Demand Response Programs: Lessons from the Northeast

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Overview of Talk

• DR strategies and design principles in wholesale markets
• Elements of a “successful” DR program
• Lessons Learned
  - ISO DR programs/markets
  - Related actions needed to support regional DR programs
## Wholesale Markets and DR Resources: Objectives, Design Principles, Key Issues

<table>
<thead>
<tr>
<th>Wholesale Market/ DR Strategy</th>
<th>DR Program Objectives</th>
<th>Design Principles and/or Key Issues</th>
</tr>
</thead>
</table>
| Day-Ahead Energy Market (DADRP) | - Increase competition among suppliers  
- Put downward pressure on day-ahead market clearing price | - Ensure equitable treatment of supply and demand-side resources while recognizing that Customer Loads are not Generators  
- Degree of Integration into ISO scheduling & settlement processes |
| “Emergency Resources” (EDRP) | - Restore system security to design levels and help avoid load shedding | - Resource value/pricing related to customers’ value of lost load |
| Real-time Energy Market (RT Price Response Program) | - Put downward pressure on real-time market clearing price | - Customers willingness/ability to respond with limited notice  
- Degree of integration into ISO Scheduling process |
| Targeted Load Response for Constrained Area | - Lower locational market clearing price  
- Preserve transmission grid reliability | - Consider offering higher incentives to reflect value of congestion relief |
Defining “Success” in the DR World

- Improve electric system reliability during system contingencies: Potential & Actual performance
- Improve efficiency of wholesale electricity markets - ↑demand-responsiveness
- Broad portfolio of participating loads & program types
- High Penetration Rates in Target Markets
- Effective coordination between ISO & retail markets (LSE,PUC)
NEDRI Public Meetings: What do customers want in DR programs?

- Timely and certain payments for performance
- Minimal downside risks (e.g. performance penalties)
- Relatively certain stream of benefits in order to make “business case” for investment
- Easy to enroll and participate (Low “hassle factor”)
- Useful “toys”: enabling technology that can be used to manage energy costs
- Customized, tailored service offerings
- Clear program goals that align with their business interests or priorities
Characteristics of Innovative Utility DR Programs

- Substantial customer response at high offer prices
- Multiple program options & features offered under a single “brand”
- LSE/customer share benefits (often not transparent to customer)
- Lots of customer care & education
- Use of customer-specific baselines
- Variety of forward contracting options
- Motivated or “incented” LSEs
Real-Time “Emergency” DR Programs

• NEDRI recommendations on ISO-NE
  - higher minimum floor payments for called resources (higher of RT LMP or $500/MWh minimum for 30 minute notice or $350/MWh for 2 hour notice)
  - reduce entry barriers for Demand Response Providers ($500 annual fee)
  - a longer-term commitment to DR programs (3 years starting with SMD; with option to extend)

• Impact
  - Doubling of MW enrolled in ISO-NE “emergency” DR program from 2002 to 2003 (112 to 260 MW)
  - Aug. 15, 2003: ~75 MW load reduction in SW CT for 10 hours
NYISO: Curtailment Potential (PPI) by Business Type and Curtailment Strategy

<table>
<thead>
<tr>
<th>Business Type</th>
<th>PPI</th>
<th>Subscribed MW</th>
<th>Active Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educ.</td>
<td>60%</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Gov/ Utility</td>
<td>50%</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Health</td>
<td>10%</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Mfg.</td>
<td>20%</td>
<td>502</td>
<td>502</td>
</tr>
<tr>
<td>Multi-Fam</td>
<td>40%</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Office Bldg.</td>
<td>30%</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Recr/ Casino</td>
<td>40%</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Trade</td>
<td>10%</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Unclassified</td>
<td>60%</td>
<td>246</td>
<td>246</td>
</tr>
</tbody>
</table>

Legend:
- Gen
- Load
- Load/Gen

Energy Analysis Department
Capacity Market needed to provide longer-term signals for DR investment

- DR resources provide system capacity and reliability benefits
  - Reflected in current ICAP markets to limited extent
  - Reservation payments help build sustainable DR business model for load aggregators
- NEDRI Recommendation
  - ISO-NE implement an effective, location-based ICAP resource credit ASAP
ICAP Payments for 1 MW in Summer 2001

Values shown are estimates of program payments
Facilitating Load participation in Day-Ahead Energy Markets: Challenges

• NYISO
  - Decent enrollment (~400 MW); few accepted bids (~10 MW)
  - Location, location, location – most enrolled participants upstate; highest need in NYC

• NEDRI Recommendations for ISO-NE:
  - ISO-NE commit to developing an “economic, price-driven” day-ahead market DR program by summer 2004, which draws upon “best practices”
NYISO Day-Ahead Market DR Program: Low Participation and Bidding Activity

Energy Analysis Department
Primary Stated Reason for Not Participating in NYISO DADRP

- Potential benefits don’t justify risks (30%),
- Operational constraints (36%)
- Inadequate knowledge of program requirements (17%)
- Other factors
  - Low program awareness levels (~35%)
  - High bid price thresholds (~median value is $0.50/kWh)

Base = 63, No response = 81
Role of regulated utilities in delivering ISO DR Programs

- Policy and market implications to how ISO payments are shared between providers and customers

- NEDRI Recommendation
  - State PUCs adopt retail tariffs that support delivery of ISO-NE DR Programs
  - 70% of ISO incentive payment for load curtailment show flow to customer; 30% to be retained by regulated service provider

- NY
  - 90% of payment passed on to customer
Public benefit/ratepayer funding to overcome DR market barriers

- Significant market and institutional barriers limit customer load participation in wholesale markets

- Experience in selected states (NY, CT, CA) suggests that small amount of SBC funds ($1-3M/yr or ~<5%) can increase DR infrastructure deployment significantly

- NEDRI Recommendation
  - Additional funds to support DR enabling infrastructure, technical assistance, and customer education/information. Funds should preferably be incremental to existing SBC funds, come from regional or state sources and be relatively small in amount
  - Enabling infrastructure includes: web-enabled EIS; advanced Metering, communication and notification tech.; load control devices
## Public Benefits Programs Support DR Enabling Technology

<table>
<thead>
<tr>
<th>State</th>
<th>Program</th>
<th>Budget (2001)</th>
<th>Eligible Enabling Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>CEC Demand Responsive Building Systems &amp; Real-time Metering Program</td>
<td>$44 M</td>
<td>• EMCS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Web-enabled Communication</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Load Control Devices</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$35M</td>
<td>• Interval Meters</td>
</tr>
<tr>
<td>NY</td>
<td>NYSERDA Peak Load Reduction Program (PON 577)</td>
<td>$11 M</td>
<td>• Short Duration Load Curtailment</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Permanent Demand Reduction</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Dispatchable Emergency Generators</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Interval Meters</td>
</tr>
<tr>
<td>NY</td>
<td>NYSERDA Enabling Technologies for Price Sensitive Load Management</td>
<td>$1 M</td>
<td>• Real-time communications and metering (mandatory)</td>
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<tr>
<td></td>
<td>(PON 585)</td>
<td></td>
<td>• Real-time price forecasting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Automated load curtailment and/or generator operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Web-enabled technology</td>
</tr>
</tbody>
</table>
Monitor and Limit Environmental Impacts of DR Programs

• Issue: more frequent use of high-polluting back-up generation

• NEDRI Recommendations
  - Adopt output-based technology-neutral standards for new onsite generators
  - Update state regulations for existing generators
  - Provide information base for envr. Analysis of DR program impacts
  - 2003 ISO-NE Programs
    ♦ Air regulators work with Demand Response providers to develop user-friendly interface and process to expedite processing of permits and waivers
    ♦ ISO-NE make info on actual load response events available to air regulators to evaluate envr. impacts
Conduct independent DR evaluation and market assessment

- NEDRI Recommendation for 2003 DR Program
  - establish DR program targets and a timetable to achieve them
  - barriers to participation by customers and market participants,
  - assessment magnitude of price-responsive loads
  - impact on market prices and system reliability
  - recommendations on proposed DR program changes