M&V for Residential DR in Energy and Capacity Markets

March 19, 2014
Evolution of Residential Demand Response

• Past
  – Direct load control (DLC)
  – Legacy DLC using radio controlled switches, one way communication, no AMI
  – All programs run by EDC

• Future
  – DLC (adaptive algorithm), thermostat controlled, behavioral programs
  – AMI
  – LSE and third party CSP participation
  – Dynamic management of customers that should be cycled
Measurement and Verification (M&V) for residential DR today

• Interval metered
  – M&V based on actual meter data
  – Must pass CBL test (like non-residential DR)

• Non-interval metered
  – M&V based on load research study using historic data
    • Deemed savings report – available for all PJM members
    • Load research study submitted by CSP
  – Switch operability study

• Sub-sampled
  – M&V based on actual meter data from a sample of customers
Deemed Savings Report

- **Outdated**
  - completed in March 2007 with data from 2001 – 2005
  - AC’s are substantially more efficient, usage patterns change

- **Geographically limited**
  - Data from BGE, PSEG, JCPL
  - Footprint has substantially increased
  - Potentially settling DR in Chicago and Kentucky with data from NJ & MD

- **Assumptions may no longer be appropriate (new capacity products)**
  - Only used during design conditions
  - Focused on one specific hour
  - Impact of multi-day events
Average energy consumption per home

Source: EIA Residential Energy Consumption Survey 2009 — Release date: June 6, 2012
Air conditioner efficiency dramatically increased since 2005

SEER – measure of AC efficiency. Higher is more efficient.

PJM has high geographic diversity
Geographic diversity in energy usage

Average home energy consumption for selected states, 2009

Million BTU per housing unit

PA, NJ, IL, IN, OH, VA, DC, MD, WV, NC, SC, AL, KY, MS
Load Research & Switch Operability Studies

• Cumbersome process to evaluate and administer
• Inconsistent methodology and detail across studies
• Quality and accuracy is not always transparent
• Valid for too long of a time period (5 years)
• Questions regarding optionality of results
  – If I do and don’t like results can I just use my older results.
Current Residential Participation in DR

• Residential DR is growing
• ~1100 MW
• ~1.2 million customers
• 16 programs
  – 2 CSPs
  – 9 IOUs
  – 5 Muni/Co-ops
• 18 zones
• 13 states + DC
## Residential participation by M&V method

<table>
<thead>
<tr>
<th>Method</th>
<th>% MW</th>
<th>% Customers</th>
<th>% Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deemed Savings</td>
<td>19%</td>
<td>30%</td>
<td>44%</td>
</tr>
<tr>
<td>Load Research</td>
<td>11%</td>
<td>8%</td>
<td>13%</td>
</tr>
<tr>
<td>Dynamic Sample</td>
<td>12%</td>
<td>13%</td>
<td>25%</td>
</tr>
<tr>
<td>Interval Meter</td>
<td>58%</td>
<td>49%</td>
<td>19%</td>
</tr>
</tbody>
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Residential M&V future guiding principles

• Accurate and consistent methodology
• Flexible structure which will allow different retail programs
• Technology agnostic
  – Ability to handle a variety of means to accomplish the load reductions
• Effective administration for all parties
  – Scalable process for a growing resource
• Customer churn
• Transition from legacy program/technology to new program/technology during DY
• Third party CSP participation & administration of customer participation to avoid double counting
• Sub-zonal events
• Economic participation in energy market and associated LSE changes