Meeting 30% of Energy Needs with Efficiency within 10 Years:

The Next Quantum Leap in Electric Energy Efficiency

NCSL Webinar
Richard Sedano

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Introducing RAP and Rich

• RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP staff have extensive utility regulatory experience. RAP technical assistance to states is supported by US DOE, US EPA and foundations.
  – Richard Sedano directs RAP’s US Program. He was commissioner of the Vermont Department of Public Service from 1991-2001 and is an engineer.
  – This presentation relies heavily on work developed in 2015 by Energy Futures Group for RAP
Presentation Outline

1. A reasonable stretch goal for energy efficiency
2. Current Best Practice
3. Opportunities for Increasing Savings
4. Policies Needed to Maximize Efficiency
1. A Reasonable Stretch Goal for Energy Efficiency
30% Electric Savings in 10 Years

- Just end-use savings in homes & businesses
- Just efficiency/conservation
- Savings still persisting in 10 Years
- Relative to business as usual baseline (net savings)
- Societally cost-effective
- All policy options “on the table”

50-100% more savings than leading states currently achieving
Analysis Perspective

• Top-down macro-level analysis
  – Lessons learned from past efforts to push envelope
  – Current differences between 2% and 1% states
• Initial list of technical, program and policy ideas for increasing savings
• Interview national “thought leaders”
• Additional research/analysis of selected ideas

We did not do a traditional potential study. Such studies are inherently poor tools for assessing the limits of what is possible.
Potential Study Estimates of "Max Achievable" Much Lower than Leading States' Actual Achievements!

Graph courtesy of Phil Mosenthal, Optimal Energy (see his ACEEE 2015 Efficiency as a Resource conference presentation)
2. Current Best Practice
States, Administrators Have Been Getting Better at Energy Efficiency
(1st Year Savings as % of Annual Sales)

<table>
<thead>
<tr>
<th>Year</th>
<th>≥2.5%</th>
<th>≥1.5%</th>
<th>≥1.0%</th>
<th>≥0.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>MA, RI</td>
<td>6 states</td>
<td>16 states</td>
<td>33 states</td>
</tr>
<tr>
<td>2006</td>
<td>CT, RI</td>
<td>3 states</td>
<td>12 states</td>
<td></td>
</tr>
</tbody>
</table>

7 states (MA, RI, VT, CA, MD, AZ, CT) currently have EERS which will lead to at least 2.0% annually savings in the future.

MA and RI 2014 Results Extrapolated to Next 10 Years

Note: Results exclude impacts of CHP (addressed later)
Transferability of MA/RI Results

- Higher than average electricity costs
- Higher than average avoided costs
- Colder than average climate
- Longer than average history of EE programs

*We expect the net impact of these factors to be small compared with opportunities discussed subsequently.*
3. Opportunities for Increasing Savings
Expanding the Definition of Efficiency

• Combined Heat and Power (CHP)
  – “Efficiency” from multi-fuel perspective
  – “Effective electric savings” potential of ~2%
    • Net of “savings penalty” for increased on-site gas use

• Conservation Voltage Reduction (CVR)
  – Utility measure, but savings on customer side of meter
  – 2+% savings nationally from application where most cost-effective, based on multiple studies
New Technology Opportunities

• **Currently known:**
  – At least 18-19% savings over 15 years*

• **Currently unknown:**
  – Definitely not zero!
  – ½ of NPCC 7th Power Plan savings from measures not in 6th Plan

• **Other:**
  – Known measures whose costs decline to point where cost-effective
  – New end uses – e.g. electric vehicles
  – Changing usage patterns – e.g. electrification of heating

* ACEEE 2015 “New Horizons” Report (savings just from “big” opportunities, in addition to CVR, CHP)
## Low Hanging Fruit Grows Back!

### LED Alternatives to Linear Fluorescent Light Fixtures

(3-lamp, 4-foot fixtures savings & costs relative to 2014 fed std)

<table>
<thead>
<tr>
<th></th>
<th>Watts</th>
<th>%</th>
<th>Savings</th>
<th>Societal Cost/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Natural Replacement</td>
<td>Early Retirement</td>
</tr>
<tr>
<td>High Performance T8</td>
<td>18</td>
<td>21%</td>
<td>$0.02</td>
<td>$0.11</td>
</tr>
<tr>
<td>LED</td>
<td>38</td>
<td>45%</td>
<td>$0.06</td>
<td>$0.11</td>
</tr>
<tr>
<td>LED w/Integrated Controls</td>
<td>56</td>
<td>66%</td>
<td>$0.07</td>
<td>$0.10</td>
</tr>
</tbody>
</table>

### Analysis by Dan Mellinger, Vermont Energy Investment Corporation (VEIC) Lighting Strategy Manager

- Already 2x to 3x savings of most common C&I lighting measure.
- Improvements by 2025 = 3x to 4x savings at or less than current HPT8 costs/kWh saved.
Emerging Program Approaches

• Upstream/Midstream incentives
• Strategic Energy Management (SEM)
• Market-specific “deeper dives”
• Others...
Upstream Incentives Experiment: PG&E Commercial HVAC Program

Graphic from Phil Mosenthal’s 2015 ACEEE EE as a Resource presentation (original source: Jim Hanna, Energy Solutions)
Industry Deep Dive Example: Efficiency Vermont’s Efficient Snow Gun Promotions

McMurry, John and George Lawrence, Efficiency Vermont, “Snow Gun Performance, Efficiency and Operating Costs”, presented at the Ski Areas Best Practices Exchange, 5/15/2014
4. Policy Needs and Considerations
Increase Ratepayer Funding of EE

• If efficiency is cheaper than supply, buy it
  – MA/RI spending ~7% of revenues on EE, but will meet ~20% of load
• Rate impact concerns often misguided
  – Bills matter
  – Rate reducing impacts of EE often greater than spending impacts
  – EE reduces consumer risk
  – EE service to more customers mitigates concerns
  – Analysis of potential economic trade-offs rarely conducted
Make EE Profitable for Utilities

- Performance incentives are motivational
- Decoupling is foundational
Align Efficiency Goals w/Long-Term Objectives

• Lifetime savings (rather than 1\textsuperscript{st} year savings)
• Multi-year performance periods
• Consider switch to measuring absolute sales or intensity
  – With appropriate adjustments (weather, electrification, etc.)
  – Societal metrics
Fix Cost-Effectiveness Screening

• All electric benefits in cost-effectiveness screening
  – including avoided T&D, environmental compliance costs, price suppression effects, reduced risk, marginal line losses, etc.

• Inclusion of non-energy impacts under TRC/SCT
  – Otherwise asymmetry/bias from inclusion of customer costs

• Societal discount rate
Recognize/Reward Market Transformation

Adapted from graphic in April 2011 RAP webinar presentation “(Supporting Energy Efficiency Codes and Standards through DSM/EE Programs”) by Allen Lee and Richard Faesy
More Regulatory Focus on “Forest”, Less on “Trees”

• Typical bias to ensure savings aren’t “over-counted”
  – Under-valuing (or no value for) market transformation (MT)
  – Quantify free riders, but under-counting (or not counting) spillover
  – Discounting or ignoring operational efficiency improvements

• Unintended/Undesirable consequences:
  – No incentive to produce MT, spillover, op improvements, etc.
  – EE cost savings likely offset by much higher added supply costs!
Consider New Models for Acquiring EE

• Competitive procurement
  – Structure carefully to truly produce innovation
  – Start with targeted “pilot” initiatives

• New utility regulatory paradigms
  – Explicit performance metrics around customer efficiency
  – Strong tie between metric performance and utility profits
  – Backstop with minimum EE requirements until concept tested

• Counting fossil fuel savings towards electric targets
  – Many end-uses may ultimately need to be electrified anyway
  – May necessitate adjustment to goals
More Stringent Codes and Standards

Particularly for existing buildings:

- Building efficiency labeling and disclosure requirements
- Rental energy ordinances
- Consider home efficiency in mortgage underwriting (SAVE Act)
30% Savings in 10 Years is Possible... ...but Requires Major Policy Changes

Gap to be addressed by unquantified practices, technologies and strategies
3 RAP Resources

• The Next Quantum Leap in Energy Efficiency

• Revenue Regulation and Decoupling

• Who Should Deliver Ratepayer Funded Energy Efficiency?
The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power sector. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at [www.raponline.org](http://www.raponline.org)