Making Demand Response Work in New England

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Presentation Outline

• Demand Response in the New England Electricity Market: What is it and Why Do We Need it?
• 2002 Demand Response Program Experience
• Proposed Demand Response Programs for 2003
• Major Issues and Challenges
• Questions and Answers
The Electricity Market is Unique

• **In most markets:**
  – Customers buy less of a good when the price goes up
  – The price of a good is set by the interaction of supply and demand

• **In the electricity market:**
  – The overall demand for electricity is inelastic, particularly in the short-run
  – The price of wholesale electricity is set primarily by the suppliers

• **The electricity market presents specific challenges:**
  – Little capability to store or inventory supply – production and delivery capacity must be sufficient to meet peak demand
  – Coordination of system and market operations is complex and must be conducted in real time
  – Real-time market conditions can be extremely volatile
  – Electricity is an “essential” good with peculiar societal characteristics
Supply Curve for the Peak Hour in 2002

FIGURE 1 – Supply Curve for the Peak Hour

August 14 2002 Hour 15
Why Do We Need Demand Response?

• System operators need load curtailment resources when reliability is threatened
  – Demand response may be the only resource available to the ISO to meet short-run planning and operational reserves
  – DR diversifies the system “insurance policy” to help “keep the lights on”

• Market operators want to encourage the strategic management of customer on-site power use at times of high prices
  – Conveying market conditions to customers and giving them an opportunity to respond promotes more efficient energy markets
  – Demand response can mitigate “price spikes” (price volatility) and market power, and allows consumers to take back some of the surplus value in the market
Making Demand Response Work

• While overall electricity demand appears to be inelastic, customers have differing energy needs and uses – these differences create opportunities for demand response

• The key to successful market driven demand response is to convey market conditions to customers in order to give them an opportunity to respond

• However, barriers prevent consumers from making efficient consumption decisions at the present time
Barriers to Market Driven DR

- **Customer/Cultural Barriers**
  - Lack of information regarding underlying wholesale market conditions, and lack of motivation to respond to such conditions
  - The belief that having electricity is a basic right, and that prices should be time invariant

- **Regulatory/Policy Barriers**
  - Policies that require utilities to continue offering time-invariant retail electricity prices, and the use of price caps
  - Uncertainties of future changes in policy (metering and billing, market rules, jurisdiction)

- **Technological Barriers**
  - Lack of interval metering and digital communications
  - Limited use of “smart” energy management systems
2002 Load Response Programs

- **Class 1 - Demand Response**
  - Emergency interruptible load program
  - Customers *must* respond within 30 minutes to system reliability threat
  - When interrupted, participants receive the energy clearing price and applicable congestion multipliers, or $100/MWh, whichever is higher
  - Participants are eligible to receive a reservation payment
  - Interval metering and internet-based communication system required

- **Class 2 - Price Response**
  - A voluntary price response program where participants are paid the energy clearing price when they respond to an ISO notice
  - Notice is issued when market prices are forecasted to be $\geq 100$/MWh
  - Allow ‘low-tech’ participation – notification by pager, e-mail, FAX
## 2002 Program Enrollment End of September

<table>
<thead>
<tr>
<th>Program Enrollment</th>
<th>Southwest CT (52 Cities/Towns)</th>
<th>Other New England</th>
<th>Totals</th>
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<tbody>
<tr>
<td></td>
<td>Customers</td>
<td>MW</td>
<td>ECS MW</td>
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<tr>
<td>Demand (Class 1)</td>
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<td>91</td>
<td>84</td>
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<tr>
<td>Price (Class 2)</td>
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<td>7</td>
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<tr>
<td>Total</td>
<td>52</td>
<td>98</td>
<td>84</td>
</tr>
</tbody>
</table>

ECS = Emergency Capability Supplement, resources acquired by ISO New England to provide SWCT with needed planning and operating reserves
Observations on 2002 Demand Response and Price

• There were no Class 1 – Demand Response calls this past summer
• There were 12 days in which Class 2 – Price Response was triggered this past summer
• Energy clearing prices were relatively low. During the critical months of June, July, and August, prices exceeded:
  – $500/MWh in only 4 hours (all occurred on 14 August 2002)
  – $200/MWh in only 8 hours
  – $100/MWh in only 36 hours
• A comprehensive independent evaluation of ISO-NE’s 2002 program experience is being conducted at the present time
Proposed Programs for 2003

- **Real-Time Demand Response**
  - 30-Minute Demand Response
  - 2-Hour Demand Response

- **Real-Time Profiled Response**
  - For non-interval metered loads

- **Real-Time Price Response**
  - Based on existing Class 2 price response program

- **Day-Ahead Demand Response**
(1) Real-Time Demand Response

- **Real-Time Demand Response**
  - Load reductions called by the ISO during NOP #4
  - Load must respond upon ISO notice within a certain amount of time
    - **30-Minute Demand Response**
      - Guaranteed minimum payment of $150/MWh
    - **2-Hour Demand Response**
      - Guaranteed minimum payment of $100/MWh
  - Customers receive real-time LMP for interrupted load
  - Resources are eligible for ICAP credit
  - Requires internet-based communication system
(2) Real-Time Profile Response

- **Real-Time Profile Response**
  - No interval metering is required
  - Response determined through statistical means
  - Load must be capable of interruption within 30-minutes
    - Aggregated loads subject to direct control (water heaters, super-thermostats, pool pumps)
  - Receive real-time LMP for interrupted load
  - Guaranteed minimum payment of $100/MWh
  - Resources are eligible for ICAP credit
(3) Real-Time Price Response

- **Real-Time Price Response**
  - A voluntary price response program where participants receive the real-time LMP for interrupted load
  - Price response is triggered by the ISO on a zonal basis when projected price reaches $100/MWh
  - Guaranteed minimum payment of $100/MWh
  - Can use Internet-based communication system, or lower tech options (i.e., options that use email, pager, fax)
    - Low Tech: Hourly meter reads provided within 36 hours
    - Super Low Tech: Hourly meter reads provided after 36 hours
(4) Day-Ahead Demand Response

- **Day-Ahead Demand Response Program**
  - Load reduction offers submitted in the day-ahead market in 1 MW increments
  - **Bid Floor and Cap**
    - Minimum bid of $50/MWh to avoid free riders (for example, planned facility shutdown)
    - A maximum bid of $500/MWh to insure that the resource is likely to be dispatched at times of high loads
    - FERC Order (12/20/2002) accepted bid floor, but raised bid ceiling to $1,000/MWh
  - Bids accepted in the day-ahead market are required to interrupt and are paid the day-ahead LMP
  - In real-time, deviations from day-ahead are charged/credited at real-time LMP
  - Resources are eligible for ICAP credit
DR Program Implementation Schedule

• **Features Available on March 1, 2003 (SMD Effective date)**
  – Real-Time Demand Response (30-minute and 2-hour options)
  – Real-Time Price Response
  – Real-Time Profiled Response
  – Application of ICAP credit

• **Features Incorporated in the 1st Update**
  – Day-Ahead Demand Response Program
  – Implementation of DR Program cost reallocation as required by FERC
  – Customer baseline adjustments
    • Recognize temporarily unavailable customers
    • Adjustment for consecutive event days
    • Temperature insensitive loads
Major Challenges: Substance

- The double payment problem and who should pay the energy incentive
  - Typically, markets do not pay customers for not consuming
  - The issue of who should pay the energy-based incentive is problematic
- Program duration
- The level and use of price floors and caps
- Defining new wholesale market participants – i.e., Demand Response Providers – to participate in the programs
- Allowing participants in the Day-Ahead program to participate in Real-Time programs if day-ahead bids are not accepted
- Location-based ICAP
- The use of diesel-fired on-site generators as a demand response resource, particularly in “economic” programs
ISO-NE Proposed Program Changes

• **ISO-NE proposed to modify its FERC-approved programs**
  
  – Increase program duration to 3 years (February 28, 2006)
    • End-use customers need at least a 3-year amortization period to justify investment and operational changes
  
  – Increase minimum payments in Real-Time Demand Response Program
    • 30-Minute Notice from $150/MWh to $500/MWh
    • 2-Hour Notice from $100/MWh to $350/MWh
    • Increasing floor prices helps recruit customers, but is unlikely to substantially increase program costs – emergency resources are called when market clearing prices are likely to be very high

• **Such changes were designed to improve program participation and support an infant industry facing numerous market barriers**
Major Challenges: Process

- The New England Demand Response Initiative (NEDRI) supported these proposed program changes
  - NEDRI
    - Represents a cooperative effort among New England electric industry stakeholders to promote effective demand response strategies
    - Sponsors include: ISO-NE, US DOE, US EPA, NYISO, NECPUC, and NESCAUM (air quality directors of New England and New Jersey)
  - Goals
    - Develop a coordinated set of policy reforms
    - Identify regulatory barriers to vibrant demand response programs
    - Develop market and regulatory strategies for New England
    - Develop demand response principles and program designs
- However, NEPOOL did not support the ISO’s proposed changes
- On 12/20/2002, the FERC Ordered NEPOOL to make a filing by 02/01/2003 to reflect the results of the NEDRI process
Questions and Answers