Hitting a Moving Target: Impacts of Changing Baselines

Rebecca Troutfetter
January 20th, 2015
Agenda

- Energy end-uses
- Measure savings, nationally
- Baseline shifts
- Savings potential implications
- Cost-benefit impacts
- Now what?
Energy End-Use

Commercial
- Space Heating: 27%
- Space Cooling: 14%
- Lighting: 10%
- Water Heating: 7%
- Refrigeration: 4%
- Other: 4%

Residential
- Space Heating: 31%
- Space Cooling: 24%
- Lighting: 14%
- Water Heating: 10%
- Refrigeration: 6%
- Other: 15%

“Other” includes:
- Electronics and Computers
- Cooking
- Ventilation
- Wet Cleaning
- Energy Adjustments
Electricity Savings from Energy Efficiency Programs - Current

**Commercial**
- Lighting: 57%
- HVAC: 11%
- Refrigeration: 8%
- Water heating: 8%
- Other*: 16%

**Residential**
- Lighting: 66%
- HVAC: 6%
- Water heating: 10%
- Refrigeration: 8%
- Other**: 18%

* Other includes IT, Appliances, Custom
** Other includes Appliances, Envelope/Whole Building, Plug loads

Sources: Program evaluations from 2010-2013 from CA, MI, NV, AR
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Natural Gas Savings from Energy Efficiency Programs - Current

Sources: Program evaluations from 2010-2013 from CA, MI, NV, AR

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Changes in Federal Standards
Commercial and Industrial Sector

- Small Electric Motors
- CAC & HP <65kBtu/hr

Refrigeration Equipment
- Boilers
- Packaged Terminal AC & HP

2014
Linear Fluorescent Systems

2015
Electric Motors

2016

2017

2018

2019
CAC & HP 65-760 kBtu/hr
Water heaters
Furnaces

2020
Service Lamps

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Changes in Federal Standards
Residential Sector

- Room Air Conditioners
- Compact Fluorescents
- Refrigerators & Freezers

- CACs and HPs
- Furnaces
- Water Heaters
- Clothes washers

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Current Commercial Energy Code Adoption Status

- ASHRAE 90.1-2010/2012 IECC equivalent or more energy efficiency
- ASHRAE 90.1-2007/2009 IECC equivalent or more energy efficiency
- ASHRAE 90.1-2004/2006 IECC equivalent or more energy efficiency
- ASHRAE 90.1-2001/2003 IECC equivalent or more energy efficiency
- No Statewide Code

*Adopted new Code to be effective at a later date

As of August 2014

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Current Residential Energy Code Adoption Status

IECC 2012, equivalent or more energy efficient
IECC 2009, equivalent or more energy efficient
IECC 2006, equivalent or more energy efficient
IECC 2003, equivalent or more energy efficient
No Statewide Code

* Adopted new Code to be effective at a later date

As of July 2014
### Changes in Federal Standards: Commercial

<table>
<thead>
<tr>
<th>Measure Type</th>
<th>Effective</th>
<th>Standard Change</th>
<th>Potential Energy Savings Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commercial</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air Conditioners and Heat Pumps</strong></td>
<td>2019</td>
<td>Standards require ≥ IEER 12.3 to 14.8 depending on equipment type and capacity</td>
<td>25-30%</td>
</tr>
<tr>
<td>(65,000 - 760,000 Btu/hr)</td>
<td>(proposed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air Conditioners and Heat Pumps</strong></td>
<td>2015</td>
<td>Standards require ≥ SEER 14 for split system CACs in South and Southwest. For HPs,</td>
<td>35%</td>
</tr>
<tr>
<td>(&lt;65,000 Btu/hr)</td>
<td></td>
<td>standards require and for ≥ SEER 14 and HSPF 8.2 for heat pumps in all regions</td>
<td></td>
</tr>
<tr>
<td><strong>Linear fluorescent systems</strong></td>
<td>2012</td>
<td>Standards raised baseline to T8 lamp and electronic ballast</td>
<td>30-40%</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>Eliminates majority of T12 electronic ballasts and less-efficient T8 and T5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>programmed-start ballasts</td>
<td></td>
</tr>
</tbody>
</table>
# Changes in Federal Standards: Residential Heating/Cooling

<table>
<thead>
<tr>
<th>Measure Type</th>
<th>Effective</th>
<th>Standard Change</th>
<th>Potential Energy Savings Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Air Conditioners (CACs)</td>
<td>2015</td>
<td>Standards require $\geq$ SEER 14 for split system CACs in South and Southwest</td>
<td>35% S &amp; SW</td>
</tr>
<tr>
<td>Heat Pumps</td>
<td>2015</td>
<td>Standards require and for $\geq$ SEER 14 and HSPF 8.2 for heat pumps in all regions</td>
<td>35%</td>
</tr>
<tr>
<td>Furnaces</td>
<td>2015</td>
<td>Standards require AFUE of 80% in all regions for gas furnaces, and 83% in all regions for oil furnaces</td>
<td>0-18%</td>
</tr>
<tr>
<td>Gas-Fired &amp; Electric Storage Water Heaters</td>
<td>2015</td>
<td>For &lt; 55 gal: EF increase based on tank volume, ex. 40 gallon gas water heater EF raises from 0.59 to 0.62 For &gt; 55 gal: Standards effectively require heat pumps for electric storage and condensing for gas storage</td>
<td>45% &lt; 55 gal For &gt; 55 gal: Standards effectively require heat pumps for electric storage and condensing for gas storage</td>
</tr>
</tbody>
</table>
# Changes in Federal Standards: Residential Lighting

<table>
<thead>
<tr>
<th>Measure Type</th>
<th>Effective</th>
<th>Standard Change</th>
<th>Potential Energy Savings Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Fluorescent Lamps</td>
<td>2012</td>
<td>100W incandescent must be ≤ 72W with rated lumens of 1490-2600</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>75W incandescent must be ≤ 53W with rated lumens of 1050-1489</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>60W incandescent must be ≤ 43W with rated lumens of 750-1049</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>40W incandescent must be ≤ 29W with rated lumens of 310-749</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>CFLs become baseline technology due to efficacy requirements</td>
<td>100%</td>
</tr>
</tbody>
</table>

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Commercial Electric Effects for 2015

2013 Savings Mix

2015 Savings Mix
Baseline shifts reduce savings by 20%
## Electric Effects - Lighting

<table>
<thead>
<tr>
<th>% of Linear Lighting in Programs*</th>
<th>Reduction in Total Program Savings Due to Lighting Baseline Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>16%</td>
</tr>
<tr>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>60%</td>
<td>24%</td>
</tr>
<tr>
<td>70%</td>
<td>28%</td>
</tr>
<tr>
<td>80%</td>
<td>32%</td>
</tr>
</tbody>
</table>
Residential Electric Effects for 2015

2013 Savings Mix vs. 2015 Savings Mix

Baseline shifts reduce savings by 30%
Commercial Gas Effects

2013 Savings Mix

2019 Savings Mix
Baseline shifts reduce savings 10%
*No adjustments made to custom since measures are unknown
Thus impacts are likely higher.

© CLEAResult, 2015
Residential Gas Effects for 2015

2013 Savings Mix

2015 Savings Mix
Baseline shifts reduce savings by 17%
Cost Implications due to Baseline Changes

- Reduced savings
- Increased incremental cost
- Increased program costs
- Decreased program cost effectiveness
# Utility Cost Test/Program Administrator Cost Test

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Savings</td>
<td>Overhead</td>
</tr>
<tr>
<td>Avoided reduction in transmission, distribution, generation, and capacity</td>
<td>Program administration, marketing, measure research, tool development, project processing, and evaluation</td>
</tr>
<tr>
<td>Avoided power plant construction</td>
<td>Increased supply costs for periods of increased load</td>
</tr>
<tr>
<td></td>
<td>Incentives paid to the customers</td>
</tr>
</tbody>
</table>
## Total Resource Cost Test

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Savings</td>
<td>Overhead</td>
</tr>
<tr>
<td>Avoided reduction in transmission, distribution, generation, and capacity</td>
<td>Program administration, marketing, measure research, tool development, project processing, and evaluation</td>
</tr>
<tr>
<td>Avoided power plant construction</td>
<td>Utility equipment, installation, and operations and maintenance</td>
</tr>
<tr>
<td>Additional resource savings</td>
<td></td>
</tr>
<tr>
<td>Applicable tax credits*</td>
<td>Customer incremental equipment, installation, and operations and maintenance</td>
</tr>
<tr>
<td>Monetized environmental and non-energy benefits*</td>
<td></td>
</tr>
</tbody>
</table>

*when applicable
# Cost Benefit Analysis

## Simple Example

- CFLs, using MEMD data

<table>
<thead>
<tr>
<th>Measure</th>
<th>Baseline</th>
<th>Net To Gross</th>
<th>EUL (yrs)</th>
<th>kWh</th>
<th>kW</th>
<th>Incentive</th>
<th>Incremental Cost</th>
<th>Program Admin Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 watt equiv. CFL Pre 2014</td>
<td>60 watts</td>
<td>82%</td>
<td>9</td>
<td>38.2</td>
<td>0.0046</td>
<td>$1.20</td>
<td>$1.20</td>
<td>$3/lamp*</td>
</tr>
<tr>
<td>60 watt equiv. CFL Post 2014</td>
<td>43 watts</td>
<td>82%</td>
<td>9</td>
<td>23.9</td>
<td>0.0029</td>
<td>$1.20</td>
<td>$1.20</td>
<td>$3/lamp**</td>
</tr>
</tbody>
</table>

*Based on review of Midwest program costs in multiple states

**Assume program admin cost to remain the same per lamp
UCT – CFLs

Cost Effective if \( \sum \frac{Benefits}{Cost} > 1 \)
Cost Effective if $\sum \frac{Benefits}{Cost} > 1$
## Changes in Program Cost – Lighting Example

<table>
<thead>
<tr>
<th>Measure</th>
<th>$/kWh (incentive &amp; admin)</th>
<th>% Increase in Program Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFL Pre-2014</td>
<td>$0.11</td>
<td>n/a</td>
</tr>
<tr>
<td>CFL Post-2014</td>
<td>$0.17</td>
<td>54%</td>
</tr>
</tbody>
</table>
## Changes in Program Cost – Lighting & Appliance Retail Program Example

<table>
<thead>
<tr>
<th>Lighting &amp; Appliance Program</th>
<th>$/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre 2014</td>
<td>$0.05</td>
</tr>
<tr>
<td>Post 2014</td>
<td>$0.08</td>
</tr>
</tbody>
</table>

- Program includes: CFLs, LEDs, advanced power strips, appliances, and window air conditioners
- Baseline change reduces savings 35%
- Cost per kWh saved increased by more than 50%
Now What?

- Prepare for battle!

- New technologies
- Program Redesign
- Be brilliant at the basics - use the MEMD savings to the fullest for cost effective measures
Conclusions

- Prepare for baseline changes!
- Capture easy prescriptive measures
- Embrace program redesign
- Monitor industry trends & look for new opportunities
Questions

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