



New England's Natural Gas- Electric Interdependencies

*US Department of Energy's
Electricity Advisory Committee*

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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



Reliability Is the Core of ISO New England's Mission

Fulfilled by three interconnected and interdependent responsibilities

Managing
comprehensive
regional **power**
system **planning**



Overseeing the day-to-day
operation of New England's
electric power generation and
transmission system

Developing and
administering the region's
competitive **wholesale**
electricity markets

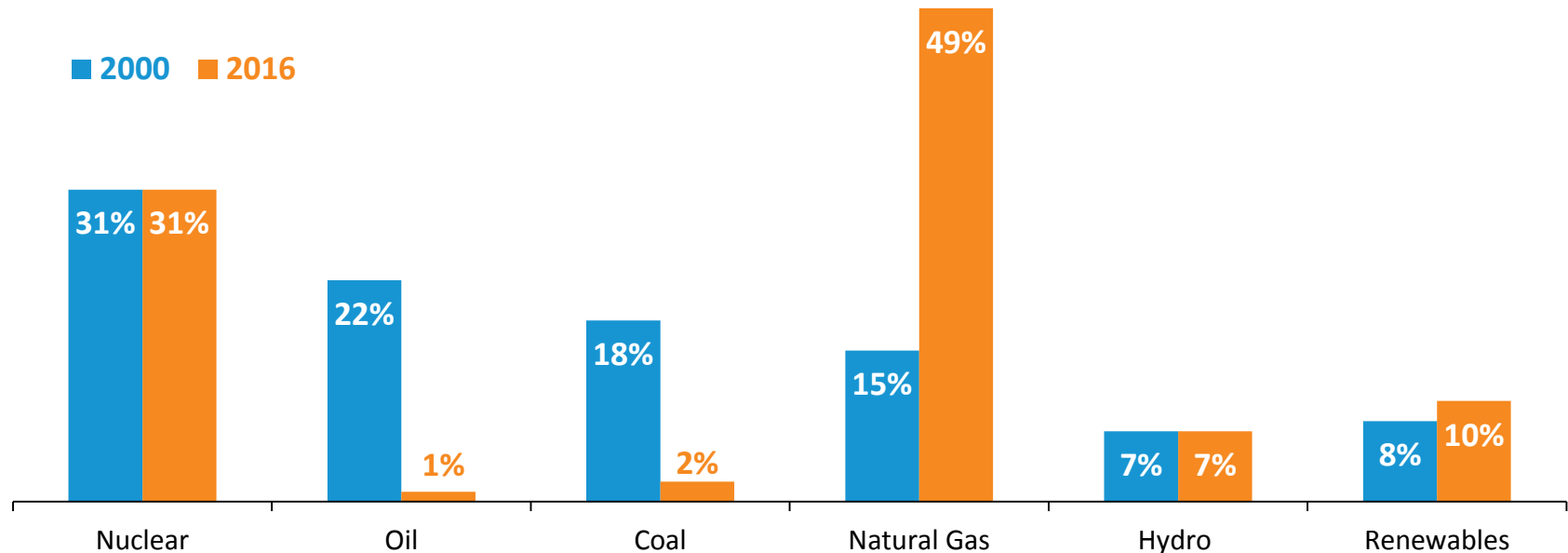


RELIANCE ON NATURAL GAS IS INCREASING IN NEW ENGLAND



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

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2016)

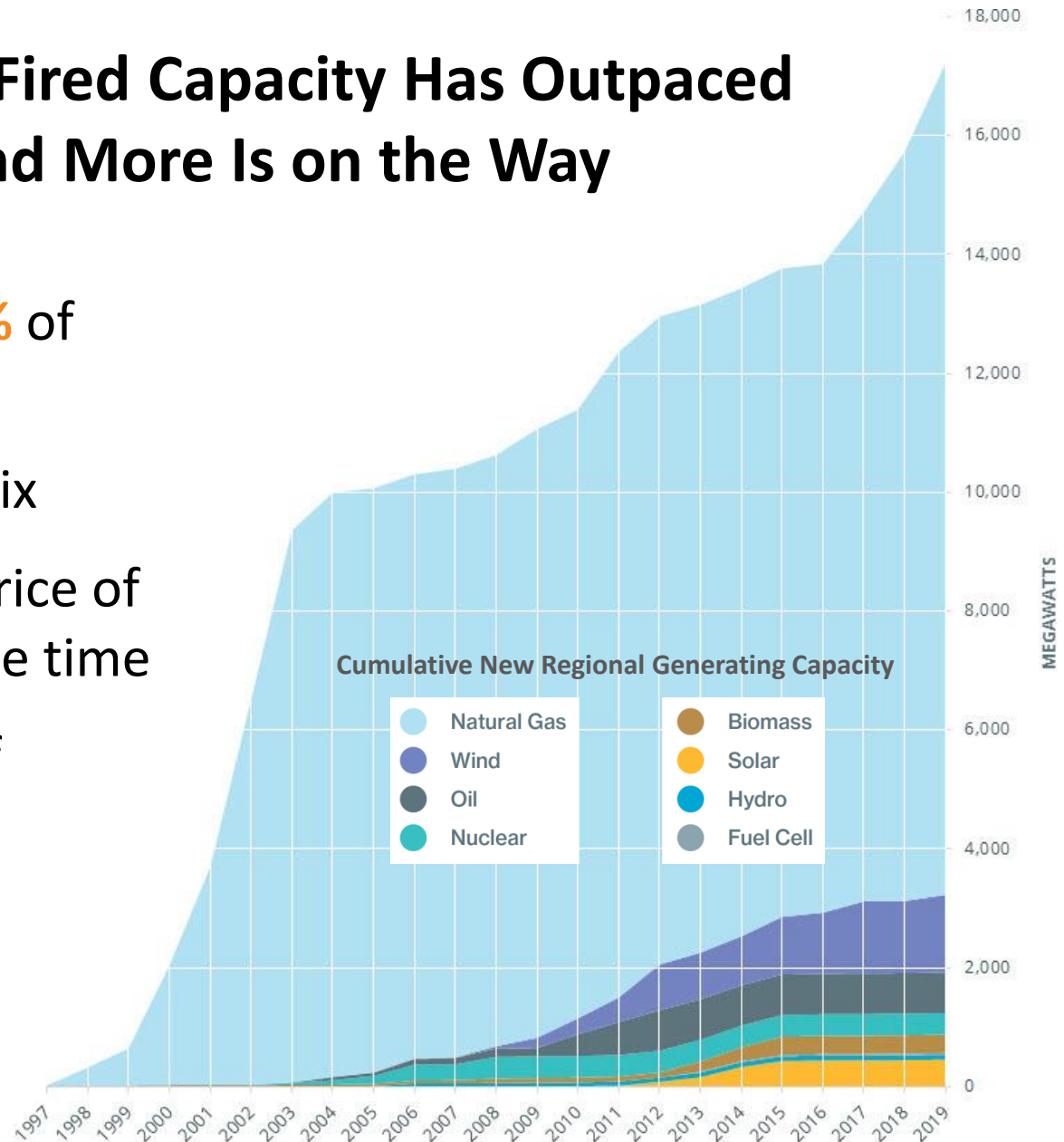


Source: ISO New England [Net Energy and Peak Load by Source](#)

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

Investment in Gas-Fired Capacity Has Outpaced All Other Fuels—and More Is on the Way

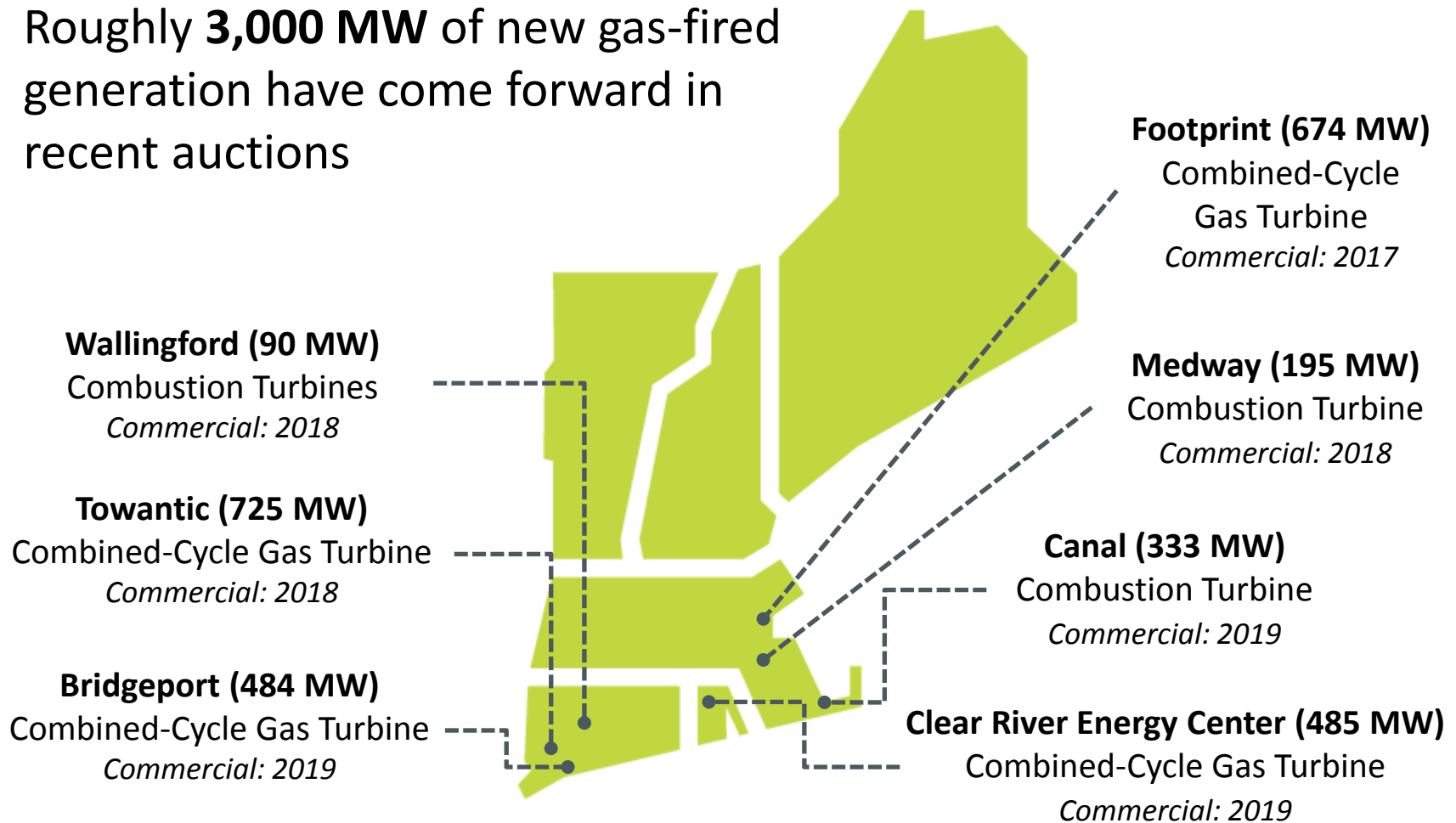
- Primary fuel for **44%** of installed capacity
- **49%** of 2016 fuel mix
- Sets the real-time price of electricity **75%** of the time
- Accounts for **50%** of proposed new generating capacity

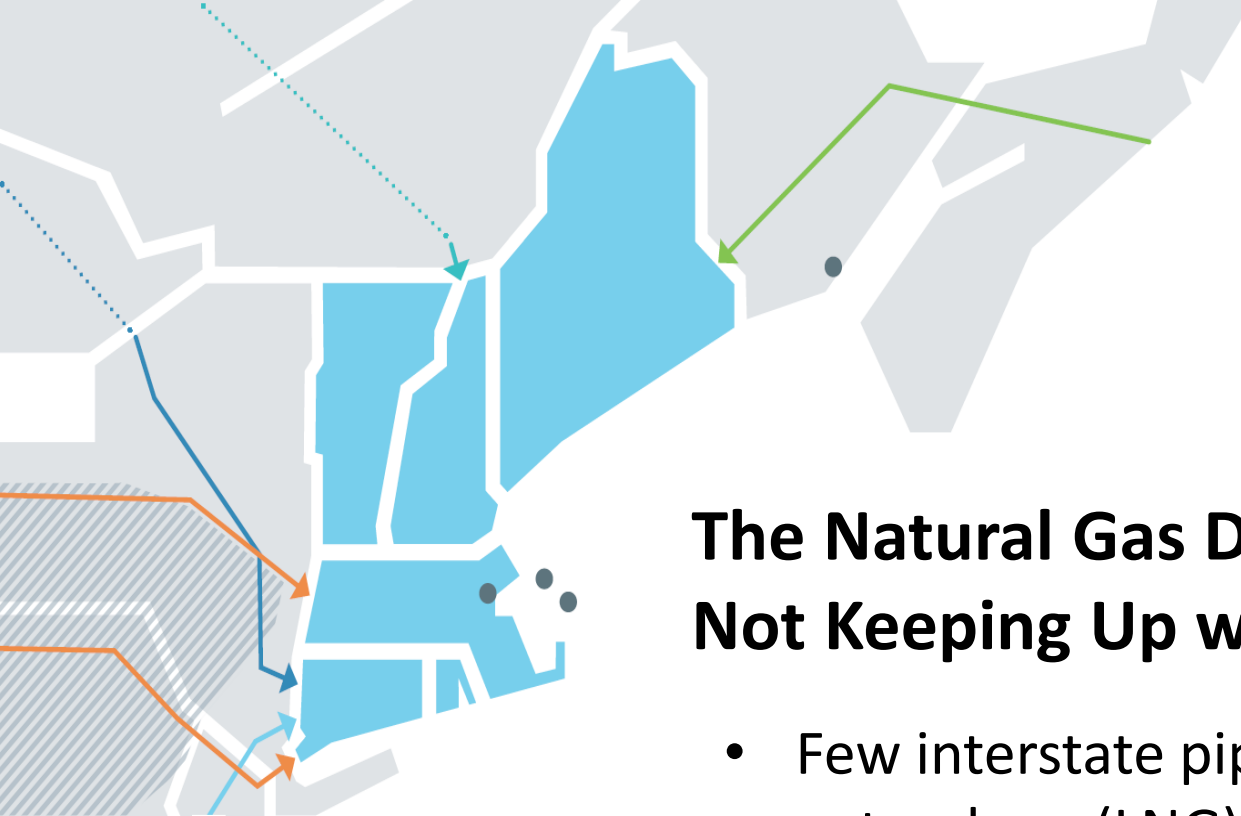


Note: New generating capacity for years 2016–2019 includes resources clearing in recent Forward Capacity Auctions.

The Forward Capacity Market Is Attracting Efficient and Fast-Starting Resources Amid Retirements

- Roughly **3,000 MW** of new gas-fired generation have come forward in recent auctions





The Natural Gas Delivery System Is Not Keeping Up with Demand

- Few interstate pipelines and liquefied natural gas (LNG) delivery points
- Regional pipelines are:
 - Built to serve heating demand, not power generation
 - Running at or near maximum capacity during winter

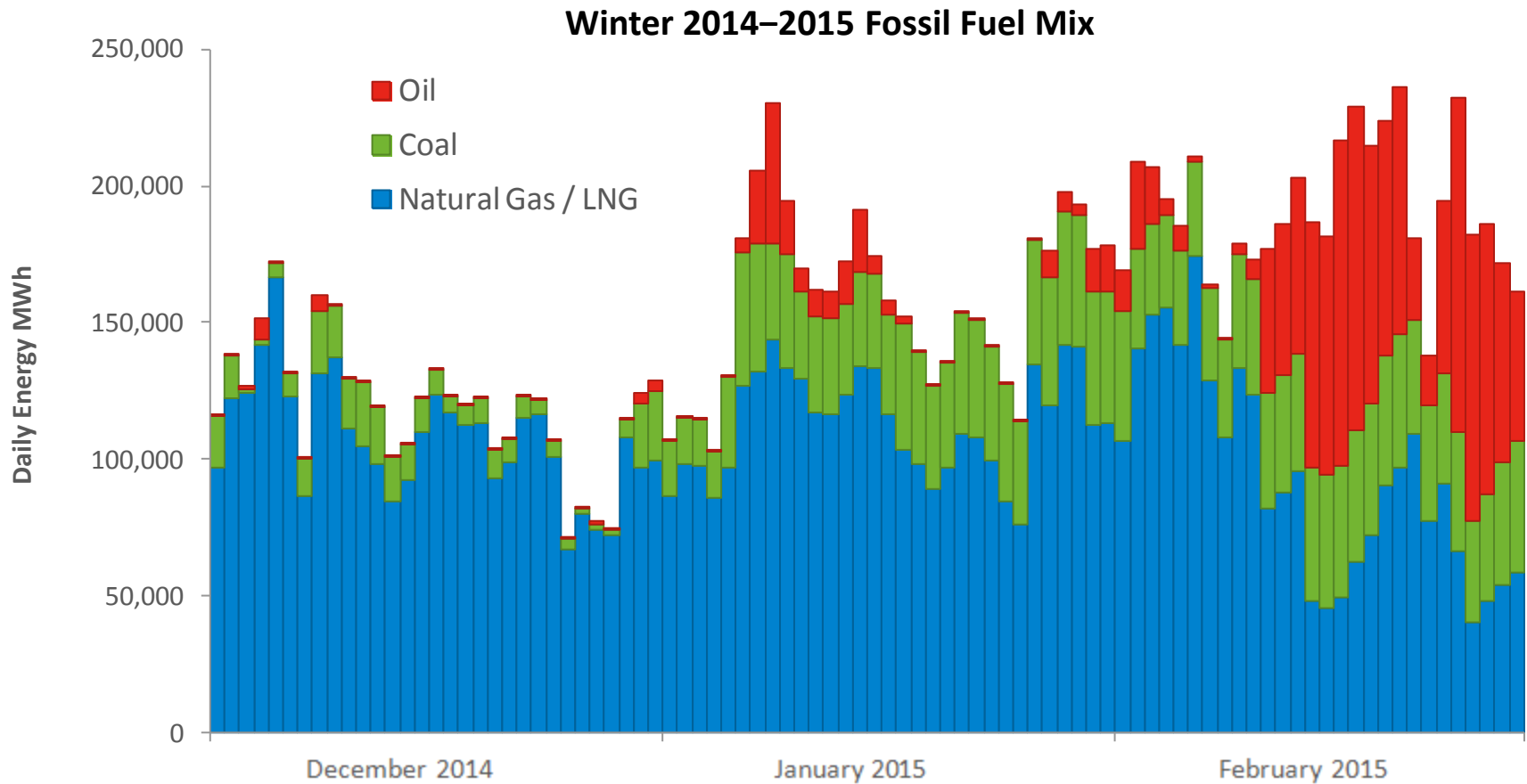


Source: ISO New England



New England Shifts to Coal and Oil in Cold Weather, But These Resources Are Retiring

Dual-Fuel Units are Becoming More Difficult to Permit

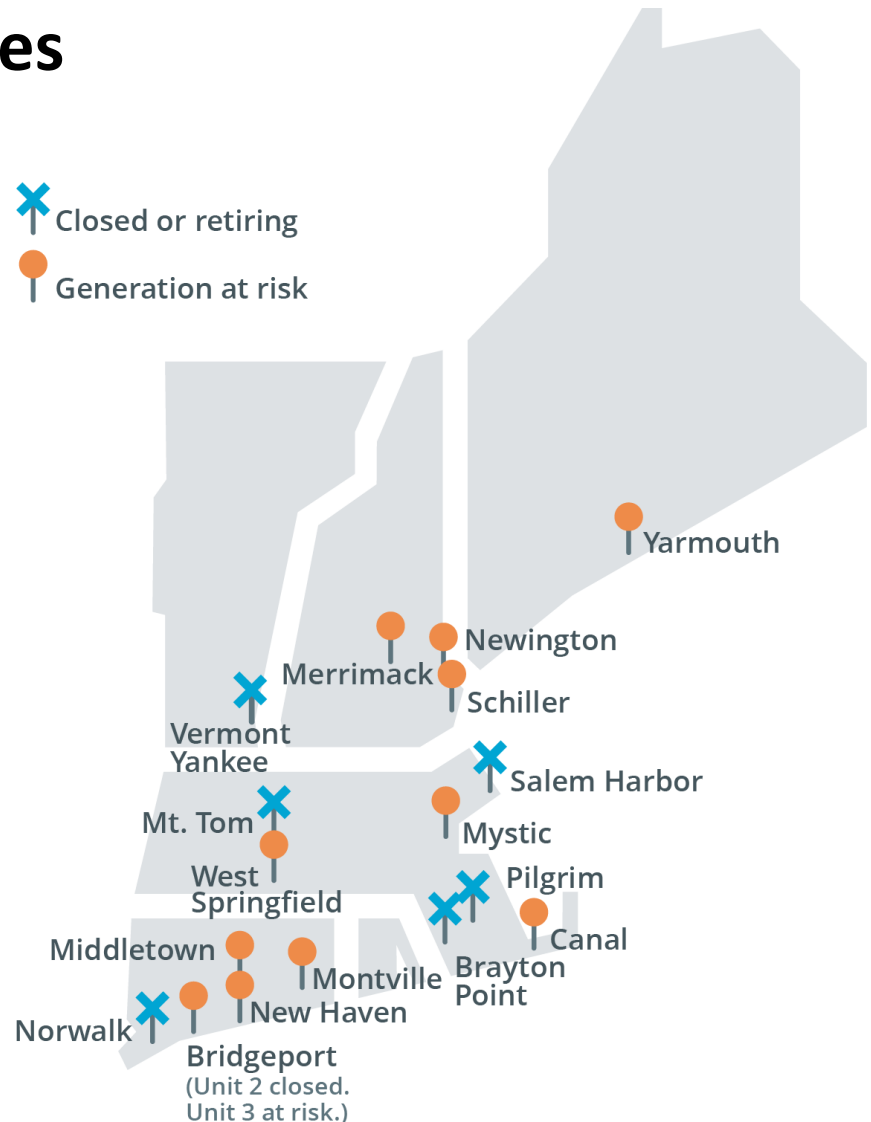


The Region Has Lost—and *Is at Risk of Losing*—Substantial Nongas Resources

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*

- ✕ Closed or retiring
- Generation at risk



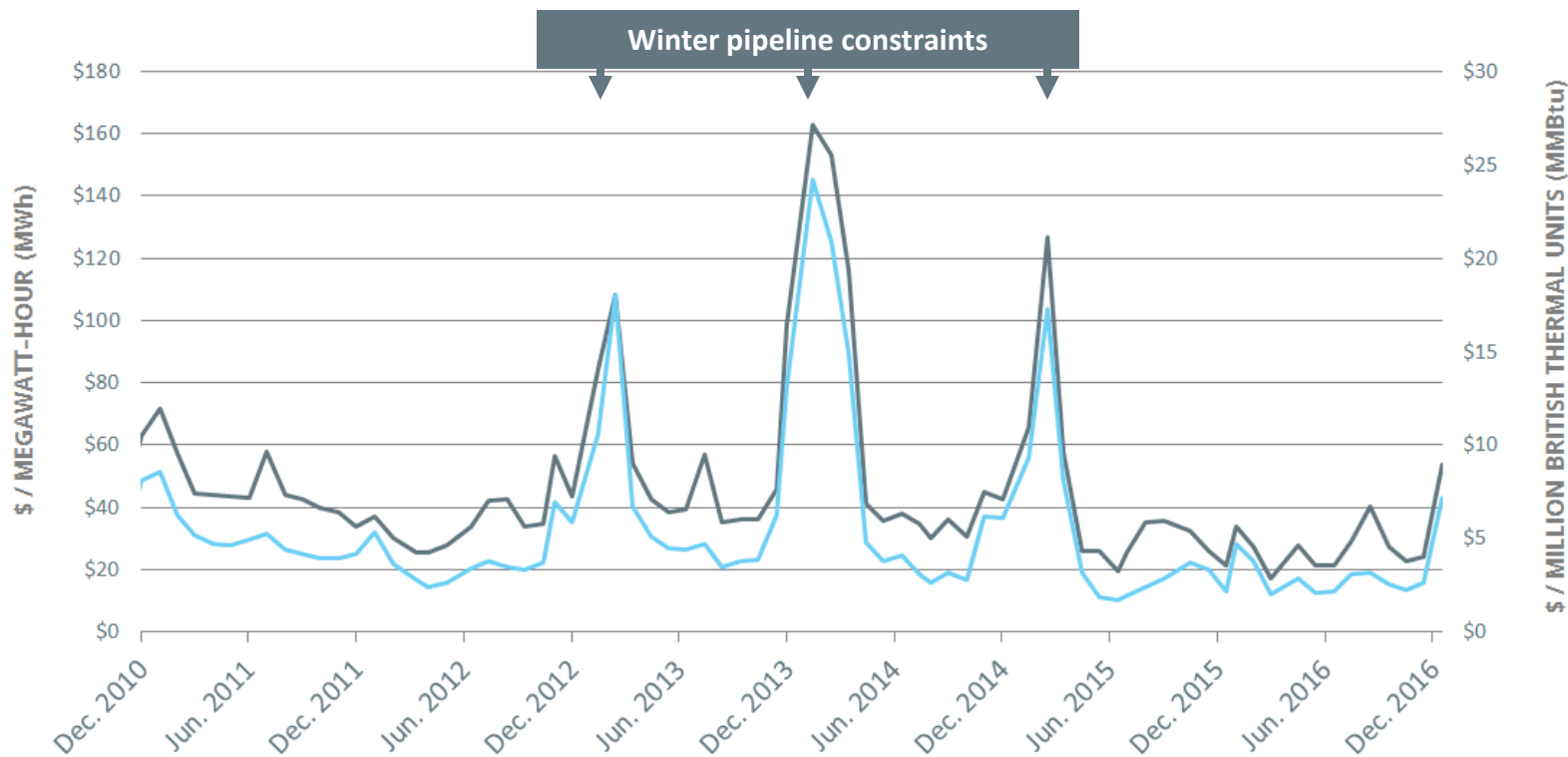
Natural Gas Pipeline Constraints Have Serious Implications

- Reliability risks and price volatility

Natural Gas Prices at Algonquin City Gate

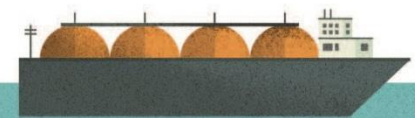
Wholesale Electricity Prices in Real-Time Energy Market

Source: ISO New England
Underlying data furnished by: 



LNG Is Increasingly Important

- An imported global commodity
- Must be contracted for in advance
- Arrivals of spot LNG cargoes depend on global prices and destination-flexible contracts, so deliveries vary annually
- Severe weather could delay ships



Operational Lessons and Observations from Recent Winters

- Gas pipelines are severely constrained when weather is cold, limiting use of gas-fired generation
 - Oil-fired resources are critical to maintaining electric system reliability when natural gas plants cannot run
- Oil-supply chain is fragile and unable to respond quickly during adverse weather conditions and/or when demand is high
 - Important to ensure adequate oil inventory prior to winter season
- Gas-supply chain is highly dependent on just-in-time logistics of LNG tanker delivery
 - LNG injections are required to meet peak gas demand days
- We observe that it is becoming more difficult to site/permit new dual-fuel facilities (gas generators that can switch to oil)
- Imported Canadian hydropower is limited during very cold weather (because Québec is a winter-peaking system)
- The region is vulnerable if large nongas generators are lost during cold weather

ISO Efforts Mitigate the Fuel-Security Risk

- New situational awareness and forecasting tools
 - Automatically query gas pipeline schedules at all key points on the gas system
 - Compare scheduled gas, estimated firm gas demand, and supply capability to derive gas available for generation
 - Communicate with pipelines and generators when constrained operation is expected
- Improved communication with pipeline operators
 - Daily verbal communication with pipeline operations during winter months, more frequent as necessary
 - Seasonal maintenance coordination meetings with pipelines
 - Sharing of expected dispatch of gas fired generation (converted to gas quantities)
- Winter reliability programs to boost fuel inventories
 - Seeks to increase inventory of on-site oil, LNG storage

ISO Efforts Mitigate the Fuel-Security Risk

- Energy-market changes to strengthen resource performance
 - Hourly offers implemented December 2014
 - Sub-hourly settlement implemented March 2017
 - Increased scarcity pricing (maximum of \$2,800/MWh plus energy offer)
- “Pay for performance” (PFP) enhancements in the FCM
 - Capacity market payments tightly linked to energy delivery during shortage hours
 - Up to \$5,455/MWh reduction in capacity payment for failure to deliver energy during times of reserve shortage
 - In addition to (presumably high) energy price

But these efforts may not be enough.

ISO New England Is Conducting a Study of Fuel Security Challenges



- ISO New England is conducting a study of fuel security challenges to the continued **reliability** of New England's power system
- In this context, fuel security refers to the ability of power plants to have or obtain the fuel required to generate electricity, especially during the winter peak season
- The study is examining more than a dozen cases of generating resource and fuel-mix combinations and will quantify each case's **fuel security risk**
 - Fuel security risk is the number and duration of energy shortfalls that could occur during the entire winter period in **2025** and that would require implementation of emergency procedures to maintain reliability

ISO New England Is Conducting a Study of Fuel Security Challenges, *continued*



- The study is **not** focused on the effects of expanded access to natural gas and will not identify needs for new or expanded pipeline capacity or natural gas infrastructure
- The study is **still underway**, with completion expected by the end of October 2017
- The results will be presented to regional stakeholders for discussion and input
- The ISO will work with stakeholders to determine whether further **operational** or **market design measures** will be needed to address the fuel security risk

Questions

