

Infrastructure Needs: Electricity-Natural Gas Interdependencies



*Regional Energy Forum: Tackling New
England's Energy Challenges*

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ISO New England's Strategic Planning Initiative

Focused on developing solutions to the region's top reliability risks

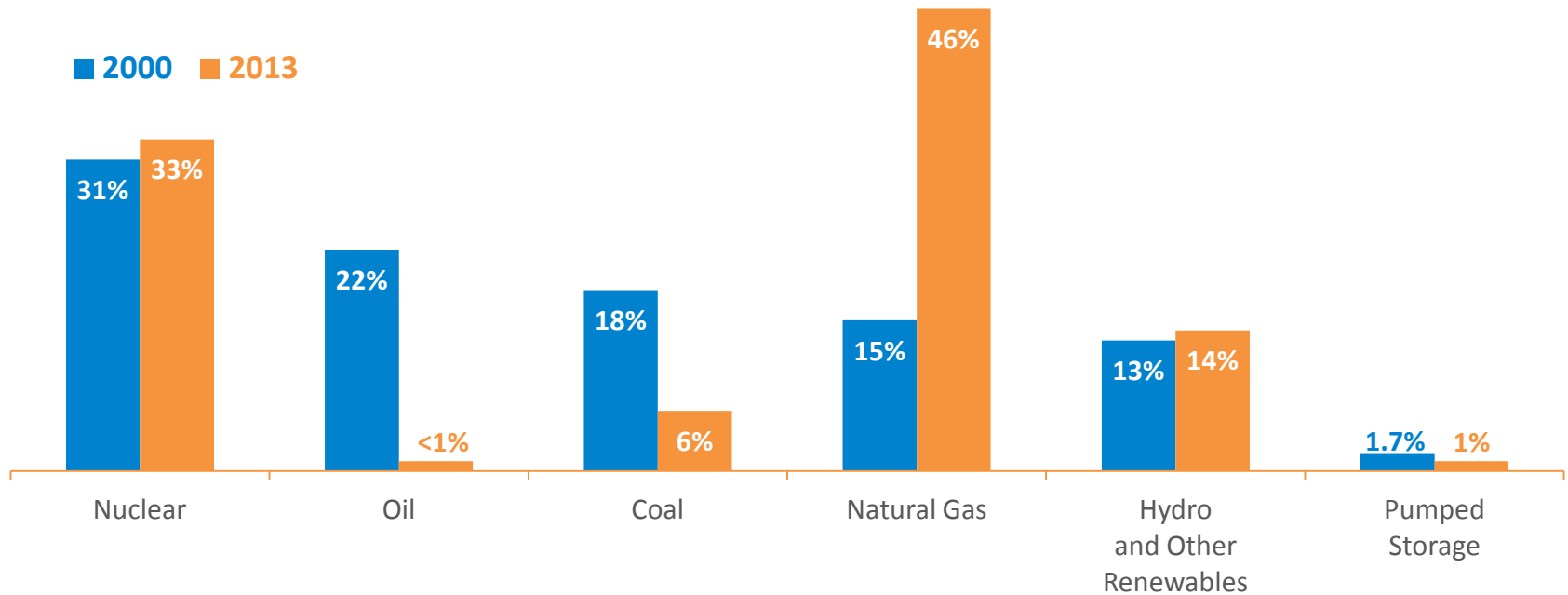
Reliability requires a flexible, high-performance fleet to address strategic risks:

- Natural gas dependency
- Power plant retirements
- Renewable resource integration



Dramatic Changes in New England's Energy Mix

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2013)



Resource Shift is Creating Reliability Challenges

- **ISO New England** is increasingly reliant on resources with uncertain performance and availability
 - **Natural gas resources** lack firm gas transportation or fuel storage and rely on “just-in-time” fuel supply
 - **Coal, oil-steam fleet** is being displaced by more efficient resources
 - **Intermittent resource growth** with inherently uncertain output
 - 1,800 MW of solar PV (cumulative) expected over the next 10 years
 - 2,000 MW of wind power proposed (up from 750 MW today)
- ISO estimates **8,300 MW of non-gas-fired generation are “at risk” for retirement by 2020** (28 older oil and coal units)
 - If all retire, ISO estimates 6,300 MW of new or repowered capacity will be needed in the region

Recent FERC Orders Address Performance Issues

- FERC approved two Forward Capacity Market enhancements that will improve resource adequacy and resource performance in the longer term (June 2018 and beyond)
 - **Sloped demand curve:**
 - Smoothens the boom-and-bust cycle of investment when the region is either just short, or just long, on capacity and
 - Alleviates the need for administrative pricing rules
 - **Pay for Performance:**
 - Capacity payments during stressed system conditions will be more closely tied to performance
 - Energy market prices will better reflect scarcity conditions



“At-Risk” Generator Retirements Have Begun

More than 3,000 MW of generation plan to retire within the next five years

Major Retirement Requests:

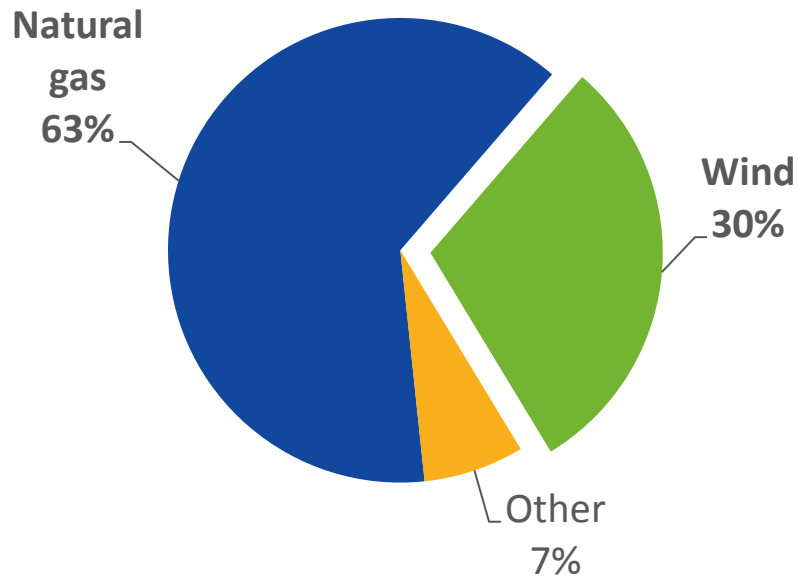
- **Salem Harbor Station (749 MW)**
 - 4 units (coal & oil)
- **Vermont Yankee Station (604 MW)**
 - 1 unit (nuclear)
- **Norwalk Harbor Station (342 MW)**
 - 3 units (oil)
- **Brayton Point Station (1,535 MW)**
 - 4 units (coal & oil)
- *Other retirements are looming*



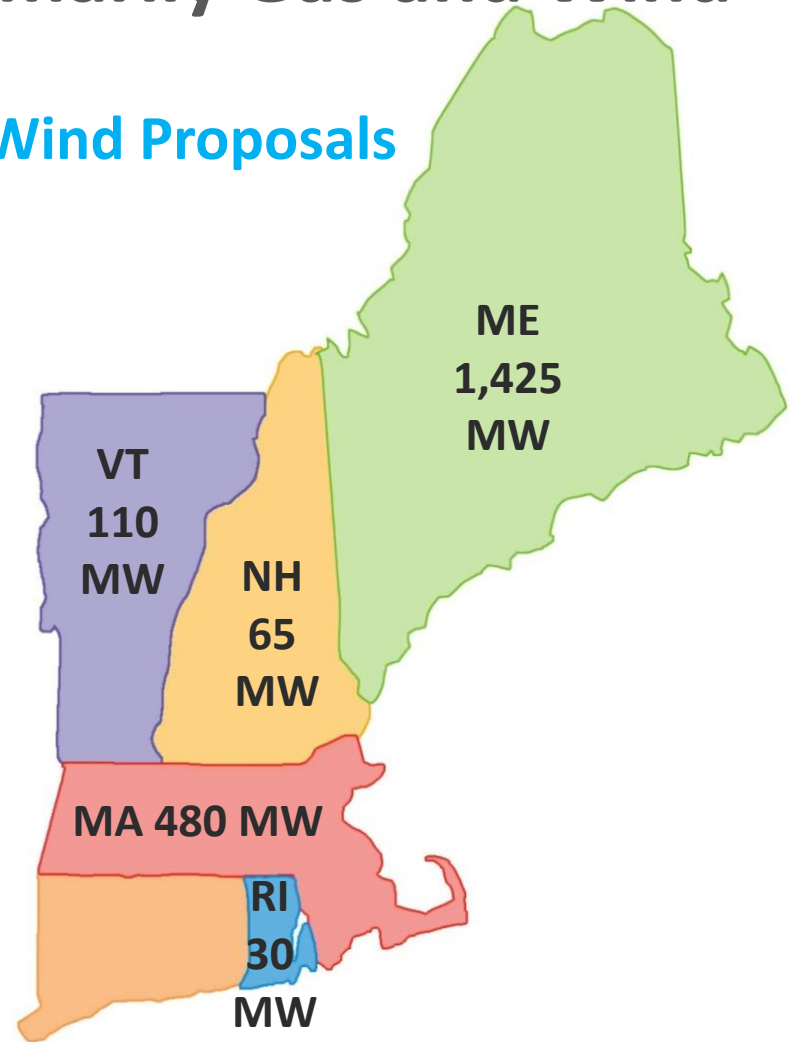
Proposed Generation is Primarily Gas and Wind

All Proposed Generation

Developers propose >4 GW of gas-fired generation and >2 GW wind; wind is mostly onshore in northern New England and offshore in southern New England



Wind Proposals

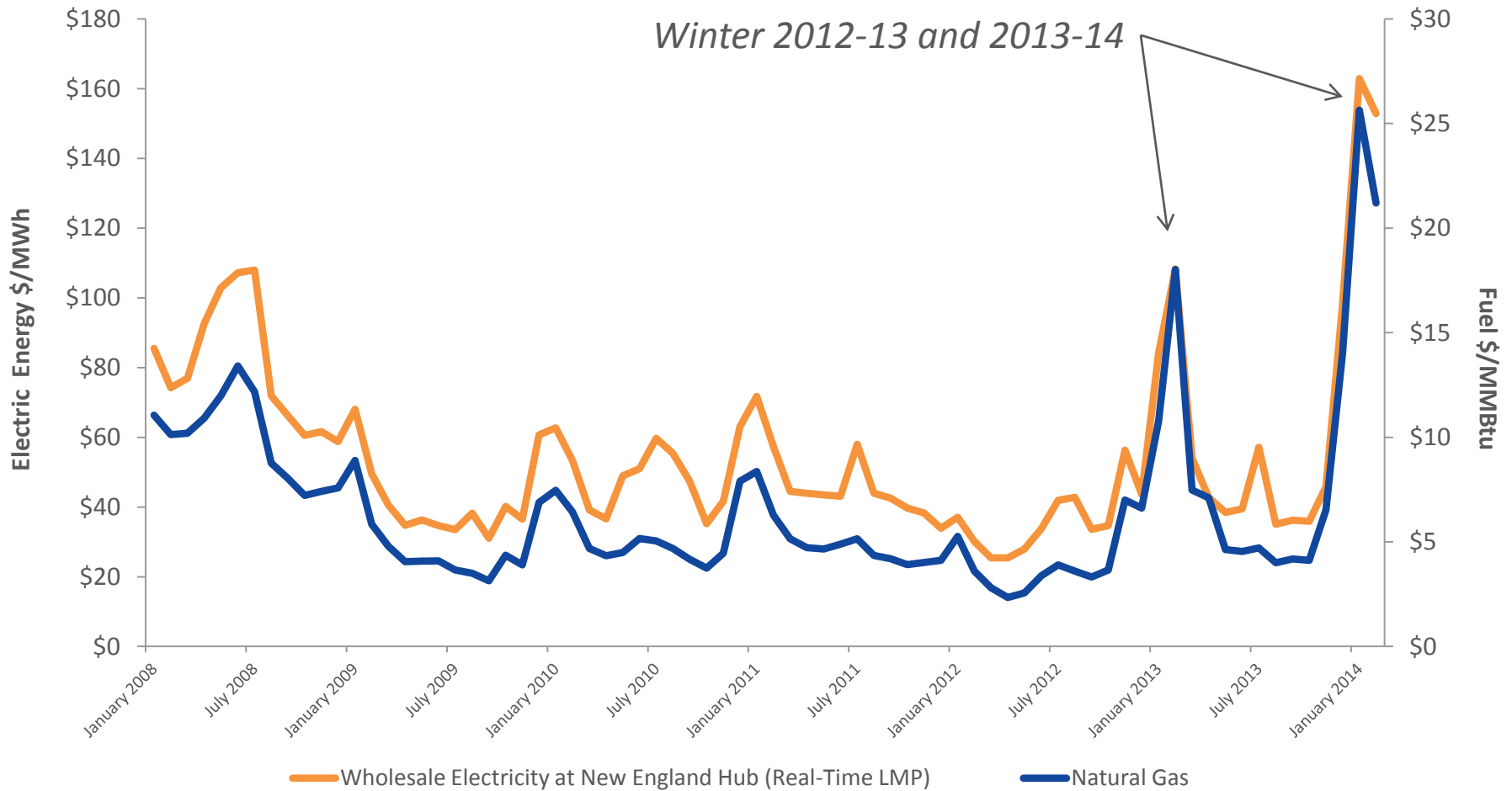


Source: ISO Generator Interconnection Queue (April 2014); includes FERC Jurisdictional and FERC Non-Jurisdictional projects.

Operating Experience this Winter was a Challenge

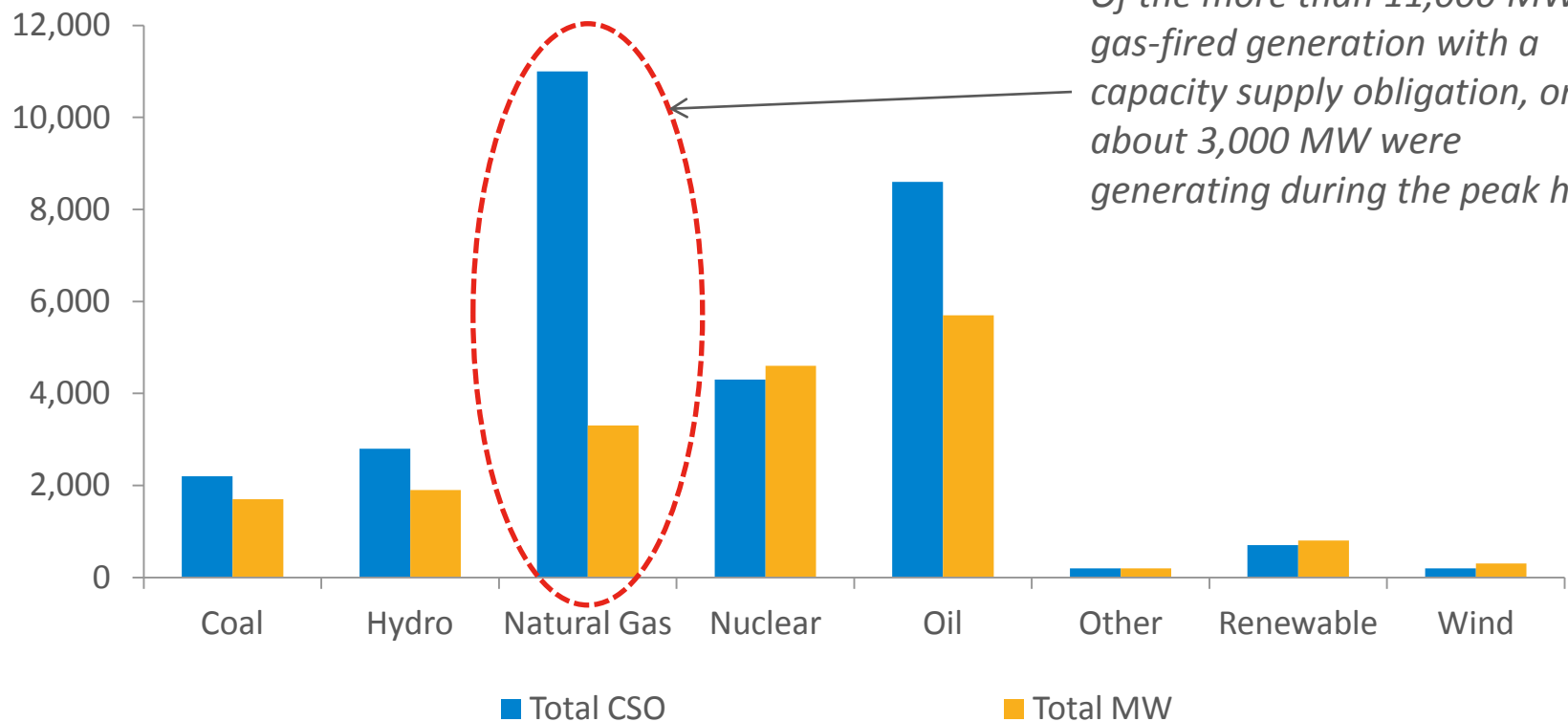
- January ranked among the coldest months in recent history
 - 9 days were in the coldest 5% of days over the past 20 years
- New England experienced *sustained* high natural gas prices
 - ISO frequently operated with little or no gas-fired generation
 - High natural gas prices made many oil-fired generators economic
- Gas pipelines were constrained even without significant use by gas-fired generators, and more constrained than we expected
- Generation fleet is operating with limited fuel inventories (other than nuclear and coal resources)
- Oil supply chain is increasingly constrained
- Oil-fired generators were vitally important to reliability this winter

Gas Price Volatility Drove Wholesale Electricity Prices to Record Levels over the Past Two Winters



Pipeline Infrastructure is Inadequate to Serve Region's Gas-fired Generation

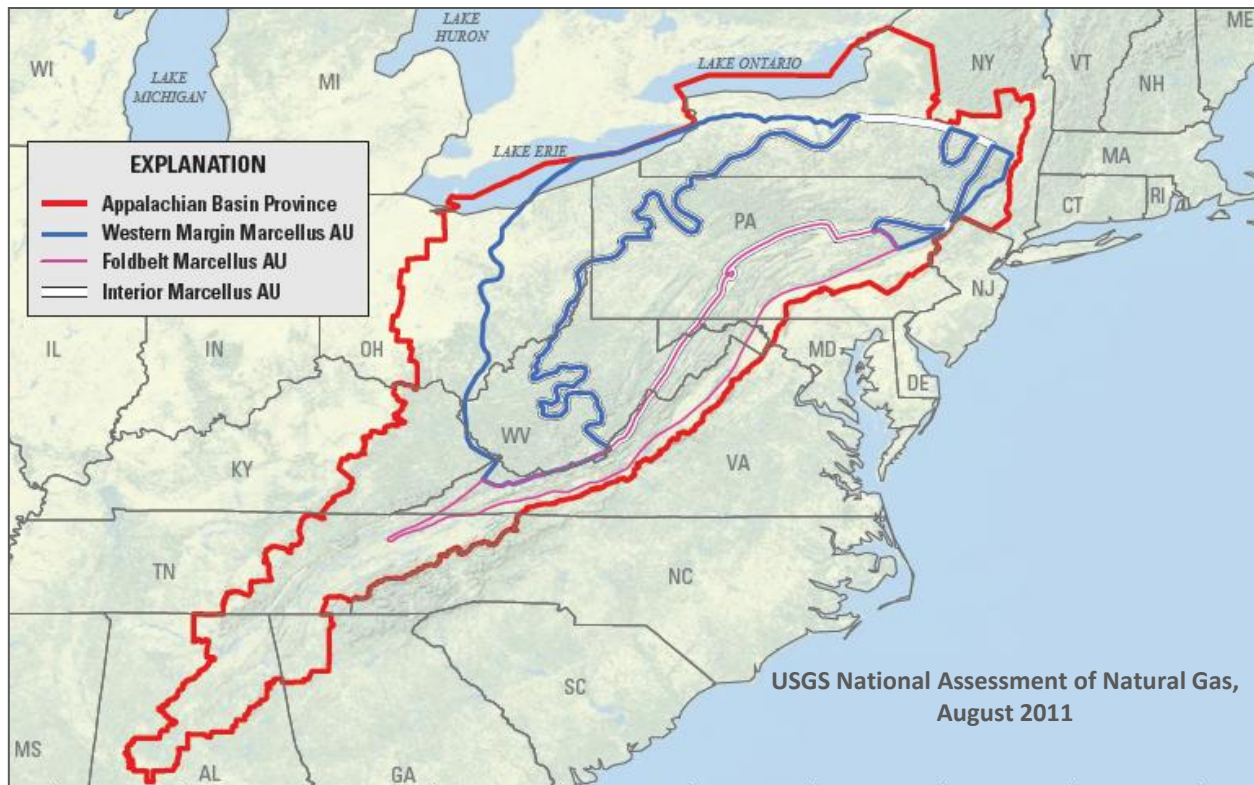
Generator Capacity Supply Obligations (CSO) vs. Output
January 28, 2014



Of the more than 11,000 MW of gas-fired generation with a capacity supply obligation, only about 3,000 MW were generating during the peak hour.

New Supply is at New England's Doorstep, but...

Moving additional natural-gas supply into New England from the west will require investment in pipeline infrastructure



Source: <http://pubs.usgs.gov/fs/2011/3092/>

... Pipeline Constraints into New England Cause High Prices and Reliability Issues



Source: The Hartford Courant, December 2013

New England Governors Request ISO's Support to Develop Electric and Natural Gas Infrastructure

- January 2014: Governors, through NESCOE, request ISO technical support and tariff filings at FERC to support their objectives to expand energy infrastructure
- **New Electric Transmission Infrastructure**
 - Enable delivery of 1,200 MW to 3,600 MW of clean energy into New England from no and/or low carbon emissions resources
- **Increased Natural Gas Capacity**
 - Increase firm pipeline capacity into New England by 1000 mmcf/day above 2013 levels, or 600 mmcf/day beyond announced projects
 - Targeted to be in-service by winter 2017/18
- Potential cost recovery through ISO tariff
 - States to decide on cost allocation

Note: NESCOE – New England States Committee on Electricity

Issues to be Addressed

- Assuming the New England States proceed with this direction, three major issues need to be addressed:
 - The appropriate design to address FERC jurisdiction under the Federal Power Act
 - Who owns the incremental pipeline capacity, and who releases it to the market?
 - Will pipeline developers build the pipe on the strength of a FERC order that guarantees net cost recovery through the ISO tariff, and who will provide the financial assurance to underwrite the arrangement in the ISO tariff?

Conclusions

- New England has a growing reliability problem due to natural gas pipeline constraints and declining resource performance
- Expected retirements will exacerbate reliability concerns
- The region is in a precarious operating position for the next several winters (and any periods of high gas demand or gas pipeline interruptions), and we will continue to seek solutions to mitigate those concerns, particularly during the winter
- Recent FERC rulings on the Forward Capacity Market will improve long-term resource adequacy and performance, but this alone will not solve natural gas constraints
- New England States are seeking to relieve natural gas infrastructure constraints to achieve reliability and economic benefits for the region

Questions

