Putting More Energy into Peak Savings: Integrating Demand Response and Energy Efficiency Programs

August 25, 2016

Summer Study 2016
NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS

“Accelerating and transforming markets for energy efficiency in the Northeast & Mid-Atlantic States”

Mission
Accelerate energy efficiency as an essential part of demand-side solutions that enable a sustainable regional energy system.

Vision
Region embraces Next Generation Energy Efficiency as a core strategy to meet energy needs in a carbon-constrained world.

Approach
Overcome barriers and transform markets via Collaboration, Education and Enterprise.

One of six Regional Energy Efficiency organizations (REEOs) funded by the U.S. DOE to support state efficiency policies and programs.
Integration of Energy Efficiency and DR: Integrated Demand Side Management (IDSM)

IDSM programs “…support two out of the three demand side technology types (EE, demand response, and distributed generation).

-California Public Utilities Commission
Outline:
Toward Integrated Demand Side Management (IDSM)

1. EE & DR Policy Drivers
2. DR Program Strategies
3. Integration of Energy Efficiency and Demand Response
4. Evaluating Benefits and Costs
5. Lessons Learned
6. The Road Ahead
IDSM Policy Drivers: Declining Load Factor

In ISO-NE, investment in energy efficiency will decrease overall load growth, but peak demand continues to grow spreading MW costs over fewer MWhs.

Forward looking program administrators are targeting system peaks on a temporal and locational basis through focus on peak coincident energy efficiency measures, demand response, and geo-targeting.

Source: ISO-NE RSP 15
IDSM Policy Drivers:
Declining DR Bids in Wholesale Markets

Source: Eric Winkler, ACEEE 2015 Intelligent Efficiency Conference
IDSM Policy Drivers: A Revolution in Customer Engagement

Moving beyond switches, toward a proliferation of connected devices
• Smart Phones, T-Stats, Hot Water Heaters, Heat Pumps, EMS, ARTUs, CALCs, PEVs, energy storage, etc.

Program Administrators Offering Demand Response
• NWA projects throughout the country
• Mass. 2016-18 Plan
• Conn. 2016-18 C&LM Plan
• Pennsylvania Act 129 Phase III
• NHEC Go Beyond the Peak
• Maryland BGE Smart Energy Rewards
• NY Dynamic Load Management Plans, Smart Home Rate in REV Track II Order

Why should utilities should get in the game? Survey Says...
• Those who are enthusiastic about smart tech identify as enthusiastic about EE; 52 percent, v. 27 percent of the general population
• Customers value connectivity almost as much as cost savings
• NGA report outlining opportunities
IDSM Policy Drivers: Non-wire Alternatives

- Voltage Optimization
- Distributed Energy Storage System (Battery)
- Solar
- Fuel Cell
- Demand Response
- Distributed Generation (Gas-fired)
- Energy Efficiency
- TOTAL 2018 NON-TRADITIONAL LOAD RELIEF NEED

Battery charges:
- Battery releases energy to grid
## Region’s IDSM DR Program Strategies

### Overview

<table>
<thead>
<tr>
<th>Program</th>
<th>Sector</th>
<th>Details</th>
</tr>
</thead>
</table>
| Manual Curtailment            | C&I          | • Based upon contractual commitments  
• 50-100kW usage reductions  
• Reservation v. voluntary enrollment  
• Opportunity for bonus payments |
| Direct Load Control (DLC)     | Res./Small C&I| • Based upon direct communication between a program administrator  
• Smaller usage reductions (~1kW) |
| Legacy DLC                    | Res./Small C&I| • Switch based, one way signal  
• Cycling an A/C condensing unit, heat pump, pool pump, or hot water heater  
• Minimum verification required |
| Two-Way DLC                   | Res./Small C&I| • Behind the meter information and communication technologies (ICT) transit data over HAN/Broadband |
| Behavioral Demand Response    | Res.         | • Based upon customer engagement  
• Can provide incentive or use behavioral triggers  
• AMI Required |

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*AMI: Advanced Metering Infrastructure*
# Region’s IDSM DR Program Strategies
## Maryland

### Maryland EmPOWER Demand Response Program (Baltimore Gas and Electric)

<table>
<thead>
<tr>
<th>Program type</th>
<th>Direct load control (A/C condenser, heat pump)</th>
<th>Direct load control (Two-way thermostat pilot)</th>
<th>Direct load control (Winter water heater)</th>
<th>Behavioral (Smart Energy Rewards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector</td>
<td>Residential</td>
<td>Residential</td>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td>Total participants (final year)</td>
<td>356,000</td>
<td>2,600</td>
<td>29,000, plus 59,000 legacy devices</td>
<td>1,100,000</td>
</tr>
<tr>
<td>Capacity saved per customer/device (kW)</td>
<td>~1.2kW</td>
<td></td>
<td></td>
<td>0.22</td>
</tr>
<tr>
<td>Total capacity (MW)</td>
<td>413</td>
<td></td>
<td></td>
<td>309</td>
</tr>
<tr>
<td>Incentives per customer</td>
<td>Cycle 50%: $50 sign-on/annually Cycle 75% $75 sign-on/annually Cycle 100% $100 sign-on/annually</td>
<td>Pending</td>
<td>Cycle 100% $25 sign-on/annually</td>
<td>$1.25/kWh saved compared to similar weather day baseline</td>
</tr>
<tr>
<td>Program average annual incentives (2015)</td>
<td>$24,075,969</td>
<td></td>
<td></td>
<td>$40,566,666</td>
</tr>
<tr>
<td>Average annual non-incentive costs (2015)</td>
<td>$13,577,940</td>
<td></td>
<td></td>
<td>Unclear</td>
</tr>
<tr>
<td>Benefit/cost ratio (TRC)</td>
<td>3.3</td>
<td></td>
<td></td>
<td>1 (assumed)</td>
</tr>
</tbody>
</table>

## Region’s IDSM DR Program Strategies

### Pennsylvania

#### Pennsylvania Act 129 Phase III Demand Response Programs (Projections)

<table>
<thead>
<tr>
<th>Program type</th>
<th>Sector</th>
<th>Total participants (final year)</th>
<th>Energy saved per customer/device (kW)</th>
<th>Total capacity (MW)</th>
<th>Incentives per customer</th>
<th>Average annual incentives (PY 2-5)</th>
<th>Average annual non-incentive costs</th>
<th>Benefit /Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct load control</td>
<td>Residential</td>
<td>~6,000</td>
<td>0.35</td>
<td>2.2</td>
<td>$28/season</td>
<td>$182,498</td>
<td>$146,188</td>
<td>0.7</td>
</tr>
<tr>
<td>BYOD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual curtailment</td>
<td>Large C&amp;I</td>
<td>27</td>
<td>387.9</td>
<td>10.5</td>
<td>$32-$40/kW</td>
<td>$416,096</td>
<td>$823,565</td>
<td>2.3</td>
</tr>
<tr>
<td>Manual curtailment</td>
<td>Dual enrolled large C&amp;I</td>
<td>108</td>
<td>387.9</td>
<td>31.4</td>
<td>$16-$20/kW</td>
<td>$624,144</td>
<td></td>
<td>2.1</td>
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<tr>
<td>Behavioral DR</td>
<td>Residential and small C&amp;I</td>
<td>50,000</td>
<td>0.07</td>
<td>3.5</td>
<td>$0</td>
<td>$0</td>
<td>$206,093</td>
<td>1.5</td>
</tr>
<tr>
<td>Met Ed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual curtailment</td>
<td>Large C&amp;I</td>
<td>20</td>
<td>256</td>
<td>22.5</td>
<td>$6,127</td>
<td>$60,858</td>
<td>$88,670</td>
<td>1.7</td>
</tr>
<tr>
<td>Manual curtailment</td>
<td>Dual enrolled large C&amp;I</td>
<td>2</td>
<td>256</td>
<td></td>
<td>$3,063</td>
<td>$13,524</td>
<td>$22,969</td>
<td></td>
</tr>
<tr>
<td>Manual curtailment</td>
<td>Small C&amp;I</td>
<td>57</td>
<td>801</td>
<td>202.9</td>
<td>$9,614</td>
<td>$547,722</td>
<td>$798,032</td>
<td>1.2</td>
</tr>
<tr>
<td>Manual curtailment</td>
<td>Dual enrolled small C&amp;I</td>
<td>6</td>
<td>801</td>
<td></td>
<td>$19,228</td>
<td>$121,716</td>
<td>$202,077</td>
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</table>

Source: Duquesne and Met Ed Act 129 Phase III Proposals (Duquesne 2015; Met Ed 2015).
## Region’s IDSM DR Program Strategies

### New York

#### New York Dynamic Load Control Demand Response Programs

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Total Participants</th>
<th>Total Capacity (MW)</th>
<th>Incentives per Customer</th>
<th>Average Annual Program Incentives</th>
<th>Average Annual Non-Incentive Costs</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NYSEG</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C&amp;I Manual curtailment distribution load relief program</td>
<td>none</td>
<td>TBD</td>
<td>Reservation Payment Option: $2.75/kW Month + $.15/kWh Bonus Payment= $.30/kWh Voluntary Option: $.15/kWh</td>
<td>$0</td>
<td>$10,640</td>
<td>4.419</td>
</tr>
<tr>
<td>C&amp;I Manual curtailment commercial system relief program</td>
<td>8</td>
<td>1.2</td>
<td>Reservation Payment Option: $2.75-3.00/kW Month + $.15/kWh Voluntary Option: $.15/kWh</td>
<td>$3,678</td>
<td>$28,577</td>
<td></td>
</tr>
<tr>
<td>Residential/small business direct load control</td>
<td>31</td>
<td>TBD</td>
<td>Free Load Control Device $25 sign up (Electronic Gift Card) $25/year for 80% of event hours</td>
<td>$1,375</td>
<td>$114,192</td>
<td>.005</td>
</tr>
<tr>
<td><strong>Orange and Rockland (O&amp;R)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C&amp;I Manual curtailment distribution load relief program</td>
<td>9</td>
<td>1.47</td>
<td>Reservation Payment Option: $3.00/kW Month + $0.50/kWh Voluntary Option: $1.00/kWh</td>
<td>$12,824</td>
<td>$34,121</td>
<td>1.02</td>
</tr>
<tr>
<td>C&amp;I Manual curtailment commercial system relief program</td>
<td>8</td>
<td>1.2</td>
<td>Reservation Payment Option: $4.00-5.00/kW Month + $.50-1.00/kWh Voluntary Option:$1.00-1.50/kWh</td>
<td>$11,708</td>
<td>$33,967</td>
<td></td>
</tr>
<tr>
<td>Residential/Small Business Direct load control</td>
<td>286 Customers 375  Devices</td>
<td>TBD</td>
<td>Direct Install: free smart t-stat BYOT: $85 sign up, $25/year</td>
<td>$31,875</td>
<td>$82,065</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: O&R and NYSEG Dynamic Load Management Annual Reports (O&R 2015; NYSEG 2015)
Region’s IDSM DR Program Strategies
New York’s Move Toward LMP+D+E
Region’s IDSM DR Program Strategies
New York’s Move Toward LMP+D+E
Integrated Demand Side Management
Synergies for Energy Efficiency and Demand Response

Combined program marketing efforts to save costs and reduce customer confusion

- Bring Your Own Device (BYOD) programs where DR-enabled technology leverages EE incentive
- Identify those who are unenrolled in an event as leads for weatherization efforts

Source: National Grid
Integrated Demand Side Management
DR/IDSM Cost-Effectiveness Considerations

- Program overlap and attribution
- Lifecycle
- Customer motivation and incentive ranges
- Weather variability
- Enrollment v. control
- FCM v. ICR

Source: MA EEAC demand savings sub-committee
Integrated Demand Side Management
Lessons Learned

• Limit silos between programs; joint marketing efforts can provide cost-saving synergies
• Consider piloting statewide initiatives through NWA programs
• Consider wide range of technologies, including winter peaking in the northeast
• Ensure that incentive available upon initial device communication, not purchase
• Consider event specific incentives, rather than singular seasonal incentive
Integrated Demand Side Management
The Road Ahead

- Potential Studies- Monte Carlo potential analysis available for every state
- California EM&V Protocols provide foundation
- Pilot through NWA projects, then evolve into EE program planning process
- Further Resources
  - MA EEAC DR Presentations (Consultant/ISO-NE)
  - MA Study
Discussion

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