The Market for CFLs in Connecticut

Key Findings from Telephone and Onsite Surveys and Multistate Modeling

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Agenda

• Research Objectives
• Research Methods
• Telephone vs. Onsite Self-Reports
• Results
• Conclusion and Recommendations
• Looking Forward
Research Objectives

• To understand the state of spiral and specialty CFL markets in Connecticut
• To estimate net effect of CFL program activity on CFL use, sales
• To measure awareness and use of LEDs and other energy efficient lighting
• To assess public knowledge of and response to new federal lighting standards
Data Collection

• Random digit dial (RDD) survey
  – Assess awareness, familiarity, satisfaction
  – Determine awareness of LEDs, other energy efficient lighting technologies, and new federal lighting standards
  – Explore lighting purchase behaviors
  – Estimate CFLs in use and storage
  – Collect demographic and housing data
  – Recruit onsite survey participants

• Survey of 2008 intercept study participants
  – Objectives similar to RDD survey

• Onsite (In-home) Saturation Survey
  – Inventory all lighting in use and storage
  – Identify CFL model numbers, purchase dates and stores
  – Identify program-supported CFLs
### Sample Sizes and Sampling Error

<table>
<thead>
<tr>
<th>Data Collection Method</th>
<th>Population</th>
<th>Sample Size</th>
<th>Sampling Error*</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDD of general population</td>
<td>1,323,431</td>
<td>500</td>
<td>3.7%</td>
</tr>
<tr>
<td>Onsite Visits</td>
<td>1,323,431</td>
<td>95</td>
<td>8.4%</td>
</tr>
<tr>
<td>Intercept Participants</td>
<td>102</td>
<td>17</td>
<td>18.3%</td>
</tr>
</tbody>
</table>

- Sampling error at the 90% confidence level (how much error associated with talking to only some people in the population)
- Not the same as “margin of error” for a confidence interval, which is related to the potential error surrounding a single estimate
- The RDD and on-site survey data were weighted to reflect the population proportions for home ownership and education from the American Community Survey (ACS)
Analysis Methods

• Descriptive statistical summaries
  – Weighted analysis to estimate awareness, satisfaction, current and potential use, and purchases, among others

• Multistate Modeling
  – Entered data collected in RDD and onsite surveys into statistical model to estimate program effect on CFL use, saturation, sales
  – Provided data to estimate net-to-gross (NTG)

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Why Multistate Modeling

• Reliable and representative sales data still not available at market level
  – Participating stores share only program sales
  – Non-participating stores rarely share data
  – Spillover effects – program activity affects non-participating stores too

• Lack of reliability in self-report methods, especially for upstream programs
  – Participants aren’t aware of program
  – Free ridership built into the design
Why Multistate Modeling (cont.)

- Limitations of comparison area approach
  - No perfect non-program comparison area
  - Cannot control for household level variation
  - Limited sample size for budgetary reasons

- Multistate effort
  - No need for perfect comparison area
  - Model controls for household level variation
  - Pooling resources gives large sample sizes
  - Similar RDD and onsite survey procedures
Sponsors of Multistate Effort

• California: California Public Utilities Commission
• Colorado: Xcel Energy
• Connecticut: Connecticut Energy Efficiency Board, Connecticut Light and Power, and The United Illuminating Company
• Massachusetts: Cape Light Compact, National Grid, NSTAR, Unitil, and Western Massachusetts Electric
• Michigan: Consumers Energy
• New York State and New York City: New York State Energy Research and Development Authority
• Wisconsin: Public Service Commission of Wisconsin
Included Areas: 9,325 RDD, 1,444 Onsite

<table>
<thead>
<tr>
<th>State</th>
<th>Program Status</th>
<th>RDD Sample Size</th>
<th>Onsite Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>Long-standing program</td>
<td>699</td>
<td>77</td>
</tr>
<tr>
<td>CO</td>
<td>Recently expanded</td>
<td>600</td>
<td>70</td>
</tr>
<tr>
<td>CT</td>
<td>Long-standing program</td>
<td>500</td>
<td>95</td>
</tr>
<tr>
<td>DC</td>
<td>No program</td>
<td>500</td>
<td>97</td>
</tr>
<tr>
<td>GA</td>
<td>Small program</td>
<td>579</td>
<td>62</td>
</tr>
<tr>
<td>IN</td>
<td>No program</td>
<td>600</td>
<td>88</td>
</tr>
<tr>
<td>KS</td>
<td>No program</td>
<td>525</td>
<td>71</td>
</tr>
<tr>
<td>MD</td>
<td>New program</td>
<td>500</td>
<td>57</td>
</tr>
<tr>
<td>MA</td>
<td>Long-standing program</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>MI</td>
<td>No program in 2008</td>
<td>657</td>
<td>86</td>
</tr>
<tr>
<td>NYS</td>
<td>Long-standing program</td>
<td>1,000</td>
<td>203</td>
</tr>
<tr>
<td>NYC</td>
<td>Long-standing program</td>
<td>502</td>
<td>100</td>
</tr>
<tr>
<td>OH</td>
<td>No program</td>
<td>501</td>
<td>98</td>
</tr>
<tr>
<td>PA</td>
<td>No program in 2008</td>
<td>653</td>
<td>59</td>
</tr>
<tr>
<td>Houston</td>
<td>No program</td>
<td>503</td>
<td>99</td>
</tr>
<tr>
<td>WI</td>
<td>Long-standing program</td>
<td>503</td>
<td>82</td>
</tr>
</tbody>
</table>
Telephone Self-reported Data vs. Onsite CFL Count Data

Notable differences between RDD and onsite data

- **Current Usage of CFLs**
  - RDD respondents not able to accurately estimate the number of CFLs currently installed
  - RDD respondents over-reported current usage of specialty CFLs

- **Storage of CFLs**
  - RDD respondents over-reported number of CFLs in storage

- **Purchases of CFLs**
  - Reported purchases in past three months similar in both methods, but
  - Greater variability in reported purchases since January 2009 and during 2008

**Mean CFL Usage**

<table>
<thead>
<tr>
<th></th>
<th>All CFLs</th>
<th>Standard CFLs</th>
<th>Specialty CFLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDD</td>
<td>11.0</td>
<td>5.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Onsite</td>
<td>9.6</td>
<td>5.7</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**Mean CFL Usage**

- All CFLs
  - RDD: 11.0
  - Onsite: 9.6

- Standard CFLs
  - RDD: 5.3
  - Onsite: 5.7

- Specialty CFLs
  - RDD: 2.5
  - Onsite: 2.5

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Awareness and Familiarity

<table>
<thead>
<tr>
<th>Aware</th>
<th>Very familiar or somewhat familiar</th>
<th>Current CFL user</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDD</td>
<td>Onsites</td>
<td>Intercept</td>
</tr>
<tr>
<td>86%</td>
<td>72%</td>
<td>100%</td>
</tr>
<tr>
<td>67%</td>
<td>81%</td>
<td>94%</td>
</tr>
<tr>
<td>63%</td>
<td>85%</td>
<td>100%</td>
</tr>
</tbody>
</table>

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CFL Penetration – Percent of Homes

- **Any CFL**:
  - RDD: 63%
  - Intercept: 85%

- **Standard CFL**:
  - RDD: 51%
  - Onsites: 84%

- **Specialty CFL**:
  - RDD: 42%
  - Onsites: 30%
  - Intercept: 94%

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CFLs in Use

Concentration of CFL Use
• Onsites
  – 23% of homes have 16 or more CFLs installed, or 56% of all CFLs observed
  – 25% of homes have between one and five CFLs installed, only 7% of all CFLs observed
• Intercept
  – 41% of homes have 16 or more CFLs installed, or 67% of all CFLs reported
  – 12% of homes have between one and five CFLs installed, only 2% of all CFLs reported

Mean CFLs in Use
Usage, Storage and Purchases Over Time

- Among RDD respondents who have used CFLs, there has been:
  - a steady increase in CFL usage since January 2008
  - a corresponding decrease in the number of CFLs in storage
  - and a decline in the number of CFLs purchased
Socket Saturation

Large potential for CFLs
• 23% of residential sockets in Connecticut contain a CFL
• 70% contain incandescent or halogen
• 29% of all sockets contain a specialty bulb of any type
  – 4% contain a specialty CFL

Socket Saturation by Type

- 64% Incandescents
- 23% CFLs
- 7% Fluorescent
- 6% Halogen
- 1% LED

NMR Group, Inc.

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Socket Saturation by Bulb Type

- LED: 1%
- Halogen: 6%
- Fluorescent: 7%
- CFLs: 23%
- Incandescents: 64%
- Any specialty bulb: 29%
- Specialty CFL: 4%

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Socket Saturation and Potential for CFLs by Bulb Feature

• Most installed CFLs are A-shaped or spiral, but this bulb shape also has greatest potential for CFLs
• 90% of remaining potential for CFLs rests in:
  – Incandescent bulb (26 million)
  – Flood shaped bulb (8 million),
  – Candelabra bulb (6 million)
• Dimmable and three-way sockets are 4% of remaining potential (1.6 million)

*Dimmable and three-way bulbs also fall within shape categories and therefore are not additive
Modeling Results

• Isolated effect of program activity on CFL use, saturation, purchases
  – Program existence related to demographic, economic factors
  – CFL use could be related to same factors
  – Modeling indemnified unique program effects

• Developed two 2008 purchase models
  – Recommended model – best fit but excludes saturation at beginning of 2008
  – Alternative model – fit not as good but includes saturation at beginning of 2008
### Models Explaining Number of Purchases in 2008

<table>
<thead>
<tr>
<th>Variables</th>
<th>Recommended Model</th>
<th>Alternative Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite Program</td>
<td>0.09</td>
<td>0.07</td>
</tr>
<tr>
<td>Years using CFLs</td>
<td>0.10</td>
<td>0.14</td>
</tr>
<tr>
<td>2008 saturation</td>
<td>n/a</td>
<td>-0.03</td>
</tr>
<tr>
<td># sockets in home</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td># household members</td>
<td>0.13</td>
<td>n/a</td>
</tr>
<tr>
<td>Identify as white</td>
<td>0.59</td>
<td>0.53</td>
</tr>
<tr>
<td>Conducted in fall</td>
<td>0.54</td>
<td>n/a</td>
</tr>
<tr>
<td>Lean democratic</td>
<td>n/a</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

- Multiply value in table by score for house for each variable, then sum to get estimated household purchases
Calculation of Net-to-Gross: Recommended Model

<table>
<thead>
<tr>
<th>Input</th>
<th>Recommended</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Observed purchases</td>
<td>247</td>
<td>247</td>
</tr>
<tr>
<td>B. Predicted w/o program</td>
<td>89</td>
<td>69</td>
</tr>
<tr>
<td>C. Onsite sample size (useable responses)</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>D. Per-household observed (A/C)</td>
<td>2.68</td>
<td>2.68</td>
</tr>
<tr>
<td>E. Per-household no program (B/C)</td>
<td>0.97</td>
<td>0.75</td>
</tr>
<tr>
<td>F. Net purchases (D – E)</td>
<td>1.71</td>
<td>1.93</td>
</tr>
<tr>
<td>G. Incented per household</td>
<td>2.12</td>
<td>2.12</td>
</tr>
<tr>
<td><strong>H. Estimated NTG observed (F/G)</strong></td>
<td><strong>0.81</strong></td>
<td><strong>0.91</strong></td>
</tr>
<tr>
<td>I. Predicted with program</td>
<td>165</td>
<td>112</td>
</tr>
<tr>
<td>J. Per-household predicted (I/C)</td>
<td>1.79</td>
<td>1.22</td>
</tr>
<tr>
<td>K. Net program purchases predicted (J – E)</td>
<td>0.82</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>L. Estimated NTG predicted (K/G)</strong></td>
<td><strong>0.39</strong></td>
<td><strong>0.22</strong></td>
</tr>
</tbody>
</table>
Other Key Findings from Modeling

• New households reached
  – Programs induce new households to try CFLs

• Duration of CFL use as a predictor variable
  – Strongly associated with number of CFLs installed, purchased, and with saturation

• Saturation and purchase rates
  – Purchase rates seem to drop when saturation nears approximately 20%, where Connecticut is now

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Overall Conclusions

• Substantial opportunity remains
  – Awareness (86%) and familiarity (67%) are high, but
  – CFLs are installed in only 23% of sockets
  – 70% of sockets contain incandescent or halogen bulbs
  – A-shaped incandescent, flood, and candelabra bulbs account for
    91% of the remaining potential for CFLs or LEDs

• The market is rapidly changing
  – CFLs more widely available and in use nationally, even in non-
    program areas
  – National CFL shipments down in 2008 and 2009 from 2007 peak
  – Programs have accomplished much, but still more to do
  – Program revision—not cessation—may be needed to boost
    saturation and keep NTG from falling
Overall Conclusions (cont.)

- Changes to upstream approaches could include
  - Incentivize stores to increase sales or market share
  - Seek to target other retail outlets such as grocery stores, drug stores, dollar stores, and ethnic markets
  - Increased—but not exclusive—focus on specialty CFLs

- Emphasize a segmented approach to downstream marketing
  - Direct installations of CFLs in low-income households
  - Promotions to motivate early replacement (prior to burn out) of incandescent bulbs
  - Promotional messages should emphasize monetary and energy savings potential

- Increased outreach to help consumers make the connection between CFLs, financial savings and environmental benefits
Looking Forward: EISA

• The Energy Independence and Security Act (EISA) effective in 2012
• Phased in over time, with products covered and required efficiency levels increasing through 2020
• Lighting market will change but, incandescent bulbs will still be available for some time
• Still substantial savings to be gained from CFLs through – and even beyond – 2012