New England’s Changing Energy Landscape

Reliability, Risk and Energy Diversity -- National Conference of State Legislatures

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New England’s Energy Use at a Glance

- **6.5 million** households and businesses; **14 million** population
- **28,130 MW** all-time summer peak demand set on August 2, 2006
- **22,818 MW** all-time winter peak demand set on January 15, 2004
- Region’s *peak* demand forecasted to grow **1.3%** annually
- Region’s overall electricity demand forecasted to grow **0.8%** annually
- Energy efficiency slows growth in peak demand and flattens overall electricity demand
ISO New England’s Strategic Planning Initiative
Focused on developing solutions to the region’s top reliability risks

Reliability requires a flexible, high-performance fleet to address strategic risks:

- Natural gas dependency
- Power plant retirements
- Renewable resource integration
Dramatic Changes in the Energy Mix

The fuels used to produce New England’s electric energy have shifted as a result of economic and environmental factors.

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2013)

Source: ISO New England 2014 Regional Electricity Outlook
Resource Shift is Creating Reliability Challenges

• **ISO New England** is increasingly reliant on resources with uncertain performance and availability
  – **Natural gas resources** lack firm gas transportation or fuel storage and rely on “just-in-time” fuel supply
  – **Coal, oil-steam fleet** is being displaced by more efficient resources
  – **Intermittent resource growth** with inherently uncertain output
    • 1,800 MW of solar PV expected over the next 10 years
    • 2,000 MW of wind proposed in New England

• ISO estimates **up to 8,300 MW of non-gas-fired generation is “at risk” for retirement by 2020** (28 older oil and coal units)
  – If all retire, ISO estimates 6,300 MW of new or repowered capacity will be needed in the region
Winter Operations Were Challenging

- January ranked among the coldest months in recent history
  - 9 days were in the coldest 5% of days over the past 20 years
- New England experienced *sustained* high natural gas prices
  - ISO frequently operated with little or no gas-fired generation
  - High natural gas prices made many oil-fired generators economic
- Gas pipelines were constrained even without significant use by gas-fired generators
- Generation fleet is operating with limited fuel inventories (other than nuclear and coal resources)
- Oil supply chain is increasingly constrained
- Oil-fired generators were vitally important to reliability this winter
Total Value of Markets Varies with Fuel Costs

Wholesale market costs have ranged from $6 billion to $14 billion

Annual Value of Wholesale Electricity Markets
(in billions)

2007: $10.2 billion (Energy Market: $10.2 billion, Ancillary Markets: $1.3 billion, Capacity Market: $1.1 billion)
2008: $12.1 billion (Energy Market: $12.1 billion, Ancillary Markets: $1.5 billion, Capacity Market: $1.2 billion)
2009: $5.9 billion (Energy Market: $5.9 billion, Ancillary Markets: $1.8 billion, Capacity Market: $1.6 billion)
2010: $7.3 billion (Energy Market: $7.3 billion, Ancillary Markets: $1.6 billion, Capacity Market: $1.3 billion)
2011: $6.7 billion (Energy Market: $6.7 billion, Ancillary Markets: $1.3 billion, Capacity Market: $1.2 billion)
2012: $5.2 billion (Energy Market: $5.2 billion, Ancillary Markets: $1.2 billion, Capacity Market: $1.1 billion)
2013: $8.0 billion (Energy Market: $8.0 billion, Ancillary Markets: $1.1 billion, Capacity Market: $1.1 billion)
“At Risk” Generator Retirements have Begun

Major Retirement Requests:

- **Salem Harbor Station (749 MW)**
  - 4 units (coal & oil)
- **Norwalk Harbor Station (342 MW)**
  - 3 units (oil)
- **Brayton Point Station (1,535 MW)**
  - 4 units (coal & oil)
- **Vermont Yankee Station (604 MW)**
  - 1 unit (nuclear)

<table>
<thead>
<tr>
<th>State</th>
<th>Total MW Retiring in New England*</th>
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<tbody>
<tr>
<td>Connecticut</td>
<td>528 MW</td>
</tr>
<tr>
<td>Maine</td>
<td>159 MW</td>
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<tr>
<td>Massachusetts</td>
<td>2,682 MW</td>
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<tr>
<td>New Hampshire</td>
<td>56 MW</td>
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<tr>
<td>Rhode Island</td>
<td>64 MW</td>
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<tr>
<td>Vermont</td>
<td>666 MW</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>4,155 MW</strong></td>
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*Megawatts based on relevant Forward Capacity Auction (FCA) summer qualified capacity (NOTE: total includes full and partial generator and demand response Non-Price Retirement (NPR) requests for Capacity Commitment Period (CCP) 2013-2014 through CCP 2017-2018)

Source: Status of Non-Price Retirement Requests; December 20, 2013
Generator Proposals in the ISO Queue

Approximately 5,000 MW

By Type
- Natural gas, 2,733, 55%
- Wind, 2,000, 40%
- Hydro, 14, 0%
- Biomass, 175, 4%
- Solar, 10, 0%
- Pumped-storage hydro, 50, 1%

By State
- MA, 2,050, 41%
- CT, 1,230, 25%
- ME, 1,300, 26%
- NH, 220, 4%
- VT, 180, 4%

Note: Natural gas and biomass include dual fuel units (oil)

Source: ISO Generator Interconnection Queue (January 2014)
New Supply is at New England’s Doorstep

Moving additional natural-gas supply into New England from the west will require investment in pipeline infrastructure

Source: http://pubs.usgs.gov/fs/2011/3092/
New England Governors Request ISO’s Support to Develop Electric and Natural Gas Infrastructure

• January 2014: Governors, through the New England States Committee on Electricity (NESCOE), request ISO technical support and tariff filings at FERC to support their objectives to expand energy infrastructure

• **New Electric Transmission Infrastructure**
  – Enable delivery of 1,200 MW to 3,600 MW of clean energy into New England from no and/or low carbon emissions resources

• **Increased Natural Gas Capacity**
  – Increase firm pipeline capacity into New England by 1000 mmcf/day above 2013 levels, or 600 mmcf/day beyond announced projects
  – Targeted to be in-service by winter 2017/18

• **Cost recovery through ISO tariff**
  – States to decide on cost allocation
Conclusions

• New England has a growing reliability problem due to natural gas pipeline constraints and declining resource performance

• The region is in a precarious operating position for the next several winters (and any periods of high gas demand or gas pipeline interruptions) as major non-gas resources retire and proposed market enhancements and energy infrastructure improvements are years away

• Expected retirements will exacerbate reliability concerns

• Wholesale electric energy market pricing will be volatile and correlated with stressed system conditions on both the gas pipeline and electrical systems
Questions