



Challenges Facing the New England Power System

2015 IEEE Power & Energy Society General Meeting

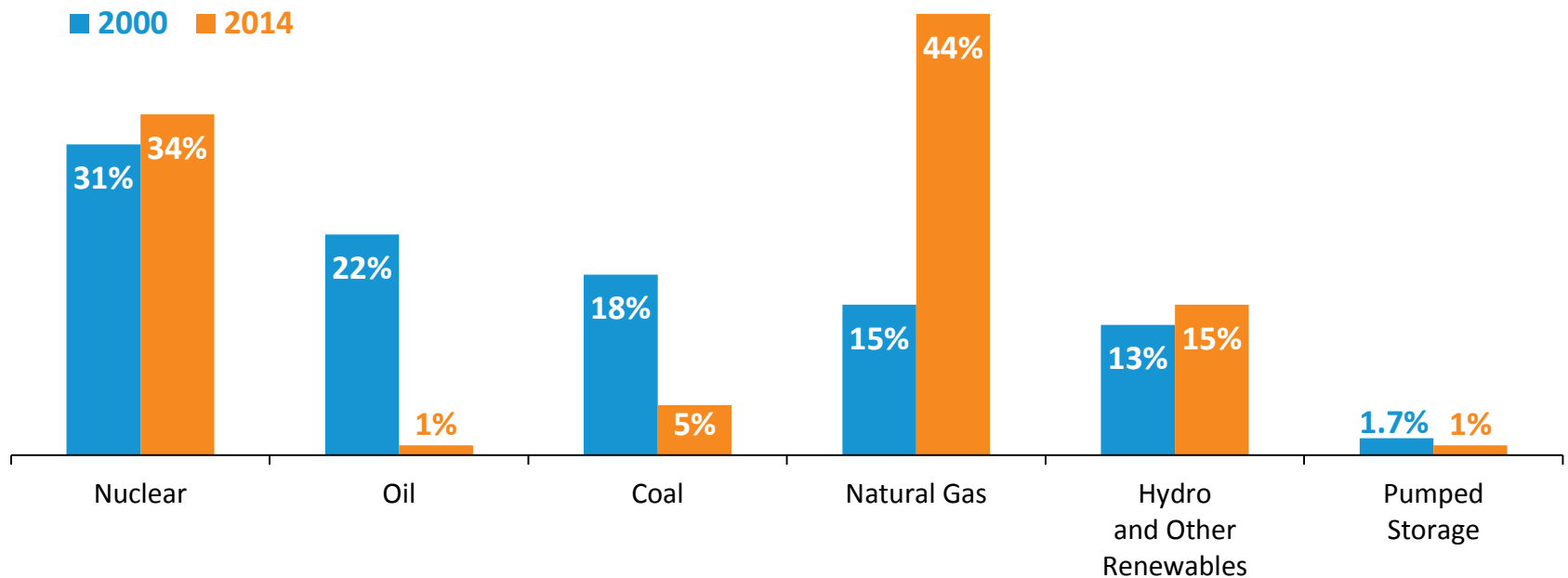
Gordon van Welie

PRESIDENT AND CEO



New England Has Seen Dramatic Changes in the Energy Mix: From Oil and Coal to Natural Gas

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



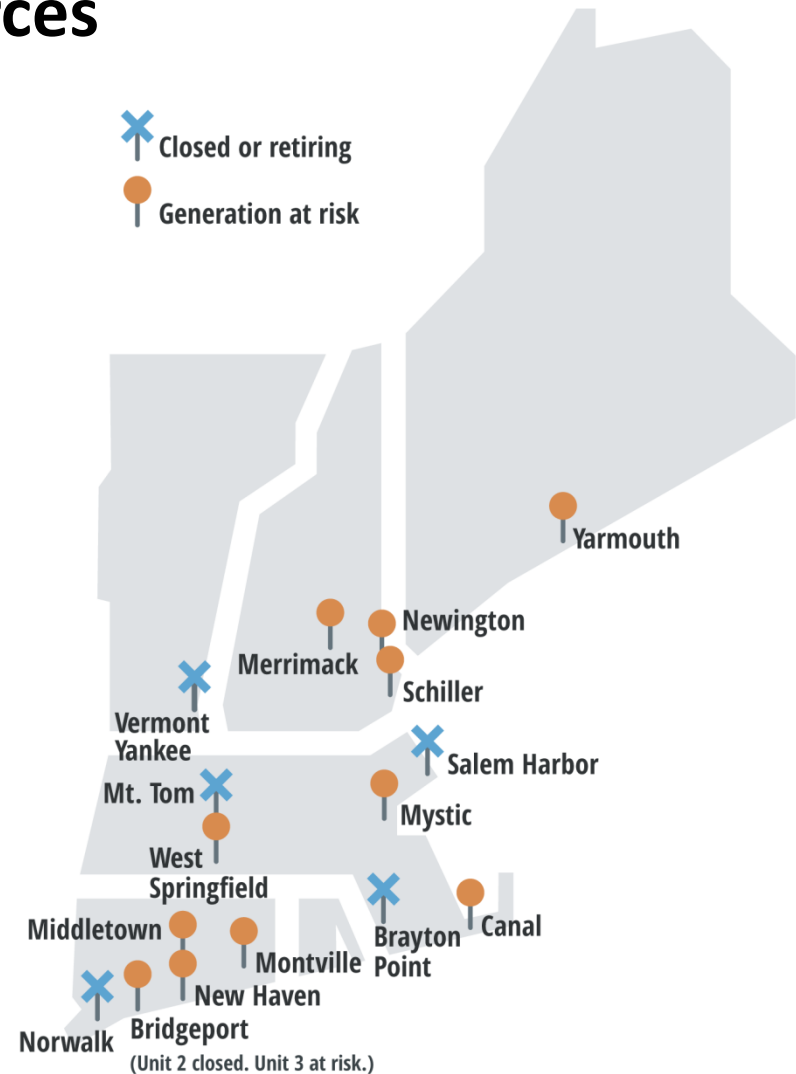
Source: ISO New England [Net Energy and Peak Load by Source](#)

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

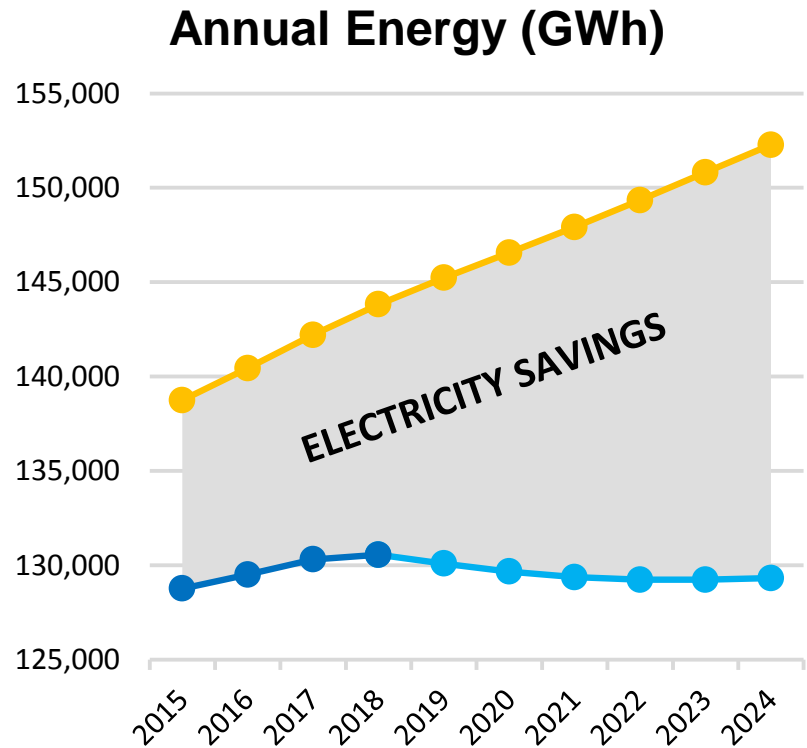
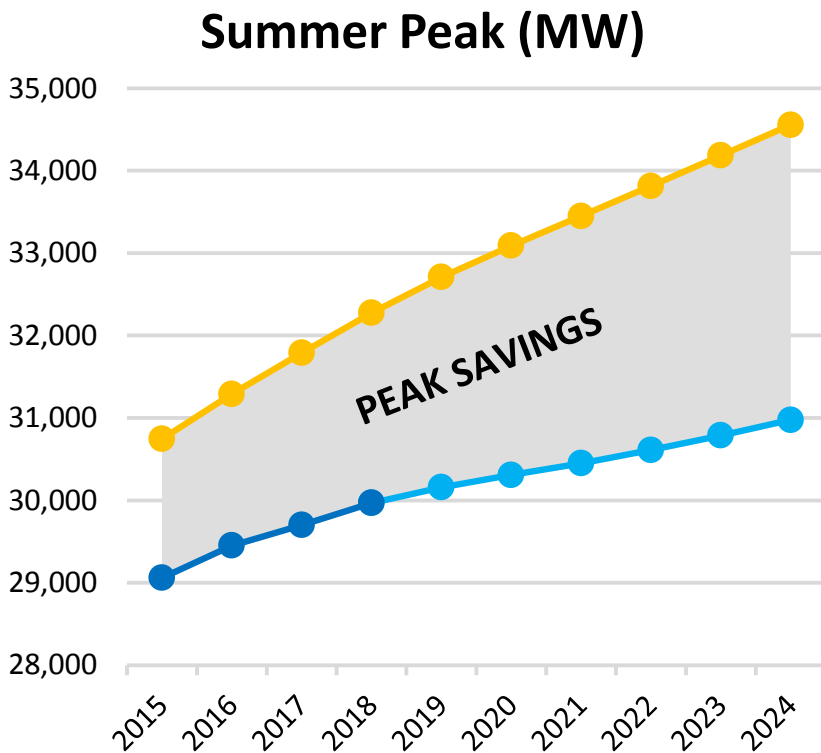
The Region Has Lost—and *Is at Risk of Losing*—Substantial Non-Gas Resources

Major Retirements Underway:

- **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)
- *Additional retirements are looming*



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

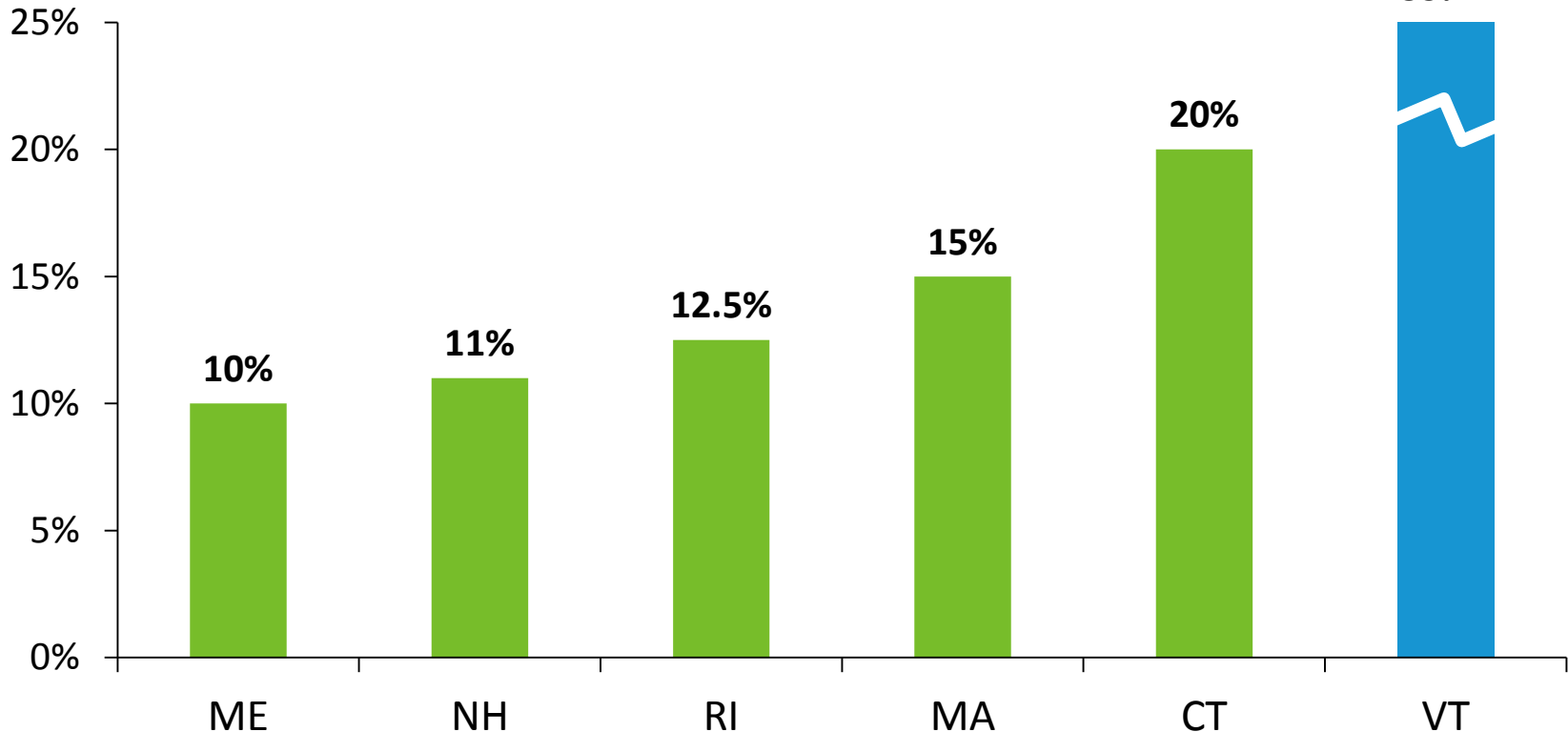


The forecast minus anticipated EE growth

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

State Policy Requirements Are Driving Proposals for Renewable Energy

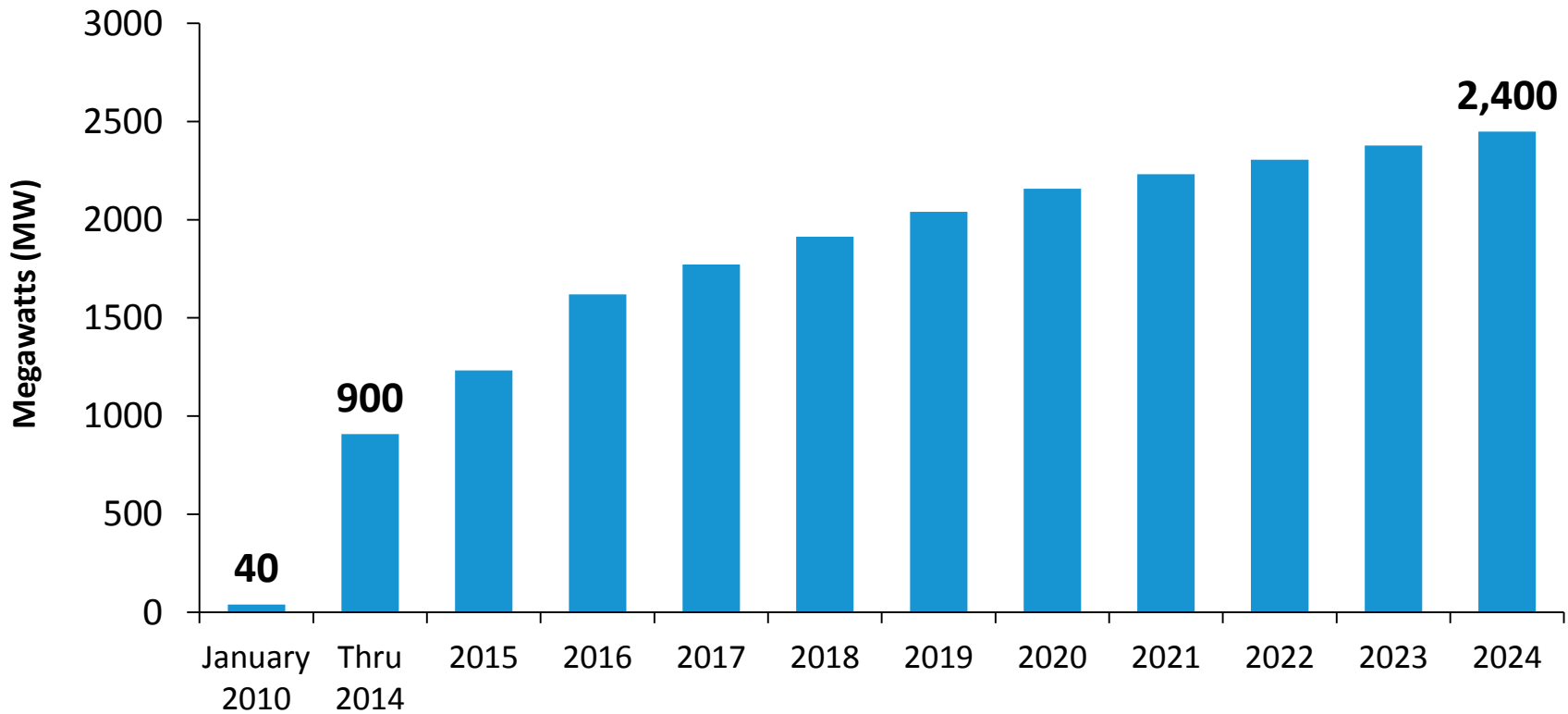
State Renewable Portfolio Standard (RPS)*
for Class I or New Renewable Energy by 2020



* 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 renewable energy.

ISO New England Forecasts Strong Growth in Solar PV

Cumulative Growth in Solar PV through 2024 (MW)



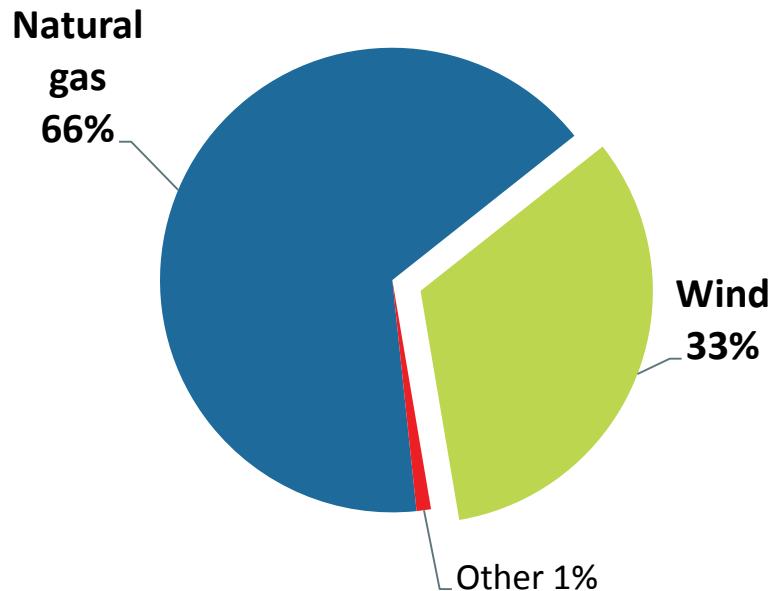
Source: [Final PV Forecast](#) (April 2015); Note: MW values are AC nameplate



Infrastructure Will Be Needed to Deliver Energy from Proposed Resources: Natural Gas and Wind Power

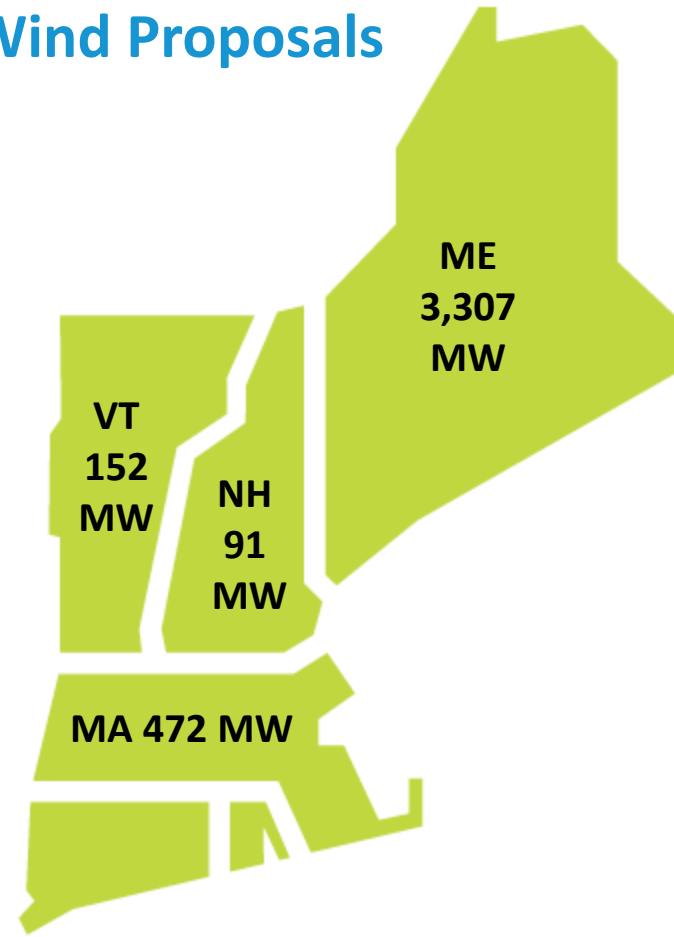
All Proposed Generation

Developers are proposing to build more than 12,000 MW of generation, including 8 GW of gas-fired generation and 4 GW of wind



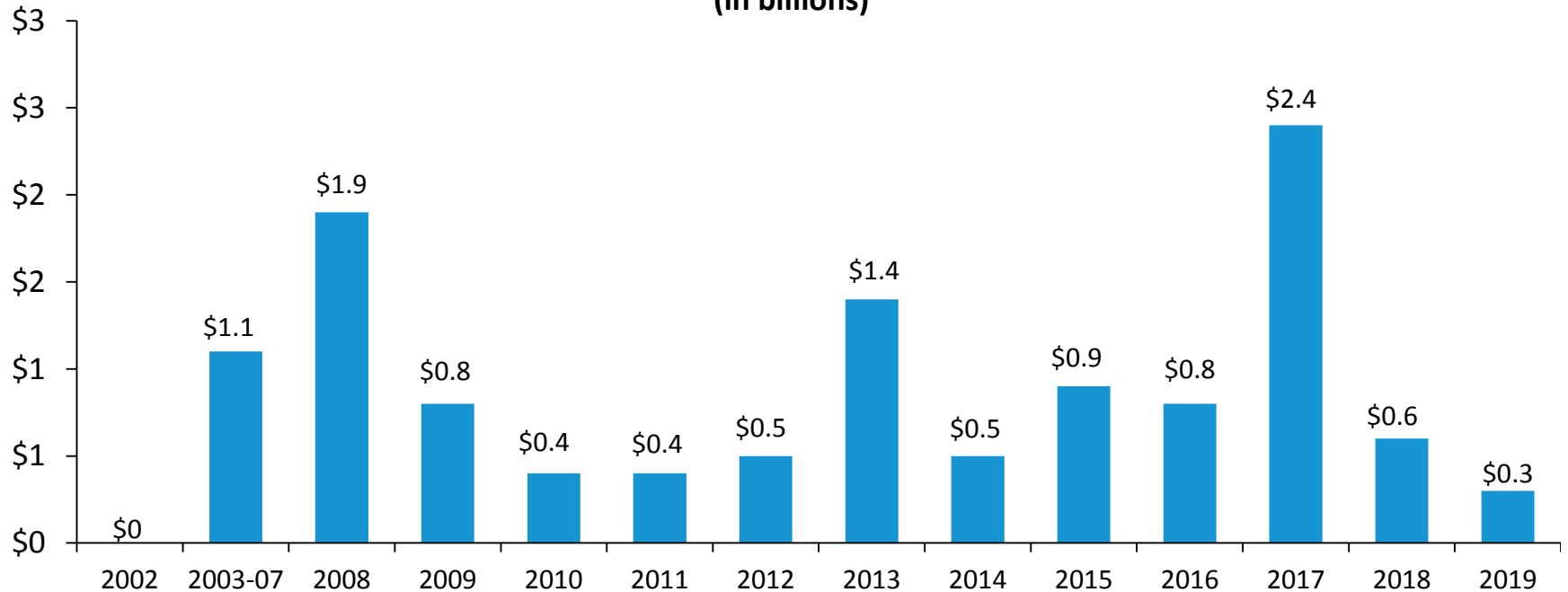
Source: ISO Generator Interconnection Queue (June 2015)
FERC Jurisdictional Proposals Only

Wind Proposals



Region Has Made Major Investments in Transmission Infrastructure to Ensure a Reliable Electric Grid

Annual Investment in Transmission to Maintain Reliability
(in billions)

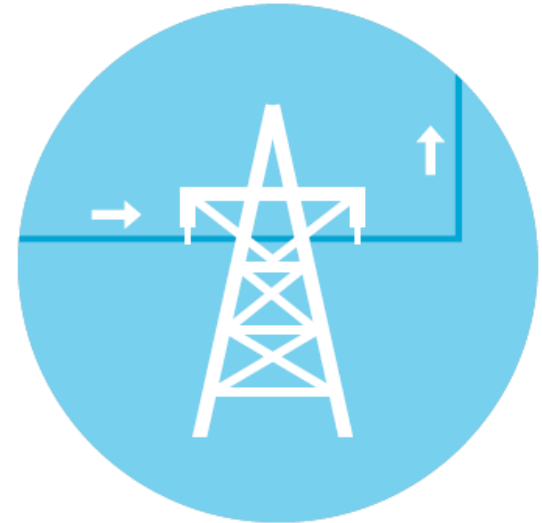


Cumulative Investment through June 2015	\$7.2 billion
Estimated Future Investment through 2019	\$4.8 billion

Source: ISO New England RSP Transmission Project Listing, June 2015
Estimated future investment includes projects under construction, planned and proposed

Elective Transmission Proposals Are Vying to Move Renewable Energy to New England Load Centers

- Ten elective transmission projects have been proposed, representing more than **7,300 MW** of potential imports, as of June 1, 2015
 - Only a subset will likely be developed
- Primarily large-scale **wind** resources from northern New England and **hydropower** from eastern Canada

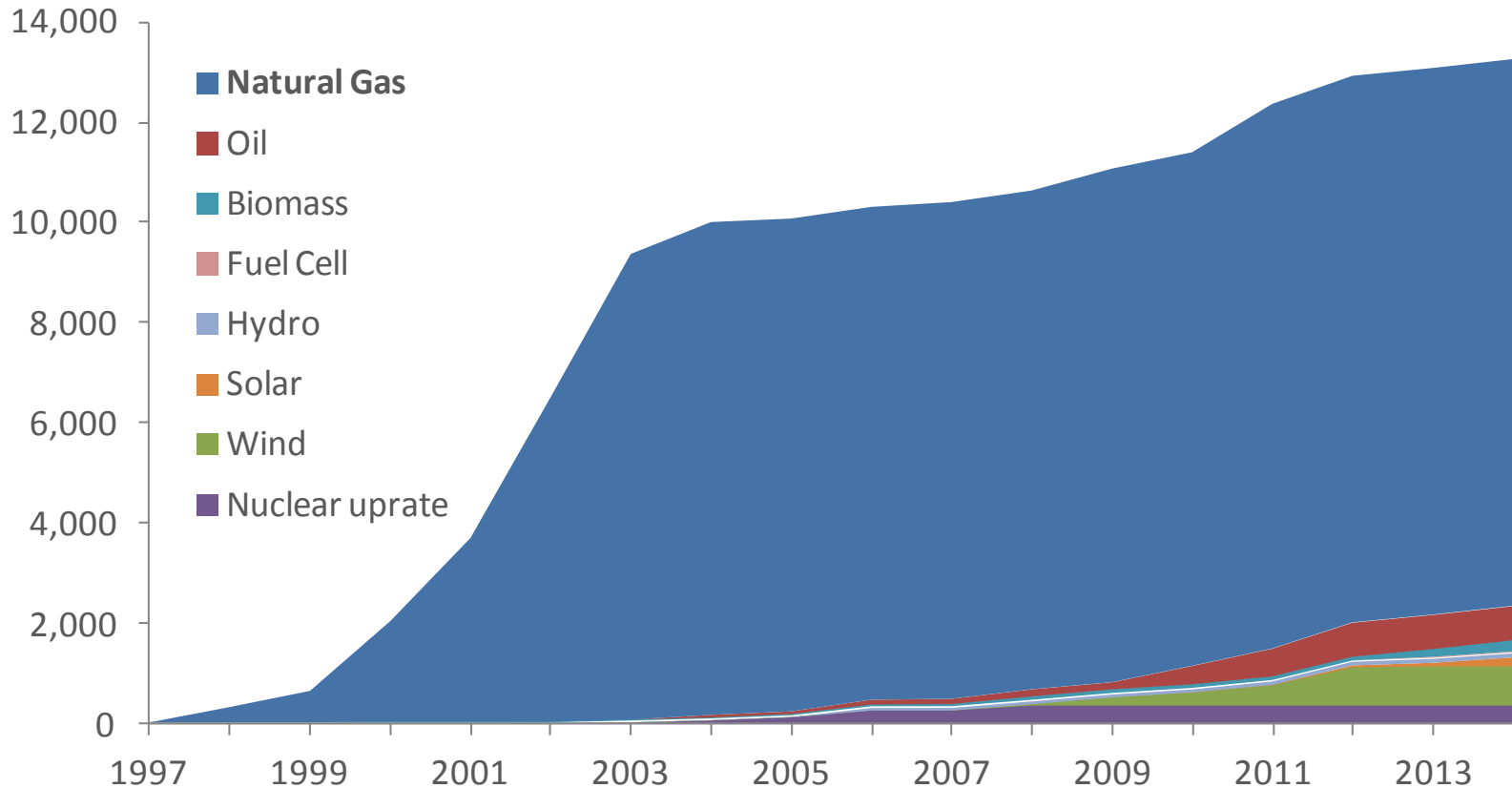


Source: ISO Interconnection Queue (June 2015)

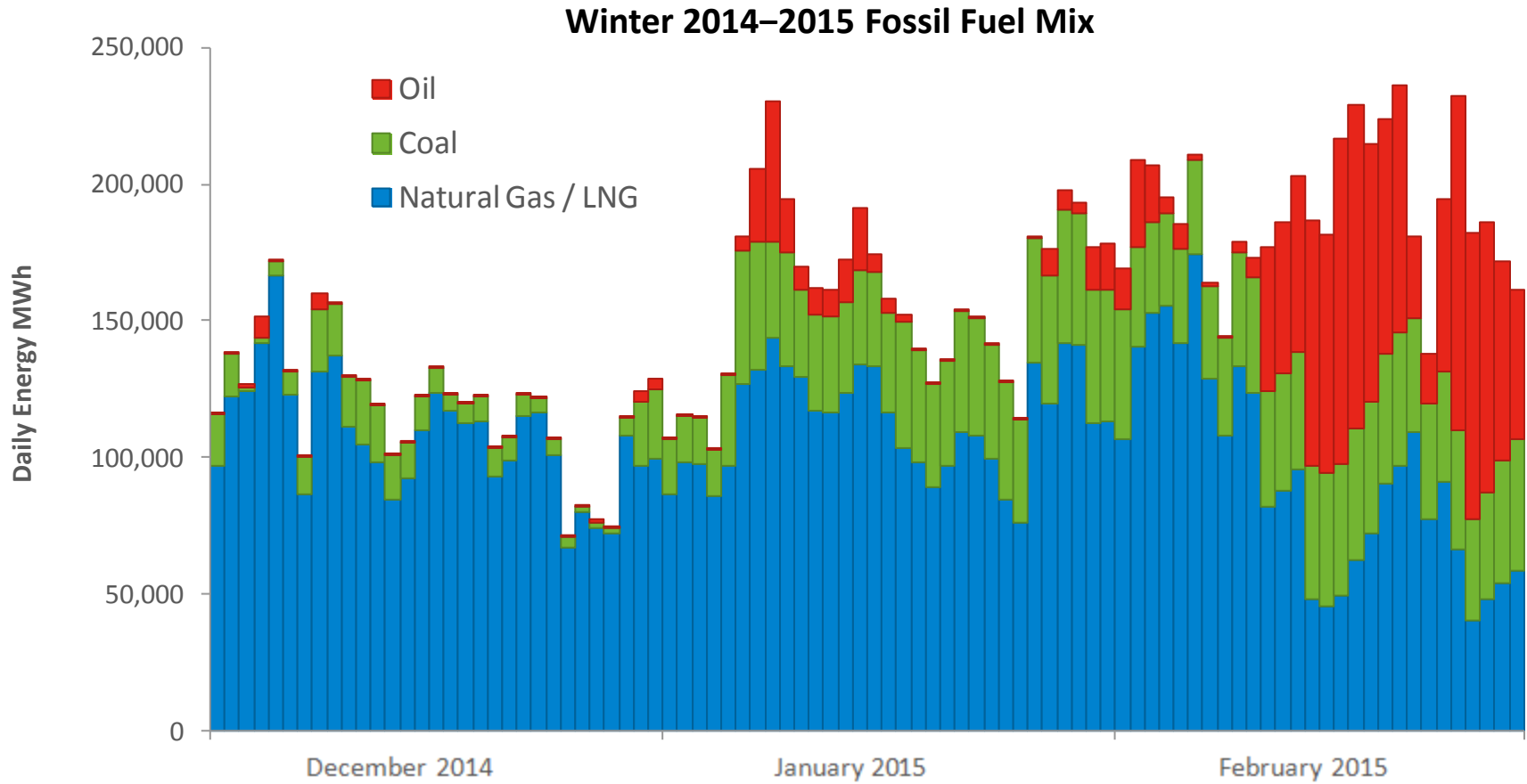
<http://www.iso-ne.com/system-planning/transmission-planning/interconnection-request-queue>

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

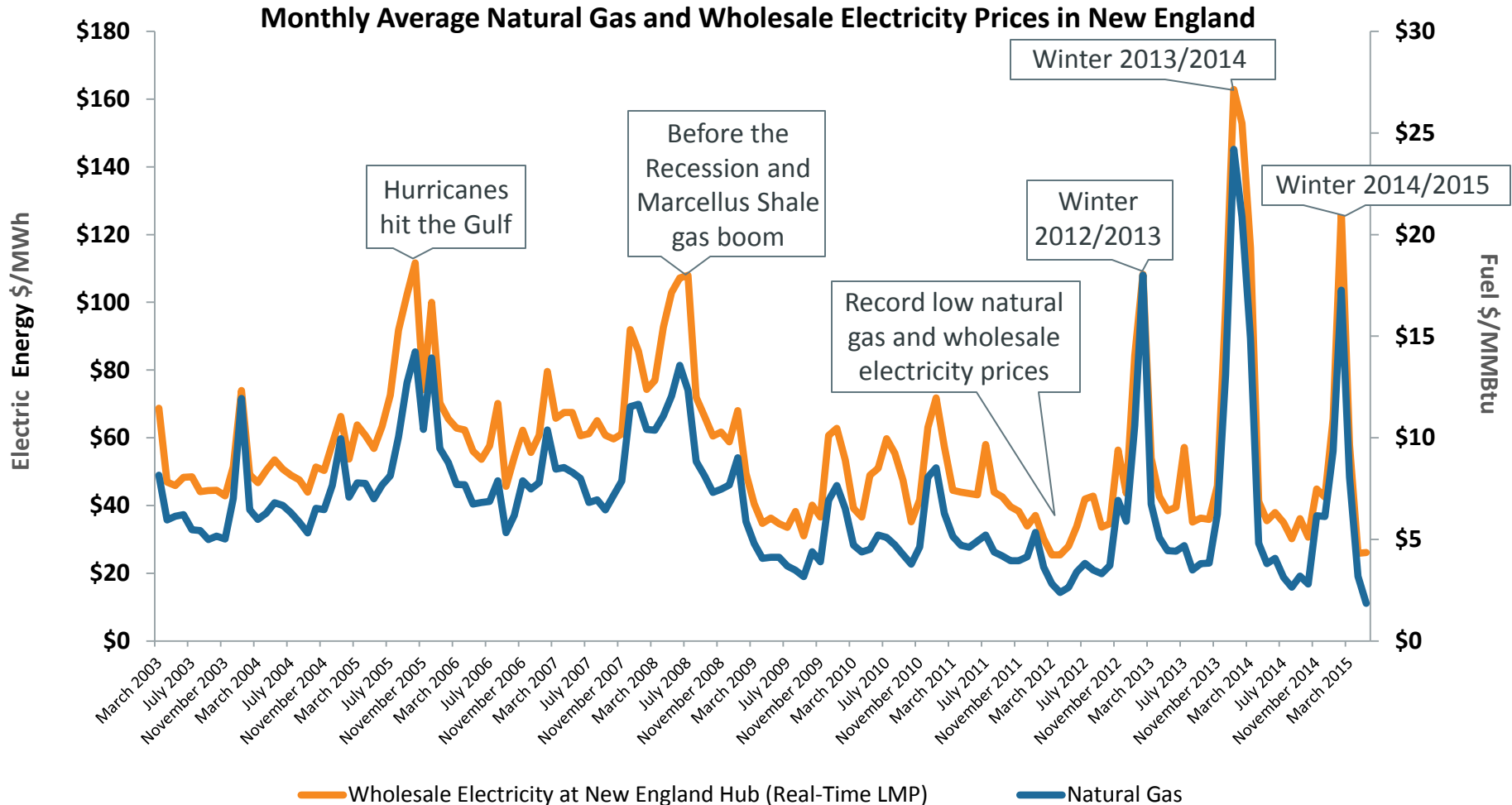
Cumulative New Generating Capacity in New England (MW)



New England Shifts to Coal and Oil in the Winter

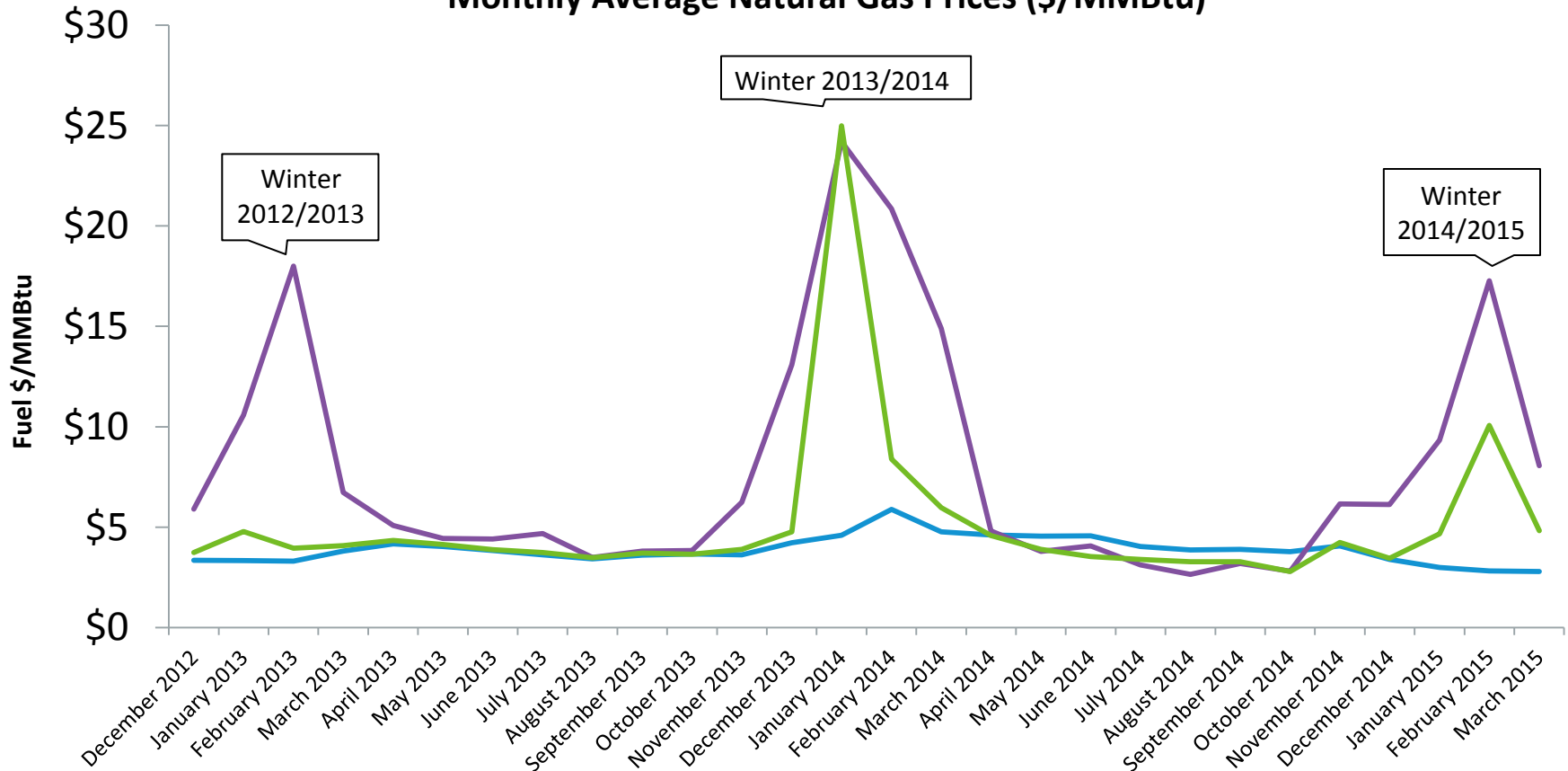


Natural Gas and Wholesale Electricity Prices Are Linked



Natural Gas Prices are High During the Winter Relative to Other Regions

Monthly Average Natural Gas Prices (\$/MMBtu)



Underlying natural gas data furnished by:



Henry Hub Algonquin Citygate Transco Zone 6 (NY)

ISO-NE PUBLIC

A Comparison of the Last Two Winters

Why were prices less volatile this past winter?

- 2014/2015 Winter Reliability Program provided incentives to fill tanks before the start of the winter
- Coldest winter weather happened in February, when days were longer and demand was down
- High forward prices, due to high prices the previous winter, attracted large supplies of LNG to the region
- Oil prices were half what they were a year ago

	Winter 2013/2014	Winter 2014/2015	% change
Average monthly temperature (°F)	26.5	25.5	- 3.8%
Total energy consumption (GWh)	33,991	33,654	- 1.0%
Peak demand (MW)	21,453	20,556	- 4.2%
Date of peak	12/17/2013	1/8/2015	-
Average wholesale energy price at Hub (\$/MWh)	\$137.60	\$76.64	- 44.3%
Average gas price at Algonquin (\$/MMBtu)	\$19.33	\$10.70	- 44.6%
Total value of energy markets (in billions)	\$5.05 B	\$2.77 B	- 45.1%

What Actions Has the ISO Taken to Improve Gas-Electric Coordination?

- Increased information sharing and operational interfaces with natural gas pipelines
- Shifted the day-ahead energy market timeline to better align the electricity and natural gas markets
- Implemented energy market offer-flexibility enhancements
- Strengthened incentives for resources to perform during stressed system conditions (i.e., reserve shortages)
- Strengthened long-term incentives through the capacity market for resources to invest in operational improvements and secure fuel arrangements to ensure resource performance (“Pay for Performance”)