MARCH 17, 2014 | CROMWELL, CONNECTICUT

Strategic Planning Initiative Addresses Serious Reliability Challenges Facing New England

Connecticut Power and Energy Society

Kevin Kirby

VICE PRESIDENT, MARKET OPERATIONS

ISO New England's Strategic Planning Initiative

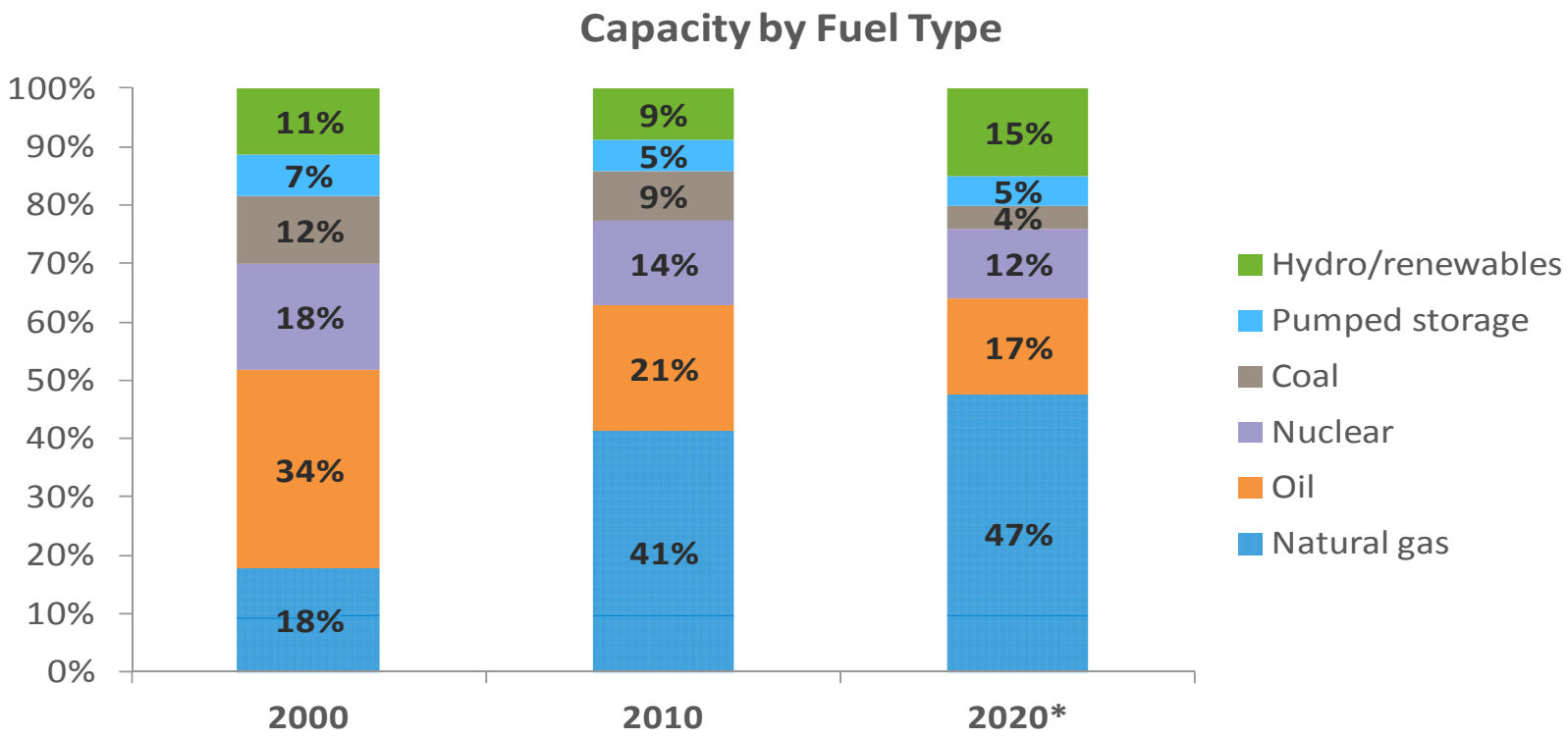
Focused on developing solutions to the top five challenges facing the region

SPI
STRATEGIC PLANNING INITIATIVE

1. Resource Performance and Flexibility
2. Increased Reliance on Natural Gas-Fired Capacity
3. Retirement of Generators
4. Integration of a Greater Level of Variable Resources
5. Alignment of Markets with Planning

Electric Grid is Undergoing Rapid Transformation

Generation is shifting from oil, coal and nuclear to natural gas and renewables



* Resources in 2020 assume approx. 5,000 MW of new resources proposed in the ISO Queue as of April 2013 (primarily natural gas and wind); and approx. 3,200 MW of non-price retirement requests for coal, oil and nuclear resources as of October 2013.

Resource Shift Creates 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
    - 600 MW of solar PV expected over the next 10 years
    - 2,000 MW of 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

Winter Reliability Program

Stop-gap measure for December 2013 through February 2014

- **Objective**
  - To obtain incremental energy inventory to help ensure reliable system conditions this winter, assuming typical New England cold weather
- **Results**
  - Obtained oil inventory; dual-fuel generation and demand response
  - Procurement balanced fuel security and reliable operations with cost
  - FERC approved program for this winter only, at cost of $75 million
  - Program used 2.7 million barrels of oil (~1.62 million MWh of energy)
- **Conclusion**
  - Program was instrumental in helping maintain system reliability this winter – cold temperatures fueled demand for natural gas and pipeline constraints limited fuel for gas-fired generators

Operating Experience this Winter

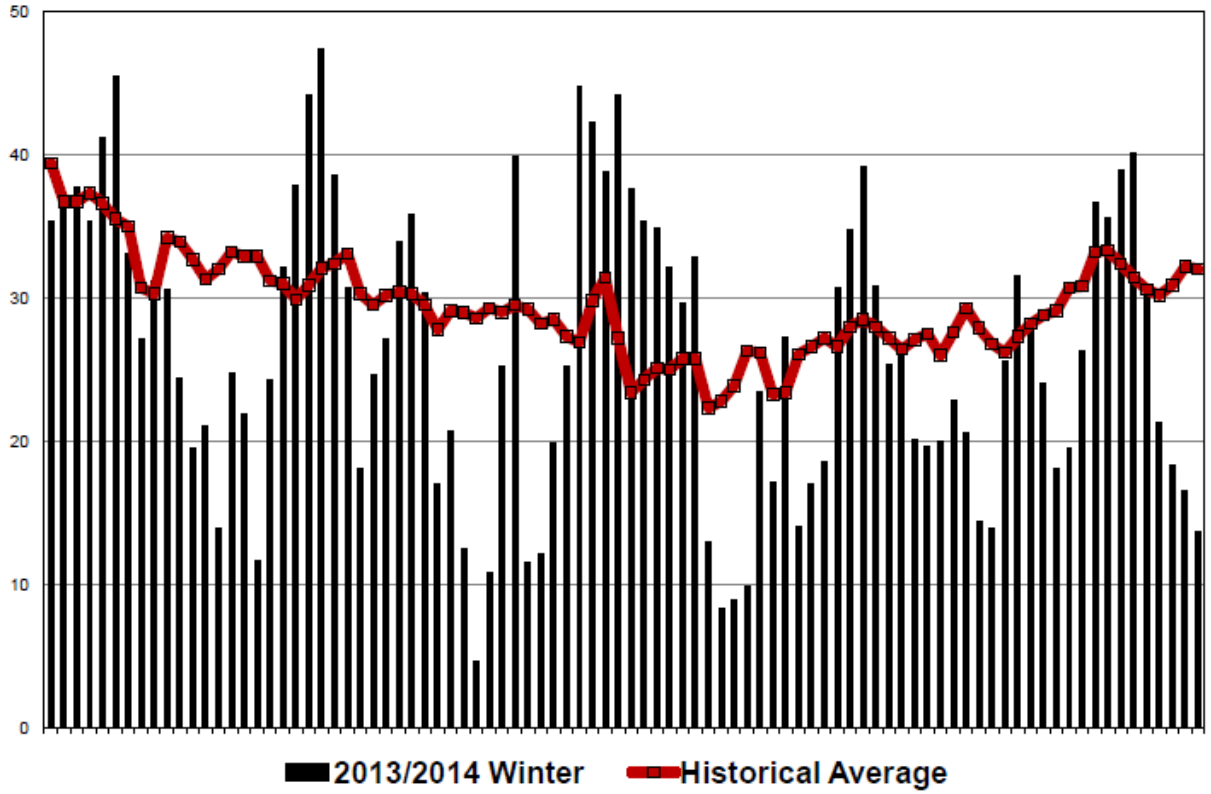
- January ranked among the coldest months in recent history
  - 9 days were in the coldest 5% of days over the past 20 years
- New England experienced *sustained* high natural gas prices
  - ISO frequently operated with little or no gas-fired generation
  - High natural gas prices made many oil-fired 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

Winter 2013-14 had Multiple Cold Stretches

Winter Daily Average Temperatures

(Dec. 1, 2013 – Feb. 28, 2014)

Relative to 20 Year Historical Average



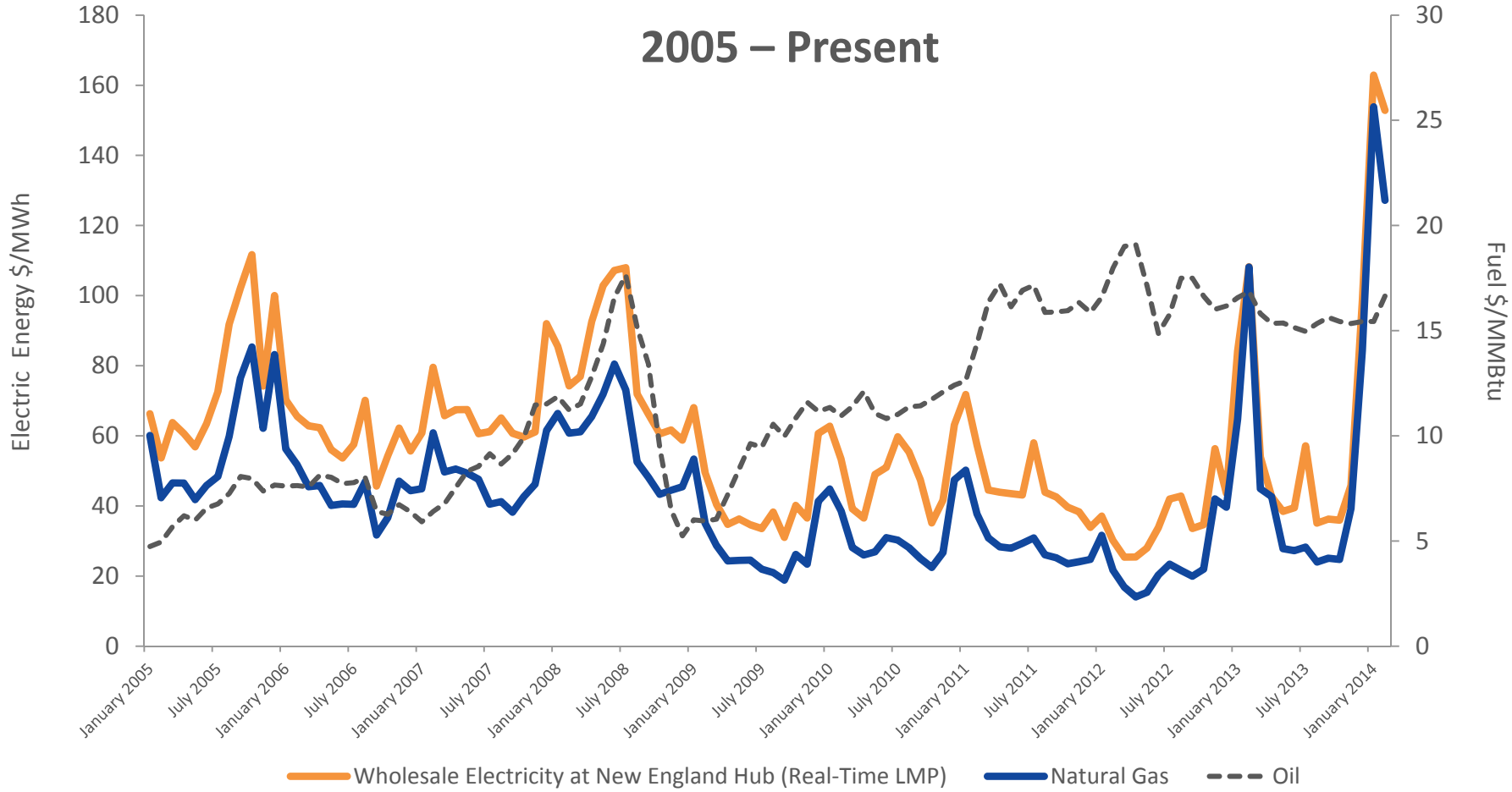
Temperatures dropped well below 20-year historical average during multiple stretches:

- December 10-17
- January 1-10
- January 21-30
- February 6-12
- February 16-19
- February 25-28

Wholesale Electricity Prices Track Natural Gas

Region saw record low and high electricity prices within the past two years

Oil-fired generation is economic in winter when gas prices go above oil



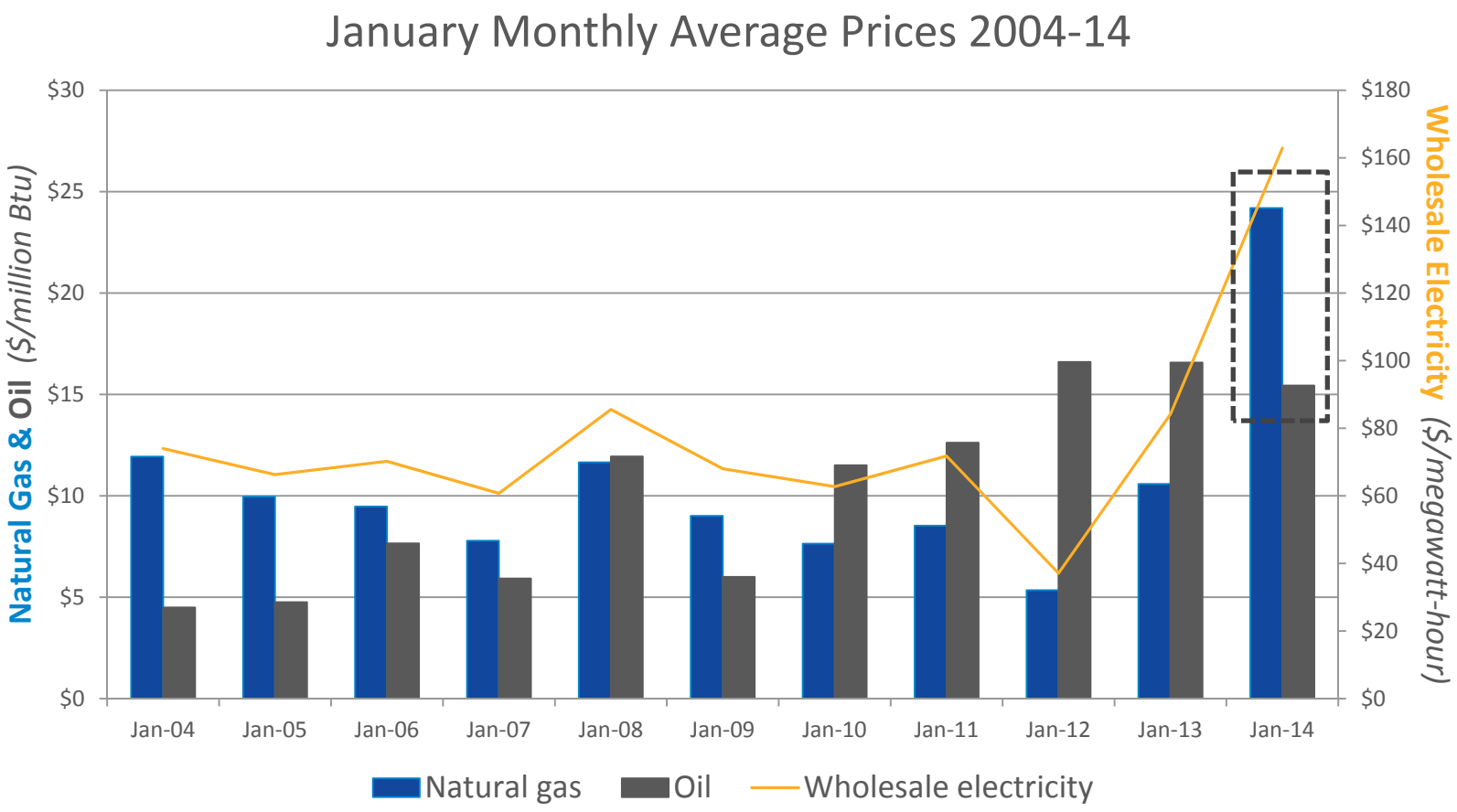
Gas and Electricity Prices are Very High This Winter

Significant increases, month-over-month and year-over-year

- **Natural gas prices surged this winter**
  - 115% higher in December than November 2013 averages
  - 88% higher in January than December 2013 averages
- **Wholesale electricity prices followed** (average real-time LMPs)
  - 115% higher in December than November 2013 averages
  - 65% higher in January than December 2013 averages
- **Prices are higher than last winter's prices**
  - Average December 2013 gas and electricity prices were up 139% and 126%, respectively, from December 2012 averages
  - Average January 2014 natural gas prices and RT wholesale electricity prices were up 137% and 94%, respectively, from January 2013 averages
- January 2014 energy market value was $2.2B, up from $1.2B in December
  - *In comparison, the energy market value for all of 2012 was approx. $5B*

Gas Prices Exceeded Oil for First Time in 5 Years

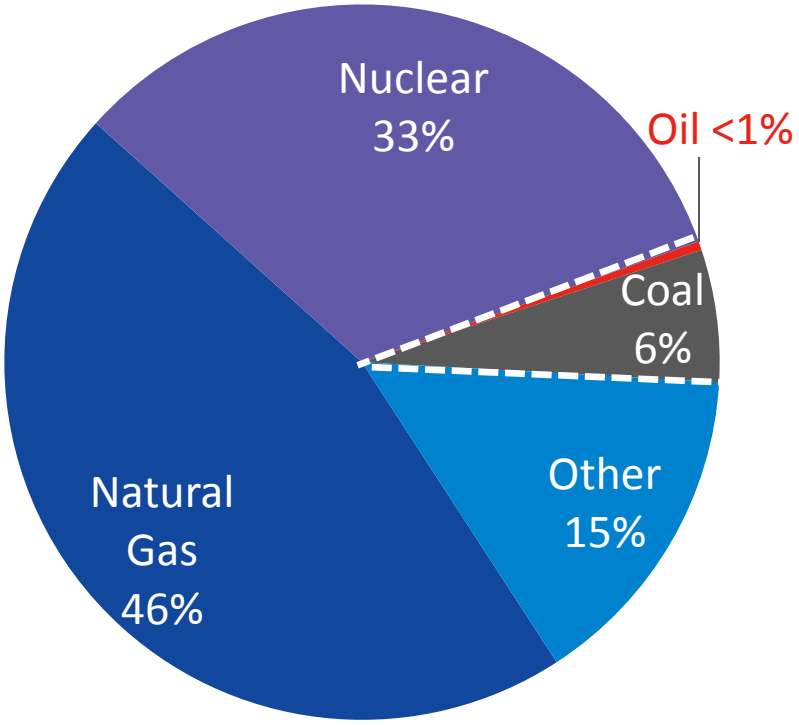
This price inversion led to greater use of non-gas resources



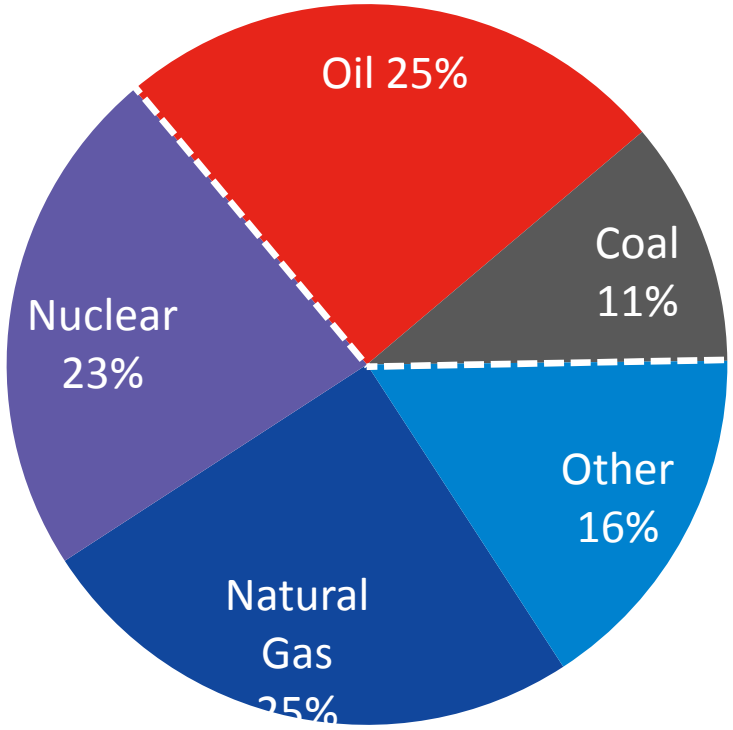
Cold Weather Increases Use of Oil and Coal

Oil and coal together represented only 7% of electric generation in all of 2013 but more than a third of electric generation on a cold day in January

2013



January 7, 2014
Evening Peak



“At Risk” Unit 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

Region is Taking Action to Improve Electric Market Efficiency and Enhance Gas-Electric Coordination

Recently Implemented (2012–2013)	Near-Term Actions (2013–2014)	Longer-Term Actions (2014–2019)
• Ongoing improvements to information sharing with natural gas pipelines • Moved Day-Ahead Market timeline in 2013 • Increased forward reserve requirements in 2013 • FERC clarification of generator obligations (must purchase fuel unless physically unavailable – economics is not an excuse)	• Tightened FCM Shortage Event trigger (effective Nov. 2013) • Developed energy market offer-flexibility enhancements (effective Dec. 2014) • Change NCPC cost allocation to drive more load to Day Ahead Market	• Strengthen Forward Capacity Market Performance Incentives "Pay-for-Performance" (will apply to 2018-19 commitment period) • Implement Demand Curve and improve zonal modeling in capacity market • Further improvements to energy market pricing • New England States are driving investments in additional gas pipelines, and transmission to enable additional renewable energy

New England Governors Seeking Infrastructure

- This winter, the region's governors, through the New England States Committee on Electricity (NESCOE), requested 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

Pipeline Constraints into New England Cause High Prices and Reliability Issues

Source: The Hartford Courant, December 2013

Conclusions

- Winter Reliability Program helped ensure reliability this winter
- Cold weather drove price volatility in natural gas and electricity markets this winter
- New England has a growing reliability problem due to gas pipeline constraints and poor performance by some resources and a need to balance an increasing amount of intermittent renewable energy
- Retirements will exacerbate reliability concerns
- Capacity market incentives are necessary, but may not be sufficient, to drive pipeline investments

Questions