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Infrastructure Needs: Electricity-Natural Gas Interdependencies

U.S. Department of Energy

Quadrennial Energy Review

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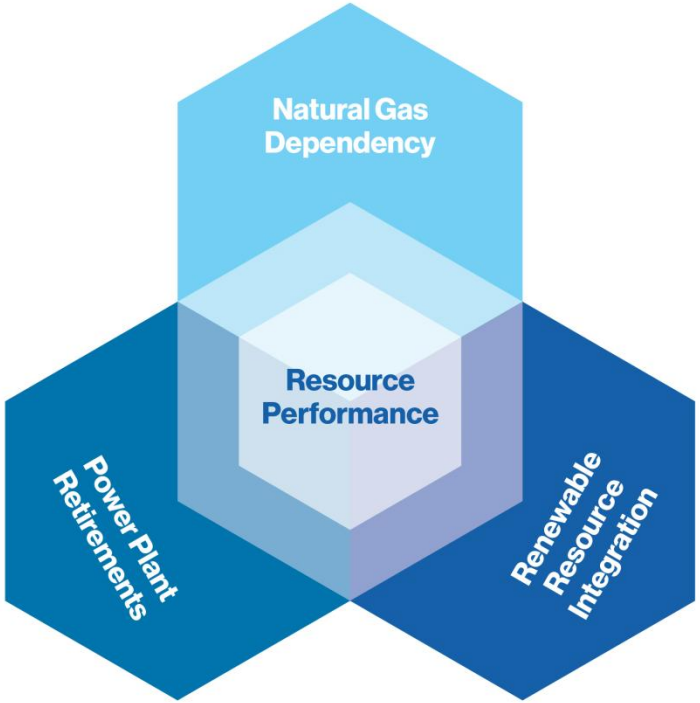
ISO New England's Strategic Planning Initiative

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

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

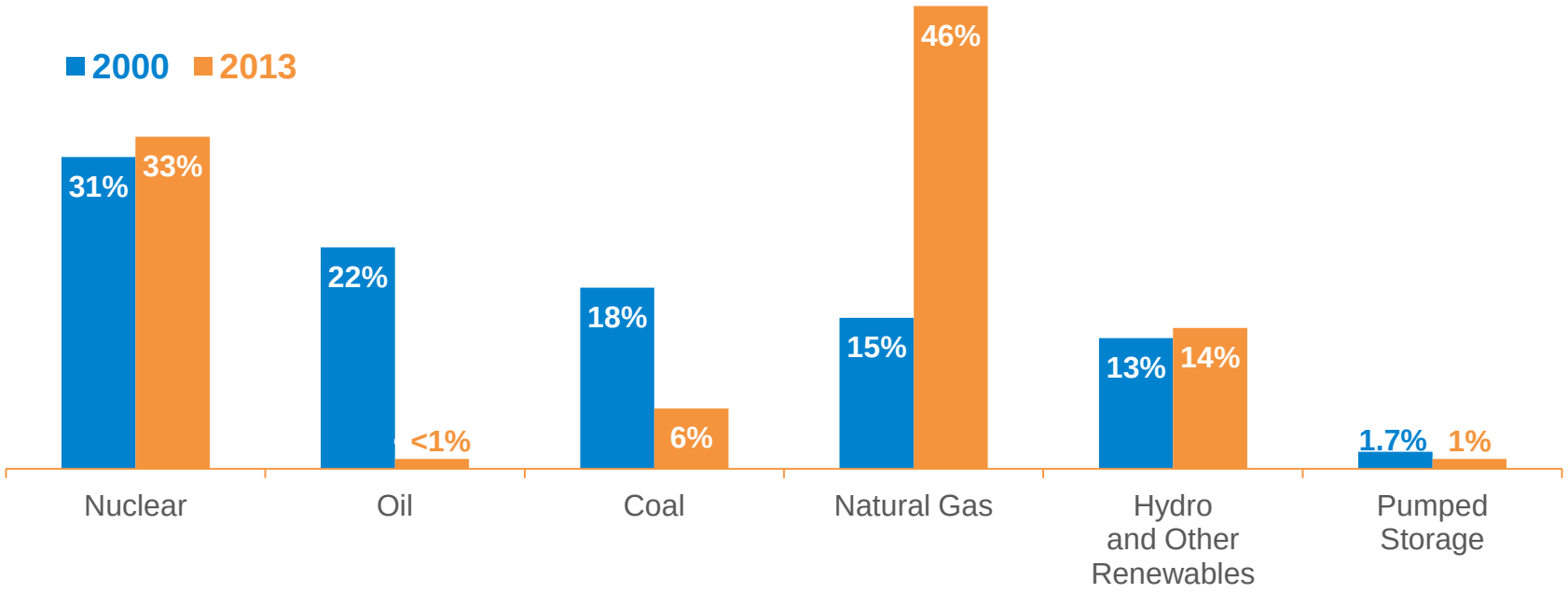
- Natural gas dependency
- Power plant retirements
- Renewable resource integration



Dramatic Changes in the Energy Mix

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

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



Source: ISO New England 2014 Regional Electricity Outlook

Resource Shift is Creating Reliability Challenges

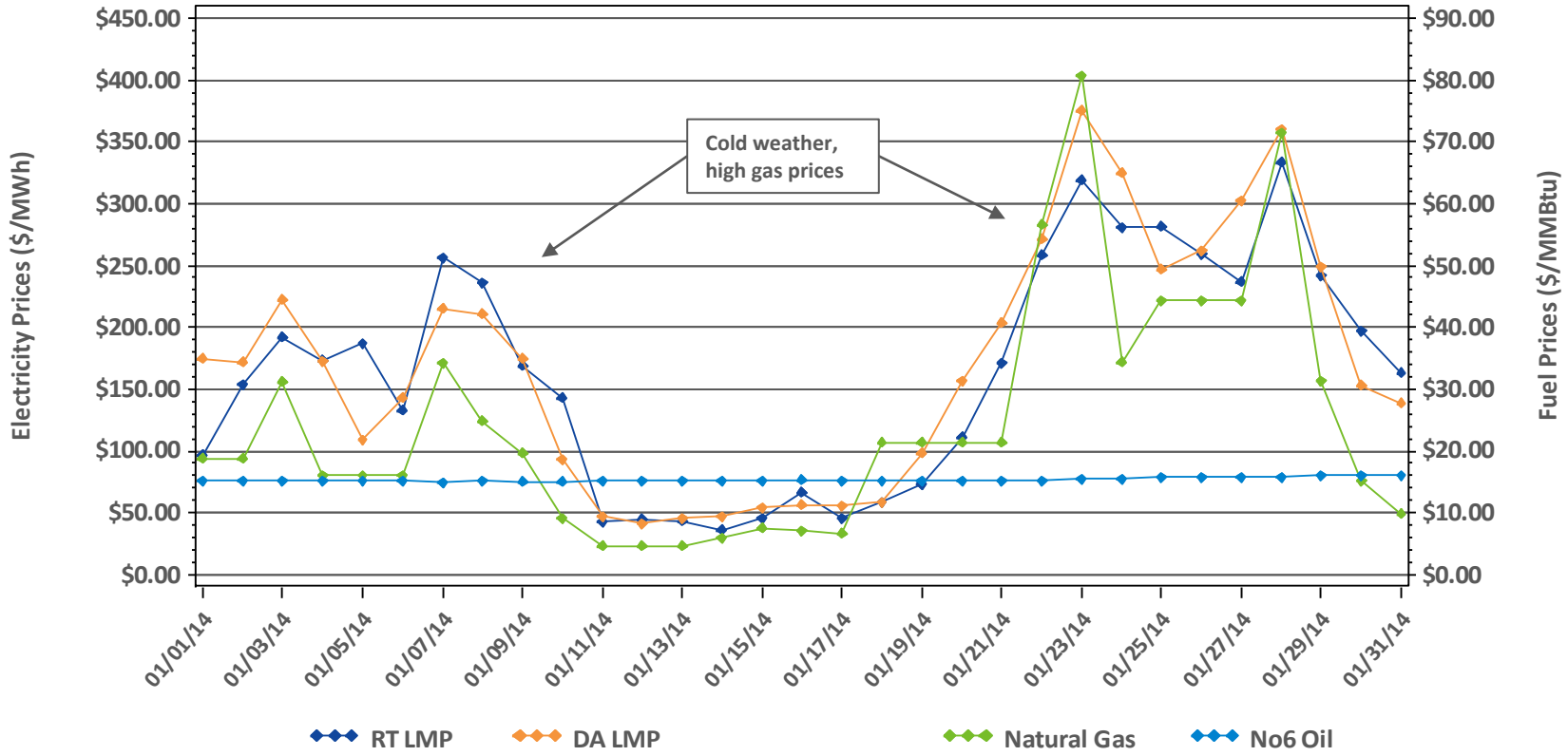
- **ISO New England** is increasingly reliant on resources with uncertain performance and availability
  - **Natural gas resources** lack firm gas transportation or fuel storage and rely on "just-in-time" fuel supply
  - **Coal, oil-steam fleet** is being displaced by more efficient resources
  - **Intermittent resource growth** with inherently uncertain output
    - 1800 MW of solar PV (cumulative) expected over the next 10 years
    - Approximately 750 MW of existing wind and 2,000 MW of new wind proposed in New England
- ISO estimates **up to 8,300 MW of non-gas-fired generation is "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

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
- 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 Drives Wholesale Electricity Prices

Daily DA and RT ISO-NE Hub Prices and Input Fuel Prices: January 1-31, 2014



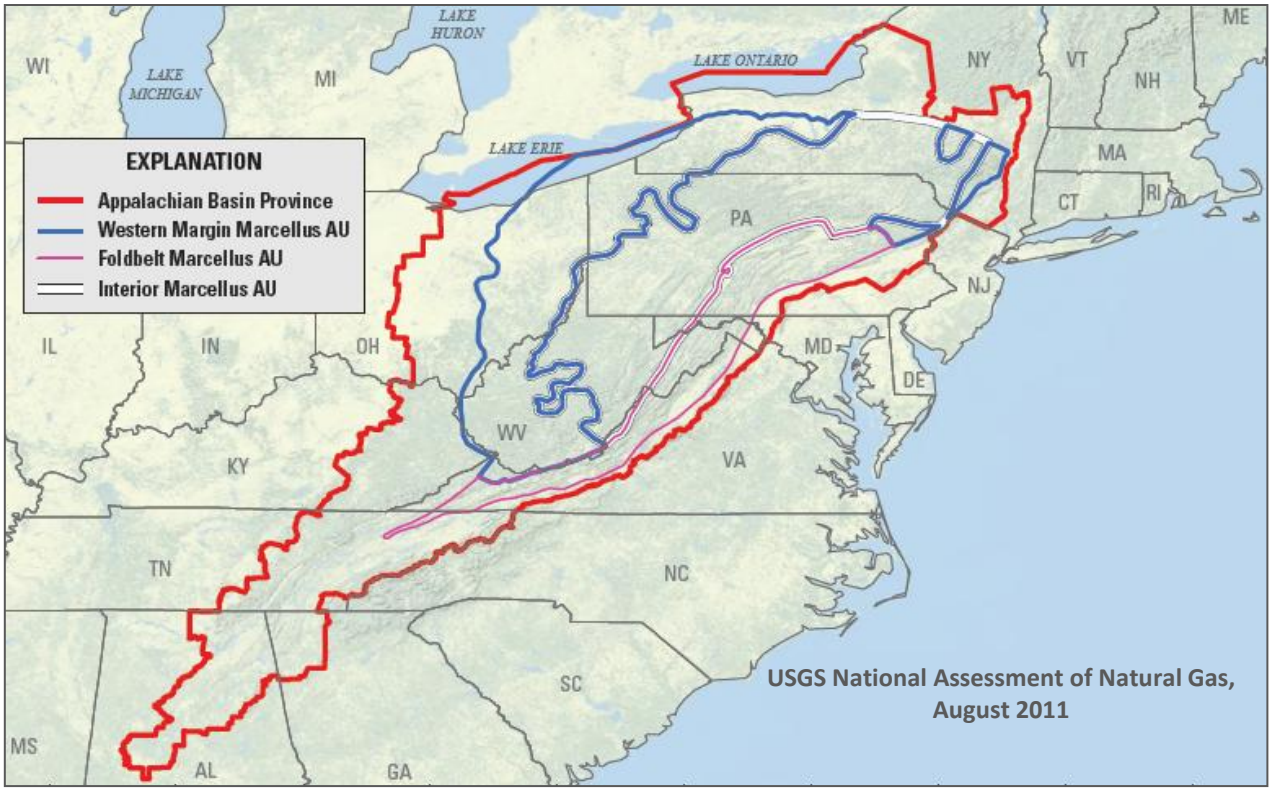
Underlying natural gas data furnished by:

ICE Global markets in clear view

Average price difference over this period (DA-RT): $5.93
Average price difference over this period ABS(DA-RT): $25.99
Average percentage difference over this period ABS(DA-RT)/RT Average LMP: 16%
Gas price is average of Massachusetts delivery points; No6 Oil is New York Spot Price from DOEs Energy Information Administration

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

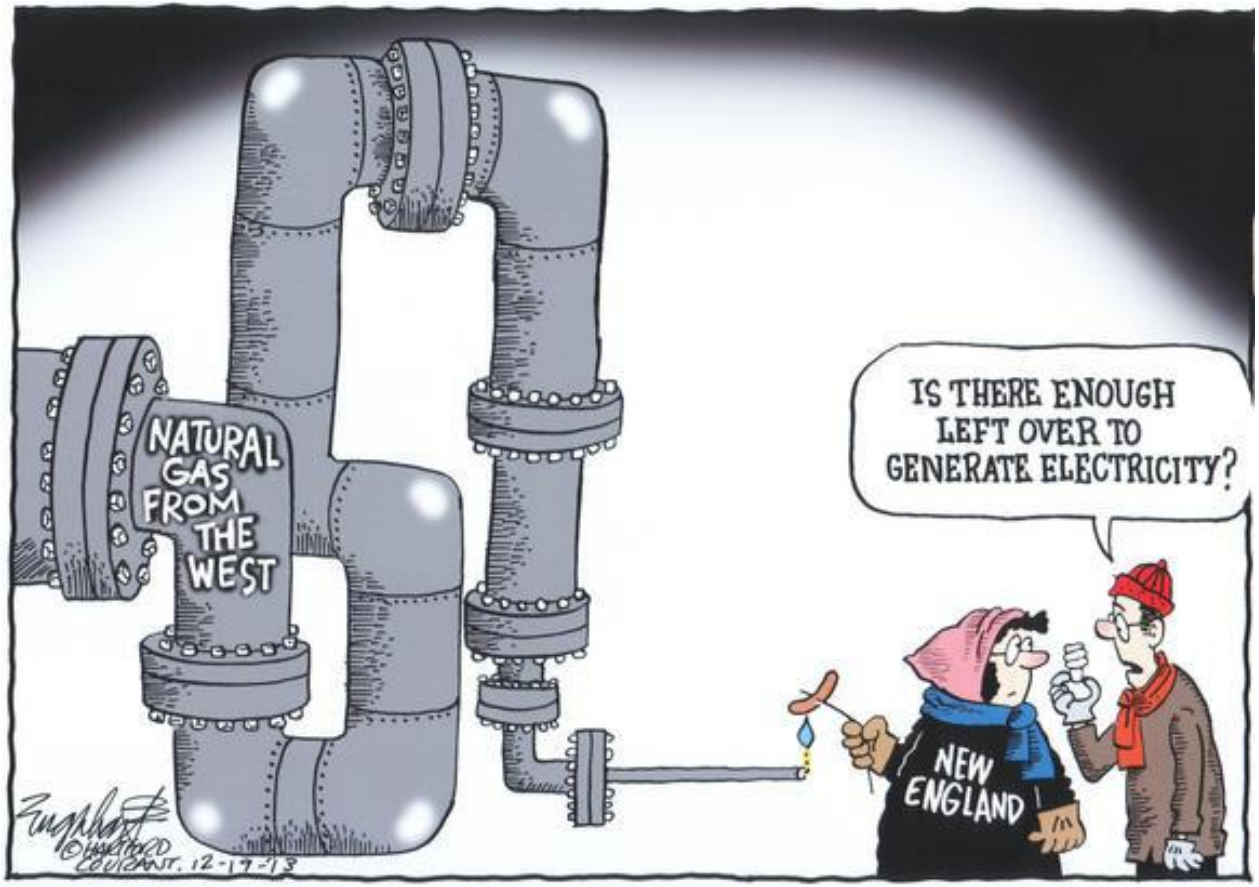
Moving additional natural-gas supply into New England from the west will require investment in pipeline infrastructure



USGS National Assessment of Natural Gas, August 2011

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

“At Risk” Generator Retirements have Begun

Major Retirement Requests:

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

Total MW Retiring in New England*	
Connecticut	528 MW
Maine	159 MW
Massachusetts	2,682 MW
New Hampshire	56 MW
Rhode Island	64 MW
Vermont	666 MW
Total	**4,155 MW**

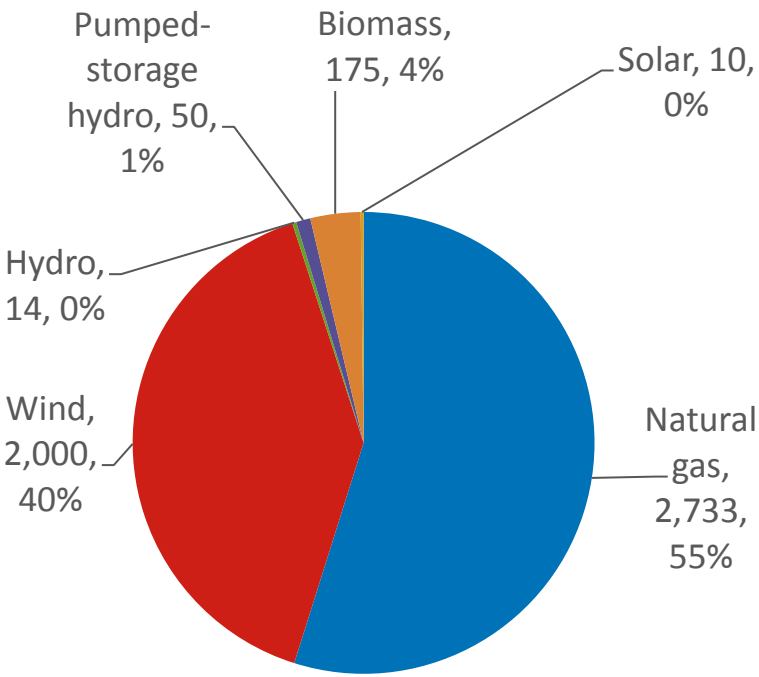
*Megawatts based on relevant Forward Capacity Auction (FCA) summer qualified capacity (NOTE: total includes full and partial generator and demand response Non-Price Retirement (NPR) requests for Capacity Commitment Period (CCP) 2013-2014 through CCP 2017-2018)

Source: Status of Non-Price Retirement Requests; December 20, 2013

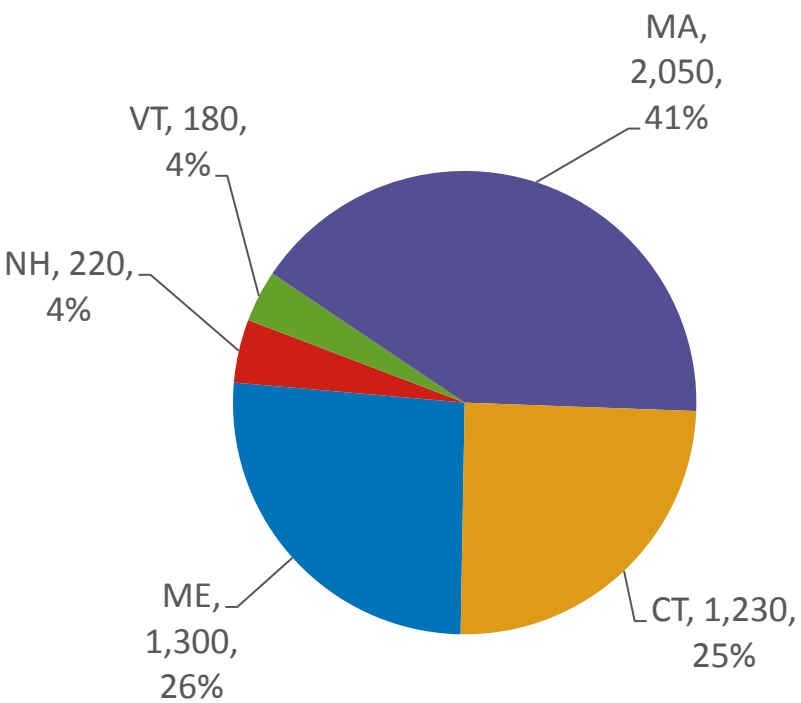
Generator Proposals in the ISO Queue

Approximately 5,000 MW

By Type



By State



Note: Natural gas and biomass include dual fuel units (oil)

Source: ISO Generator Interconnection Queue (January 2014)

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
- Cost recovery through ISO tariff
  - States to decide on cost allocation
- Assuming the NE States proceed with this direction, 3 major issues to be addressed:
  - The appropriate design to address FERC jurisdiction under the Federal Power Act
  - Who owns the incremental pipeline capacity, 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
- The region is in a precarious operating position for the next several winters (and any periods of high gas demand or gas pipeline interruptions) as major non-gas resources retire and proposed market enhancements and energy infrastructure improvements are years away
- Expected retirements will exacerbate reliability concerns
- Wholesale electric energy market pricing will be volatile and correlated with stressed system conditions on both the gas pipeline and electrical systems
- Capacity market incentives are necessary to improve generator performance and ensure reliability, but may not be sufficient on their own to drive pipeline investments

Questions