New England Governors Eastern Canadian Premiers Annual Conference

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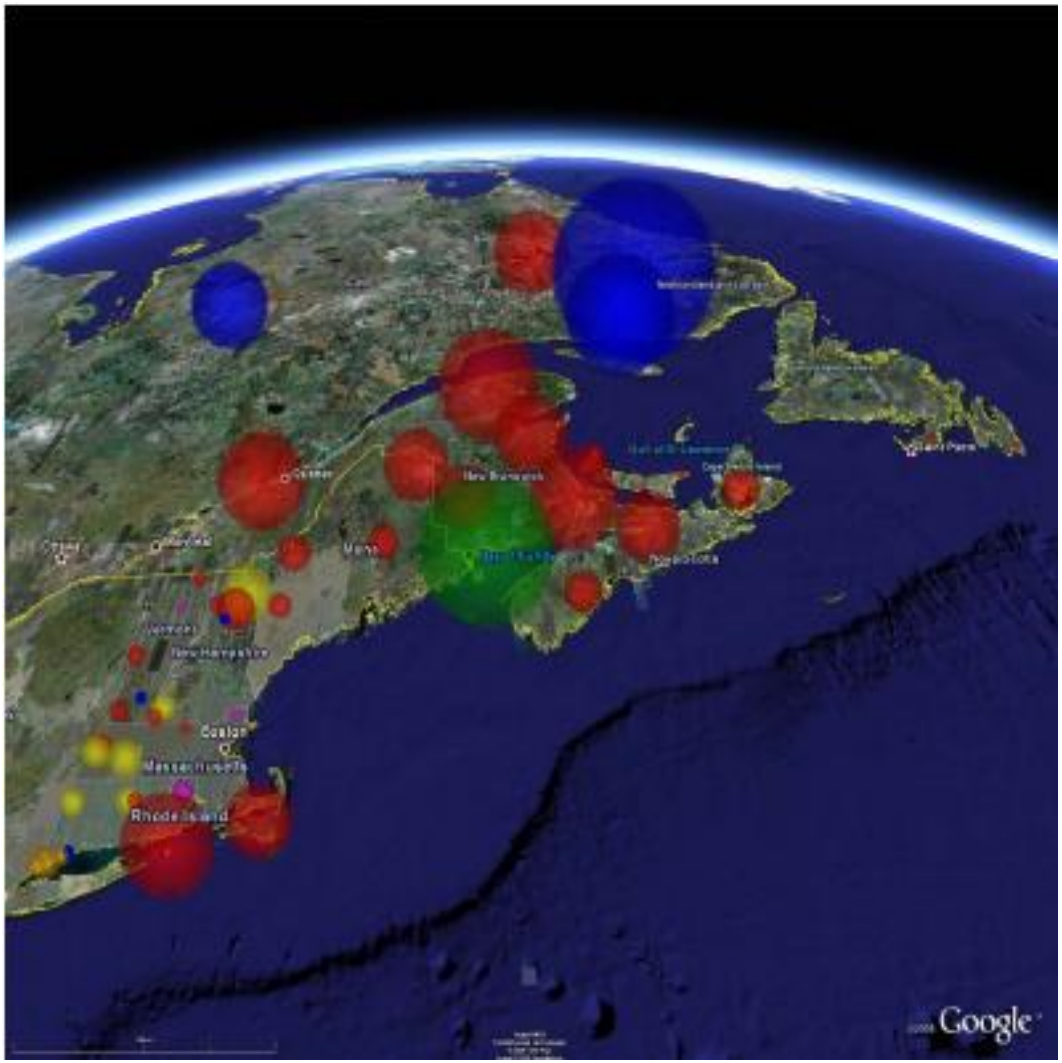
Halifax, Nova Scotia

Examination of Proposed Renewables & Clean Energy Resources in 2008

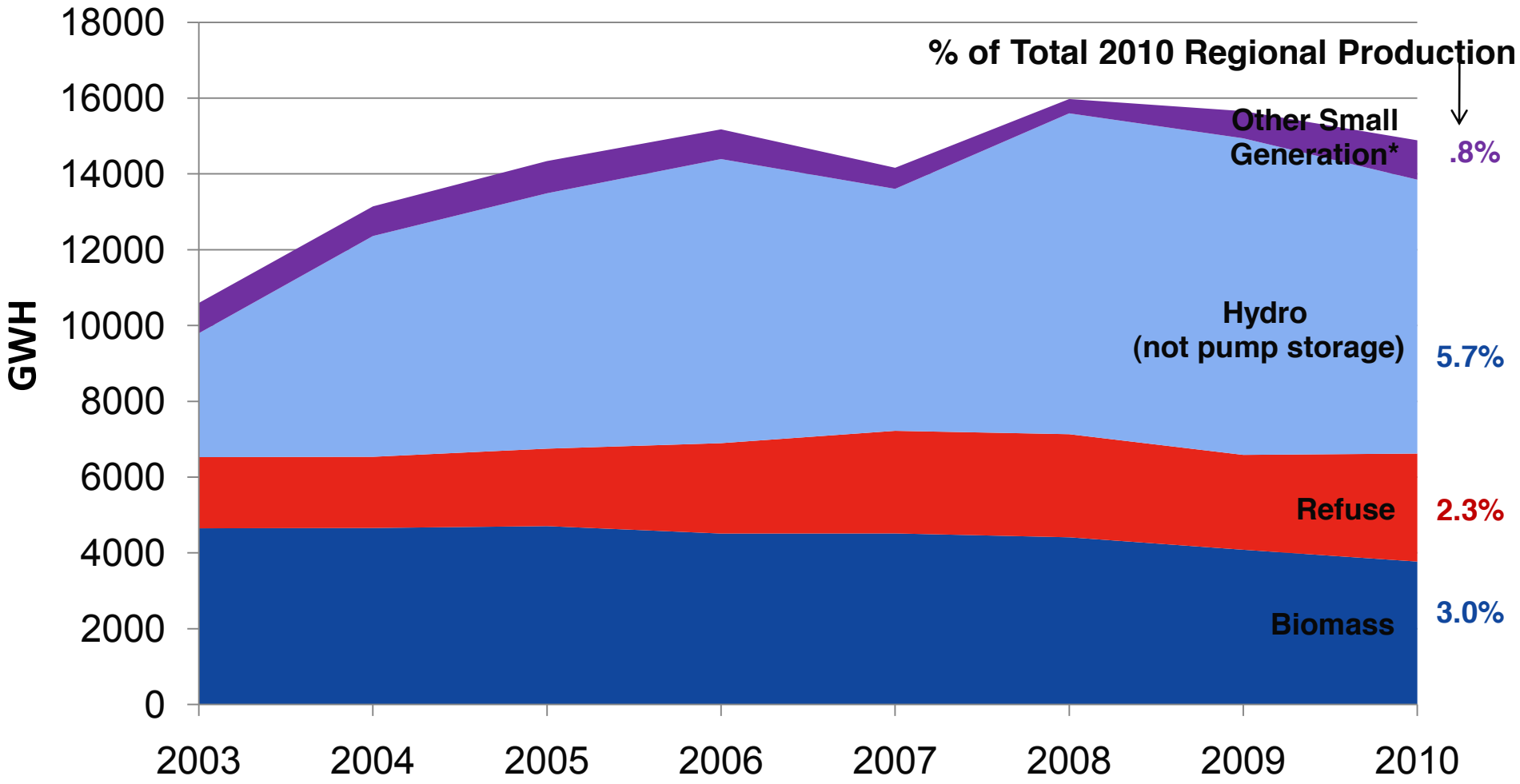


Hydro
Nuclear
Landfill gas
Wind
Biomass
Fuel cells

- Eastern Canada
  - Large hydro and wind
- New England
  - Wind and small dispersed resources

New England Renewable Energy Production

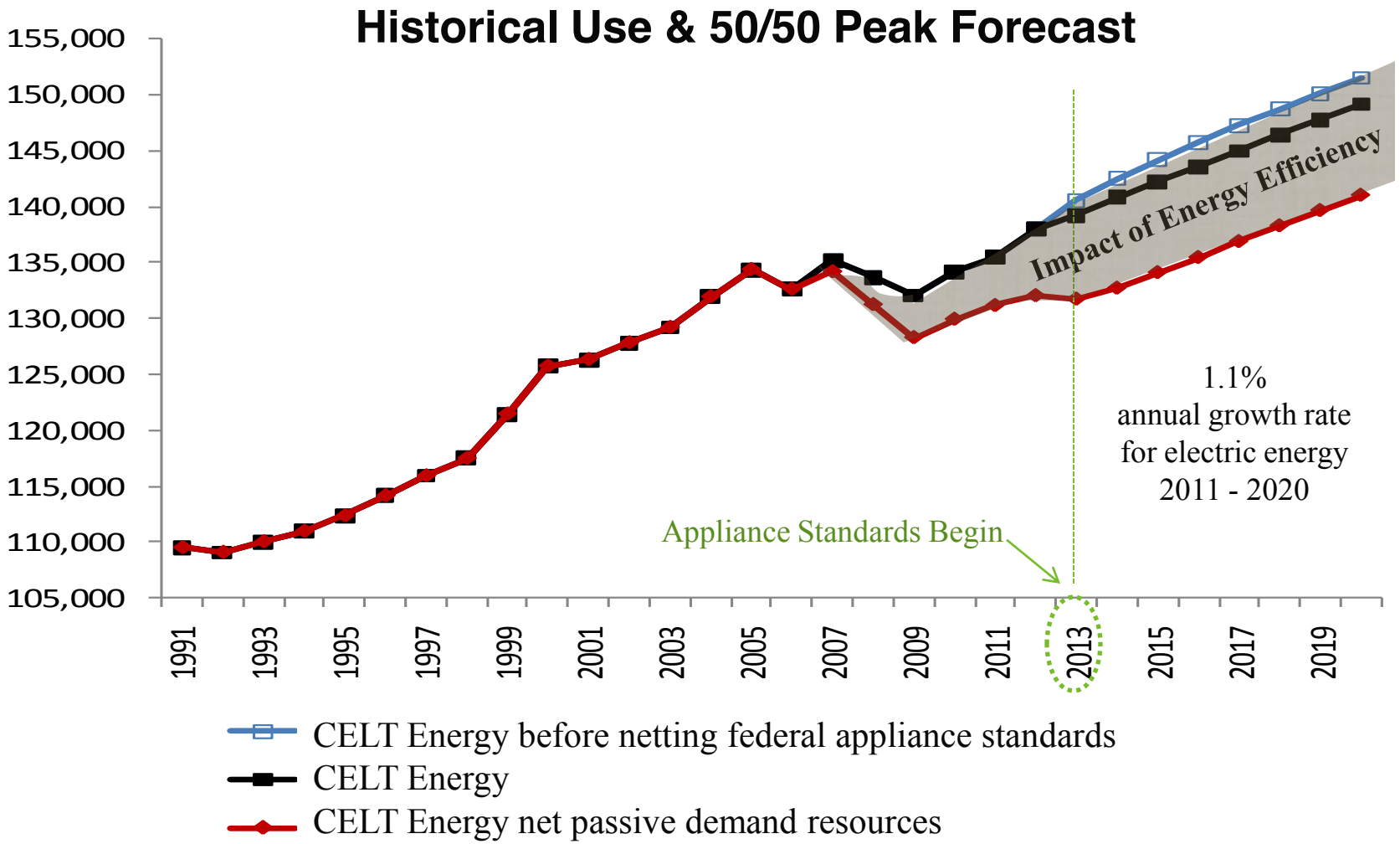
12% today, but 30% required by 2020



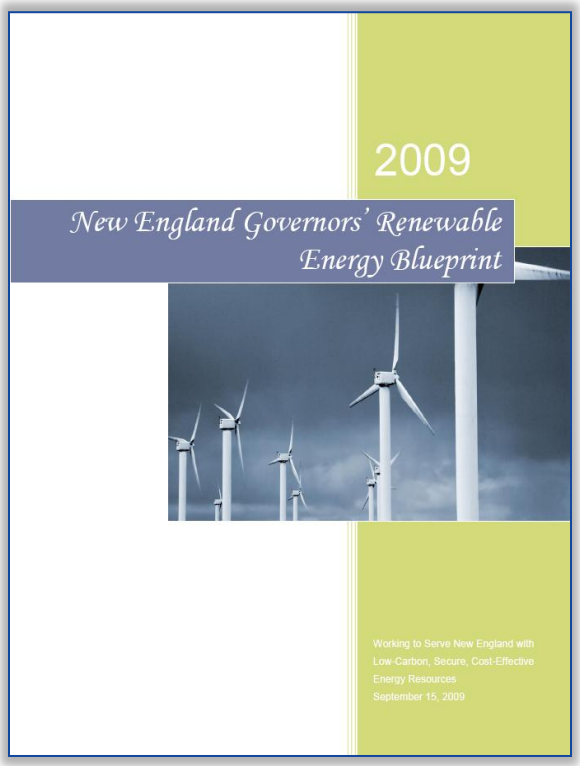
(*Note: Other small generation includes: landfill gas, methane, solar, wind, and steam)

Source: http://www.iso-ne.com/markets/hstdata/rpts/net_eng_peak_load_sorc/energy_peak_source.xls

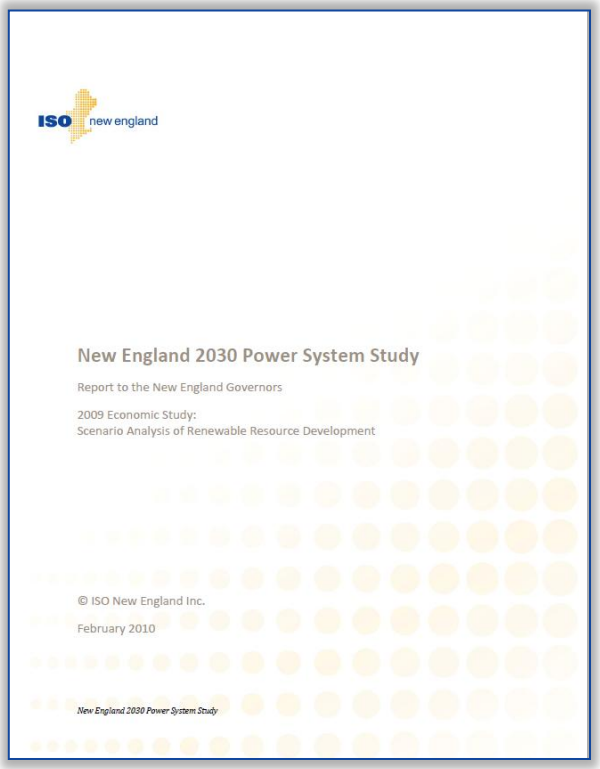
New Energy Efficiency & Appliance Standards Temper Growth



New England Governors Adopt Long-term Renewable Energy Vision in 2009

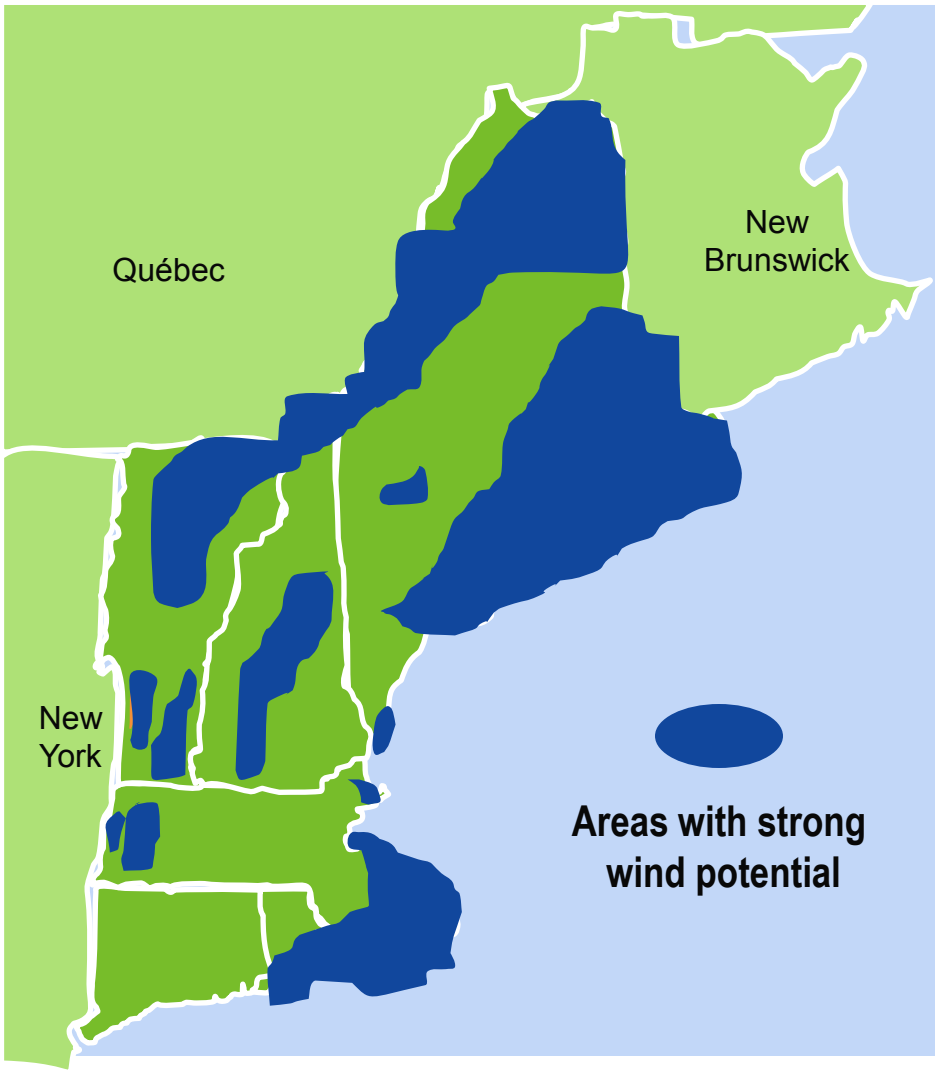


States' Blueprint as guiding policy and regulatory framework



ISO economic study as technical support

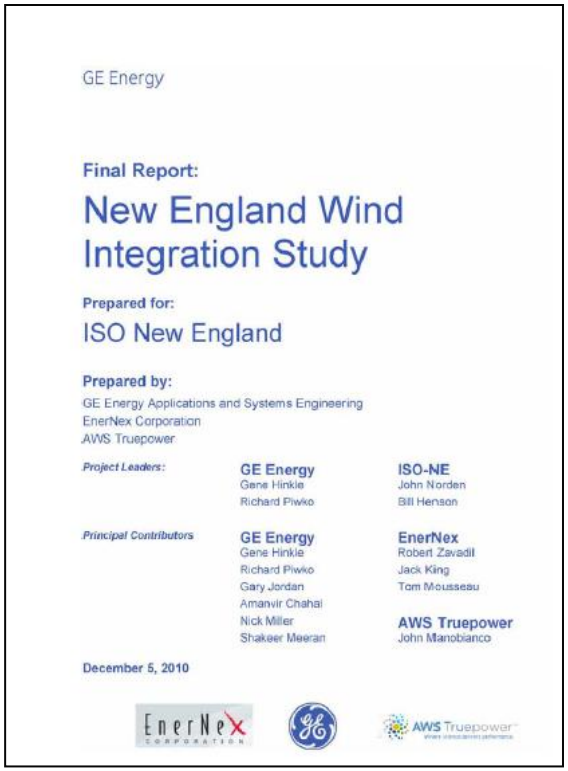
Wind Potential Areas; Benefits & Challenges



- Significant potential
  - Best in north and off-shore
- Wind Benefits:
  - Fuel diversity
  - State renewable portfolio goals
  - Fuel costs
- Challenges:
  - Higher capital costs
  - Siting issues
  - Intermittent/operational concern
  - Cost of transmission investment
  - Low natural gas prices
- Wind on System
  - +250 MW now
  - +550 MW by end of 2011

ISO Completes Comprehensive Regional Wind Study in 2010

- Large-scale wind integration achievable with additional transmission investment
- Wind resources should be expected to reduce fossil-fueled generation
  - Including natural gas and oil
- Flexible resources needed to manage variability
  - Additional regulation and operating reserves needed
  - Natural gas fleet may provide flexibility
- Centralized wind power forecasting required



GE Energy

Final Report:

New England Wind Integration Study

Prepared for:

ISO New England

Prepared by:

GE Energy Applications and Systems Engineering
EnerNex Corporation
AWS Truepower

Project Leaders:	**GE Energy** Gene Hinkle Richard Piwko	**ISO-NE** John Norden Bill Henson
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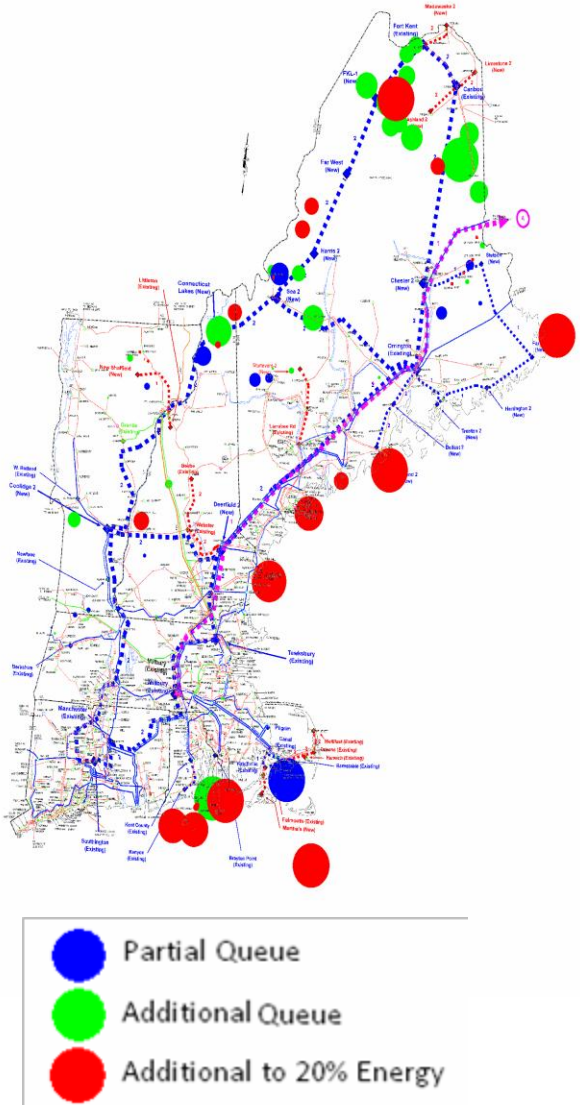
December 5, 2010

EnerNex CORPORATION · AWS Truepower

Study Considers Several Potential Scenarios

- Combination of on- and off-shore development can produce 20% of region's energy need, reduce emissions

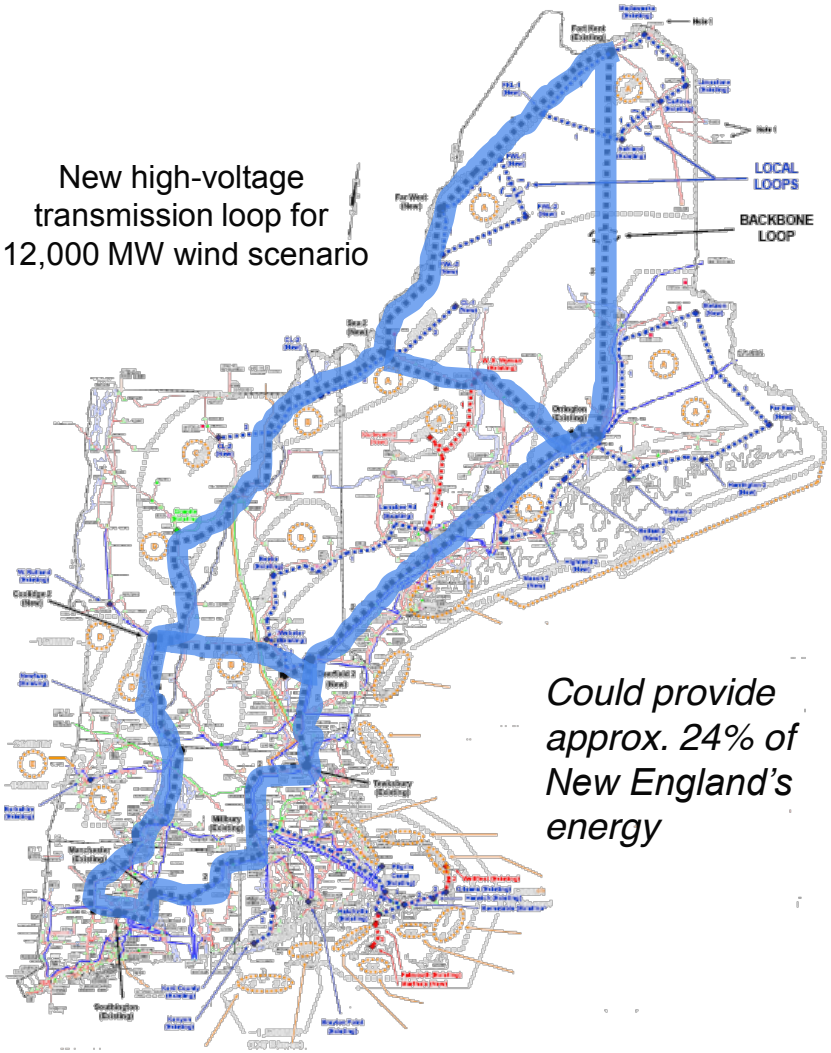
Pollutant	Approximate annual reduction	Approximate reduction vs. no wind
NOx	6,000 tons	26%
SOx	4,000 tons	6%
CO2	12,000,000 tons	25%



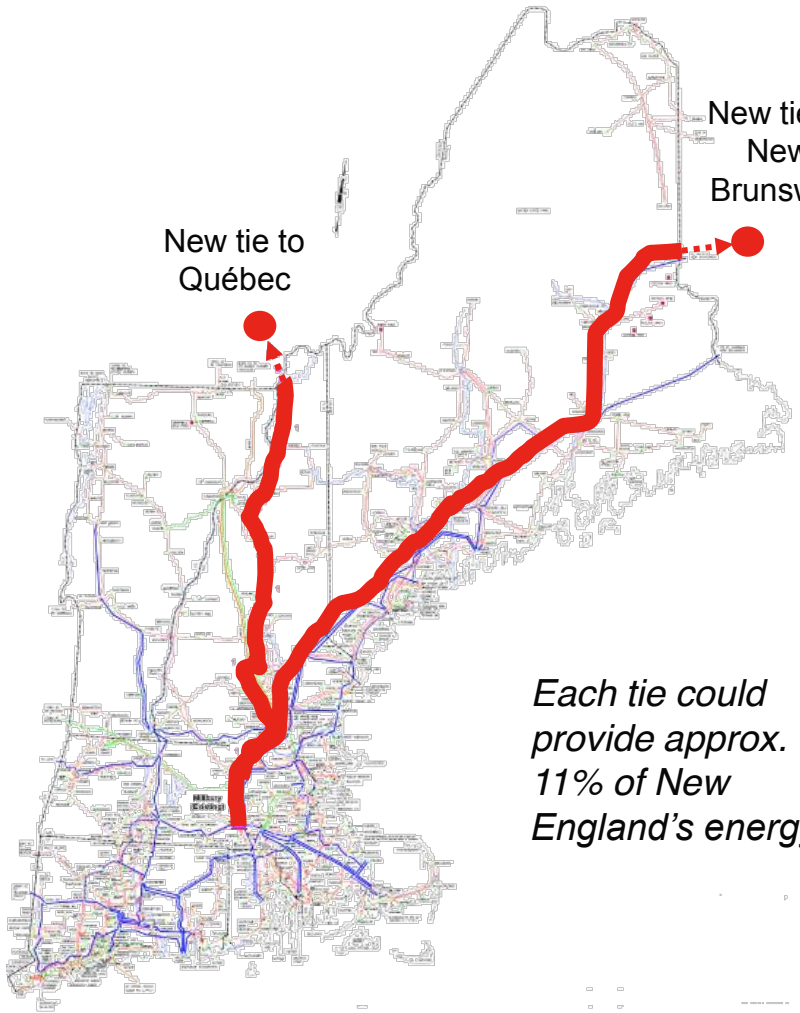
Conceptual Overlays Considered

Transmission needed to access New England wind & imports from Canada

New high-voltage transmission loop for 12,000 MW wind scenario



Could provide approx. 24% of New England's energy

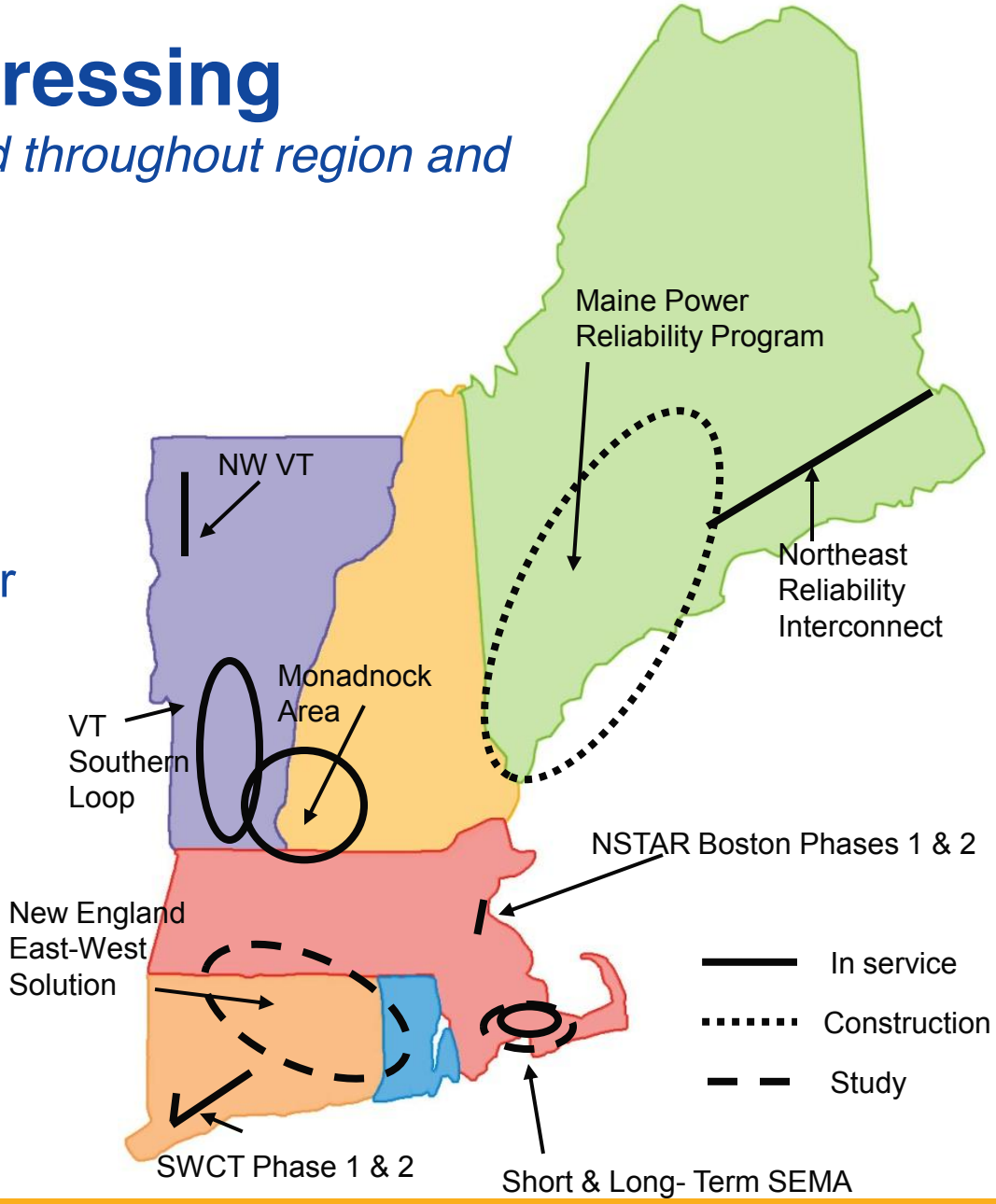


Each tie could provide approx. 11% of New England's energy

Transmission Progressing

Transmission projects developed throughout region and improved import capability

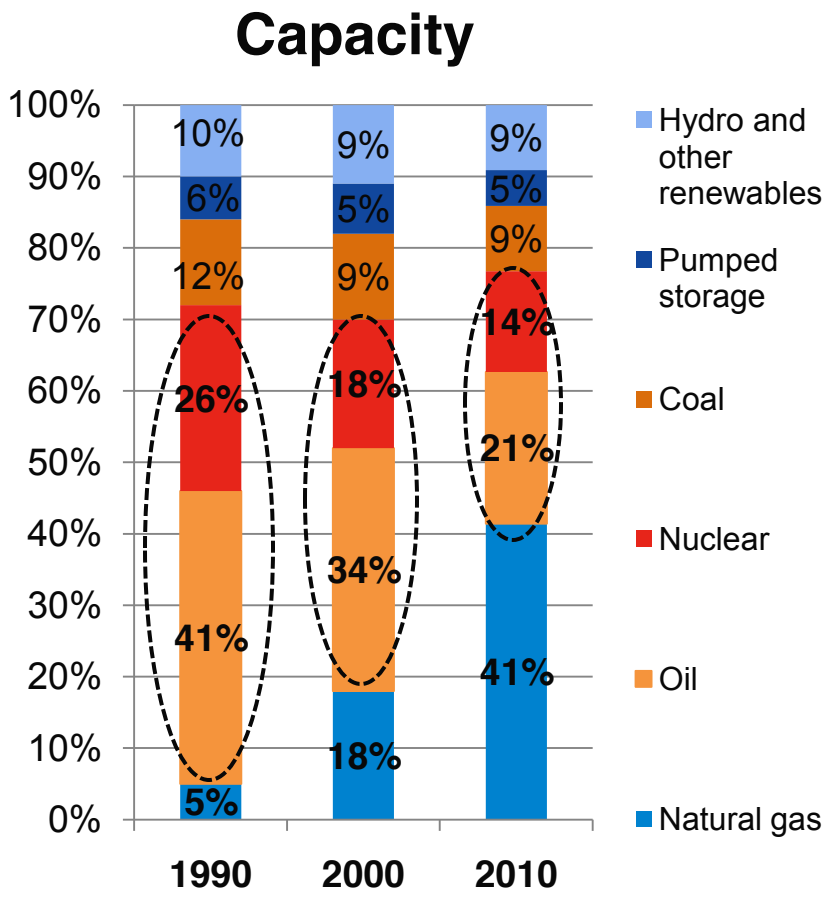
- Reliability improved across region
  - Reduced congestion
  - Minimized reliance on older and less efficient units
  - Economic dispatch of generation
- Foundation set for renewable resource integration – but more transmission needed



Recent Shift in Regional Capacity

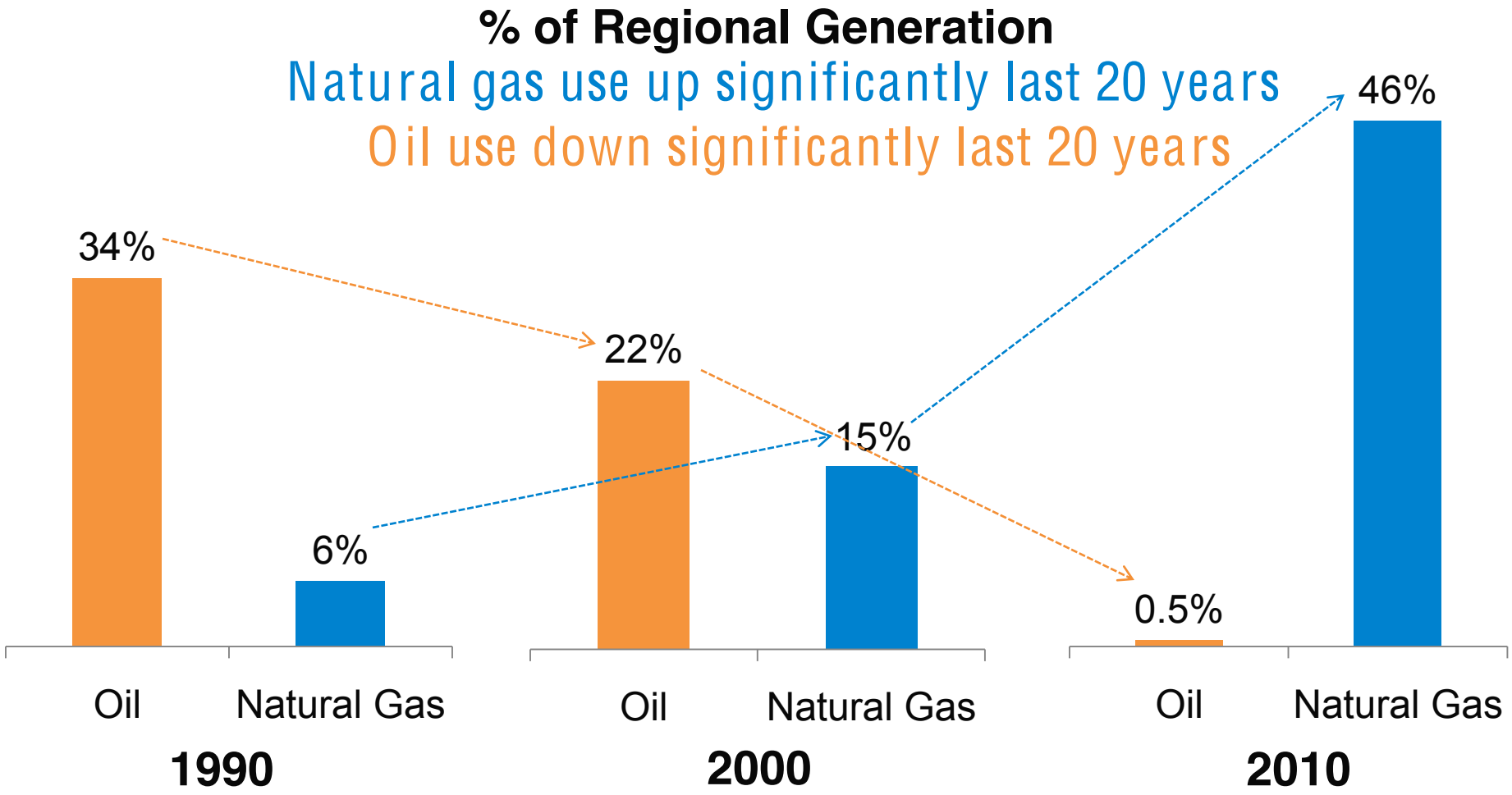
Generation fleet historically dominated by nuclear & oil

- Region largely dependent on oil & nuclear through 1990's
- Efficient combined-cycle gas units have displaced older oil-fired generators
- Investments in transmission system have reduced reliance on older fossil units
- Renewable resources growing in interconnection queue



Shift in Regional Energy Generation

Natural Gas now dominant fuel



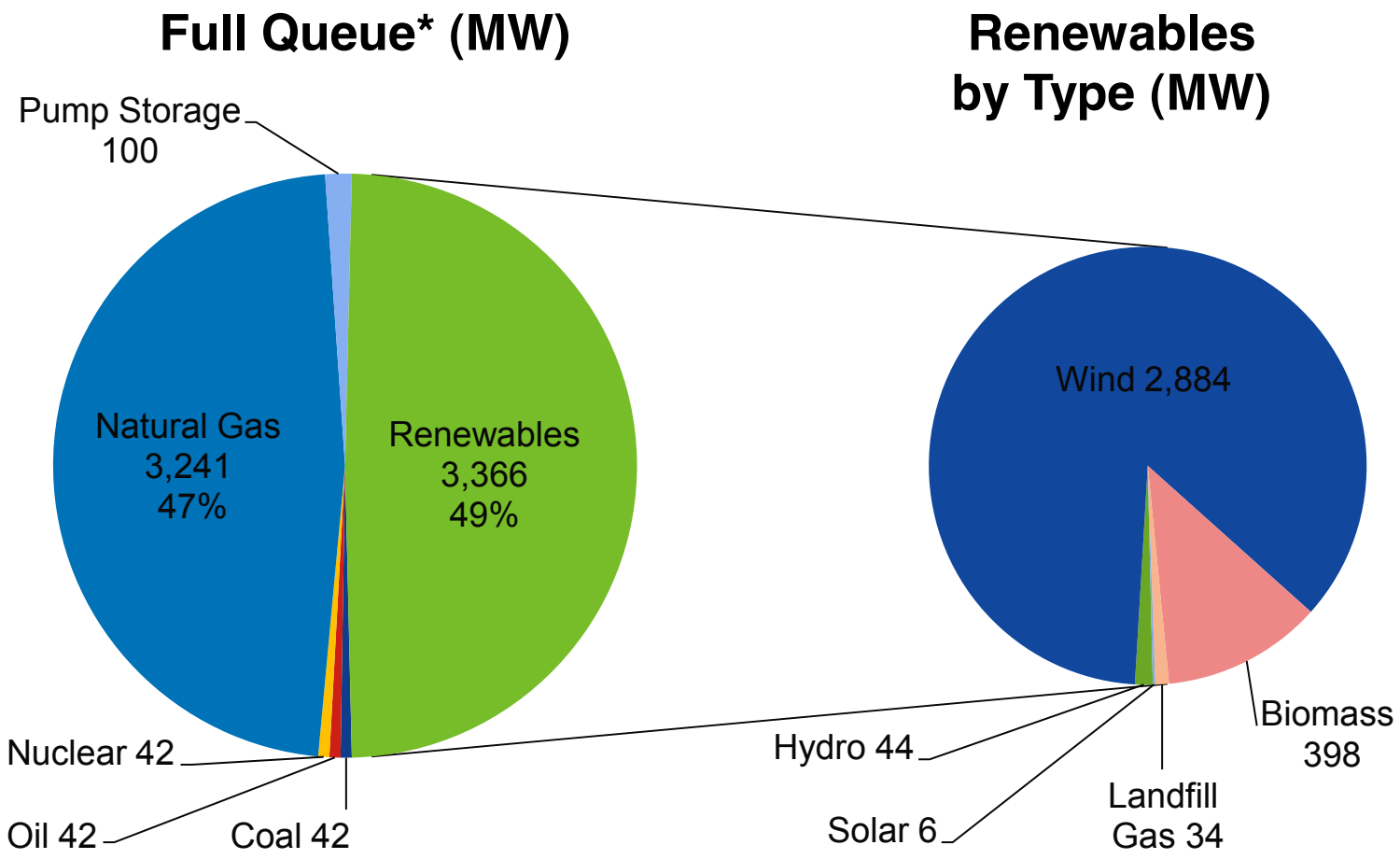
Factors Likely to Result in More Changes?

- Market conditions
  - Relatively low cost of natural gas can displace other resources
- Upcoming US Environmental Protection Agency rules
  - Clean Air Transport Rule
  - Utility Air Toxics Rule
  - Cooling Water Intake Rule
  - Coal Combustion Residuals
- Aging fossil-fuel plants

Age as of 2030	Total MW of Coal and Oil Units
≥ 50 years old	8,600
≥ 60 years old	4,300
≥ 70 years old	1,200

7,000 MWs of Projects Proposed for Region

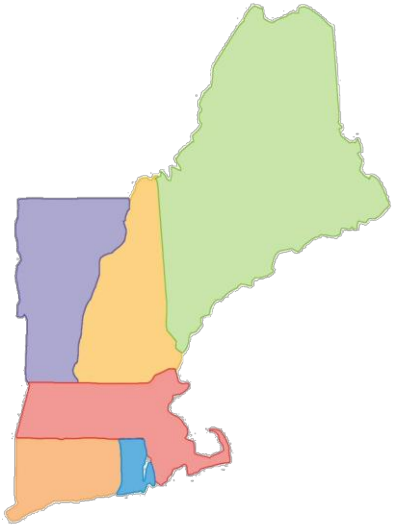
Majority of proposed projects in Queue natural gas or renewables*



*June 2011 FERC Jurisdictional Section of Generator Interconnection Queue

Planning in New England and Beyond

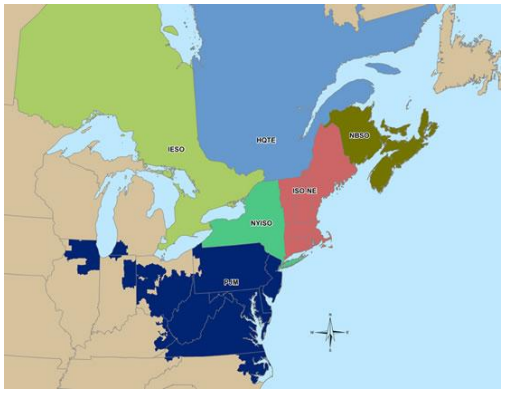
New England



New England States Committee on Electricity

- Coordinated procurement for renewables
- Identified almost 5,000 MW of potential development

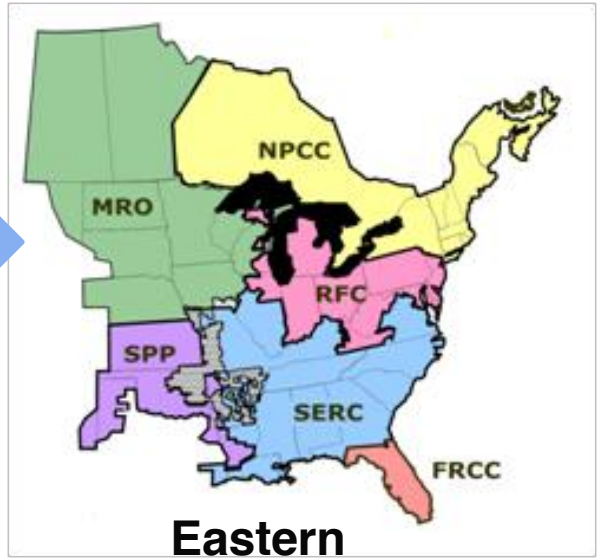
Inter-Area



Federal Energy Commission Regulatory

- NOPR: transmission for "public policy;" cost allocation; interregional coordination
- Order expected this year

Interconnection-Wide



Eastern Interconnection Planning Collaborative

- Potential resource and transmission scenarios
- Final report to US DOE end of 2012

Closing Thoughts …

- New England's generation fleet has changed significantly and will continue to evolve
- Renewables – specifically wind – can have expanded role
- New England Strategic Planning Initiative evaluating potential loss of older fossil-fired generation and integration of new resources, such as wind
- ISO will continue to get feedback from the states and looks forward to the opportunity to provide updates to New England Governor's and Eastern Canadian Premiers