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

- LED Lamps 34%
- LED Fixtures 17%
- Non-LED Lighting 15%
- All Other EVT Measures 34%
Rapid Growth in LED Lamps

Efficiency Vermont LED Product Adoption

- LED Lamps
- LED Fixtures
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
  o 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”:

- 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
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

<table>
<thead>
<tr>
<th>Mean Daily HOU</th>
<th>NRL Study Bulbs</th>
<th>Smart Bulbs</th>
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</thead>
<tbody>
<tr>
<td>Kitchen</td>
<td>4.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Living space</td>
<td>3.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Household*</td>
<td>2.7</td>
<td>2.5</td>
</tr>
</tbody>
</table>
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 inopportunune 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?

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!
Thank you!

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Find the Full Report Here:
www.efficiencyvermont.com/news-blog/whitepapers