New England Electricity Outlook

Environmental and Energy Technology Council of Maine (E2Tech)

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Director, External Affairs
Key Points

• Transmission investments have addressed reliability needs; FERC Order 1000 expands planning to address public policy needs
• New England’s resource mix is changing rapidly – what’s driving it?
• The region is discussing options to further integrate wholesale markets and public policy
ISO New England (ISO) Has Two Decades of Experience Overseeing the Region’s Restructured Electric Power System

- **Regulated by** the Federal Energy Regulatory Commission
- **Reliability coordinator** for New England under the North American Electric Reliability Corporation
- **Independent** of companies in the marketplace and neutral on technology
New England’s Transmission Grid Is the Interstate Highway System for Electricity

- ISO-NE plans the system to meet mandatory reliability standards
- **8,600 miles** of high-voltage transmission lines (115 kV and above)
- **13 transmission interconnections** to power systems in New York and Eastern Canada
- 16% of region’s energy needs met by **imports** in 2015
- Developers propose additional transmission infrastructure to achieve **public policy** goals
Major Components of Transmission Planning

- The transmission planning process begins by developing a **study scope** and identifying all key inputs for a **needs assessment**
- If an identified reliability-based transmission need is *less than or equal to three years out*, the ISO will develop **solution alternatives**, in coordination with the transmission owner(s) and stakeholders
- If a reliability need is *more than three years out*, the ISO will issue a request for proposals (RFP) for **competitive solutions**
  - Public Policy and Market Efficiency Transmission Upgrades are developed only through a competitive RFP process
- Starting in 2017, the ISO, working with the states and stakeholders, will be responsible for identifying **public policies** that are driving transmission needs
- If there are identified public policies that are driving transmission needs, the ISO is responsible for selecting the most cost-effective transmission project to address those public policies
Transmission Projects to Maintain Reliability Have Progressed throughout New England

**Major 345 kV Projects**

- Southwest Connecticut Reliability Project, Phases 1 & 2
- Boston 345 kV Transmission Reliability Project, Phases 1 & 2
- Northwest Vermont Reliability Project, and Vermont Southern Loop Project
- New England East-West Solution
  - Greater Springfield Reliability Project
  - Rhode Island Reliability Project
  - Interstate Reliability Project
- Southeast Massachusetts
  - Short-term Lower SEMA Upgrades
  - Long-term Lower SEMA Project
- Maine Power Reliability Program
- Greater Boston Project

Source: RSP Transmission Project List, June 2016; RSP Transmission Project List also includes 115kV projects
Region Has Made Major Investments in Transmission Infrastructure to Ensure a Reliable Electric Grid

Annual Investment in Transmission to Maintain Reliability (in billions)

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Cumulative Investment through June 2016: $7.88 billion
Estimated Future Investment through 2020: $4.18 billion

Estimated future investment includes projects under construction, planned and proposed
ISO New England Is Focused on Developing Solutions to the Region’s Top Reliability Risks

• **Ensuring Resource Adequacy**
  - New England will need sufficient resources to replace retiring assets. These resources must be able to perform under adverse weather conditions

• **Inadequate Natural Gas Infrastructure**
  - New England is challenged to meet electricity demands with existing natural gas infrastructure (currently during the winter, but in the future this may also become a summer problem)

• **Renewable Resource Integration**
  - Maintaining reliability as increasing levels of distributed generation and intermittent resources come online
Natural Gas Is the Dominant Fuel Source for New Generating Capacity in New England

Cumulative New Generating Capacity in New England (MW)

- Natural Gas
- Fuel Cell
- Hydro
- Solar
- Biomass
- Nuclear
- Wind
- Oil

Note: New generating capacity for years 2016 – 2019 includes resources clearing in recent Forward Capacity Auctions.
New England Has Relatively Few Interstate Natural Gas Pipelines and Few Delivery Points for LNG
New England Has Seen Dramatic Changes in the Energy Mix

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2015)

Source: ISO New England [Net Energy and Peak Load by Source](#)

Other renewables include landfill gas, biomass, other biomass gas, wind, solar, municipal solid waste, and miscellaneous fuels
Power Plant Emissions Have Declined with Changes in the Fuel Mix

*Reduction in Aggregate Emissions (ktons/yr)*

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<td>20.49</td>
<td>11.68</td>
<td>39,317</td>
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<tr>
<td>% Reduction, 2001–2014</td>
<td>↓ 66%</td>
<td>↓ 94%</td>
<td>↓ 26%</td>
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*Reduction in Average Emission Rates (lb/MWh)*

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<td>2014</td>
<td>0.38</td>
<td>0.22</td>
<td>726</td>
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<tr>
<td>% Reduction, 1999–2014</td>
<td>↓ 72%</td>
<td>↓ 95%</td>
<td>↓ 28%</td>
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Gas and Wholesale Electricity Prices Are Closely Linked

Monthly Average Natural Gas and Wholesale Electricity Prices in New England

Pipelines are constrained in cold weather

Wholesale Electricity at New England Hub (Real-Time LMP)  Natural Gas
When Pipelines are Unconstrained, New England’s Wholesale Prices are Competitive with Other Regions
Winter Reliability Programs Have Proven Valuable

*Programs run from December 1 through February 28*

- **Objective**: Create incentives for generators to secure fuel supply and delivery arrangements before the winter begins

- **Solution**:
  - Offset costs to commission dual-fuel capability at gas-fired plants
  - Offset the carrying costs of firm fuel purchased by generators that is unused at the end of the season
  - Compensation for demand response

- **FERC has approved** programs that will **bridge the gap** until the Forward Capacity Market’s Pay-for-Performance incentives take effect in June 2018
The Region Has Lost—and Is at Risk of Losing—Substantial Non-Gas Resources

Major Generator Retirements:

- **Salem Harbor Station (749 MW)**
  - 4 units (coal & oil)

- **Vermont Yankee Station (604 MW)**
  - 1 unit (nuclear)

- **Norwalk Harbor Station (342 MW)**
  - 3 units (oil)

- **Brayton Point Station (1,535 MW)**
  - 4 units (coal & oil)

- **Mount Tom Station (143 MW)**
  - 1 unit (coal)

- **Pilgrim Nuclear Power Station (677 MW)**
  - 1 unit (nuclear)

- **Additional retirements are looming**
Large Non-Gas Generators Have Recently Retired or Announced Plans to Retire, and More Retirements Are Likely

- More than 25% of the generating fleet is “at risk” for retirement
- In December 2012, ISO-NE identified 28 generators "at risk" for retirement (did not include nuclear)
- In one year (2014) 10% of the fleet announced plans to retire by 2017 (FCA #8 – 3,135 MW)

- Major Retirements:
  - Salem Harbor
  - Vermont Yankee
  - Norwalk Harbor
  - Brayton Point
  - Mount Tom
  - Pilgrim Nuclear

- Retired 1997 - 2012
  - 3,200 primarily oil, coal and nuclear

- In December 2012, ISO-NE identified 28 generators "at risk" for retirement (did not include nuclear)
  - 2,300 Coal
  - 6,000 Oil

- Retired 2013 – 2015 or announced retirements through the FCM for 2016 and beyond
  - 4,200 oil, coal and nuclear
ISO-NE’s Capacity Market Has Attracted New Peaking and Combined-Cycle Gas Generation to Load Centers

• **3,000 MW** of gas-fired generation have come forward in recent auctions (FCAs 7–10) with commitments to be available in 2017–2019

• A mix of existing and new resources cleared in FCA 10, including three new, gas-fired, dual-fuel power plants totaling **1,300 MW**

• FCA 10 also attracted new renewable resources, demand resources, and imports:
  
  – Solar: 40 MW
  – Wind: 27 MW
  – Hydro: 2 MW
  – Demand resources: 371 MW
  – Imports from New York/Canada: 1,361 MW
State Policy Requirements Drive Proposals for Renewable Energy

State Renewable Portfolio Standard (RPS)* for Class I or New Renewable Energy by 2020

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<th>Requirement</th>
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<tr>
<td>ME</td>
<td>10%</td>
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<tr>
<td>NH</td>
<td>11%</td>
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<tr>
<td>RI</td>
<td>14%</td>
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<td>MA</td>
<td>15%</td>
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<tr>
<td>CT</td>
<td>20%</td>
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<tr>
<td>VT</td>
<td>59%*</td>
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* State Renewable Portfolio Standards (RPS) promote the development of renewable energy resources by requiring electricity providers (electric distribution companies and competitive suppliers) to serve a minimum percentage of their retail load using renewable energy. Vermont’s new Renewable Energy Standard has a ‘total renewable energy’ requirement (reflected above), which recognizes large-scale hydro and all other classes of new and existing renewable energy.
Renewable and EE Resources Are Trending Up

- **Wind (MW)**
  - Existing: 800
  - Proposed: 4,800

- **Solar (MW)**
  - PV thru 2015: 1,300
  - PV in 2025: 3,300

- **Energy Efficiency (MW)**
  - EE thru 2015: 1,700
  - EE in 2025: 3,800

*Final 2016 ISO-NE PV Forecast, AC nameplate capacity from PV resources participating in the region’s wholesale electricity markets, as well as those connected “behind the meter.”*

*2016 CELT Report, EE through 2015 includes EE resources participating in the Forward Capacity Market (FCM). EE in 2025 includes an ISO-NE forecast of incremental EE beyond the FCM.*

Nameplate capacity of existing wind resources and proposals in the ISO-NE Generator Interconnection Queue; megawatts (MW) as of September 2016.
Energy Efficiency and Behind-the-Meter Solar Are Slowing the Growth in Demand for Electricity

Note: Summer peak demand is based on the “90/10” forecast, which accounts for the possibility of extreme summer weather (temperatures of about 94°F).

Infrastructure Will Be Needed to Deliver Energy from Proposed Resources

All Proposed Generation

Developers are proposing to build over 12,000 MW of generation, including almost 6,500 MW of gas-fired generation and more than 4,800 MW of wind

Wind Proposals

- ME: 3,452 MW
- VT: 30 MW
- NH: 79 MW
- MA: 10 MW
- Offshore wind: MA 1,254 MW

Source: ISO Generator Interconnection Queue (September 2016) FERC Jurisdictional Proposals Only
Developers Are Proposing to Move Renewable Energy to New England Load Centers

- As of **September 1, 2016**, fourteen elective transmission projects had been proposed in the ISO Interconnection Queue, totaling more than **9,000 MW** of potential transfer capability, including:
  - Large-scale hydro resources from eastern Canada, and
  - Onshore wind resources from northern New England

- Projects seek to address public policy goals, not reliability needs

- In addition, offshore wind resources are emerging in southern New England

*Source: ISO Interconnection Queue (September 2016)*

[http://www.iso-ne.com/system-planning/transmission-planning/interconnection-request-queue](http://www.iso-ne.com/system-planning/transmission-planning/interconnection-request-queue)
Electric Grid of the Future Will Look Very Different

We are moving toward a “hybrid” grid with grid-connected and distributed resources, and a continued shift toward natural gas and renewable energy.
New England Has Two Overarching Policy Goals – Are They Compatible?

1. Achieving reliability through competitive wholesale markets, and

2. Achieving reductions in carbon emissions
An Initiative Is Underway to Integrate Markets and Public Policy (IMAPP)

• In August, NEPOOL launched a stakeholder process with the goal of identifying potential adjustment(s) to the wholesale electricity market(s) to accommodate and achieve the New England states' public policy objectives

• The region’s competitive wholesale electricity markets are designed to maintain reliability through the selection of the most economically efficient set of resources

• The states have environmental and renewable energy goals that are beyond the objectives of the wholesale electricity markets
IMAPP: Looking Ahead

• NEPOOL’s goal is to develop a “framework document” by December 2 to provide guidance to the ISO regarding potential changes to the wholesale power markets

• This is an extremely important effort and we are encouraged by the attention of both NEPOOL and the New England states to this initiative

• In 2017, ISO New England will work with the states, NEPOOL and the FERC to determine the most effective path forward

Note: For information on the individual proposals, visit the NEPOOL website or the ISO’s Wholesale Markets and State Public Policy Initiative webpage.
Questions
For More Information...

• Subscribe to the **ISO Newswire**
  – *ISO Newswire* is your source for regular news about ISO New England and the wholesale electricity industry within the six-state region

• Log on to **ISO Express**
  – *ISO Express* provides real-time data on New England’s wholesale electricity markets and power system operations

• Follow the ISO on **Twitter**
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• Download the **ISO to Go App**
  – *ISO to Go* is a free mobile application that puts real-time wholesale electricity pricing and power grid information in the palm of your hand