Strategic Planning Initiative Addresses Serious Reliability Challenges Facing New England

Environmental and Energy Technology Council of Maine

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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
Electric grid is undergoing rapid transformation

• Generation is shifting from oil, coal and nuclear resources and toward natural gas and renewable resources

• Public policy is driving toward investment in energy efficiency and “behind the meter” distributed generation
Oil is decreasing

Percent of New England’s total generating capacity

* Resources in 2020 assume approx. 5,000 MW of new resources proposed in the ISO Queue as of April 2013 (primarily natural gas and wind); and approx. 3,200 MW of non-price retirement requests for coal, oil and nuclear resources as of October 2013.
Coal is decreasing

Percent of New England’s total generating capacity

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Nuclear is decreasing

Percent of New England’s total generating capacity

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Natural gas is increasing

Percent of New England’s total generating capacity

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Hydro and renewable resources are increasing

Percent of New England’s total generating capacity

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Renewable and EE resources are trending up

**Wind**
- Existing: 700 MW
- Proposed: 2,000 MW

**Solar**
- PV thru 2013: 180 MW
- PV in 2023: 630 MW

**Energy Efficiency**
- 2012: 223 MW
- 2017-23: 1,426 MW

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Nameplate capacity of existing wind resources and proposals in the ISO-NE Generator Interconnection Queue; megawatts (MW).

*Revised interim ISO-NE Distributed Generation Forecast*, based on state policies; net MW capacity.

*Draft ISO-NE Energy Efficiency Forecast for 2017-23*, peak MW savings based on state-sponsored EE program budgets: $1.9B–6.3B.
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
    • 600 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
Operating experience this winter was a challenge

• 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
This winter had multiple cold stretches

Winter Daily Average Temperatures
Relative to 20 Year Historical Average

Temperatures dropped well below 20-year historical average during multiple stretches:
- December 10-17
- January 1-10
- January 21-30
- February 6-12
- February 16-19
- February 25-28
Wholesale electricity prices track natural gas

Region saw record low and high electricity prices within the past two years
Oil-fired generation is economic in winter when gas prices go above oil
Gas and electricity prices were very high this winter

Significant increases, month-over-month and year-over-year

• Natural gas prices surged this winter
  – 115% higher in December than November 2013 averages
  – 88% higher in January than December 2013 averages

• Wholesale electricity prices followed (average real-time LMPs)
  – 115% higher in December than November 2013 averages
  – 65% higher in January than December 2013 averages

• Prices are higher than last winter’s prices
  – Average December 2013 gas and electricity prices were up 139% and 126%, respectively, from December 2012 averages
  – Average January 2014 natural gas prices and RT wholesale electricity prices were up 137% and 94%, respectively, from January 2013 averages

• January 2014 energy market value was $2.2B, up from $1.2B in December
  – In comparison, the energy market value for all of 2012 was approx. $5B
Cold weather increases use of oil and coal

Oil and coal together represented only 7% of electric generation in all of 2013 but more than a third of electric generation on a cold day in January.

### 2013
- Natural Gas: 46%
- Nuclear: 33%
- Coal: 6%
- Other: 15%
- Oil: <1%

### January 7, 2014
- Natural Gas: 25%
- Nuclear: 23%
- Oil: 25%
- Coal: 11%
- Other: 16%
“At Risk” 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>MW Retiring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>528 MW</td>
</tr>
<tr>
<td>Maine</td>
<td>159 MW</td>
</tr>
<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>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,155 MW</strong></td>
</tr>
</tbody>
</table>

*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
New supply is at New England’s doorstep, but... Moving additional natural-gas supply into New England from the west will require investment in pipeline infrastructure.

... Pipeline constraints into New England cause high prices and reliability issues

Source: The Hartford Courant, December 2013
New England governors seek new infrastructure

• This winter, the region’s governors, through the New England States Committee on Electricity (NESCOE), requested 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
Conclusions

• Cold weather drove price volatility in natural gas and electricity markets this winter

• New England has a growing reliability problem due to gas pipeline constraints and poor performance by some resources and a need to balance an increasing amount of intermittent renewable energy

• Retirements will exacerbate reliability concerns

• Capacity market incentives are necessary, but may not be sufficient, to drive pipeline investments
Questions