



Regional Energy Overview and What's Trending

*Massachusetts Municipal Association's
Annual Meeting and Trade Show*

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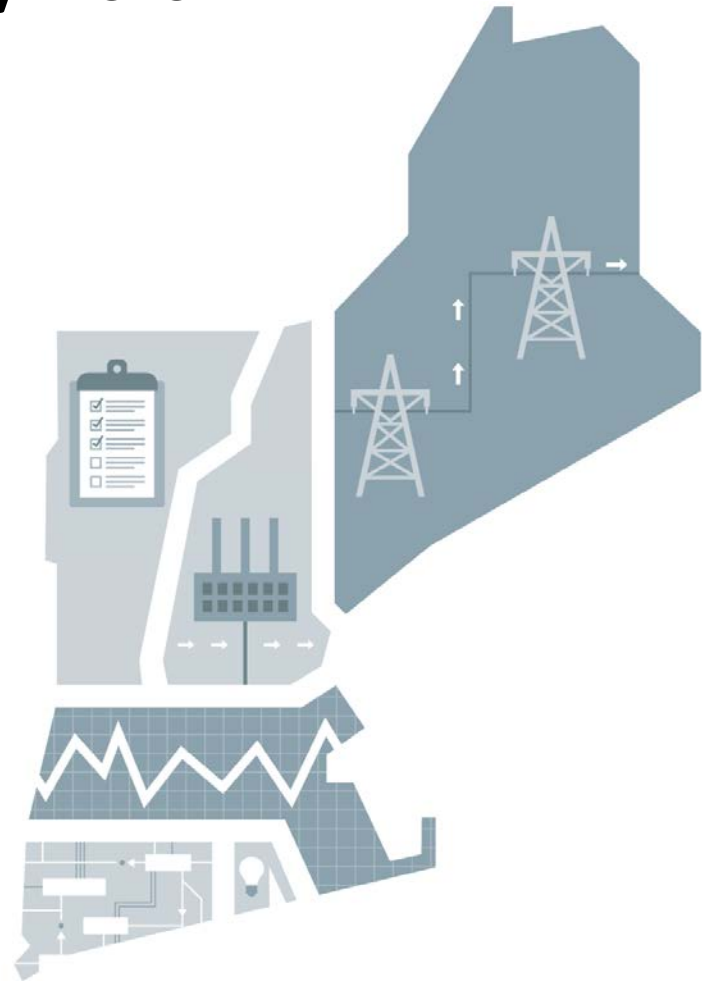
SENIOR EXTERNAL AFFAIRS REPRESENTATIVE



ISO New England Is Focused on Developing Solutions to the Region's Top Reliability Risks

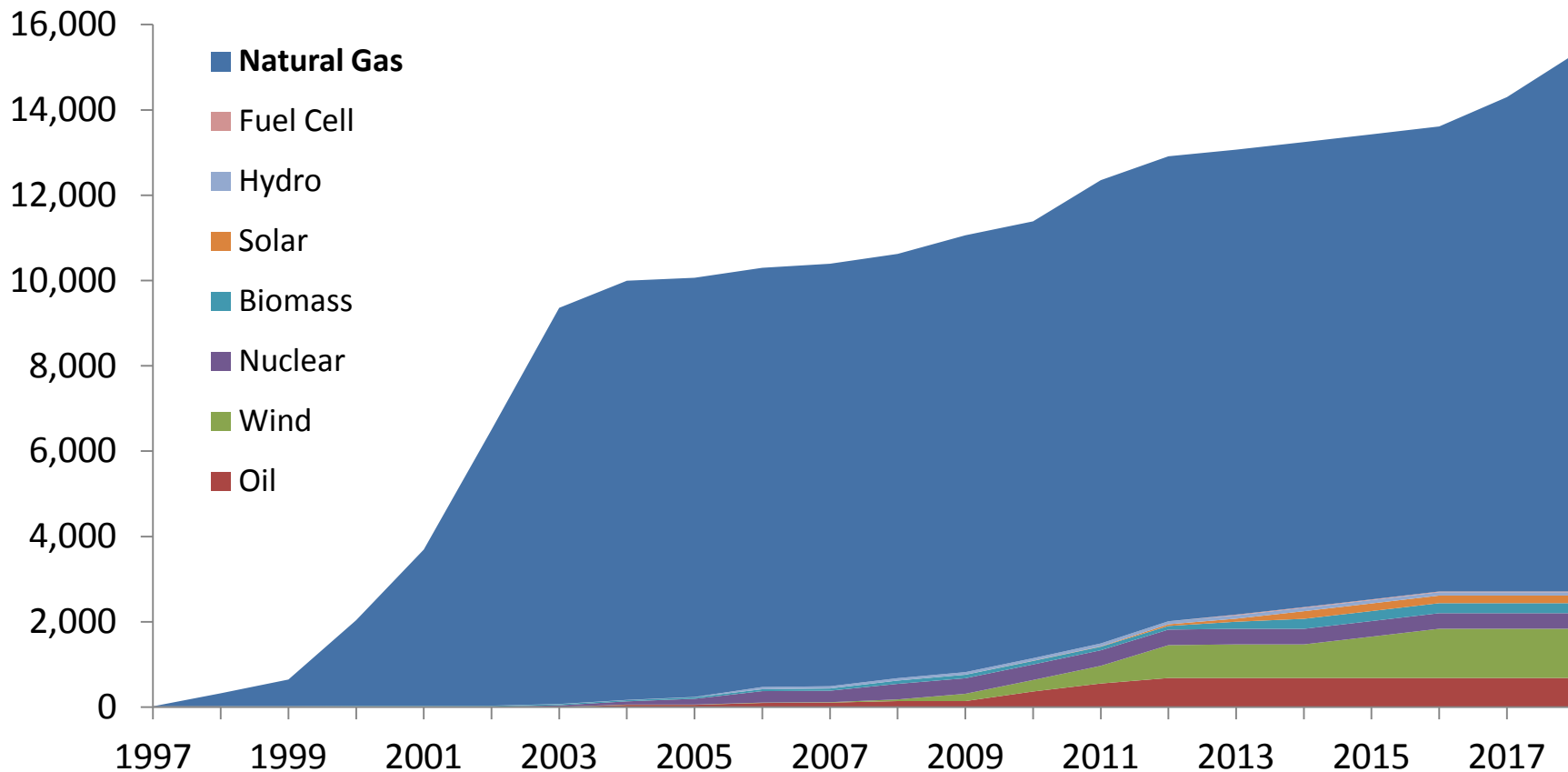
Reliability requires a flexible, high-performance fleet:

- Reliance on Natural Gas
 - “Just-in-time” fuel delivery presents an immediate risk to reliability
- Power Plant Retirements
 - New England will need new ways to meet peak demand as aging plants close
- Renewable Resource Integration
 - Balancing variable generation with reliability will require changes in system operations



Region Has Not Developed Gas Pipeline Infrastructure to Keep Pace with Growth of Gas-fired Generation

Cumulative New Generating Capacity in New England (MW)



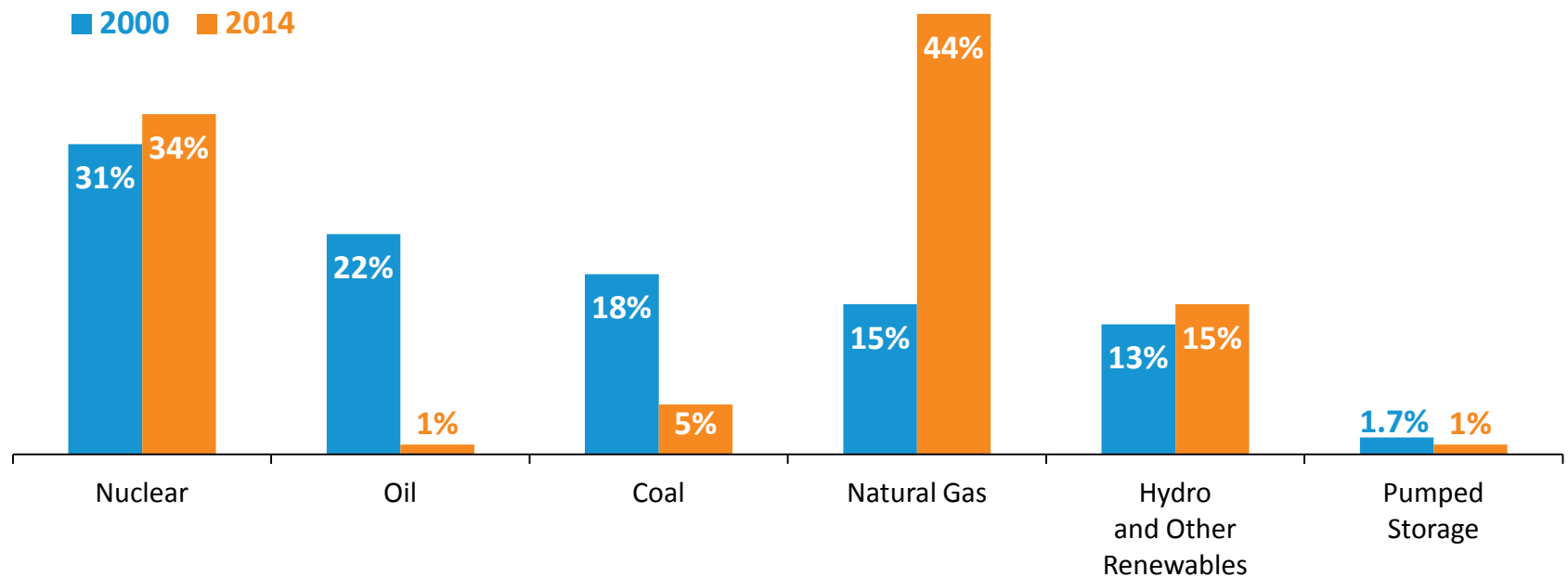
Note: New generating capacity for years 2016 – 2018 includes resources clearing in recent Forward Capacity Auctions.



New England Has Seen Dramatic Changes in the Energy Mix

The fuels used to produce the region's electric energy have shifted as a result of economic and environmental factors

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2014)

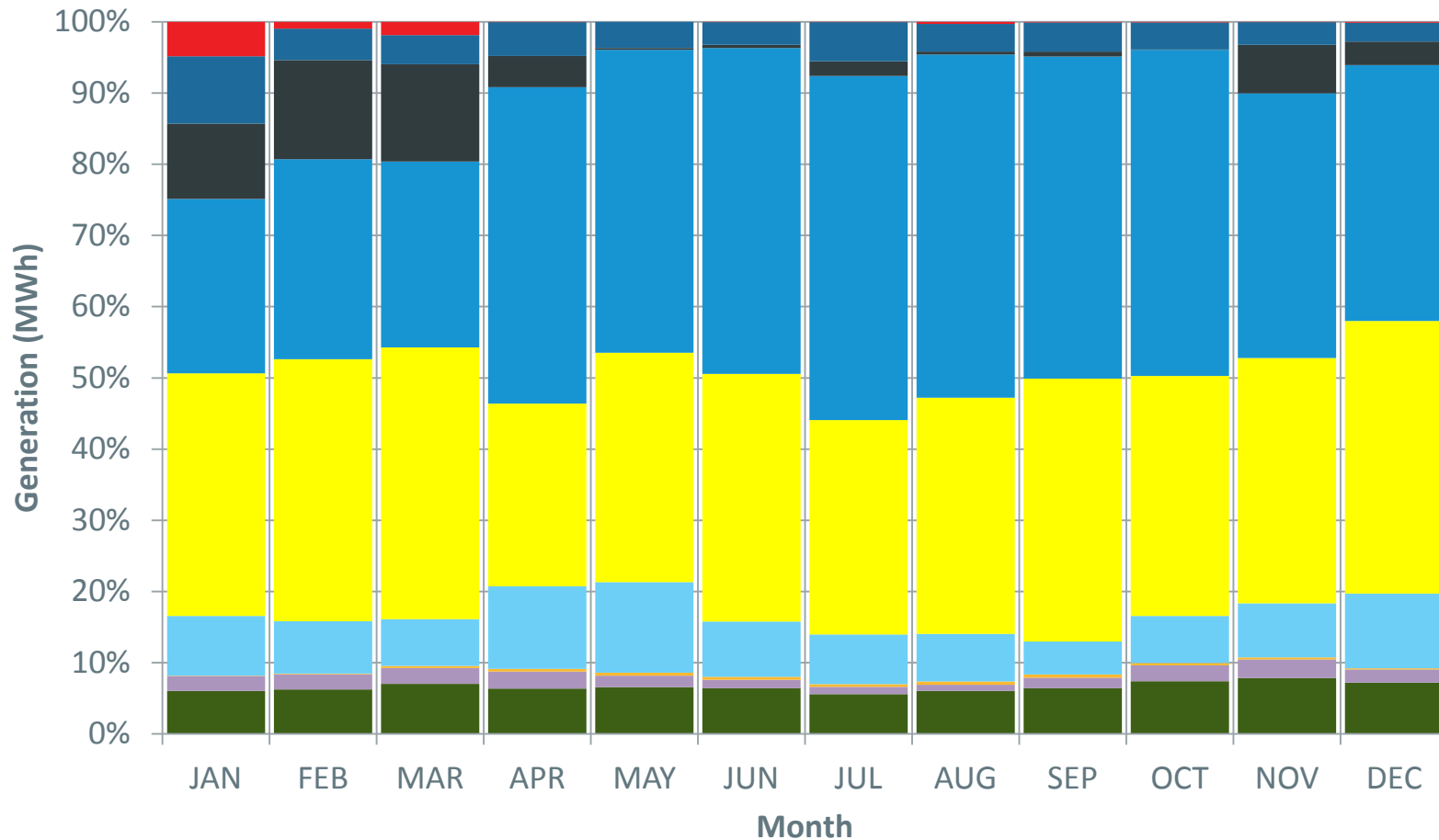


Source: ISO New England [Net Energy and Peak Load by Source](#)

Other renewables include landfill gas, biomass, other biomass gas, wind, solar, municipal solid waste, and miscellaneous fuels



Natural Gas and Nuclear Resources Represented Vast Majority of 2014 Generation

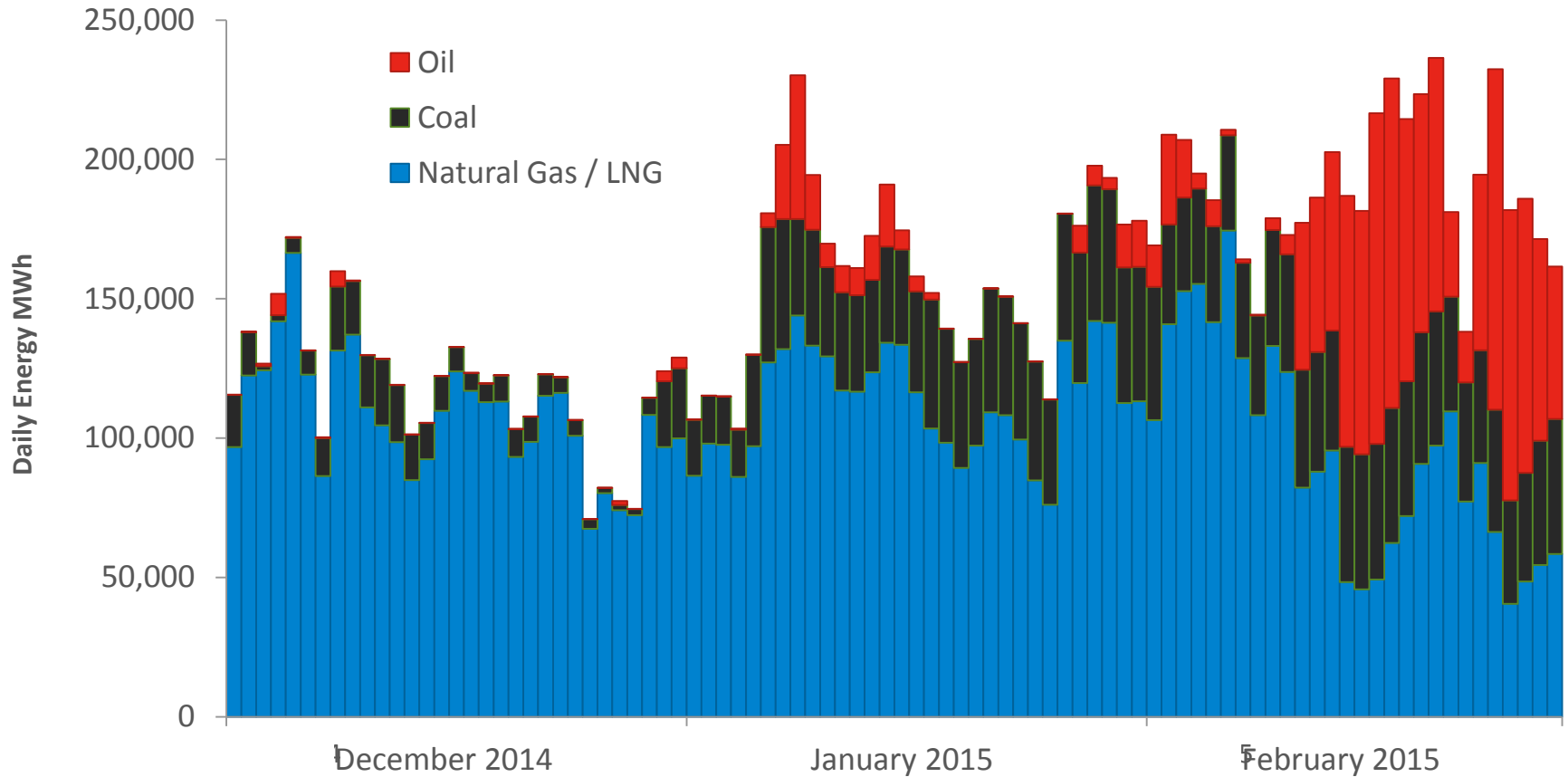


■ Other Renewables ■ Wind ■ Solar ■ Hydro ■ Nuclear ■ Natural Gas ■ Coal ■ Oil/Gas ■ Oil



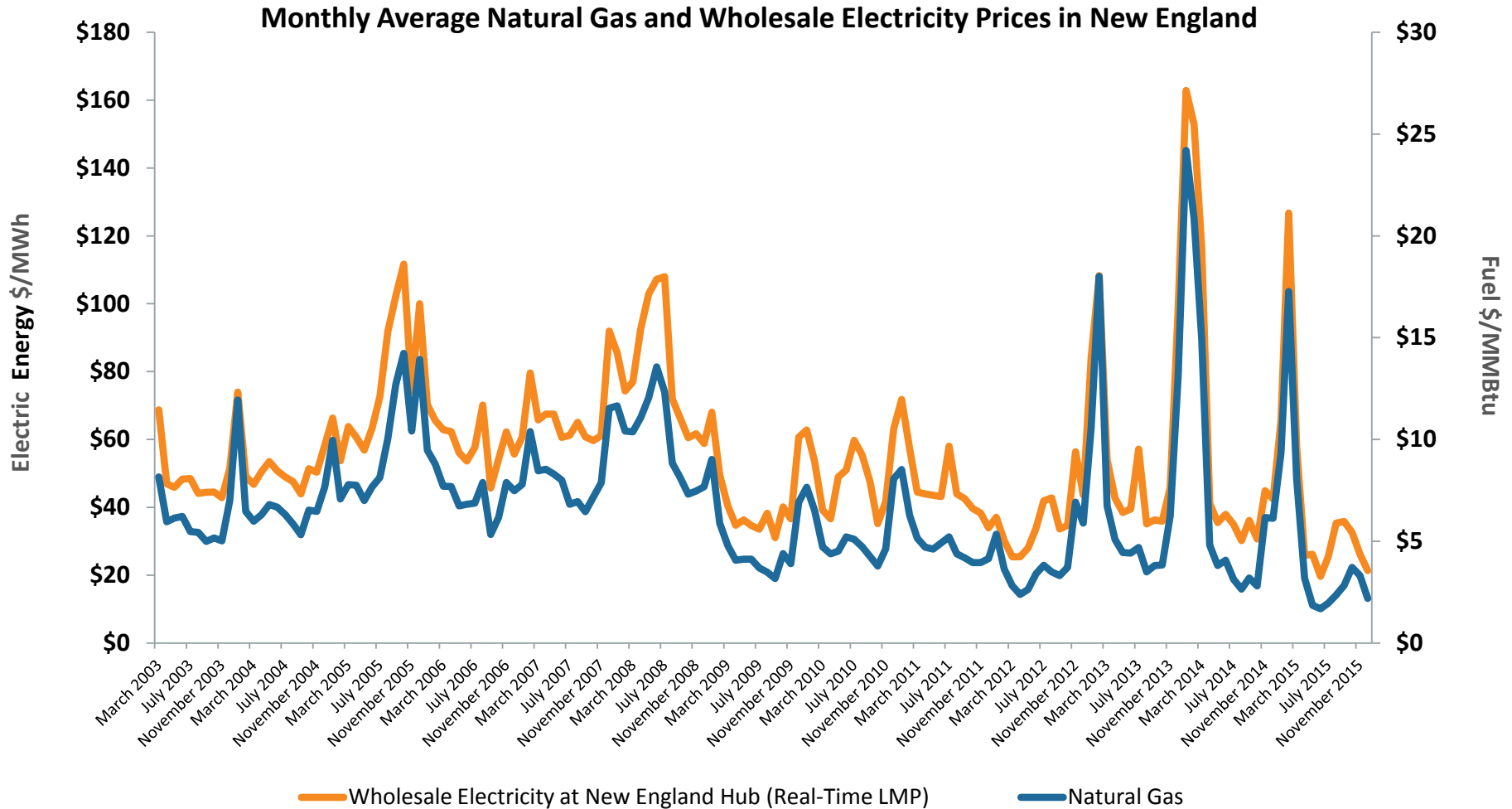
New England Shifted to Coal and Oil Last Winter

Daily Energy for December 2014 - February 2015 (MWh)



Natural Gas and Wholesale Electricity Prices Are Linked

Because of New England's heavy reliance on natural gas as a fuel source, natural gas typically sets the price for wholesale electricity



Power Plant Emissions Have Declined with Changes in the Fuel Mix



Reduction in Aggregate Emissions (ktons/yr)

Year	NO _x	SO ₂	CO ₂
2001	59.73	200.01	52,991
2014	20.49	11.68	39,317
% Reduction, 2001–2014	↓ 66%	↓ 94%	↓ 26%

Reduction in Average Emission Rates (lb/MWh)

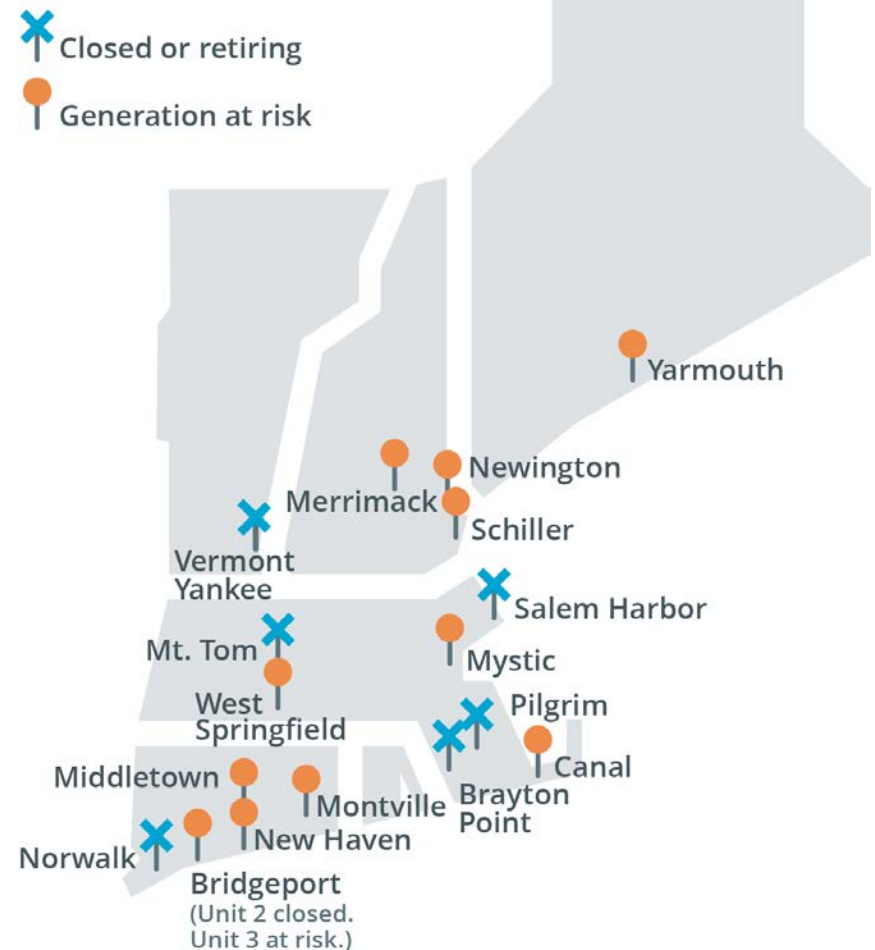
Year	NO _x	SO ₂	CO ₂
1999	1.36	4.52	1,009
2014	0.38	0.22	726
% Reduction, 1999–2014	↓ 72%	↓ 95%	↓ 28%

Source: [2014 ISO New England Electric Generator Air Emissions Report](#), January 2016

The Region Has Lost—and *Is at Risk of Losing*—Substantial Non-Gas Resources

Major Generator Retirements:

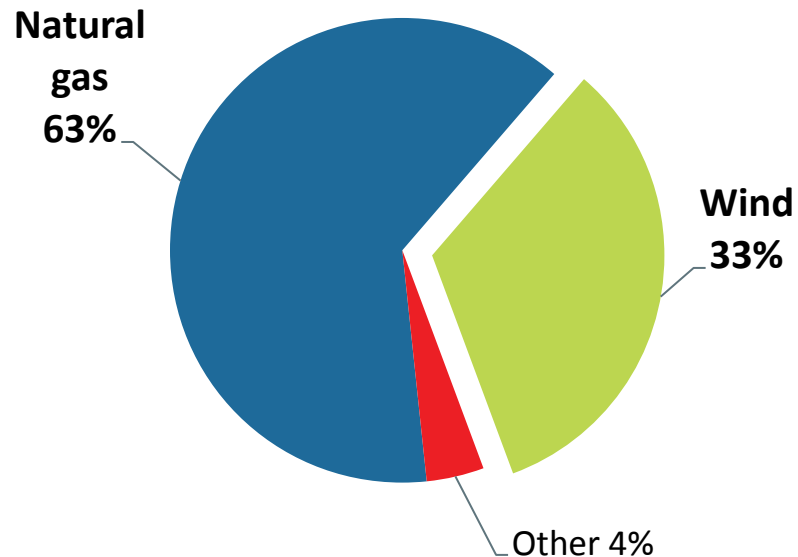
- **Salem Harbor Station (749 MW)**
 - 4 units (coal & oil)
- **Vermont Yankee Station (604 MW)**
 - 1 unit (nuclear)
- **Norwalk Harbor Station (342 MW)**
 - 3 units (oil)
- **Brayton Point Station (1,535 MW)**
 - 4 units (coal & oil)
- **Mount Tom Station (143 MW)**
 - 1 unit (coal)
- **Pilgrim Nuclear Power Station (677 MW)**
 - 1 unit (nuclear)
- *Additional retirements are looming*



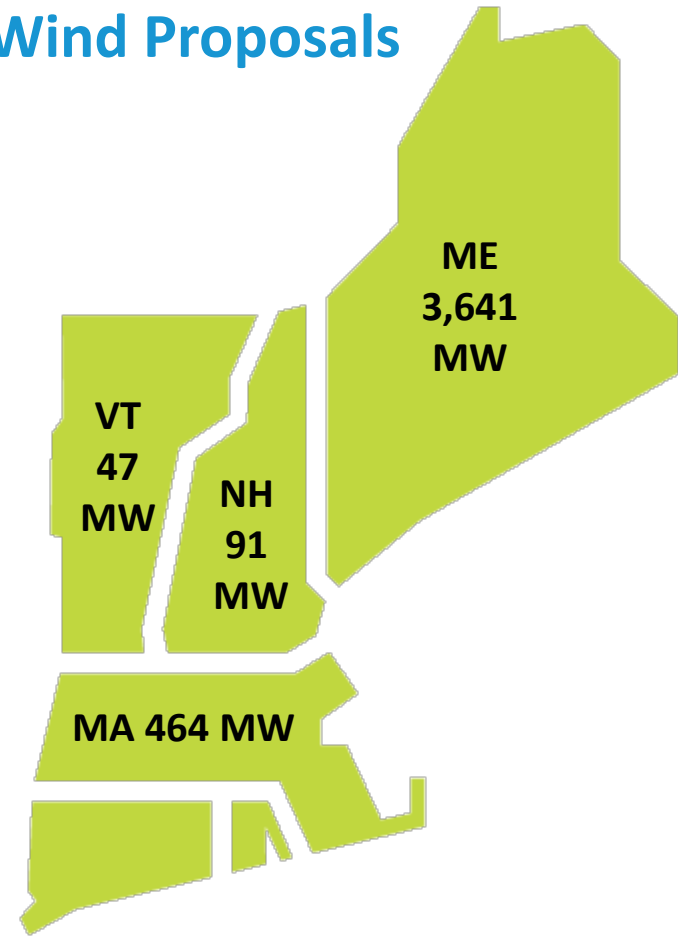
Infrastructure Will Be Needed to Deliver Energy from Proposed Resources

All Proposed Generation

Developers are proposing to build 13,000 MW of generation, including nearly 8,200 MW of gas-fired generation and more than 4,200 MW of wind



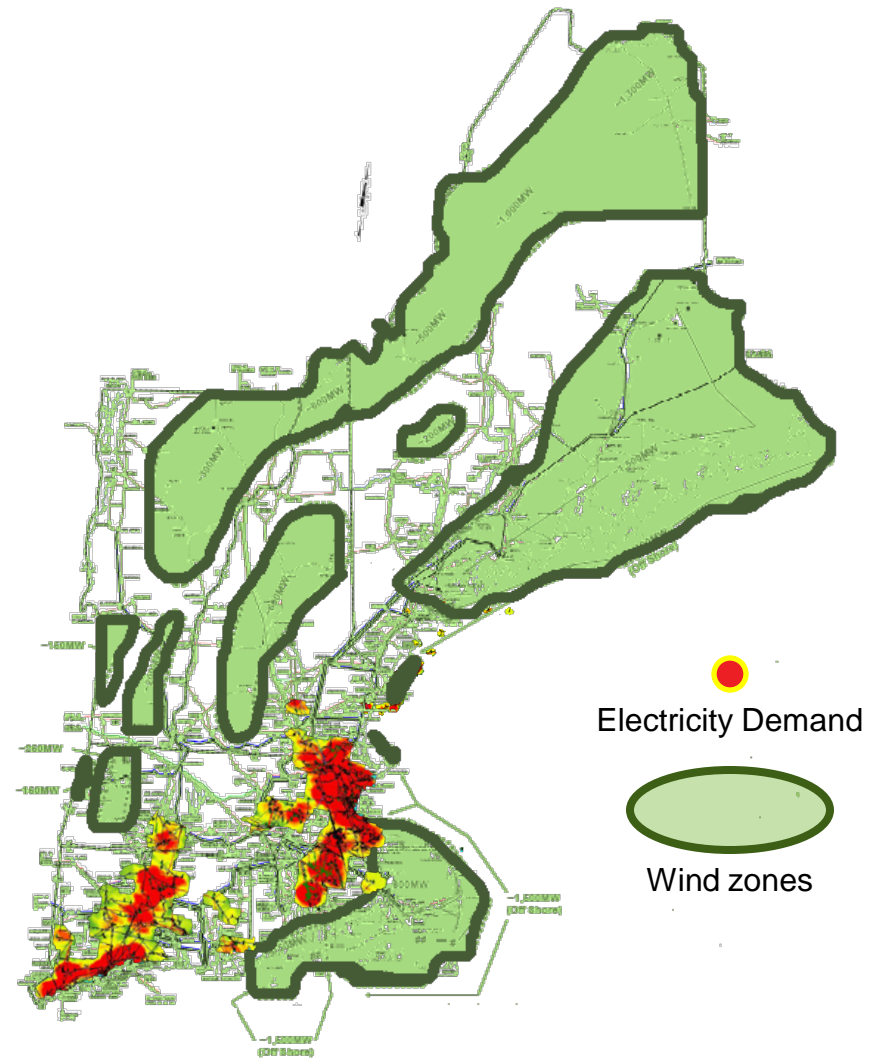
Wind Proposals



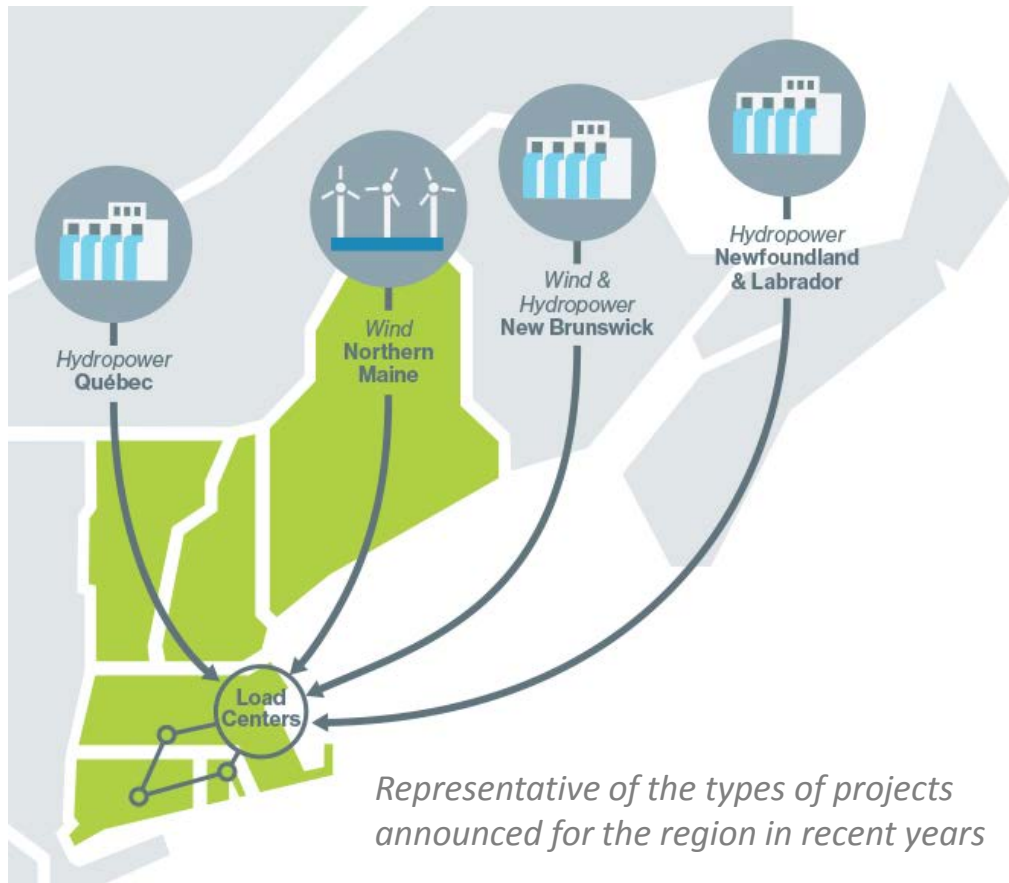
Source: ISO Generator Interconnection Queue (January 2016)
FERC Jurisdictional Proposals Only

New England Has Significant Wind Potential

- Population and electric demand are concentrated along the coast in central and southern New England
- 12,000 MW of onshore and offshore wind potential
 - Preliminary screening eliminated wind sites near urban areas and sensitive geographic locations (e.g., Appalachian Trail)
- Transmission will be required to connect potential wind resources to load centers in New England



Transmission Developers Are Proposing to Move Renewable Energy to New England Load Centers



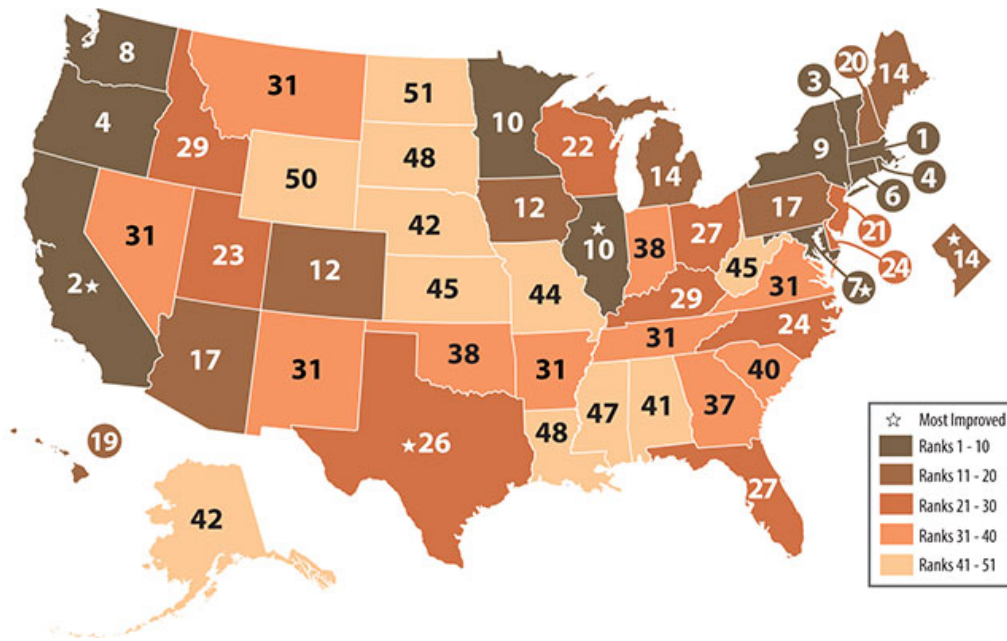
- As of **January 1, 2016**, eleven elective transmission projects had been proposed in the ISO Interconnection Queue, totaling more than **7,000 MW** of potential transfer capability
 - Primarily large-scale **hydro** resources from eastern Canada and **wind** resources from northern New England
- These projects seek to address public policy goals, not reliability needs

Source: ISO Interconnection Queue (January 2016)

<http://www.iso-ne.com/system-planning/transmission-planning/interconnection-request-queue>

Energy Efficiency Is a Priority for State Policymakers

2015 State Energy-Efficiency Scorecard



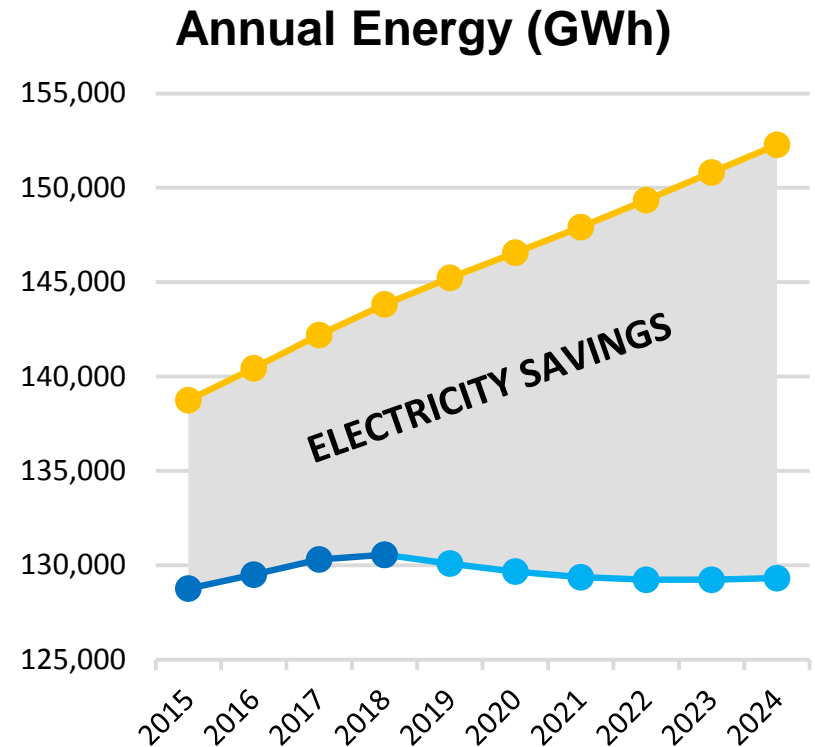
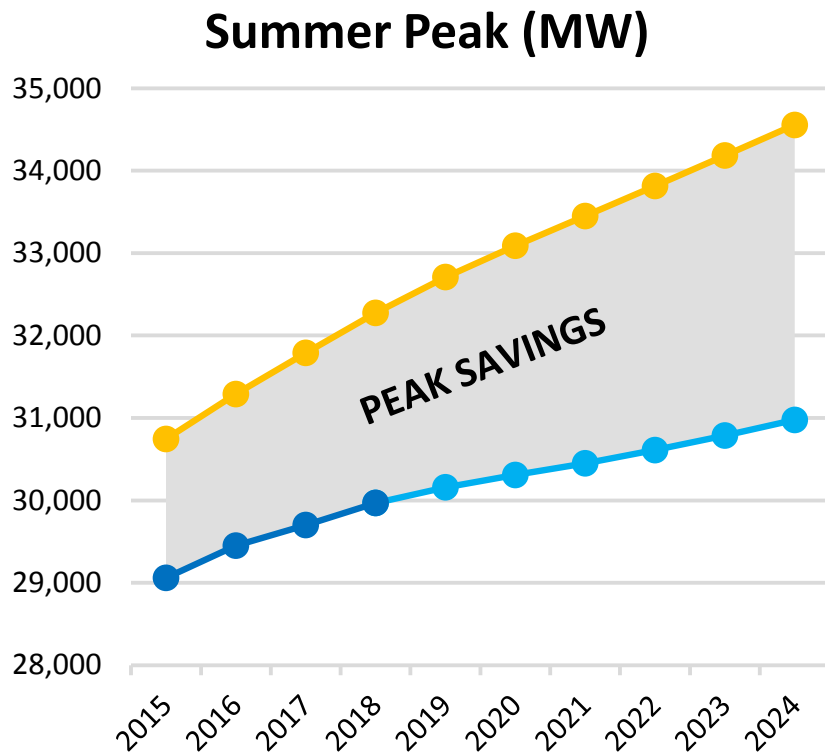
Source: American Council for an Energy-Efficient Economy

Ranking of state EE efforts by the *American Council for an Energy-Efficient Economy*:

- Massachusetts 1
- Vermont 3
- Rhode Island 4
- Connecticut 6
- Maine 14
- New Hampshire 20

- Billions spent over the past few years and more on the horizon
 - Approximately \$3 billion invested from 2009 to 2013
 - ISO estimates \$6.2 billion to be invested in EE from 2019 to 2024

Energy Efficiency Is Slowing Peak Demand Growth and Flattening Energy Use



The gross forecast of peak demand and energy use



The forecast minus the impact of EE participating in the Forward Capacity Market to date



The forecast minus anticipated EE growth

Source: [Final ISO New England EE Forecast for 2019-2024](#) (April 2015)

Renewable and EE Resources Are Trending Up

