Regional Update

Business & Industry Association

2012 Energy Seminar

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PRESIDENT & CEO

Presentation Overview

- Strategic Planning Initiative: Increased Reliance on Natural Gas-Fired Capacity
- Generation, ISO Queue, Wholesale Electricity and Gas Prices
- Oil and Coal: Use on Peak Day, Start-up Times, Aging Units
- Electric and Gas Business Models, Market Alignment
- Other Factors Compound Gas Dependency
- Short-, Medium- and Long-term Actions
- Transmission Development: Reliability and Elective Projects
- Strategic Transmission Analysis of Generation Retirements
- Moving Forward

Dependence on Natural Gas is New England's *Highest-Priority* Strategic Risk

Five Strategic Risks:

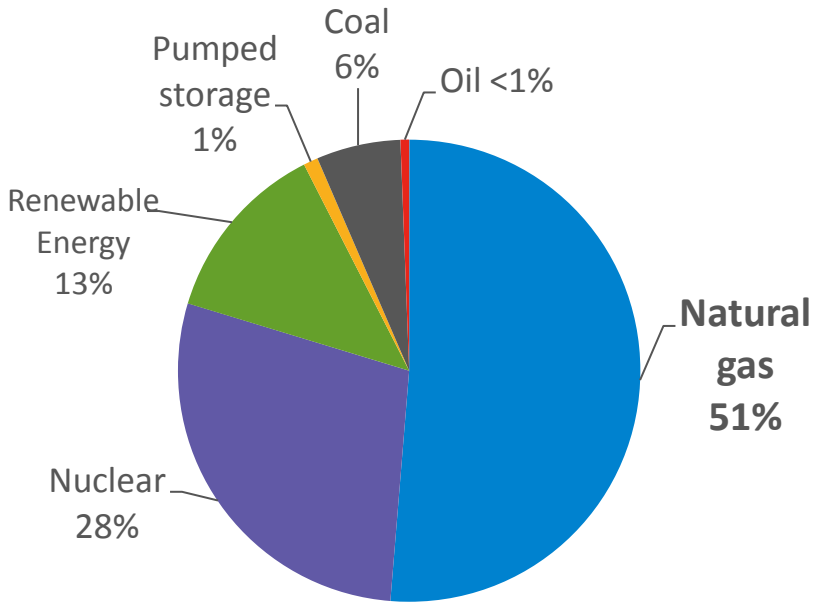
SPI
STRATEGIC PLANNING INITIATIVE

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

Natural Gas has Become the Dominant Fuel for Power Generation in New England

Existing Generation

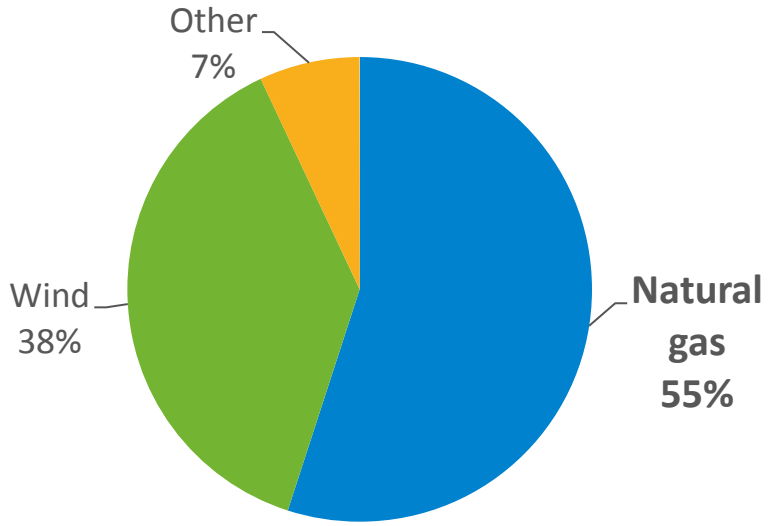
Natural gas has largely displaced oil- and coal-fired generation



Energy by Fuel Type, 2011 (GWh)

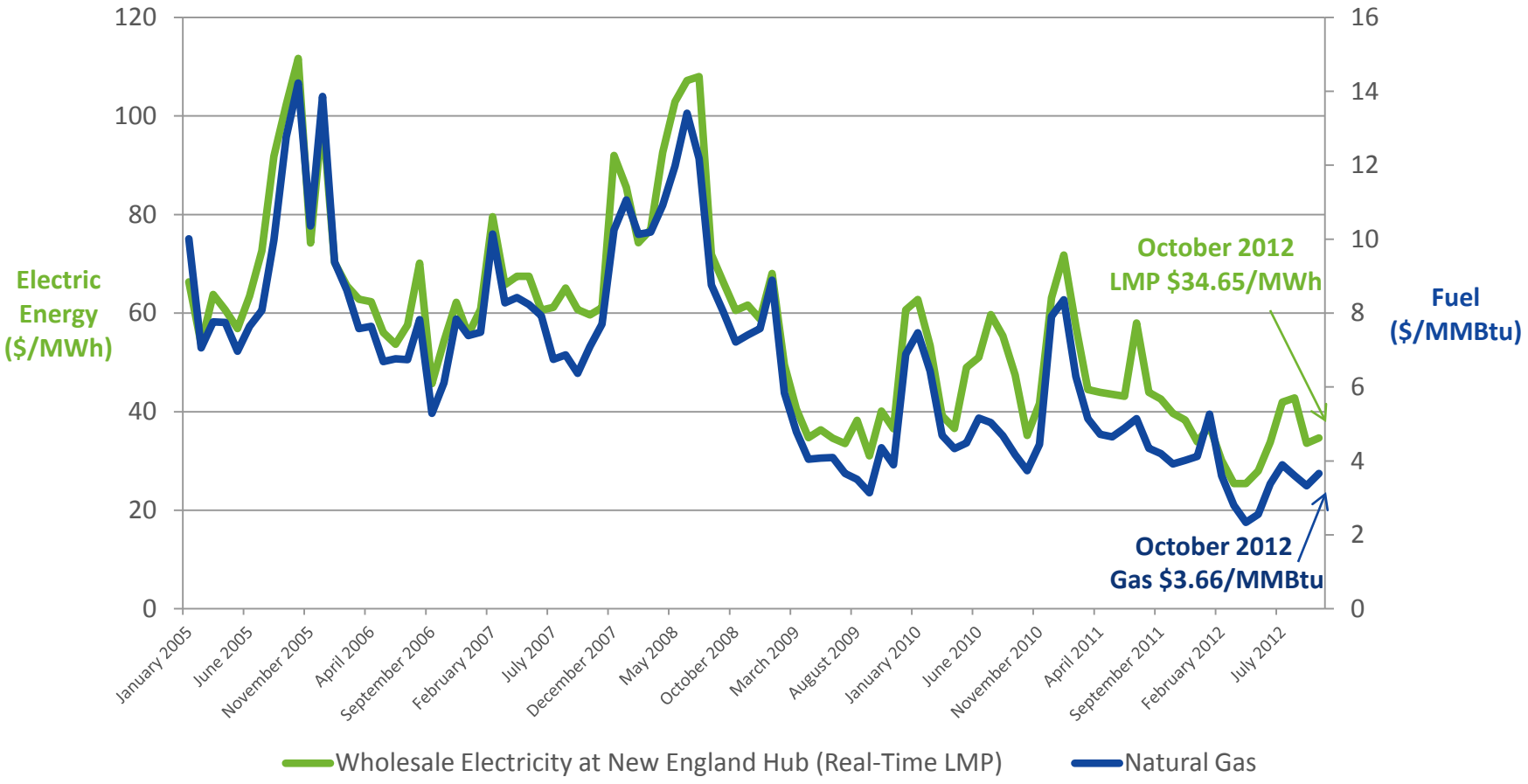
Proposed Capacity

Natural gas is the fuel of choice for new capacity and gas-fired generators will be needed to balance variable energy resources



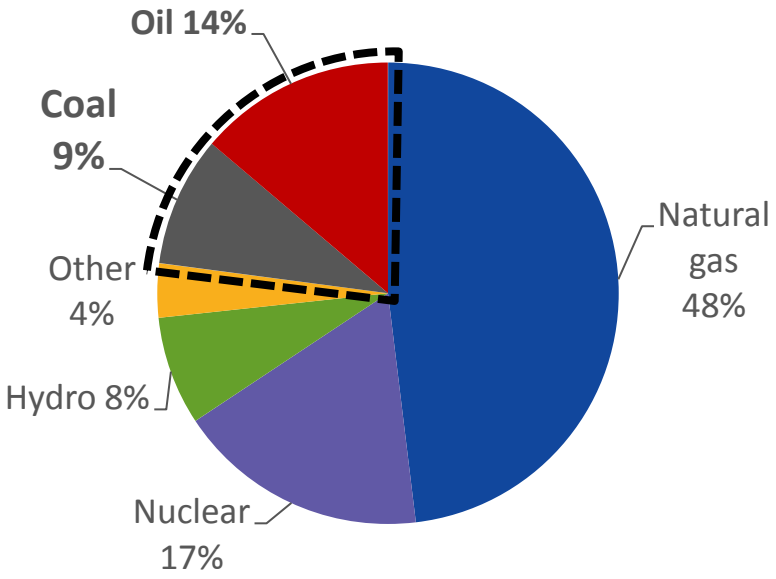
ISO Generator Interconnection Queue
Summer 2012, nameplate capacity (MW)

Wholesale Electricity Prices Track Natural Gas



Oil and Coal Resources are Still Needed

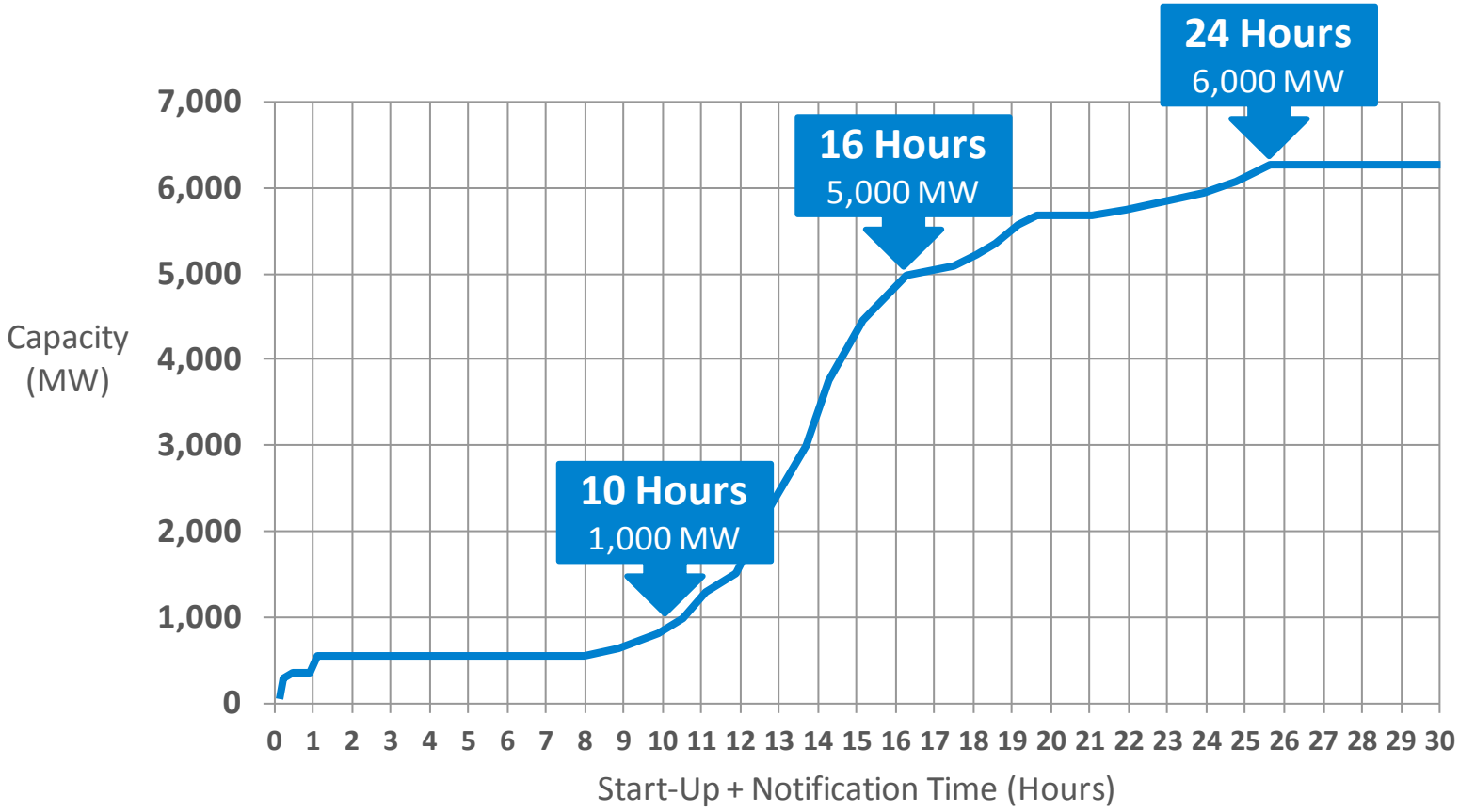
Peak Day
July 22, 2011



- Coal- and oil-fired resources supplied nearly **25%** of energy during the 2011 system peak
- But challenges remain for system operators
  - Resources have long start-up times and take even longer to come online reliably after extended periods offline

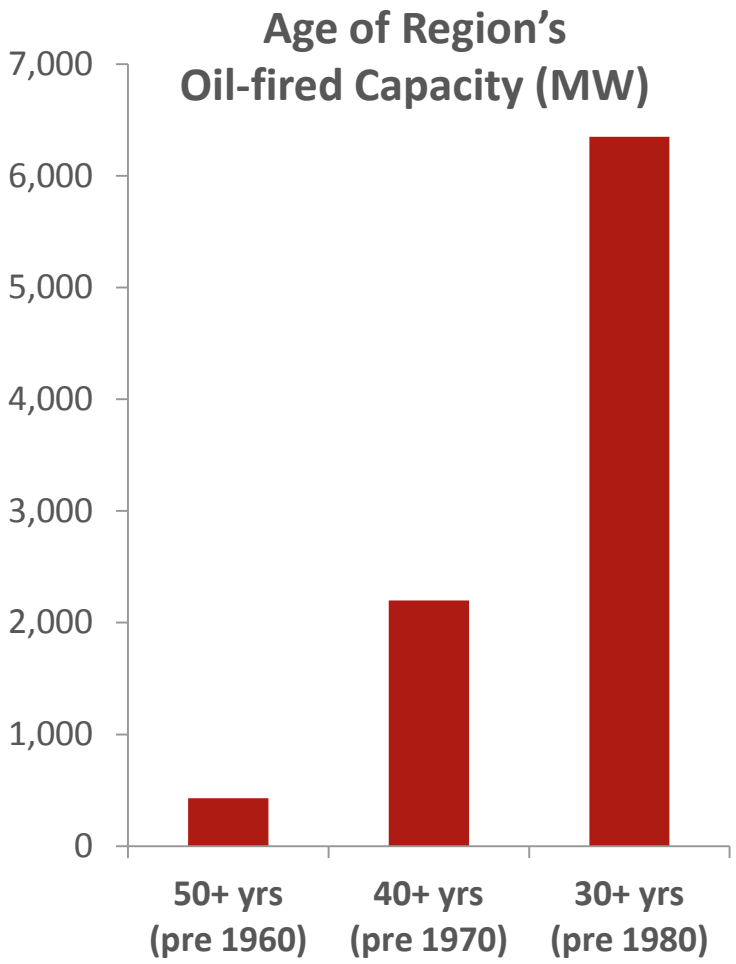
Oil and Coal Resources have Long Start-Up Times

Time before resources can be online from "cold start"



Aging Oil-fired Generators Facing Challenges

- Oil-fired generators
  - Represent over 20% of region's capacity but <1% of total generation
  - Often reduce fuel storage due to high costs and infrequent operation
- Challenges for oil units
  - Infrequently dispatched
  - Environmental regulations
  - Potential for reduced capacity payments
  - Old and getting older



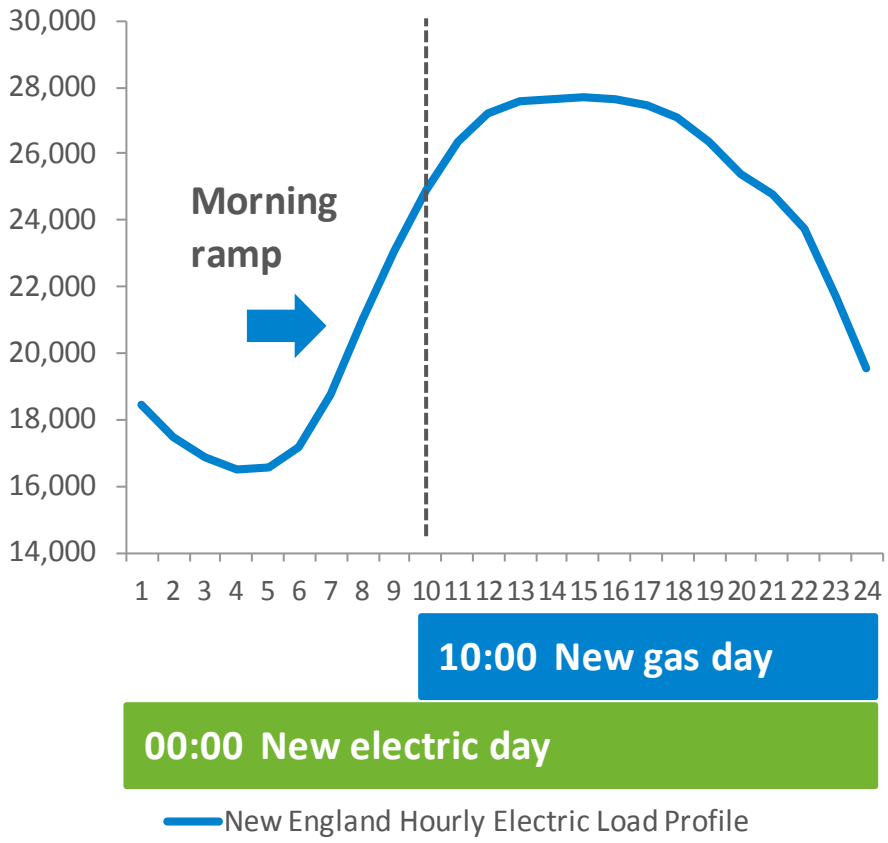
Electric and Gas Systems Have Very Different Business Models

	Electric Grid	Natural Gas Pipelines
Design	Designed to serve demand for all customers in the region	Designed to serve demand of customers with firm contracts
Coordination	Centrally operated to optimize utilization of regional power system	Pipeline manages own operations; relatively loose coordination between pipelines
Investment and Planning	System is planned to meet forecasted demand; future investments paid through transmission or wholesale market tariff; mandatory reliability standards require operating reserves to mitigate the risk of contingencies	No investment for forecasted demand; additional pipeline capacity only built if customers commit to take firm capacity
Peak	Summer (and winter)	Winter
Service	Mandatory reliability standards require operating reserves to mitigate the risk of contingencies	Non-firm service is interruptible

Gas and Electric Markets are Not Aligned

Different operating days make it difficult for gas-fired generators to satisfy scheduling in both markets

- Some gas units needed for the electric system's morning ramp can't get gas until 10 AM—at start of new gas day
- System operator needs more time to determine whether commitment of non-gas generation is required



Other Factors Compound Gas Dependency

- Overall pipeline capacity is inadequate to meet the anticipated demand of the power sector
- Coordinating maintenance and operations of electric and gas systems presents significant challenges
- Gas dependency issues exist year-round, not just in cold weather
- Flexibility is needed to balance intermittent wind resources and load swings, and to respond to intraday contingencies
- Future retirement of older non-gas-fired resources may exacerbate the problem

Short- and Medium-term Actions (2012–14)

- Closely monitor generator fuel inventory and reinforce current dispatch/energy production obligations
- Improved auditing of generator characteristics
- Improve ISO's ability to share generator-specific information with gas pipelines
- Improve coordination of electric- and gas-sector maintenance
- Allow resources to submit hourly offers and intraday re-offers in the energy market to reflect changing fuel costs
- Move up the Day Ahead Market timing to provide timely commitment of resources needed for reliability

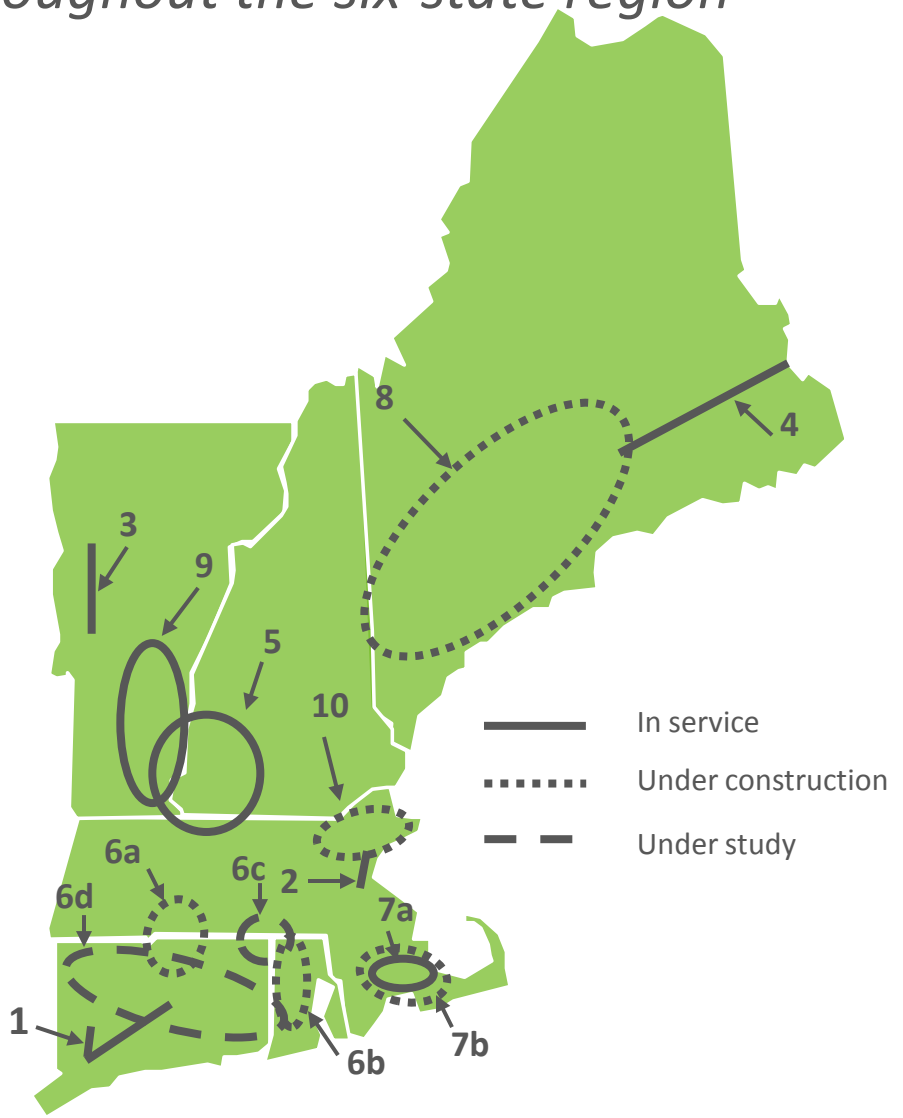
Long-Term Actions

- Enhance Forward Capacity Market performance incentives
  - ISO proposing a ‘pay for performance’ incentive approach
  - Over-performing resources will be paid a premium through revenue transfers from under-performing resources (during periods when the region is short energy and operating reserves)
  - This incentive will drive resources to perform when and where needed, including creating a strong incentive for fuel security
  - ISO anticipates filing changes in late 2013 for effect in 2018–19 (for Forward Capacity Auction 9)

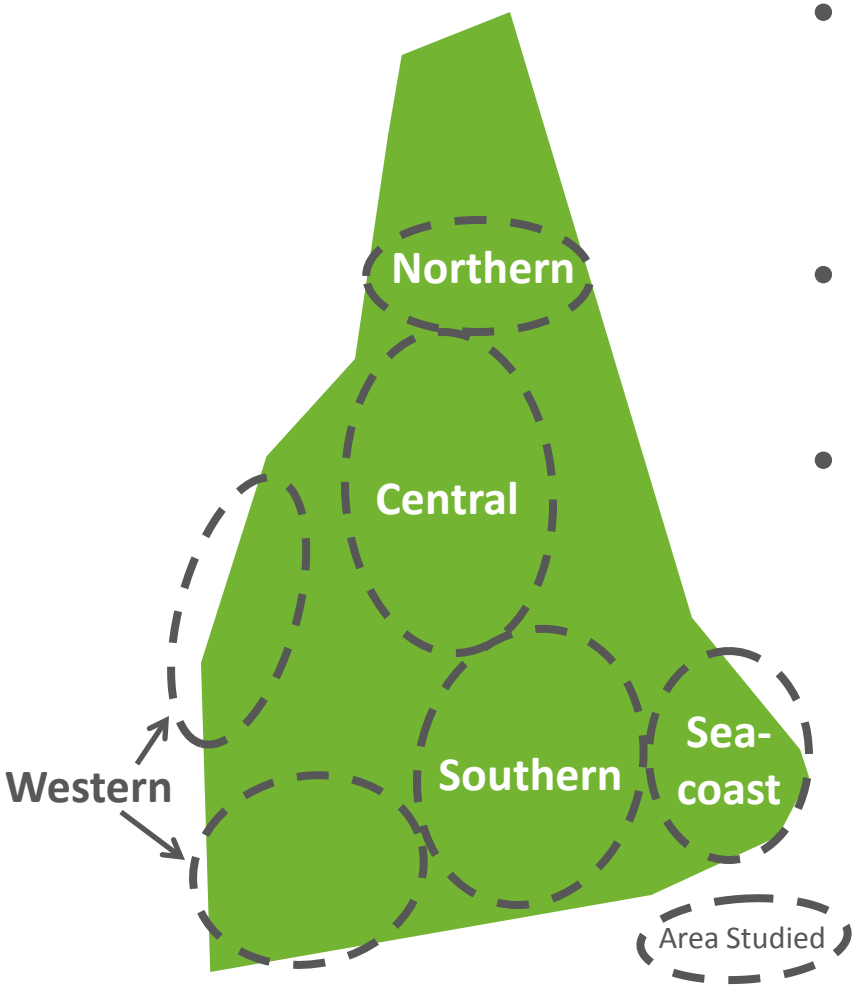
Projects to Maintain Reliability are Progressing

Transmission projects planned throughout the six-state region

1. Southwest CT Phases I & II
2. NSTAR 345 kV Project, Phases I & II
3. Northwest Vermont
4. Northeast Reliability Interconnect
5. Monadnock Area
6. New England East-West Solution
   a. Greater Springfield Reliability Project
   b. Greater Rhode Island Reliability Project
   c. Interstate Reliability Project
   d. Greater Hartford/Central Connecticut
7. Southeast Massachusetts
   a. Short-term upgrades
   b. Long-term Lower SEMA Project
8. Maine Power Reliability Program
9. Vermont Southern Loop
10. Merrimack Valley/North Shore Reliability

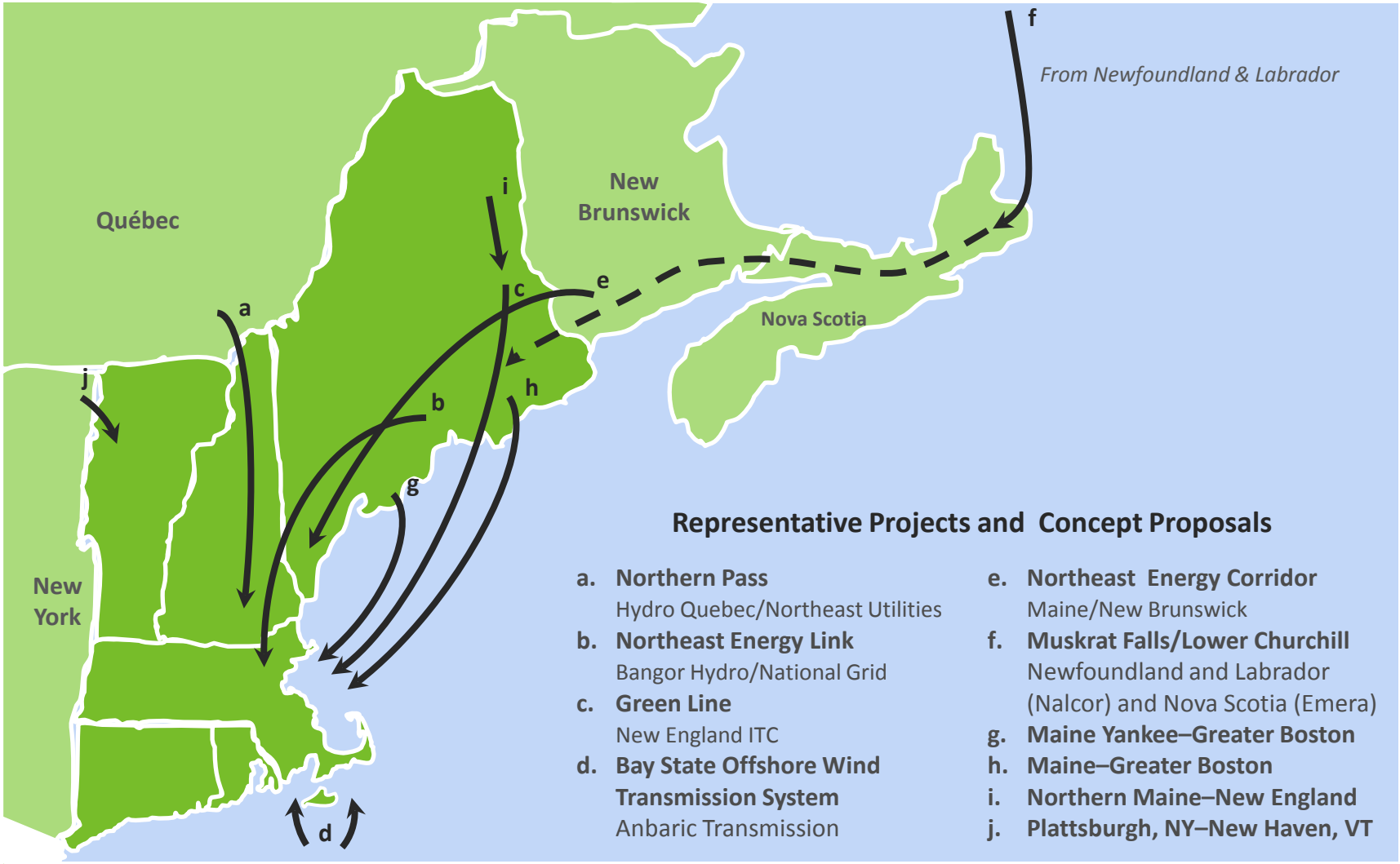


Transmission Upgrades Are Proposed for Reliability in New Hampshire



- Transmission solutions proposed to meet 10-year needs throughout the Granite State
- $430 million in proposed investments
- Areas studied include:
  - Northern Area (Coos County)
  - Central Area (Lakes & White Mtns.)
  - Western Area (Upper Valley and Keene)
  - Southern Area (Concord – Nashua)
  - Seacoast Area
    - Most significant upgrades in state
    - Highest demand growth in the region

Developers Proposing Elective Transmission Projects



Representative Projects and Concept Proposals

a. **Northern Pass**
Hydro Quebec/Northeast Utilities

b. **Northeast Energy Link**
Bangor Hydro/National Grid

c. **Green Line**
New England ITC

d. **Bay State Offshore Wind Transmission System**
Anbaric Transmission

e. **Northeast Energy Corridor**
Maine/New Brunswick

f. **Muskrat Falls/Lower Churchill**
Newfoundland and Labrador (Nalcor) and Nova Scotia (Emera)

g. **Maine Yankee–Greater Boston**

h. **Maine–Greater Boston**

i. **Northern Maine–New England**

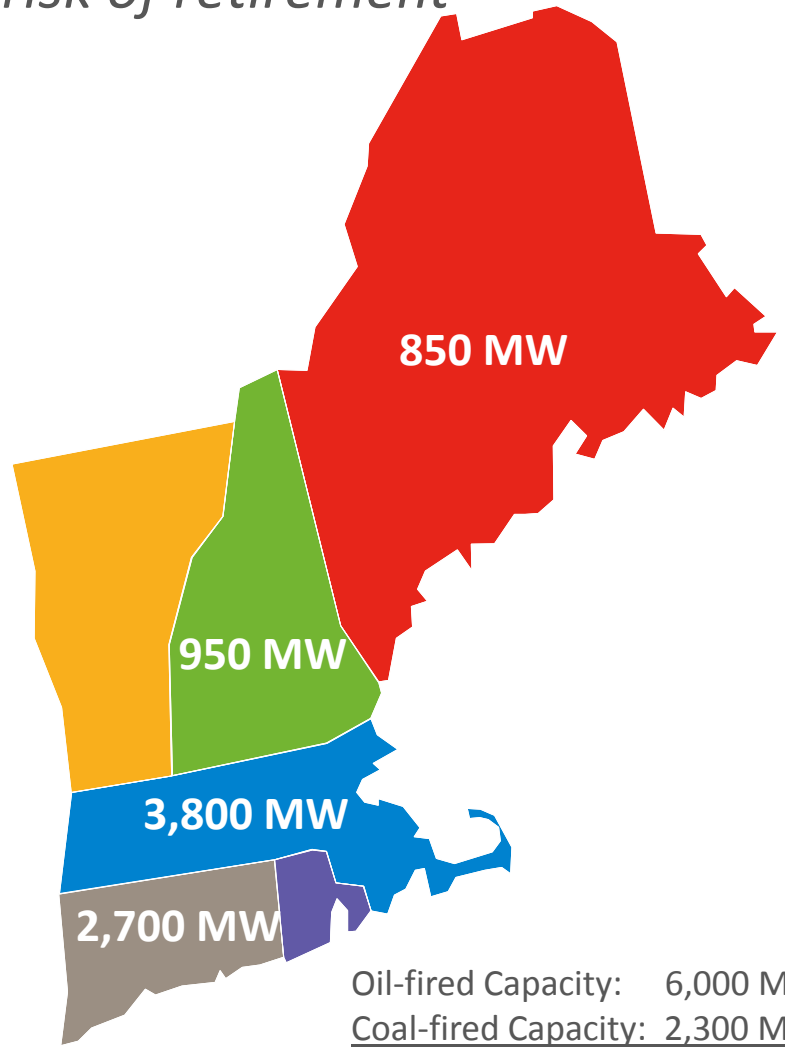
j. **Plattsburgh, NY–New Haven, VT**

Note: These projects are NOT reliability projects, but ISO New England' s role is to ensure the reliable interconnection of these types of projects.

Generation Retirement Analysis

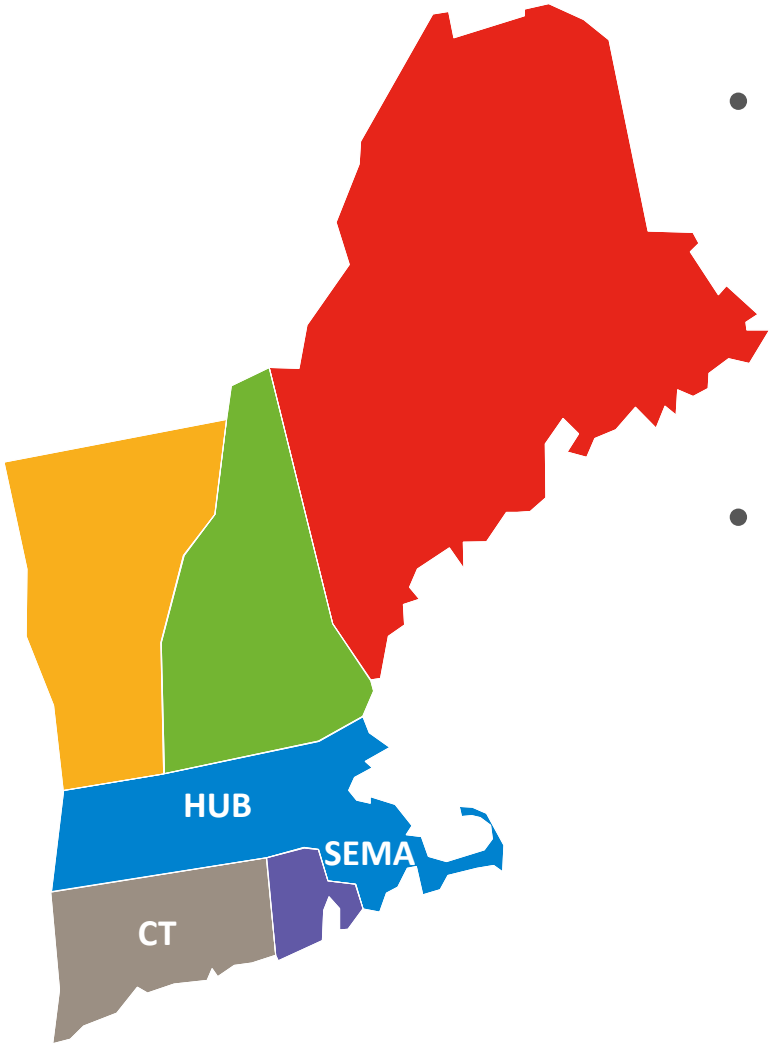
Significant amounts of generation at risk of retirement

- Evaluate reliability impact associated with retirement of 8,300 MW of coal- and oil-fired resources by 2020
- Combination of new, repowered and existing resources will be needed to cover a nearly 6,000 MW shortfall in New England resource adequacy requirements



Oil-fired Capacity:	6,000 MW
Coal-fired Capacity:	2,300 MW
Total At-Risk:	8,300 MW

Transmission Development Provides Flexibility



- Existing and planned transmission provides significant flexibility for the location of new resources and their ability to serve load across the region
- Where replacement capacity is needed:
  - Approximately 5,100 MW can be integrated into the Hub
  - At least 900 MW must be in Southeastern Massachusetts (SEMA) or Connecticut (CT) due to transmission constraints

Moving Forward

- Growing dependence on natural gas for power generation is the highest-priority strategic risk for New England
- The ISO is actively working with stakeholders to develop solutions through the wholesale markets
  - The ISO's actions are necessary to address the challenges
  - Action also will be required by the FERC, generators, pipelines owner/operators and the states to fully address these challenges
- Transmission investment can help facilitate retirements and repowering efforts, but new resources will also be needed

Questions