full Report Here:

www.efficiencyvermont.com/news-blog/whitepapers