Managing Regional Electricity Market Risks: A New England Perspective

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Topics

• Background on ISO New England
• Regional Operator’s Perspective on Risks
• New England Experience and Examples
• Using Demand Response to Address Risks
ISO New England Inc.

- A private, not-for-profit corporation created in 1997 to oversee and manage New England’s deregulated wholesale electric power system
- Responsible for:
  - Power system reliability
  - Market operations
  - Regional system planning
- Regional Transmission Organization:
  - Independent of companies doing business in the market
  - Owns no market assets
New England’s Electric Power System

- 14 million people; 6.5 million households and businesses
- 350+ generators/power plants
- 31,000 MW total supply
- 8,000+ miles of transmission lines
- Interconnections to three neighboring systems
- Peak demand: ~25,500 MW
- System serves six states, but is regulated by the FERC
The Regional Operator’s Ideal Power System

<table>
<thead>
<tr>
<th>Function</th>
<th>Objective</th>
<th>Reliability</th>
<th>Economy</th>
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<tbody>
<tr>
<td><strong>Operations</strong></td>
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<td>(1) Sufficient resources and services are available for reliable system operation in real time</td>
<td>(2) Most of the time, markets clear at marginal cost; consumers respond to prices especially during scarcity conditions</td>
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<td>(short-run)</td>
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<td><strong>Planning</strong></td>
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<td>(3) Sufficient investment being made far enough in advance to achieve reliable system operation in real time</td>
<td>(4) A balanced portfolio of resources that address uncertainties in resource performance, input prices (e.g., fuel), etc.</td>
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Risks From a Regional Operator’s Perspective

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<tr>
<td>Operations</td>
<td>(1) Inadequate contingency reserves resulting in load shedding</td>
<td>(2) Extreme price volatility with suppliers exercising market power</td>
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<td>Planning</td>
<td>(3) Inadequate investment to meet peak load plus reserve margin</td>
<td>(4) Region’s asset portfolio results in high/unstable costs or insecure supply</td>
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• In the short-run, reliable system operations require contingency reserves (i.e., ancillary services)
  – Regulation, 10-minute, 30-minute

• New England ancillary service markets (ASM) are a work in progress
  – Implementation currently planned in two phases (Fall 2005 and Summer 2006)
  – ASM are complex markets
  – In the meantime, ISO New England relies upon Reliability Must Run (RMR) generators to provide reserves
Operations – Reliability (cont.)

• Typical demand resources cannot provide reserves today, and may find it difficult to participate in ASM in the future
  – Definitions, communication, telemetry, and system infrastructure issues

• ISO New England implements a Real-Time Demand Response Program to address times of capacity deficiencies
  – However, capacity deficiency situations are rare (hopefully)
  – It is likely that demand response is an under-utilized reserve resource

• **Issue:** *Enabling demand to fully participate in ASM is a major challenge, but is also very promising*
Operations – Economy

- Economic efficiency requires some price responsive demand. Demand response addresses concerns for:
  - Price volatility
  - Market clearing price levels and risk premiums
  - Market power

- Most electricity customers are not price responsive
- Retail rates and wholesale prices are disconnected in real-time
  - Few customers are motivated to reduce load when wholesale prices are high because they are not exposed to such prices

- Few customers have the technology to automatically respond to price
• ISO New England implements programs to encourage demand to respond to wholesale prices
  – Real-Time Price Response Program
  – Day-Ahead Load Response Program

• However, dynamic *retail* pricing (e.g., Real Time Pricing, Critical Peak Pricing, etc.) would likely be more effective
  – Customer education and infrastructure development is also needed

• **Issue:** *States need to implement such a policy*
  – *ISO administers wholesale markets only*
  – *States have jurisdiction over retail markets*
Planning – Reliability

- New England as a region has sufficient capacity at the present time
- Maintaining long term resource adequacy is a growing concern
  - High load growth in Southwest Connecticut, Northeastern Massachusetts, and Northwest Vermont
  - Significant number of generators face extreme financial difficulty
  - Generator retirements are anticipated
- Market design enhancements to improve price signals for long-term investment have encountered substantial opposition creating uncertainty
- Transmission investment has not kept pace with growth
  - $2 – 4 billion of transmission investment is needed over the next 10 years
  - Inadequate transmission has resulted in local reliability problems being experienced today – i.e., Southwest Connecticut (SWCT)
ISO-NE issued an RFP in December 2003 for up to 300 MW of new emergency resources in SWCT.

SWCT RFP Results:
- Eligible resources included Quick Start Generation, Demand Response, and On-Peak Conservation (C&LM).
- 34 Proposals Received, 8 Suppliers Selected.
  - Selection criteria: cost, viability, reliability benefit.
  - All selected resources were either C&LM or Demand Response.
- Contracts Executed in April 2004.
- 4-Year Term with 5th Year Option.
- Total cost about $128 Million over 4 years.

Issue: Who should take long positions in the market?
Planning – Economy

• A competitive wholesale electricity market has been in place in New England since 1997
  – 8,000 MW of gas-fired capacity added since 1999

• About 10,332 MW of New England’s capacity uses natural gas only
  – 41% of electricity production in New England burns natural gas
  – By 2010 that number is expected to grow to 49%

• After Texas, New England is the most dependent region on natural gas in North America
  – Natural gas fired power plants typically set wholesale electricity prices
Planning – Economy (cont.)

• January 14–16, 2004: coldest weather in 20 years (−9°F)
  – Highest recorded winter peak demand of 22,817 MW
  – Large amounts of gas-fired capacity unavailable = 6,061 MW
    • Fuel related = 2,964 MW; Equipment or weather related = 3,097 MW
  – Lowest operable capacity margin = -110 MW (OP4)
  – Natural gas is used as a space heating fuel in the region
  – Load shedding was avoided

• However, the Cold Snap resulted in changes to System Operations, market timelines and flexibility, market monitoring and analysis, and dual-fuel capability

• Issue: Will markets provide sufficient resource diversity? Do we need a long-term regional planning process?
Allow Demand Response (DR) to Address Risks

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<td>• DR can provide contingency reserve services</td>
<td>• DR allows demand to respond to price</td>
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<td>• Implement ASM and enable DR to participate</td>
<td>• Retail markets should develop dynamic retail pricing products</td>
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<td><strong>Planning</strong></td>
<td><strong>(long-run)</strong></td>
<td>• DR can be rapidly implemented to provide capacity</td>
<td>• DR is a diverse resource that can enhance the region’s portfolio</td>
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<td>• Implement capacity markets, enable DR to participate, and encourage long positions</td>
<td>• Enable DR to participate in all markets; include DR in long-term planning</td>
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