



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.

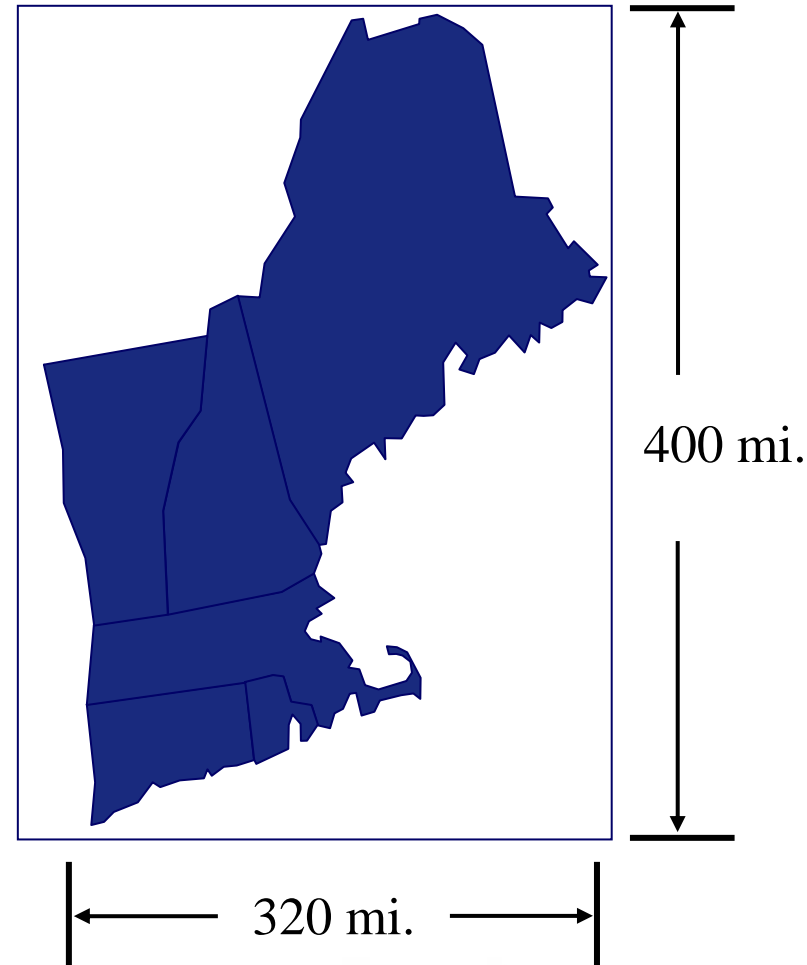
- A private, not-for-profit corporation created in 1997 to oversee and manage New England's deregulated wholesale electric power system
- Responsible for:
 - Power system reliability
 - Market operations
 - Regional system planning
- Regional Transmission Organization:
 - Independent of companies doing 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

| Objective Function | Reliability | Economy |
|-----------------------------------|--|---|
| Operations (short-run) | (1) Sufficient resources and services are available for reliable system operation in real time | (2) Most of the time, markets clear at marginal cost; consumers respond to prices especially during scarcity conditions |
| Planning (long-run) | (3) Sufficient investment being made far enough in advance to achieve reliable system operation in real time | (4) A balanced portfolio of resources that address uncertainties in resource performance, input prices (e.g., fuel), etc. |



Risks From a Regional Operator’s Perspective

| Objective Function | Reliability | Economy |
|-----------------------------------|---|--|
| Operations (short-run) | (1) Inadequate contingency reserves resulting in load shedding | (2) Extreme price volatility with suppliers exercising market power |
| Planning (long-run) | (3) Inadequate investment to meet peak load plus reserve margin | (4) Region’s asset portfolio results in high/unstable costs or insecure supply |



Operations – Reliability

| | |
|---|---|
| 1 | 2 |
| 3 | 4 |

- 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 | | | |---|---| | 1 | 2 | | 3 | 4 | (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

| | |
|---|---|
| 1 | 2 |
| 3 | 4 |

- 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



Operations – Economy | | | |---|---| | 1 | 2 | | 3 | 4 | (cont.)

- 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

| | |
|---|---|
| 1 | 2 |
| 3 | 4 |

- 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)



Planning – Reliability | | | |---|---| | 1 | 2 | | 3 | 4 | (cont.)

- 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

| | |
|---|---|
| 1 | 2 |
| 3 | 4 |

- 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 | | | |---|---| | 1 | 2 | | 3 | 4 | (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

| Objective Function | Reliability | Economy |
|-------------------------------------|---|---|
| Operations (short-run) | <ul style="list-style-type: none"> •<i>DR can provide contingency reserve services</i> •<i>Implement ASM and enable DR to participate</i> | <ul style="list-style-type: none"> •<i>DR allows demand to respond to price</i> •<i>Retail markets should develop dynamic retail pricing products</i> |
| Planning (long-run) | <ul style="list-style-type: none"> •<i>DR can be rapidly implemented to provide capacity</i> •<i>Implement capacity markets, enable DR to participate, and encourage long positions</i> | <ul style="list-style-type: none"> •<i>DR is a diverse resource that can enhance the region's portfolio</i> •<i>Enable DR to participate in all markets; include DR in long-term planning</i> |



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