Energy Efficiency and Demand Response Opportunities

Steven Nadel, Executive Director
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Feb. 17, 2015
Potential Energy Savings from EE Policies in 51 States

Source: ACEEE, Change is in the Air
Results in Perspective

• Savings in 2030 are a 25% reduction relative to 2012 consumption (varies from 22-30% by region)

• 247 GW of avoided capacity

• Net savings of $48 billion
  • Efficiency investments required to generate 2030 savings: $47 billion
  • Retail price of avoided electricity: $95 billion

• Economic impacts
  • $17.2 billion increase in GDP in 2030
  • 611,000 jobs in 2030
# Estimates of 2013 Utility-Sector Program Savings

<table>
<thead>
<tr>
<th>State</th>
<th>2013 net incremental savings (MWh)</th>
<th>% of retail sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhode Island</td>
<td>161,831</td>
<td>2.09%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>1,116,442</td>
<td>2.05%</td>
</tr>
<tr>
<td>Vermont</td>
<td>99,074</td>
<td>1.78%</td>
</tr>
<tr>
<td>Arizona</td>
<td>1,317,329</td>
<td>1.74%</td>
</tr>
<tr>
<td>Hawaii</td>
<td>159,056</td>
<td>1.67%</td>
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<tr>
<td>Michigan</td>
<td>1,284,863</td>
<td>1.51%</td>
</tr>
<tr>
<td>Oregon</td>
<td>676,046</td>
<td>1.43%</td>
</tr>
<tr>
<td>Washington</td>
<td>990,143</td>
<td>1.35%</td>
</tr>
<tr>
<td>California</td>
<td>3,223,733*</td>
<td>1.25%</td>
</tr>
</tbody>
</table>

* 2012 data; 2013 data not yet available
Cost Trends by Year

Utility Levelized Cost of Saved Energy (2011$ per kWh)

Maximum
Average
Minimum

Source: Molina 2014

Different states & methodology
ACEEE “Next Big Things” Study

1. Appliances & standards (RF, CW, CD)
2. New construction programs & codes
3. Very efficient packaged AC for residential & commercial
4. Smart manufacturing and buildings
5. Strategic energy mgmnt for large C&I
6. Combined heat & power
7. Reduce key plug loads
8. Advanced lighting design & controls
9. Real-time feedback & advanced thermostats
10. Whole building retrofits
11. Conservation voltage reduction
12. Advanced water heaters
13. Residential LEDs
14. Industrial fans, pumps & compressors
Intelligent Efficiency in Buildings

• Use data and sensors to identify problems, then solve them
• NRDC study of 3 Energy Star offices using OnSite achieved 13% average savings. Other vendors report similar results

<table>
<thead>
<tr>
<th>Square Feet</th>
<th>2012 Occupancy</th>
<th>KWH Used 2011</th>
<th>KWH Used 2012</th>
<th>Study Period Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1707</td>
<td>109,926</td>
<td>1,965,135</td>
<td>1,516,274</td>
<td>23% $58,352</td>
</tr>
<tr>
<td>1828</td>
<td>332,928</td>
<td>5,590,937</td>
<td>5,227,183</td>
<td>7% $47,288</td>
</tr>
<tr>
<td>1909</td>
<td>239,128</td>
<td>5,197,305</td>
<td>4,327,589</td>
<td>17% $113,063</td>
</tr>
</tbody>
</table>

Total 12,753,377 11,071,046 13.2% $218,703
Energy Efficiency and Demand Response Can Be Synergistic
Energy Efficiency and Demand Response

• Can market both EE and DR programs together – joint promotions, same account representative

• Some new technologies do both EE & DR
  • Smart building controls
  • Smart thermostats
  • Smart manufacturing systems
  • Electric vehicles with smart charging
# Smart Thermostats: Preliminary Results

<table>
<thead>
<tr>
<th></th>
<th>Percent Savings</th>
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<tbody>
<tr>
<td></td>
<td>Heat</td>
</tr>
<tr>
<td>ETO heat pumps</td>
<td>12%</td>
</tr>
<tr>
<td>PG&amp;E HAN</td>
<td></td>
</tr>
<tr>
<td>Cadmus (U.S.)</td>
<td>4.5%</td>
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<tr>
<td>Vassar (So. CA)</td>
<td></td>
</tr>
<tr>
<td>Vectren</td>
<td>12.5%</td>
</tr>
<tr>
<td>Nest/MyEnergy</td>
<td>9.6%</td>
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</table>
Behavioral Efficiency & Demand Response

- Many analyses find 2% average kWh savings from monthly bill reports
- OPower reports 3% average kW savings with a behavioral-only demand response program
BG&E Smart Energy Rewards

- Bill credit of $1.25/kWh saved; 5-10 peak days
- Notifications via customer’s preferred channel
- In 2013 pilot, 75-93% of customers earned a credit, averaged $8-11/ event
- Reduced peak load by average of 5% with behavior; 23% for customers who agree to direct load control
Evaluation, Measurement & Verification (EM&V)

1. Build on established methods such as explained in SEE Action guides

2. Measure savings relative to business-as-usual baseline; do not worry about attributing savings to utility programs vs. other interventions ("adjusted gross savings"/ "net savings lite")

3. Deemed savings okay but need to periodically revise these estimates based on impact evaluations, esp. for programs with large savings
Conclusions

• Large efficiency savings still available – so far “the fruit grows back on the tree”
• Demand response adds significant additional savings as well as synergies
• New technology and marketing opportunities to do EE and DR together
• EM&V needs to be good but not perfect (e.g. concentrate on the largest savings)
Contact Information

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2015 ACEEE Conferences

- Hot Water Forum, Feb. 22-24, Nashville
- Market Transformation Symposium, April 20-22, Washington, DC
- Energy Efficiency Finance Forum, May 31-June 2, San Francisco
- Industrial Summer Study, August 4-6, Buffalo, NY
- Energy Efficiency as a Resource, Sept. 20-22, Little Rock, AR
- Behavior, Energy and Climate Change Oct. 18-21, Sacramento
- Intelligent Efficiency – Dec. 6-8, Boston