New England Governors Eastern Canadian Premiers Annual Conference

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July 11, 2011
Halifax, Nova Scotia
Examination of Proposed Renewables & Clean Energy Resources in 2008

- Eastern Canada
  - Large hydro and wind

- New England
  - Wind and small dispersed resources
New England Renewable Energy Production

12% today, but 30% required by 2020

% of Total 2010 Regional Production

(*Note: Other small generation includes: landfill gas, methane, solar, wind, and steam)

New Energy Efficiency & Appliance Standards Temper Growth

Historical Use & 50/50 Peak Forecast

- CELT Energy before netting federal appliance standards
- CELT Energy
- CELT Energy net passive demand resources

1.1% annual growth rate for electric energy 2011 - 2020

Appliance Standards Begin

Impact of Energy Efficiency

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States’ Blueprint as guiding policy and regulatory framework

ISO economic study as technical support
Areas with strong wind potential

- Significant potential
  - Best in north and off-shore

- Wind Benefits:
  - Fuel diversity
  - State renewable portfolio goals
  - Fuel costs

- Challenges:
  - Higher capital costs
  - Siting issues
  - Intermittent/operational concern
  - Cost of transmission investment
  - Low natural gas prices

- Wind on System
  - +250 MW now
  - +550 MW by end of 2011
ISO Completes Comprehensive Regional Wind Study in 2010

- Large-scale wind integration achievable with additional transmission investment
- Wind resources should be expected to reduce fossil-fueled generation
  - Including natural gas and oil
- Flexible resources needed to manage variability
  - Additional regulation and operating reserves needed
  - Natural gas fleet may provide flexibility
- Centralized wind power forecasting required
Study Considers Several Potential Scenarios

- Combination of on- and off-shore development can produce 20% of region’s energy need, reduce emissions

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Approximate annual reduction</th>
<th>Approximate reduction vs. no wind</th>
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<tbody>
<tr>
<td>NOx</td>
<td>6,000 tons</td>
<td>26%</td>
</tr>
<tr>
<td>SOx</td>
<td>4,000 tons</td>
<td>6%</td>
</tr>
<tr>
<td>CO2</td>
<td>12,000,000 tons</td>
<td>25%</td>
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Conceptual Overlays Considered

Transmission needed to access New England wind & imports from Canada

New high-voltage transmission loop for 12,000 MW wind scenario

Could provide approx. 24% of New England’s energy

New tie to Québec

Each tie could provide approx. 11% of New England’s energy

New tie to New Brunswick
Transmission Progressing

*Transmission projects developed throughout region and improved import capability*

- Reliability improved across region
  - Reduced congestion
  - Minimized reliance on older and less efficient units
  - Economic dispatch of generation

- Foundation set for renewable resource integration – but more transmission needed
Recent Shift in Regional Capacity

*Generation fleet historically dominated by nuclear & oil*

- Region largely dependent on oil & nuclear through 1990’s
- Efficient combined-cycle gas units have displaced older oil-fired generators
- Investments in transmission system have reduced reliance on older fossil units
- Renewable resources growing in interconnection queue
Shift in Regional Energy Generation

Natural Gas now dominant fuel

% of Regional Generation
Natural gas use up significantly last 20 years
Oil use down significantly last 20 years

1990
Oil: 34%  Natural Gas: 6%

2000
Oil: 22%  Natural Gas: 15%

2010
Oil: 0.5%  Natural Gas: 46%
Factors Likely to Result in More Changes?

- Market conditions
  - Relatively low cost of natural gas can displace other resources
- Upcoming US Environmental Protection Agency rules
  - Clean Air Transport Rule
  - Utility Air Toxics Rule
  - Cooling Water Intake Rule
  - Coal Combustion Residuals
- Aging fossil-fuel plants

<table>
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<tr>
<th>Age as of 2030</th>
<th>Total MW of Coal and Oil Units</th>
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<tbody>
<tr>
<td>≥ 50 years old</td>
<td>8,600</td>
</tr>
<tr>
<td>≥ 60 years old</td>
<td>4,300</td>
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<tr>
<td>≥ 70 years old</td>
<td>1,200</td>
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7,000 MWs of Projects Proposed for Region

Majority of proposed projects in Queue* natural gas or renewables

Full Queue* (MW)

- Natural Gas: 3,241 (47%)
- Renewables: 3,366 (49%)
- Coal: 42
- Nuclear: 42
- Oil: 42
- Pump Storage: 100

Renewables by Type (MW)

- Wind: 2,884
- Biomass: 398
- Solar: 6
- Landfill Gas: 34
- Hydro: 44

*June 2011 FERC Jurisdictional Section of Generator Interconnection Queue

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Planning in New England and Beyond

New England

New England States Committee on Electricity
- Coordinated procurement for renewables
- Identified almost 5,000 MW of potential development

Inter-Area

Federal Energy Commission Regulatory
- NOPR: transmission for “public policy;” cost allocation; interregional coordination
- Order expected this year

Interconnection-Wide

Eastern Interconnection Planning Collaborative
- Potential resource and transmission scenarios
- Final report to US DOE end of 2012
Closing Thoughts …

• New England’s generation fleet has changed significantly and will continue to evolve

• Renewables – specifically wind – can have expanded role

• New England Strategic Planning Initiative evaluating potential loss of older fossil-fired generation and integration of new resources, such as wind

• ISO will continue to get feedback from the states and looks forward to the opportunity to provide updates to New England Governor’s and Eastern Canadian Premiers