# ISO New England – An Overview of Markets, Planning and Vermont Issues

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# Overview

Section I: Background on ISO-New England

- ISO's Responsibilities; markets; planning role

Section II: Vermont Capacity and Load Growth

- Vermont's resources and future load

Section III: Vermont Needs Assessment

- Future scenarios analyzed

Section IV: Vermont Solutions Assessment

- Options to address future potential deficiencies under study

# Section I –
# Background on ISO-New England

# About ISO New England

- **Not-for-profit corporation created in 1997 to oversee New England's restructured electric power system**
- **Independent System Operator**
  - Independent of companies doing business in the market
  - No financial interest in companies participating in the market
- **Regulated by the Federal Energy Regulatory Commission (FERC)**
- **Headquartered in Holyoke, MA**

# New England's Electric Power System

- 6.5 million electricity customers, population 14 million
- 350+ generators
- 8,000+ miles of high-voltage transmission lines
- 13 interconnections with systems in New York and Canada
- 31,000+ megawatts of total supply (summer)
- 2,000+ MW of demand response (9/09)
- Peak demand:
  - Summer: 28,130 megawatts (8/06)
  - Winter: 22,818 M W (1/04)
- 400+ participants in the marketplace
- $12 billion electric energy market (2008)

# ISO's Major Responsibilities

1. **Reliable Power System Operations**
   - Maintain minute-to-minute reliable operation of the region's electric power grid
   - Perform centralized dispatch of the lowest-priced resources
   - Coordinate operations with neighboring power systems
2. **Efficient and Competitive Markets**
   - Administer New England's wholesale electricity markets
     - Energy, Capacity and Reserves
   - Internal and external market monitoring

# ISO's Major Responsibilities, cont.

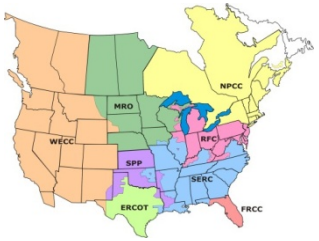
## 3. Administer Regional Transmission Tariff, including Comprehensive Regional System Planning

- Administer requests for interconnection of generation, merchant transmission, and regional transmission system access
- Conduct periodic transmission system needs assessments:
  - Reflect Market Solutions with a firm commitment,
  - Identify future system needs (deficiencies),
  - Provide information and opportunities for market participants (e.g., demand resources, generation, merchant transmission) to take action to address system needs
- Develop 10-year transmission plan to ensure a reliable and efficient power system if market responses do not fully address system needs

# Reliability Standards Guide Regional Transmission Planning

- North American Electric Reliability Corporation
  - Reliability Standards for the Bulk Power System in North America
- Northeast Power Coordinating Council
  - Basic Criteria for the Design and Operation of Interconnected Power Systems
- ISO New England
  - Reliability Standards for the New England Area Bulk Power Supply System

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION





ISO new england

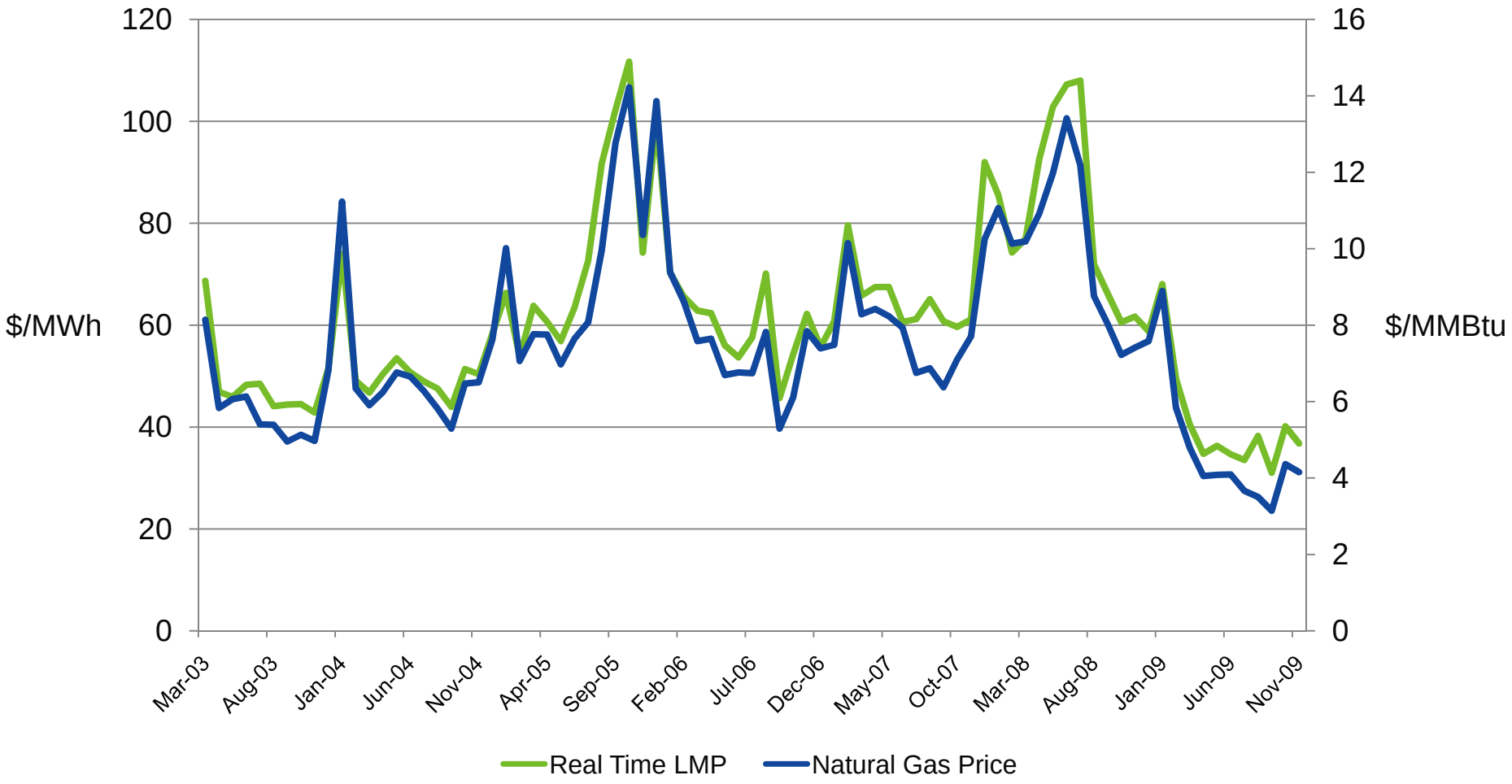
**Standards are used to ensure that the regional transmission system can reliably deliver power to consumers under a wide range of future system conditions.**

# Wholesale Power Markets in New England

- Three primary market mechanisms in New England
  - Energy Markets
  - Reserve Markets
  - Forward Capacity Market
- All three markets are designed to reflect locational differences in prices
- Generation, Demand Resources, and Imports all participate within the market framework

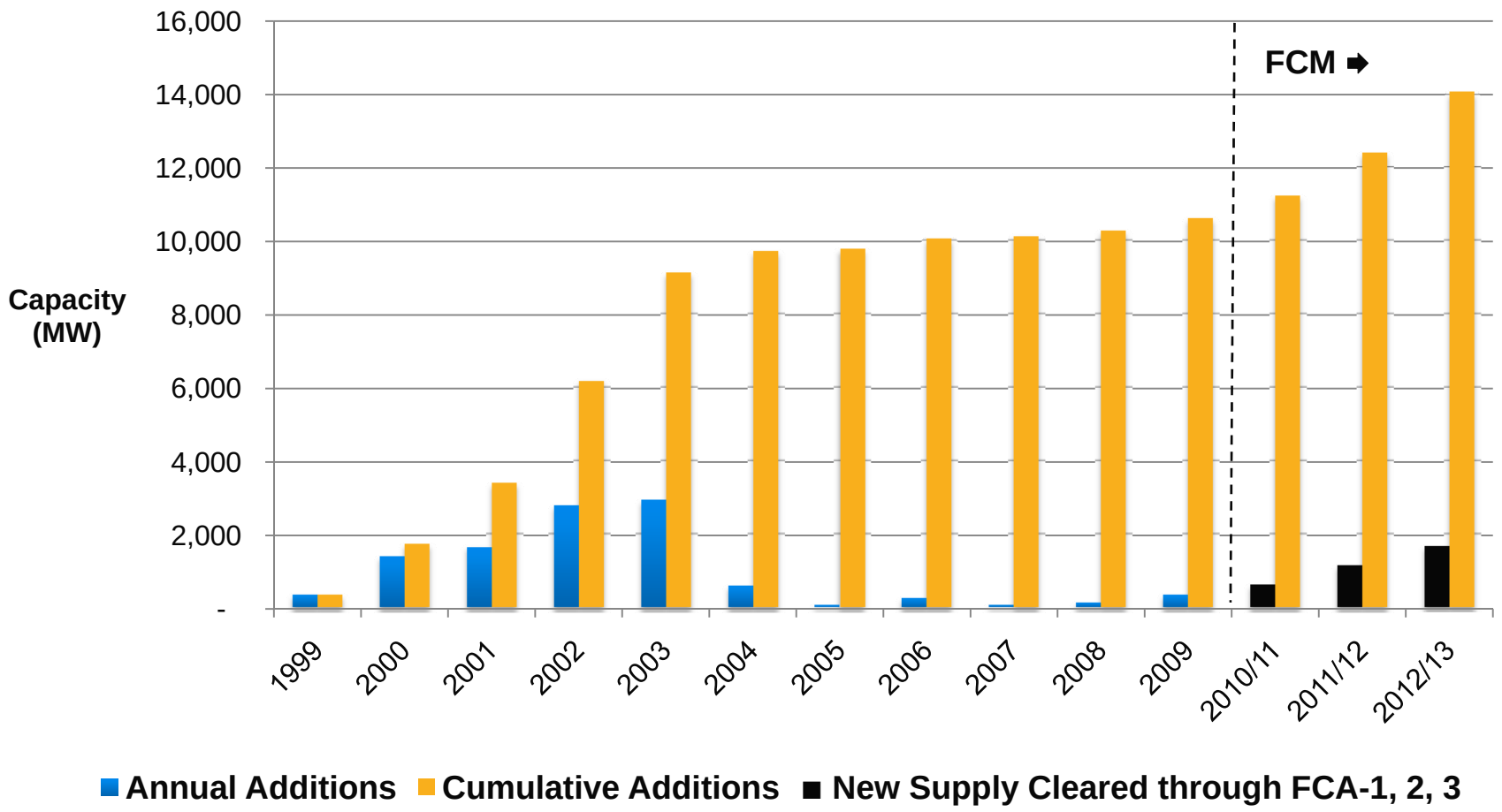
# Wholesale Electricity Prices Track Natural Gas

*Natural Gas and wholesale electricity prices have both recently declined*



# New Generation Additions in New England

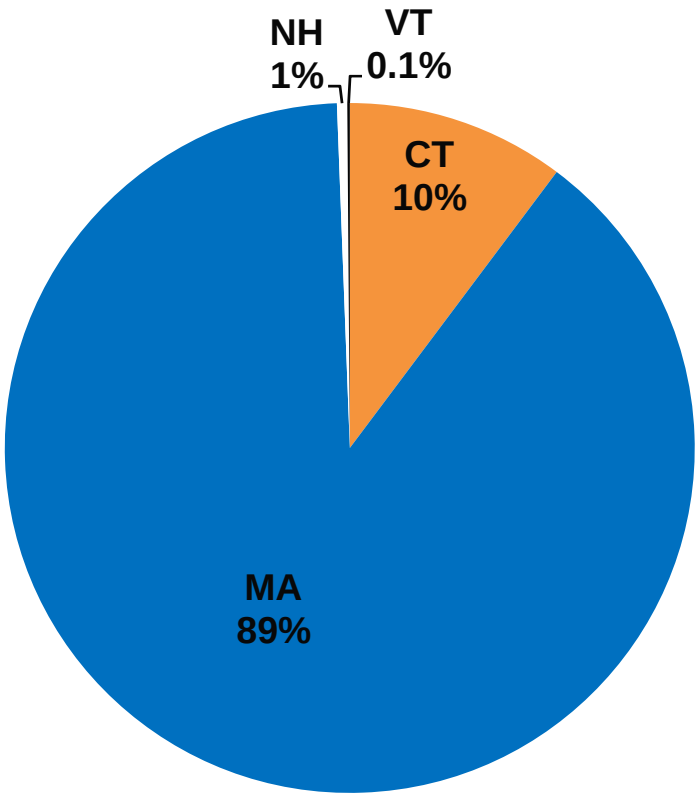
*10,500 MW added since 1999; plus 3,500 MW committed for 2010-2012*



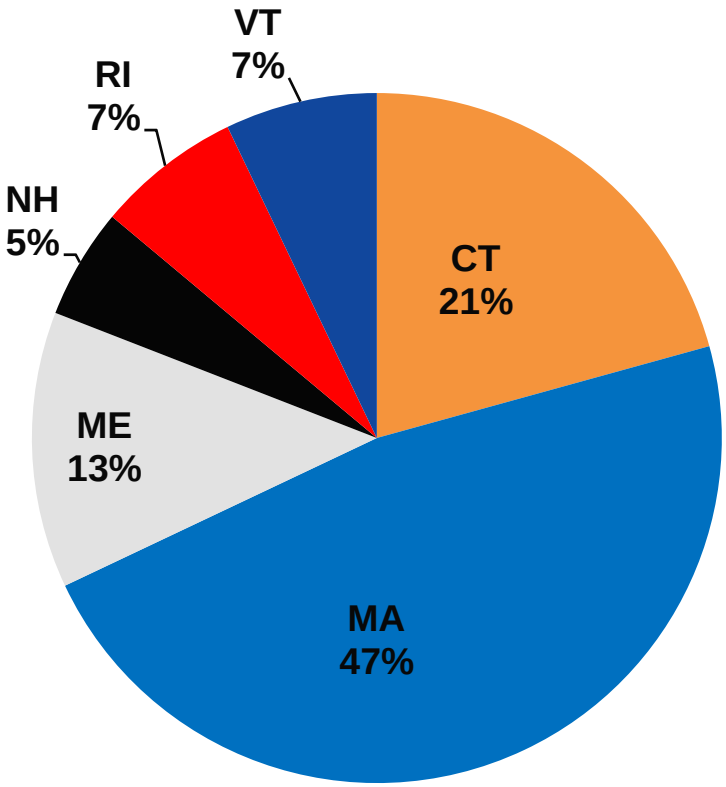
# Results of 3rd Forward Capacity Auction

*For Delivery in 2012-2013*

## New Supply Resources (1,670 MW)



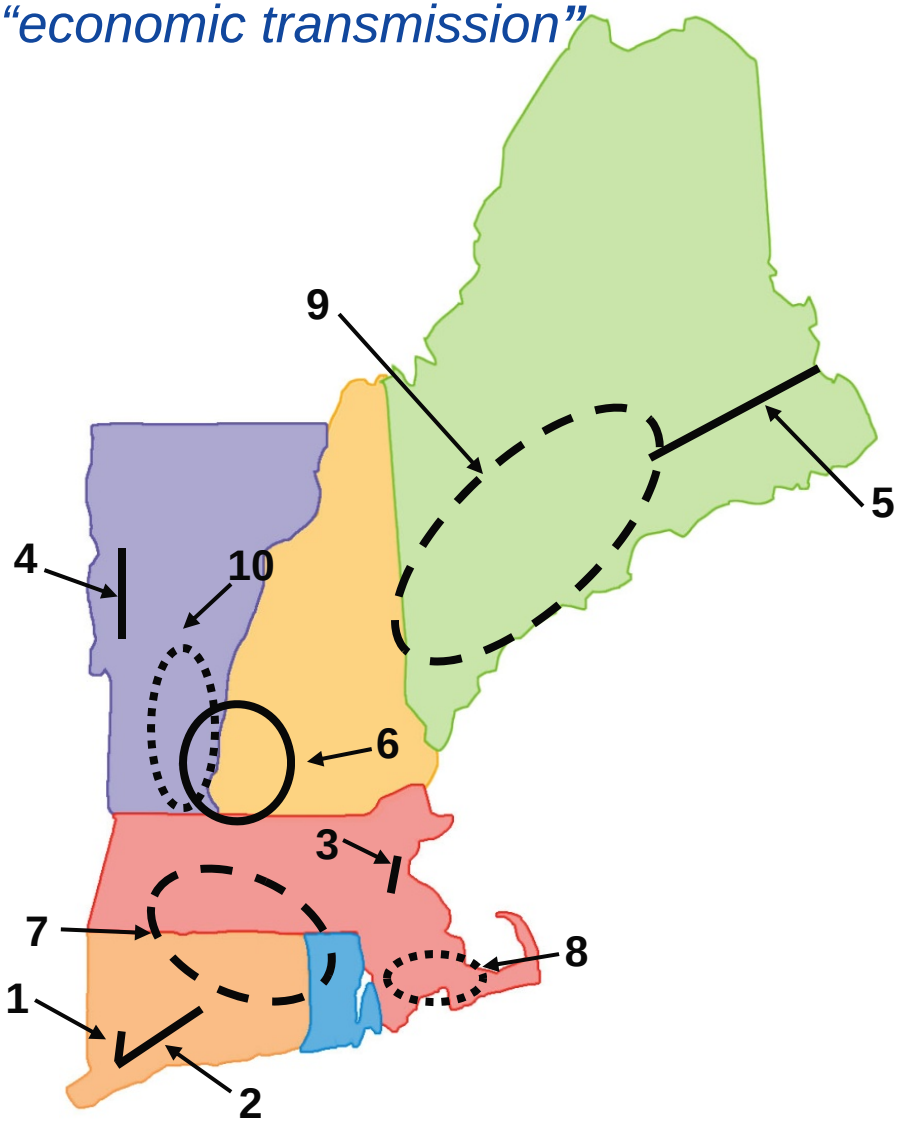

## New Demand Resources (309 MW)



# Transmission Investment Throughout Region

*Reliability projects create foundation for "economic transmission"*

1. Southwest CT Phase I
2. Southwest CT Phase II
3. NSTAR 345 kV Project, Phases I & II
4. Northwest Vermont
5. Northeast Reliability Interconnect
6. Monadnock Area
7. New England East-West Solution
8. Southeast Massachusetts
9. Maine Power Reliability Program
10. Vermont Southern Loop




In service

Under construction

Under study

*~ $4 Billion in service*

*~ $5 Billion in planning/siting/construction*

# ISO New England Planning Process

- ISO-NE is responsible for regional system planning for the six-state region
  - Identifies system needs
  - Reflects evolving market solutions
  - Backstop regional transmission plan
  - Includes interregional planning
  - Process is open and ongoing

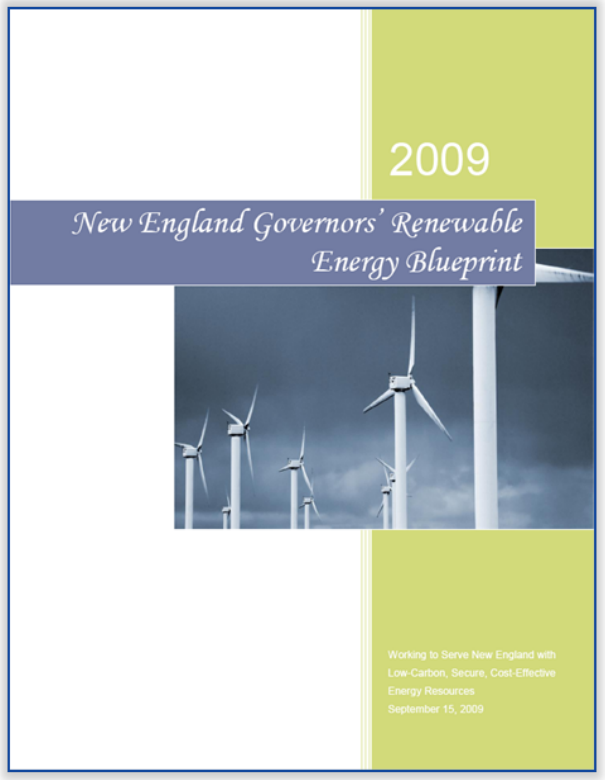
# Regional System Plan (RSP)

- Ten-year planning horizon
- Regular updates on status of transmission projects in the plan
- Incorporates ongoing transmission planning needs assessments and transmission solution development studies
- Provides opportunities for market solutions (e.g., resources, including generation, demand-side measures, and merchant transmission)
- Transmission Owners (TOs) make regulated transmission proposals as backstop for regional reliability and market efficiency needs
- Regional Economic Studies

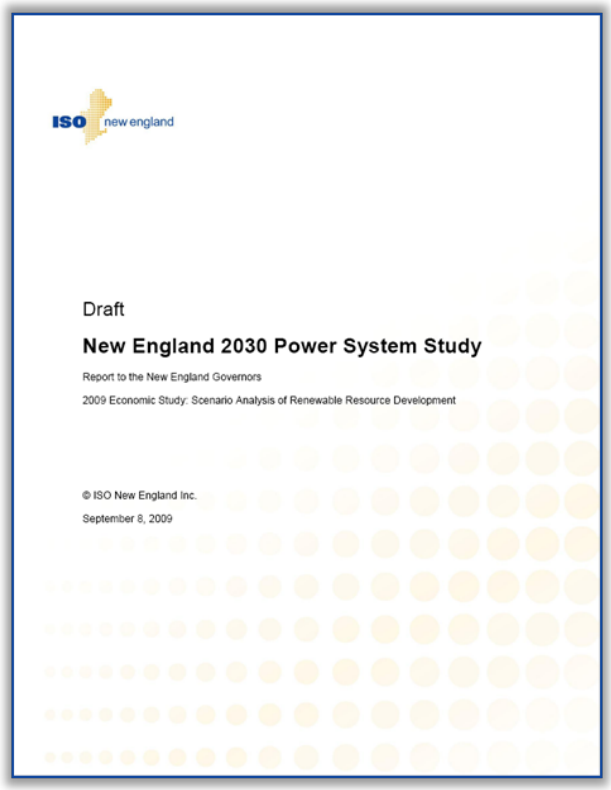
# RSP Expands Beyond Regional Transmission Planning

- Resource adequacy and other system needs
- Fuel diversity challenges and progress
- Environmental challenges and requirements
- Emerging issues and technologies
  - Wind integration
  - Smart Grid
  - Eastern Interconnection Planning Collaborative (EIPC)

# New England Governors Adopt Long-term Renewable Energy Vision




**States' Blueprint as guiding policy and regulatory framework**




**ISO economic study as technical support**

# New England's Economic Study Approach -- A Model for National Planning

- **"Scenario analysis"** of varying levels of renewable development
  - Up to 12,000 MW of onshore and offshore wind
    - Wind site screening
  - Imports, demand resources, plug-in electric vehicles, energy storage
- **Long-term horizon:** approx. 20 years in the future (around 2030)
  - Retire and repower units in service for 50 / 60 / 70 years
  - Deploy new technologies
- **Sensitivity analysis**
- **Policymakers approve study assumptions**

# Study Results – Lots of Information to Guide Decisions

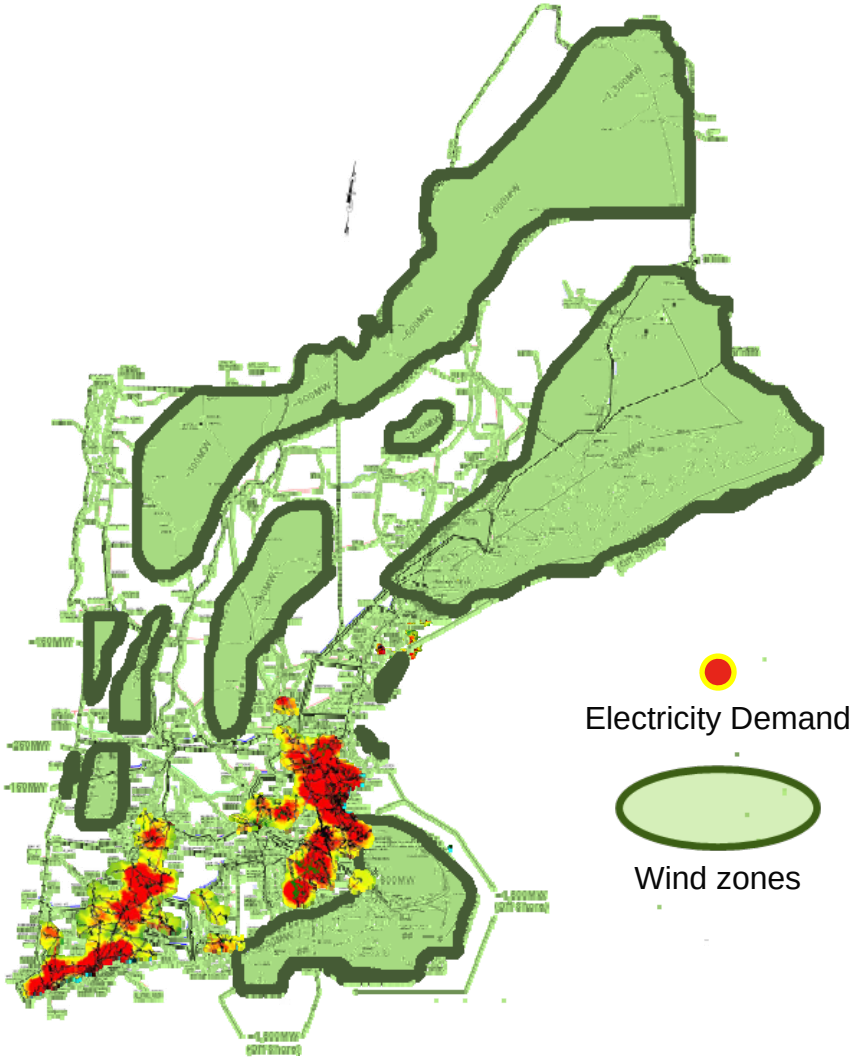
- **Economic metrics:**
  - Wholesale energy prices and emissions allowance prices
  - Production costs
  - Transmission cost estimates

- **Environmental metrics:**
  - SOx, NOx and $CO_2$ emission levels

- **Comparison of scenarios based on:**
  - Renewable energy produced
  - Energy produced by fuel type i.e. from gas, wind and coal, etc.
  - New circuit-miles of transmission and transmission costs estimates

# Study Conclusions: Large Wind Resources Remote from Demand, But Transmission is Possible

- Population and electricity demand concentrated in southern New England
- Wind resources do not overlap with high energy demand areas
- New “backbone” transmission needed
  - Many options available



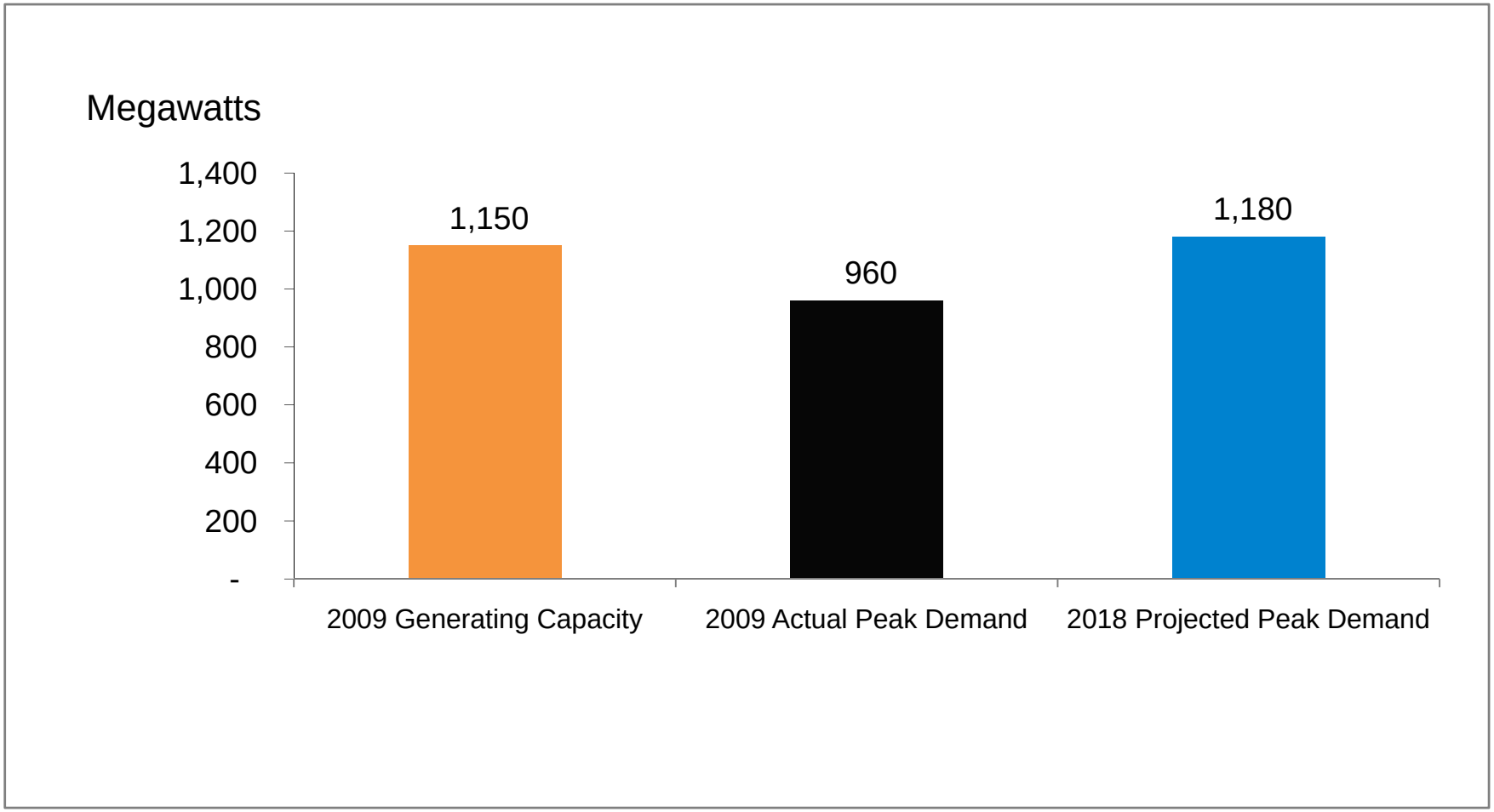
# Section II:  Vermont Capacity and Load Growth

# Modest Growth Forecast

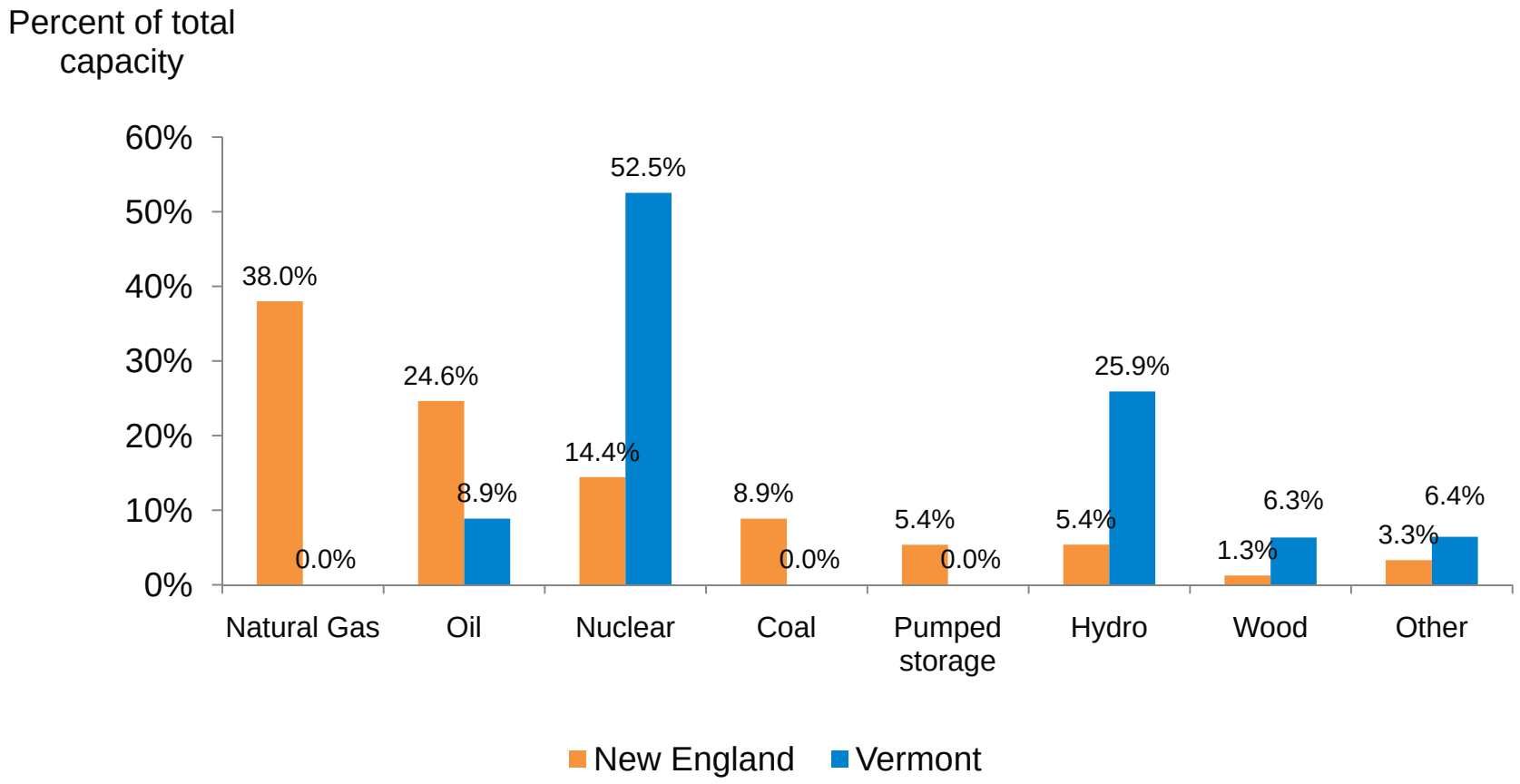
- ISO New England forecasts that Vermont's overall electricity demand will **grow** at a rate of 0.5% annually over the next decade.
  - Growth rate down from 0.7% forecast last year.

- ISO New England forecasts that Vermont's peak (summer) demand will **grow** at a rate of 1.0% annually over the next decade.
  - Growth rate down from 1.2% forecast last year.

# Supply and Demand in Vermont



# Fuel Mix: New England and Vermont



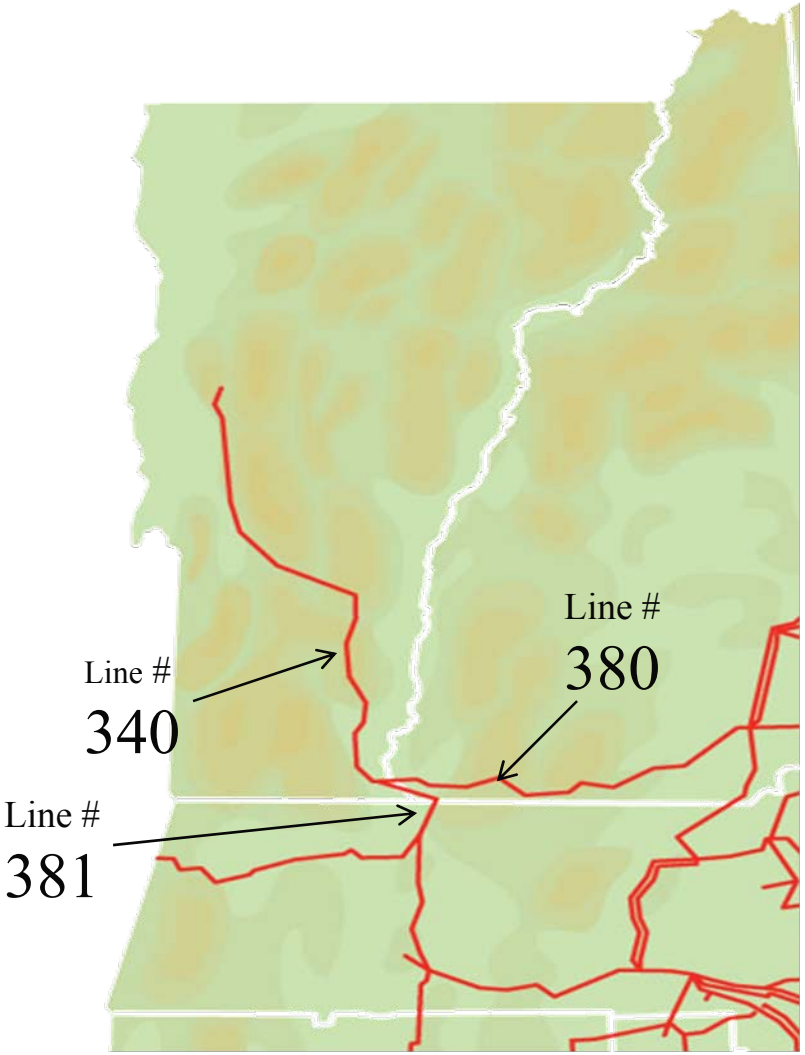
# Section II –
# Vermont Needs Assessment

# Vermont Yankee

- ISO-NE has *not* received a request from the plant's owners to study the impact of Vermont Yankee (VY) retiring.
  - A formal request triggers an in depth evaluation to assess the whether the grid can operate reliably in its absence

- However, as part of our regional planning responsibilities, ISO-NE is conducting a Needs Assessment for Vermont's transmission system that looks at some operating scenarios focusing on VY.

# 345 kV Transmission in Vermont



# Vermont Needs Assessment - Scope

- ISO-NE regularly conducts assessments of the region's transmission system
- ISO-NE currently finalizing VT Needs Assessment, draft released in December 2009
- Needs analysis tested various conditions and sensitivities for years 2009-2018
- Numerous issues, deficiencies and potential NERC reliability standard violations were identified

# Vermont Needs Assessment – General Findings

- Computer simulations identified potential deficiencies that we expect to arise under certain conditions, absent improvements to the grid, including:
  - Transmission line overloads
  - Low voltage violations within Vermont
  - Loss of load in portions of VT
  - Similar findings with or without VY in operation

# Vermont Needs Assessment -- VY

- Potential problems identified with Vermont Yankee out of service include:
  - In Vermont, the same issues identified in our general findings apply, only more severe
  - There is a greater regional impact
  - Transmission and grid upgrades would be necessary to address these issues

# Vermont Needs Assessment – VY (Cont.)

- Potential problems identified with Vermont Yankee out of service include:
  - Overloads on 115 kV lines in VT, NY and severe overloads in NH -- with certain combinations of large transmission lines out of service
  - Low voltage conditions in Vermont and the region – VY controls high and low voltage conditions on the regional grid:

# Section III –
# Vermont Solutions Assessment

# Vermont Solutions Assessment

- Objectives
  - Development of alternative solutions to address system deficiencies shown by the needs assessment
  - Evaluation and determination of the effectiveness of each alternative solution
  - Identification of the most cost-effective and reliable transmission solutions required to address system deficiencies
  - Selection of preferred solution

# Vermont Solutions Assessment (cont.)

- Transmission solutions under consideration to address long-term issues include:
  - Various 115 kV line and substation upgrades in VT
  - A new tie lines into northern or eastern VT
  - A new transmission line within VT
  - Additional reactive support to control and improve voltage performance
- New generation resources and energy efficiency could also be part of the solutions and delay/displace some of the transmission solutions

# Vermont Solutions Assessment (cont.)

- Next steps
  - Complete solutions assessment
  - Rank alternatives considering
    - Cost estimates
    - Timing and ease of construction
  - Continue coordinating potential solutions for common issues raised in VT & NH Needs Assessments
  - Post draft Solutions Assessment for Stakeholder review 2nd/3rd Quarter 2010

# Conclusions

- Vermont Needs Assessment identifies potential future deficiencies with and without Vermont Yankee
  - Voltage control and transmission are key
  - Deficiencies more severe with VY out of service
- Potential Solutions Being Identified
  - It is likely that investments in the following will be necessary:
    - Voltage support upgrades
    - Transmission upgrades
      - Timing will be critical here
        - Northwest Reliability Project 4 -5 years
        - Southern Loop Project 3-4 years