

Smart Lighting – New Frontier for Savings?

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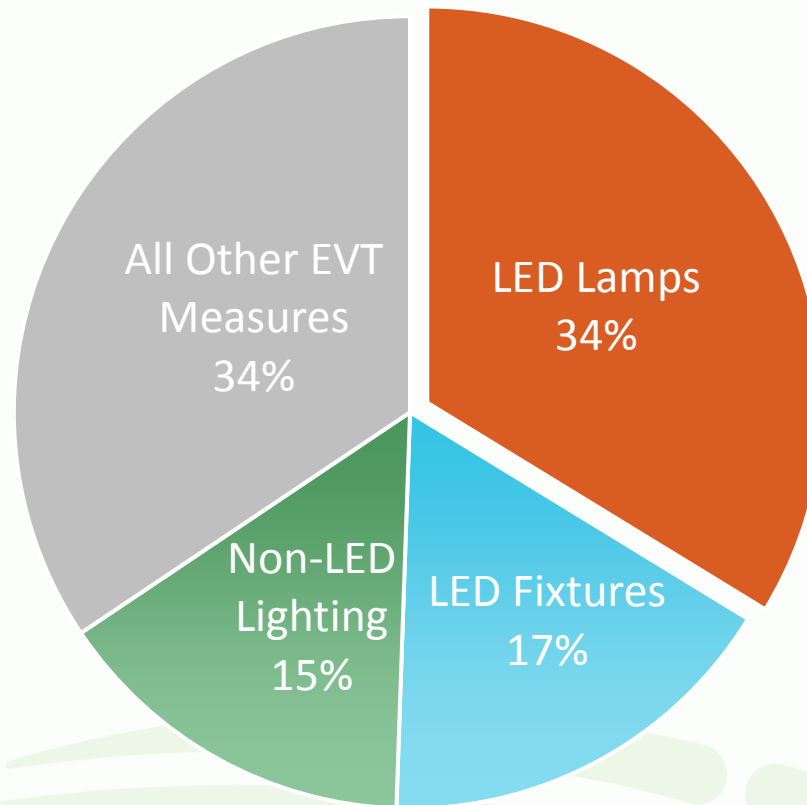
Who is Efficiency Vermont?

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



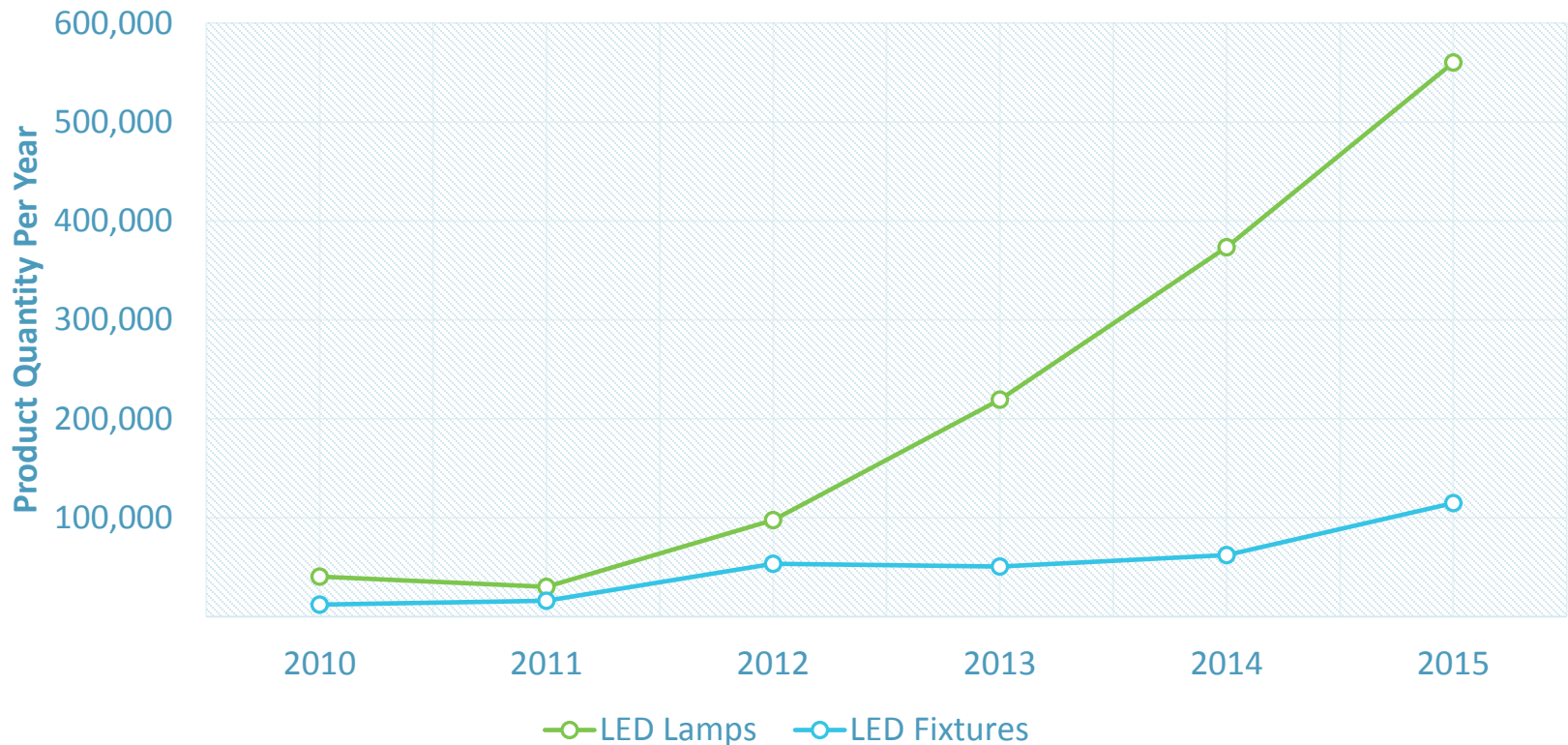
Lighting – Significant Contribution

2015 Efficiency Vermont
Wide Savings



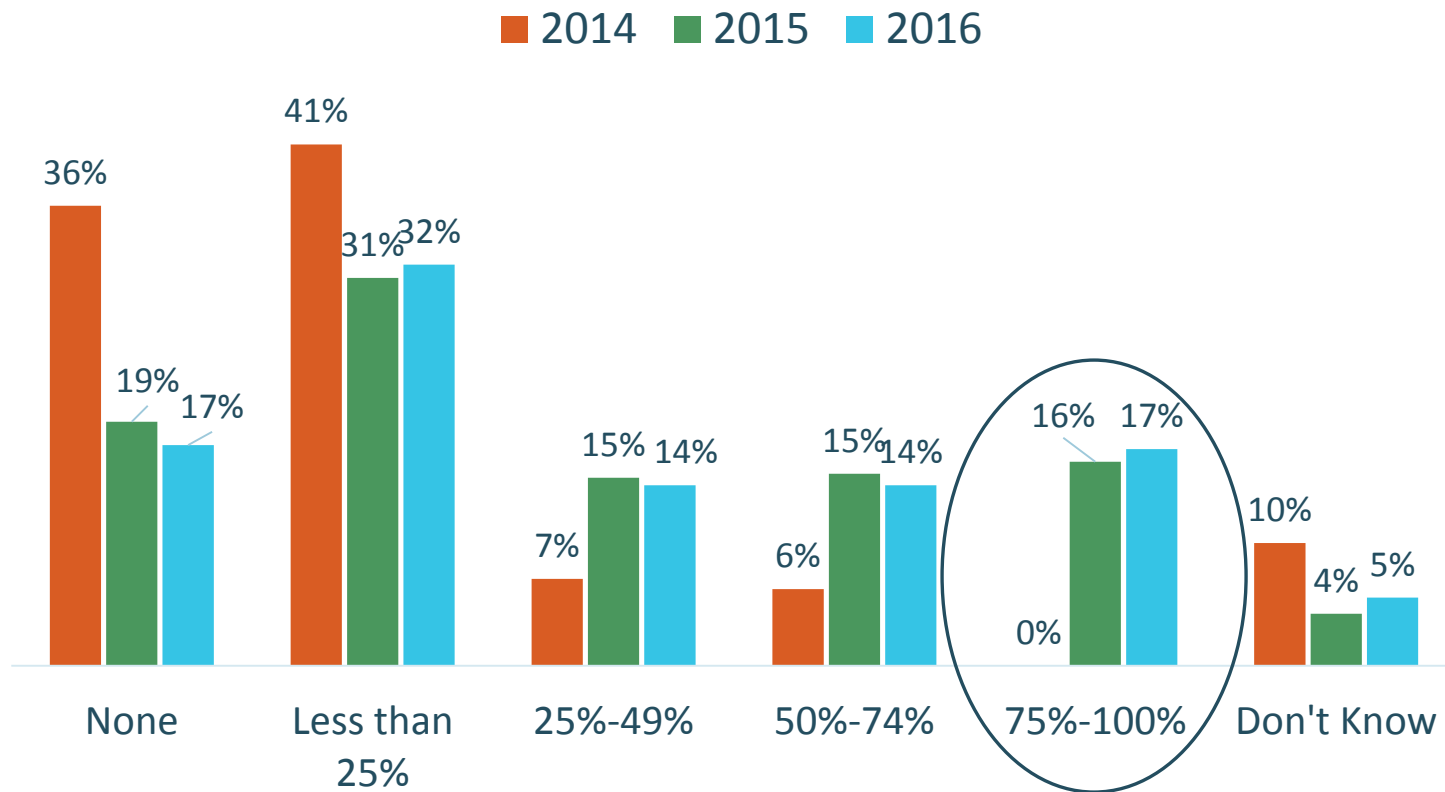
Rapid Growth in LED Lamps

Efficiency Vermont LED Product Adoption



Interior LED Adoption 2014-2016

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

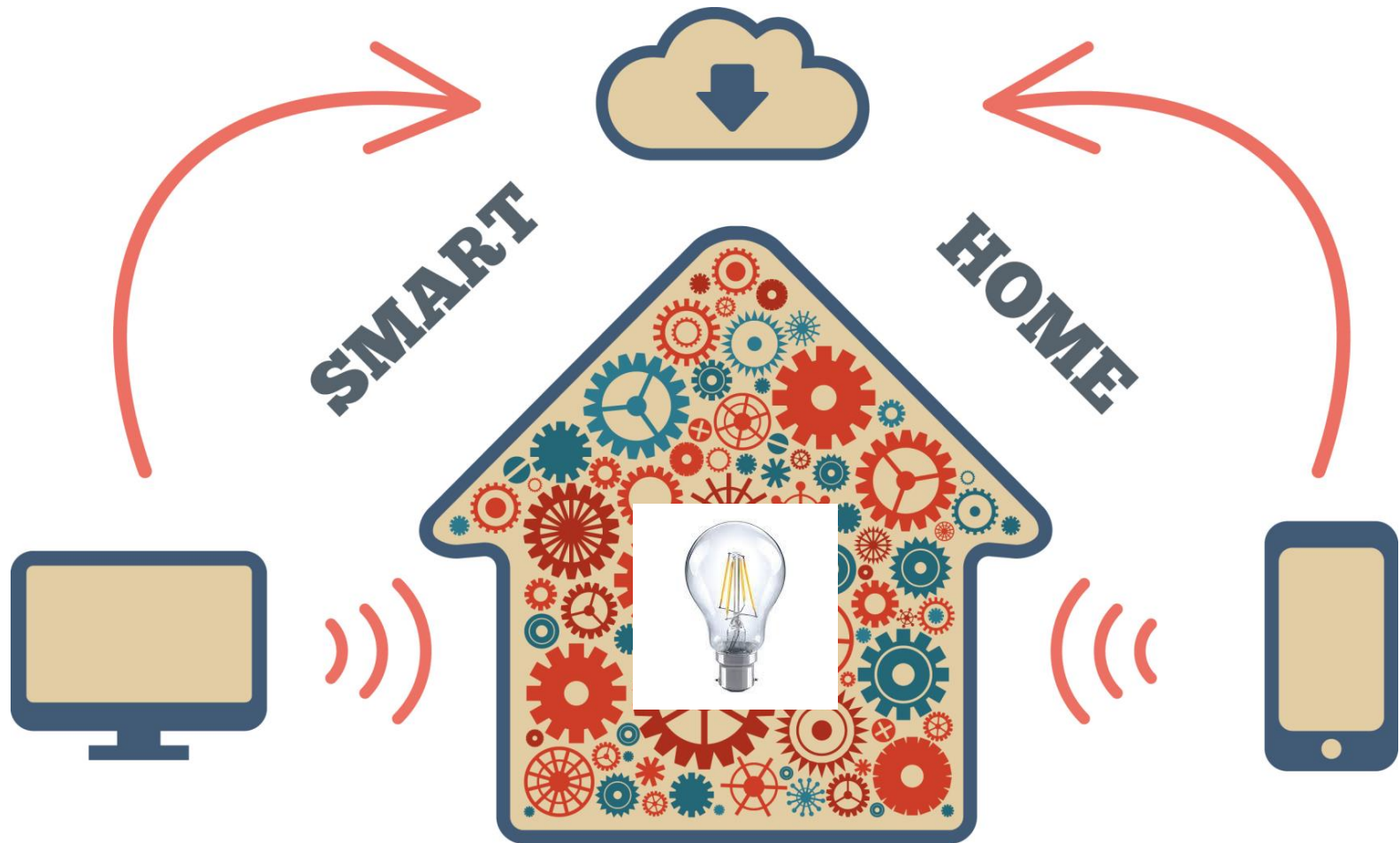


Lighting in the Future?

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



Savings in the future – Control



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



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



Program / Pilot Design

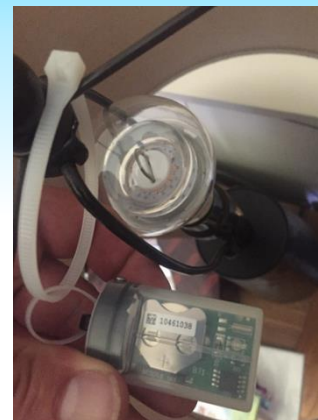


- **Product selection**
- **Assess DIY-nature of smart hubs & smart lighting**
- **No EEU instruction regarding set-up, or use of product**
 1. Participant attempts to install product on their own
 2. Staff verifies/adjusts install at initial visit to ensure basic functionality
 3. Participant uses products 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



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

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

The User Experience



Participants “satisfied”
or “very satisfied”:

Would you
recommend?

80% Smart Hub

87% Smart Bulb

74% Smart Outlet

80% Smart Hub

87% Smart Bulb

60% Smart Outlet

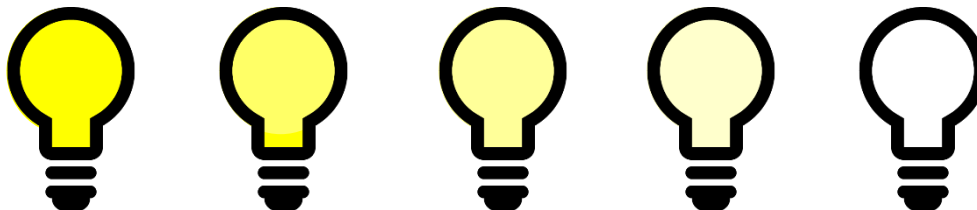
Results: Dimming Opportunity

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



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

Results: Hours of Use (HOU)

No statistically significant HOU difference in:

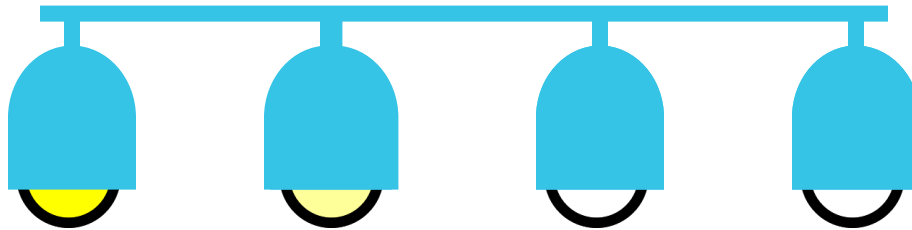
- **Homes that Regularly Used Automation**
 - Opportunity for efficiencies in scheduling
- **Manufacturer's Ecosystems**
 - Program could be scaled across manufacturers assuming strict selection criteria



Unexpected Opportunity



- Remote control of single bulb in circuit



- Correcting for inopportune switch placement

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?



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!



Thank you!

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Find the Full Report Here:

www.efficiencyvermont.com/news-blog/whitepapers



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