Overview of ISO New England and the New England Wholesale Power Markets

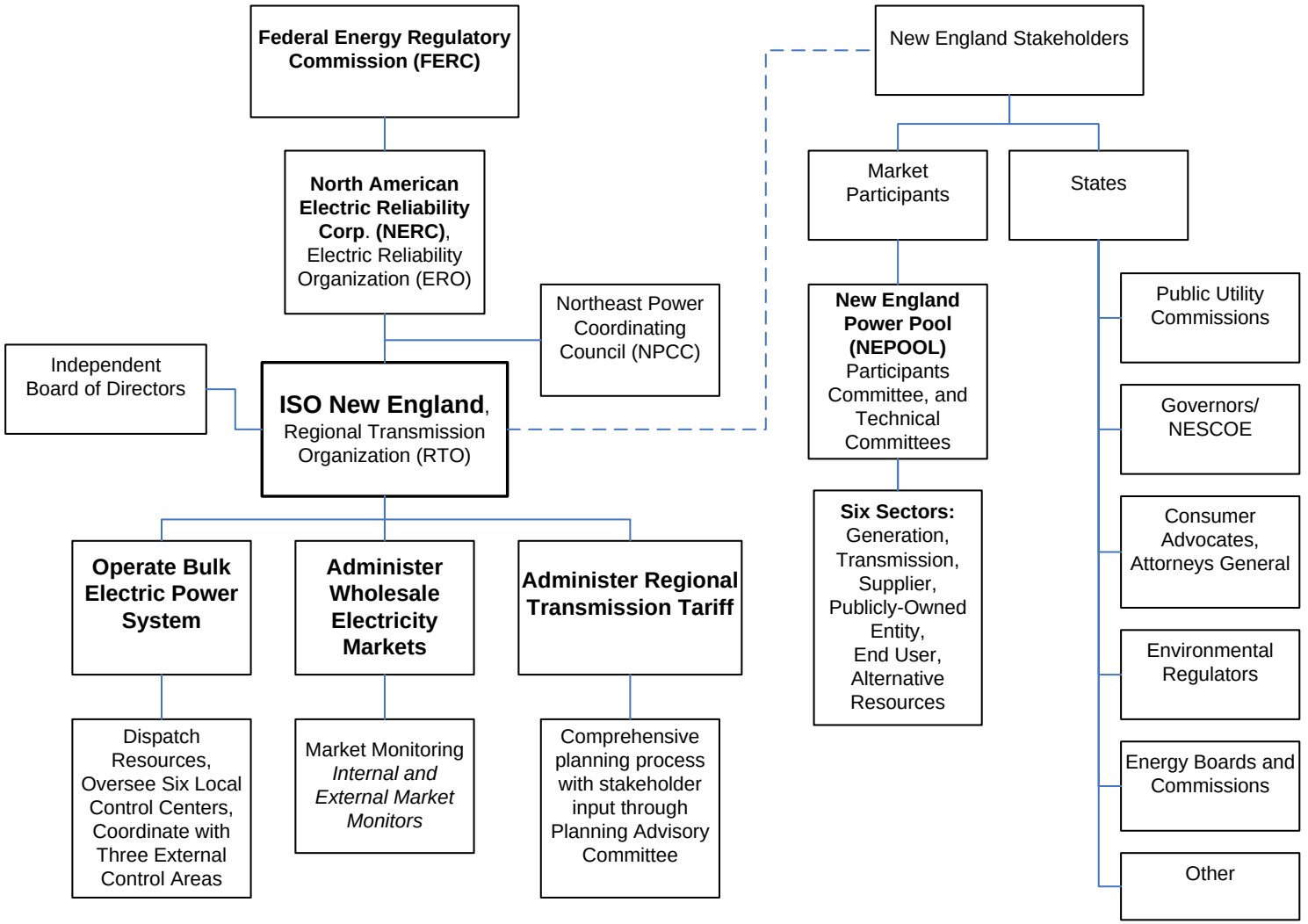
Boston Chapter of IEEE PES Technical Meeting
June 15, 2010

Stephen J. Rourke
Vice President, System Planning

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**

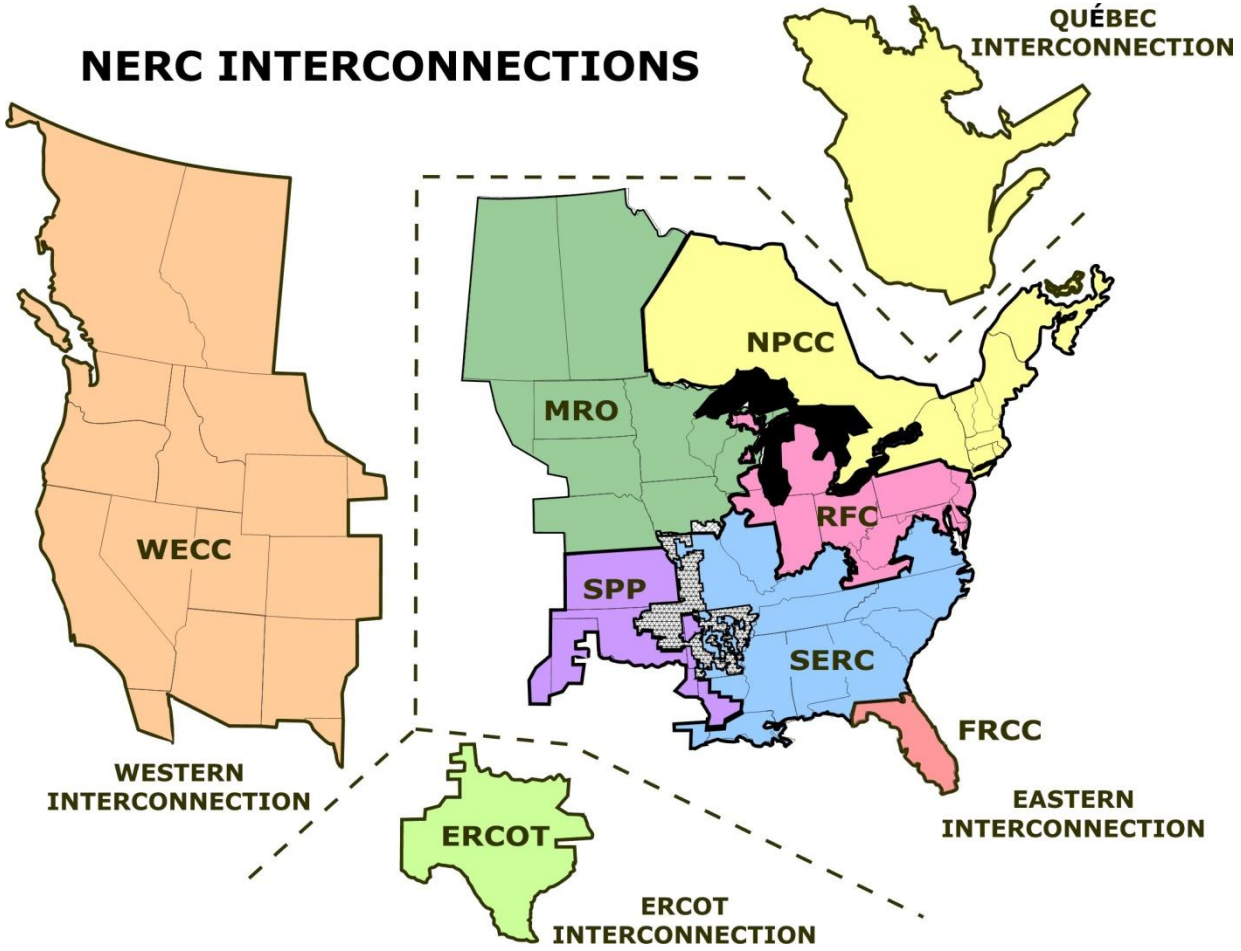
ISO New England and Stakeholders



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+ MW of total supply (summer)
- 2,000+ MW of demand response (9/09)
- Peak demand
  - Summer: 28,130 MW (8/06)
  - Winter: 22,818 MW (1/04)
- 400+ participants in the marketplace
- $12 billion electric energy market (2008)

Part of the Eastern Interconnection



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

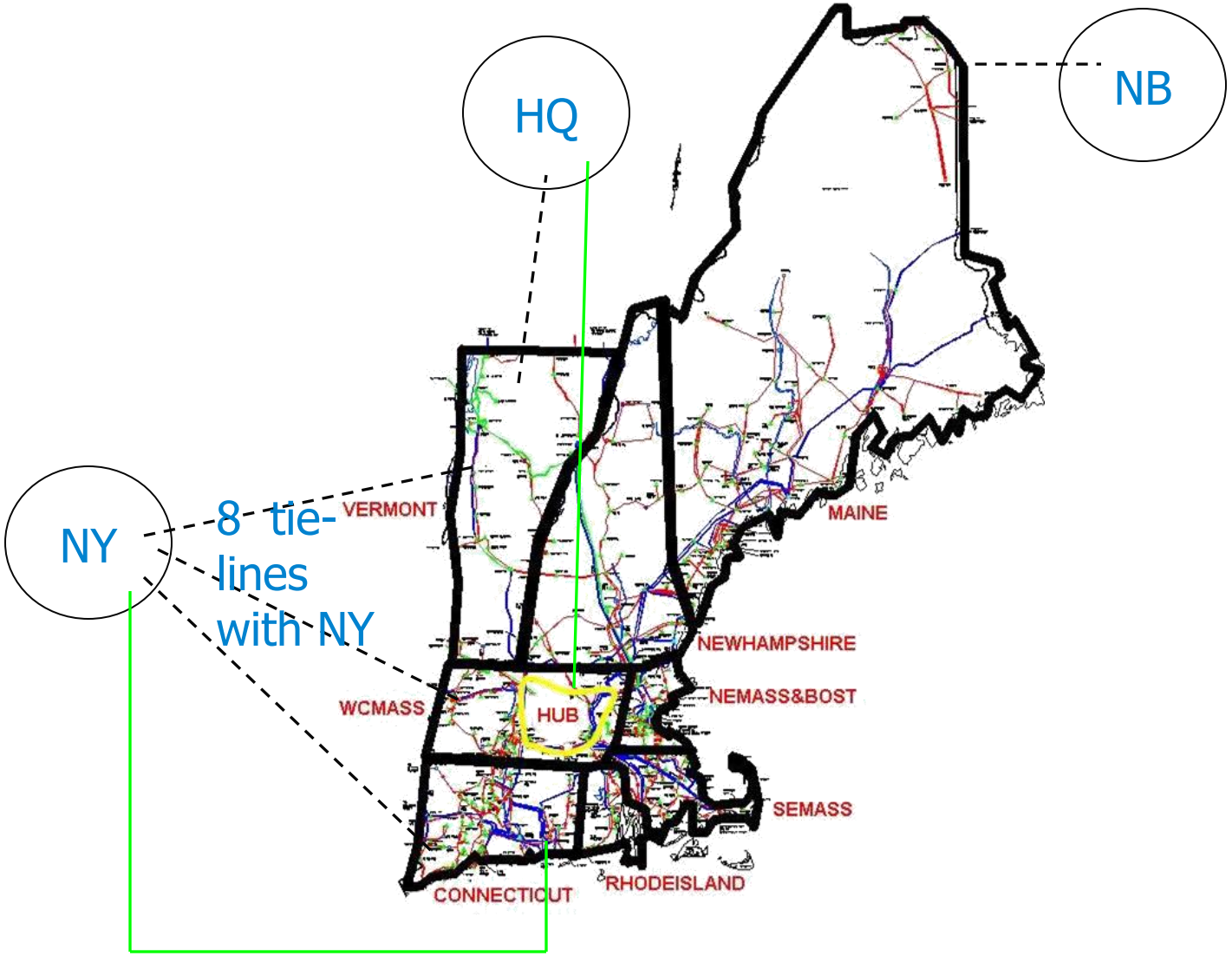
ISO's Major Responsibilities, cont.

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

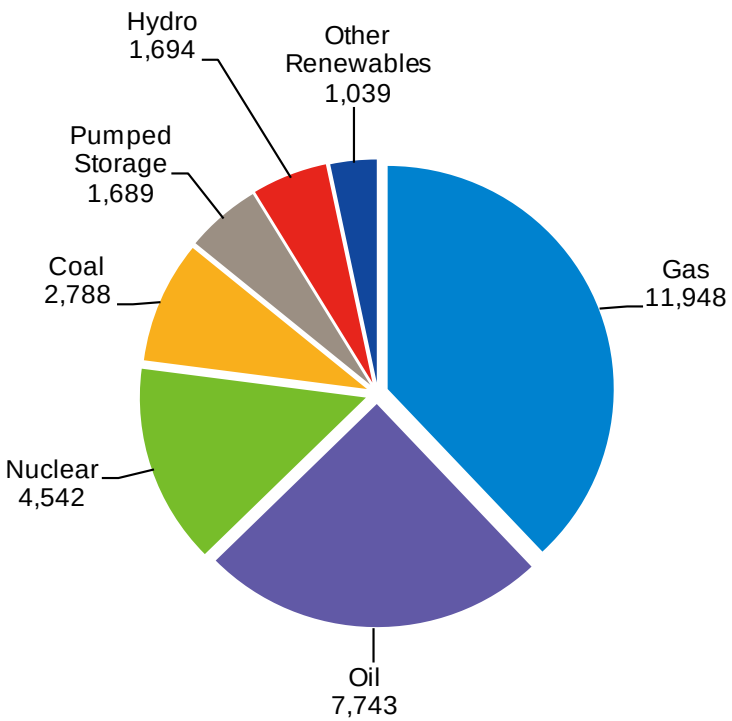
New England's Physical Electric System

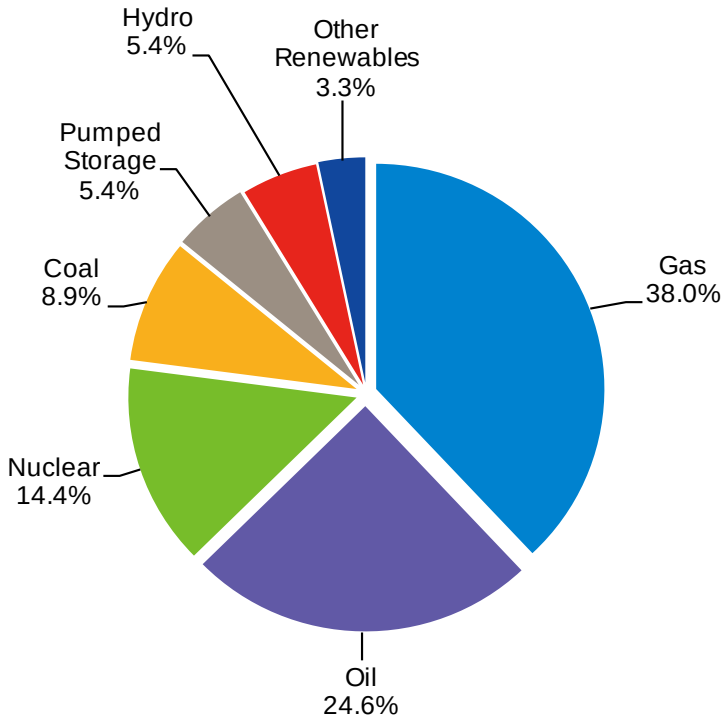
Operation of the Interconnected Power System



New England Generation Capacity Mix by Primary Fuel Type

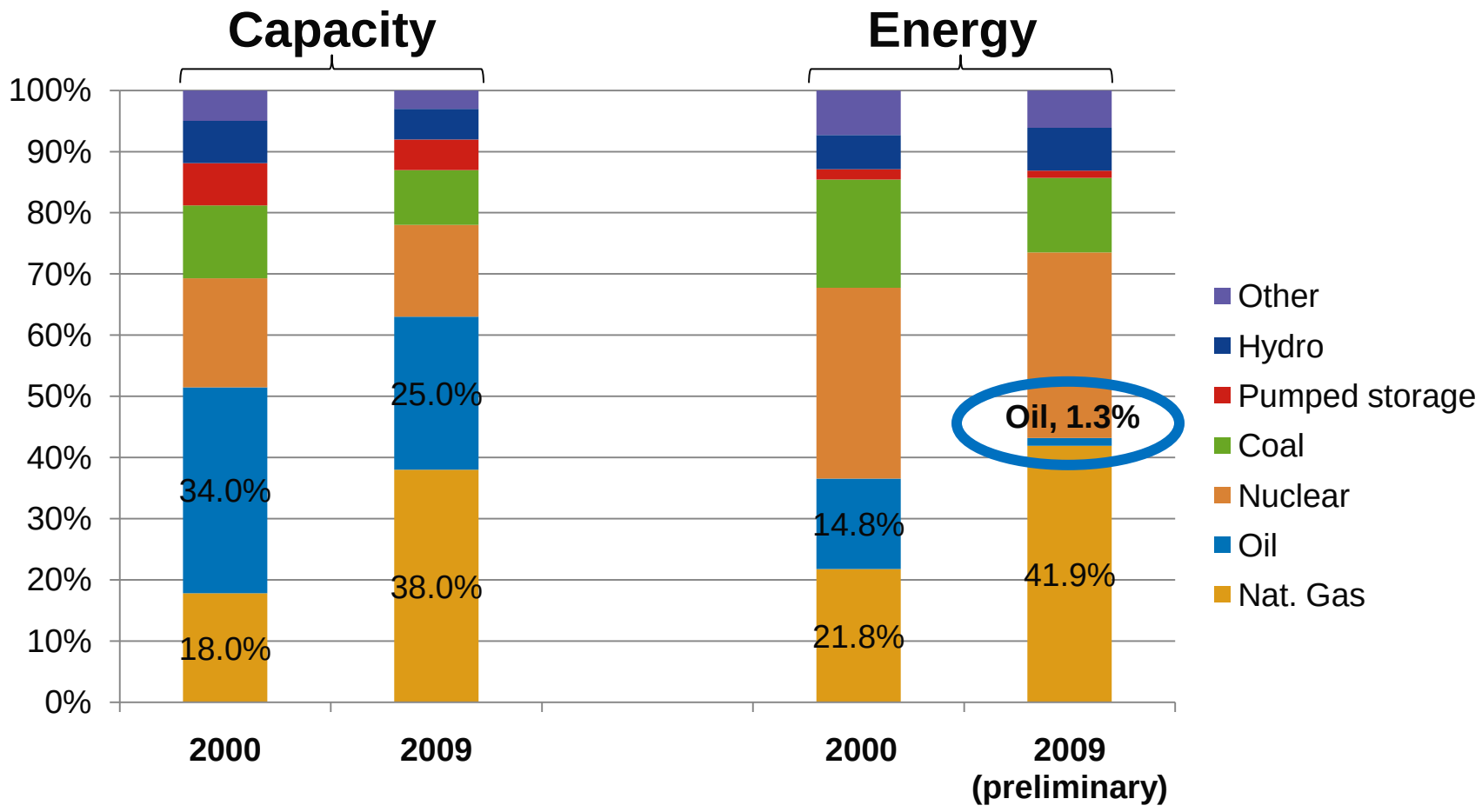
2009 Summer Ratings, MW, and Percentage



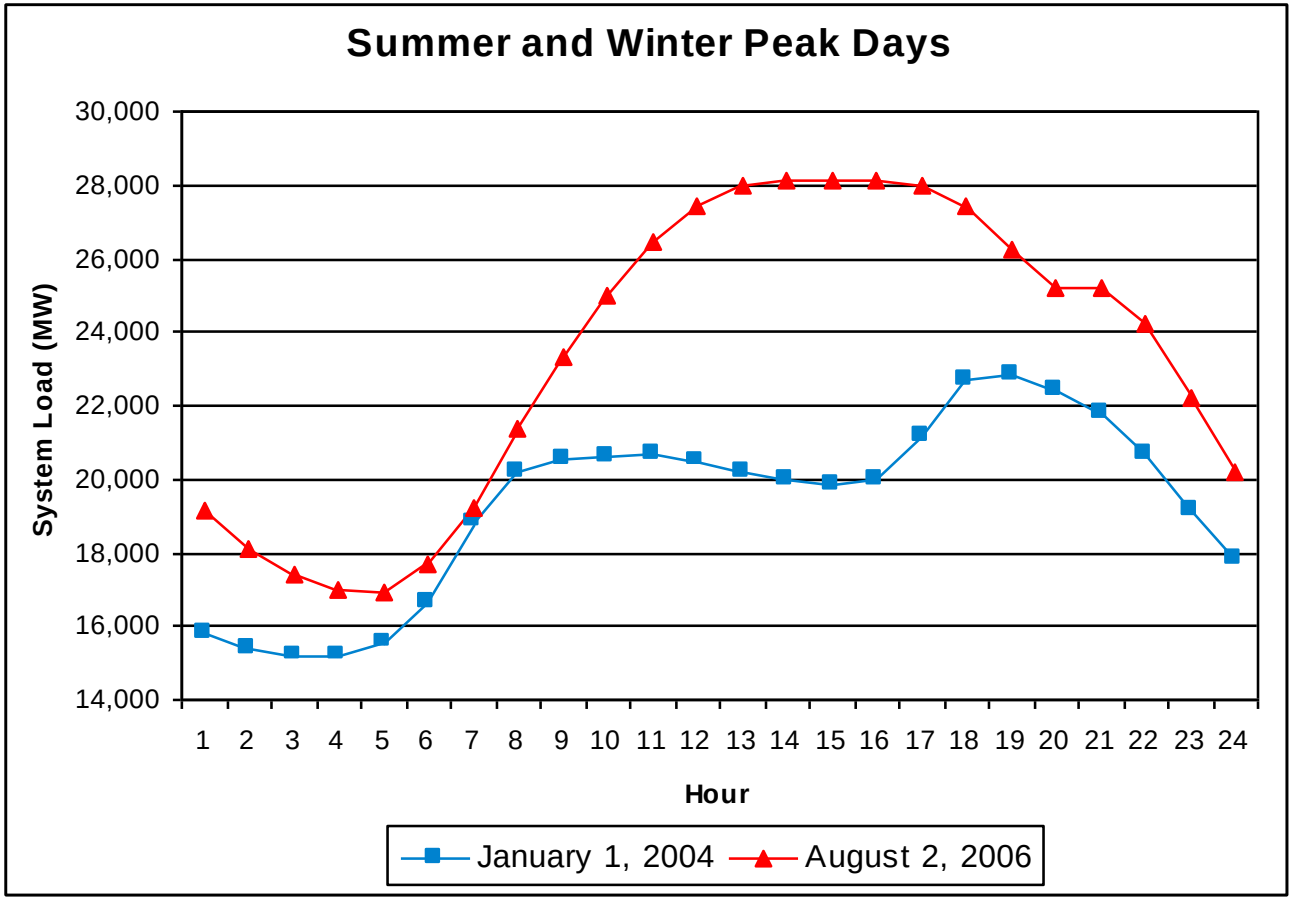


Shift in New England's Fuel Mix

New highly efficient natural-gas-fired generators displace use of fuel oil



Summer and Winter Peak Demand



ISO New England Control Room

Control Room Operators

GENERATION COORDINATOR
Responsible for scheduling external contracts with other control areas communicating with generators

FORECASTER
Responsible for forecasting electricity demand

LOADER
Responsible for unit dispatch, balancing demand with generation

SECURITY
Responsible for transmission security

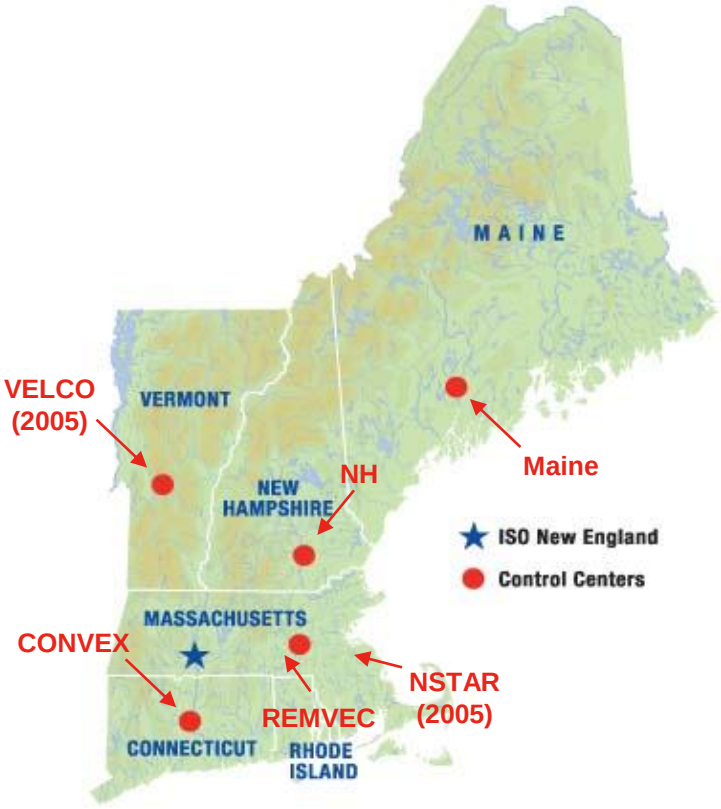
SPARE
Available workspace for emergencies

SENIOR
Responsible for overseeing Real-Time Operations and Evaluating Next-Day Conditions

SUPERVISOR
Responsible for overseeing operations

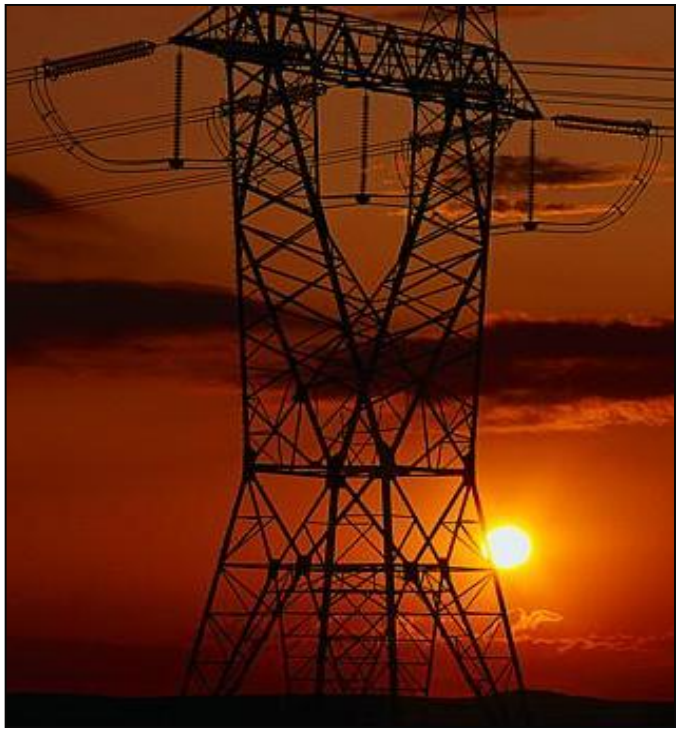
Central Dispatch by ISO New England

- Dispatch New England's resources as a single system to
  - Maintain reliability throughout the region
  - Minimize cost of electric production in New England
  - Adhere to national, regional, and local operating procedures and policies
- Relies on Local Control Centers (LCCs) operated by Transmission Owners for transmission system switching



Adequate Transmission

- Competitive markets require a way to get power where it needs to go, when it's needed
- Transmission constraints in New England have resulted in
  - "Load pockets" (electricity does not get in easily), i.e., Southwest CT or Northeast MA
  - "Bottled generation" (generation cannot be transmitted easily), i.e., Maine
- The establishment of ISO New England as a Regional Transmission Organization (RTO) has given the ISO the authority to require Transmission Owners to build transmission subject to state siting authority



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

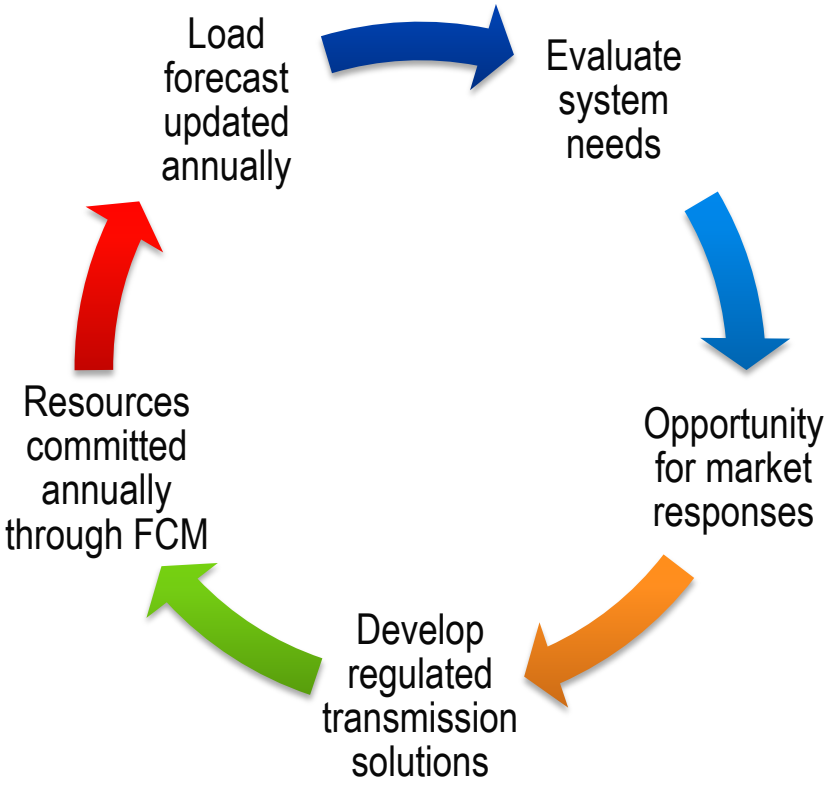
NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

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.

New England's Planning Process is Continuous, Adaptive, Successful

- Transparent, 10-year annual needs assessment reflects
  - Updated load forecasts
  - Market responses
  - Timing of future resource needs
- Identifies regionally preferred transmission solutions
- Results: reliability-based transmission investment across the region

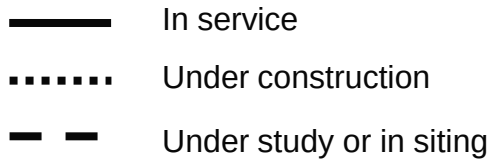


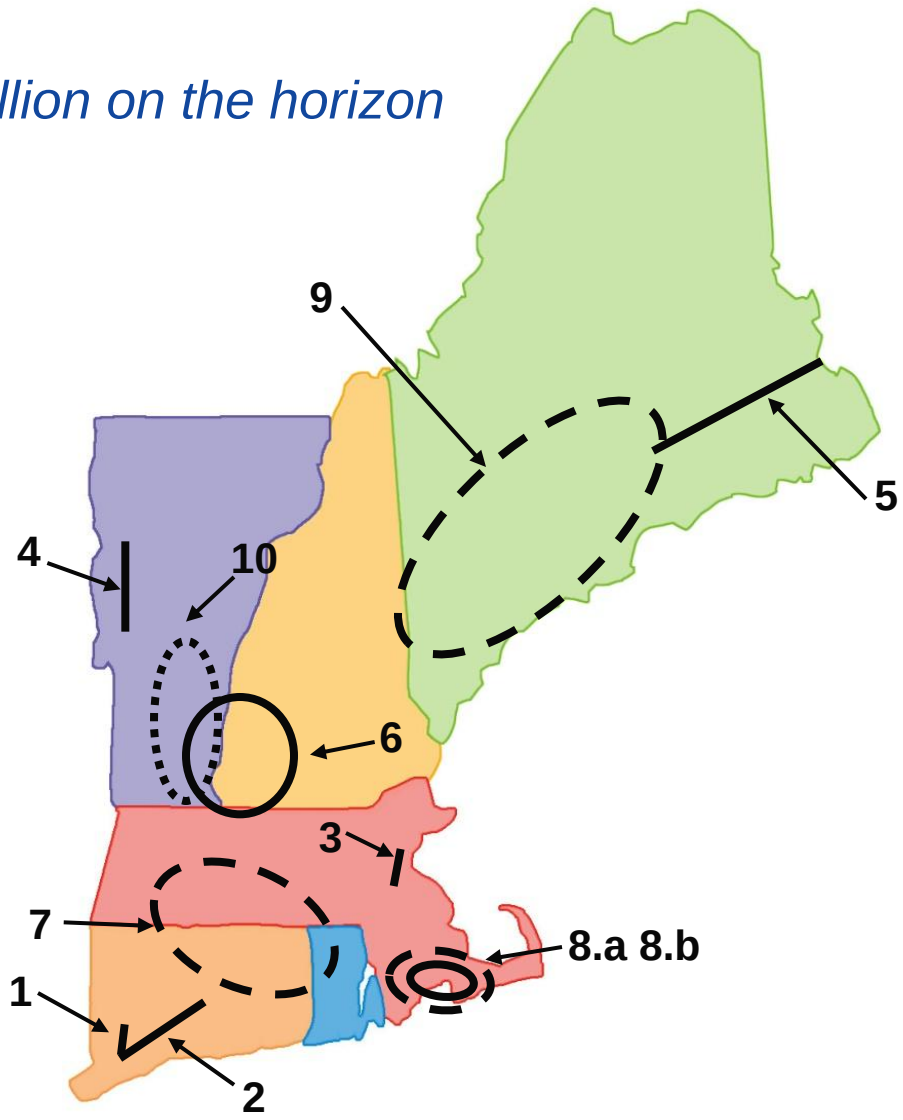
FCM – Forward Capacity Market

Transmission Projects to Maintain Reliability are Progressing

$4 billion in service; Additional $5 billion on the horizon

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
   a. Short-term Upgrades
   b. Long-term Upgrades
9. Maine Power Reliability Program
10. Vermont Southern Loop

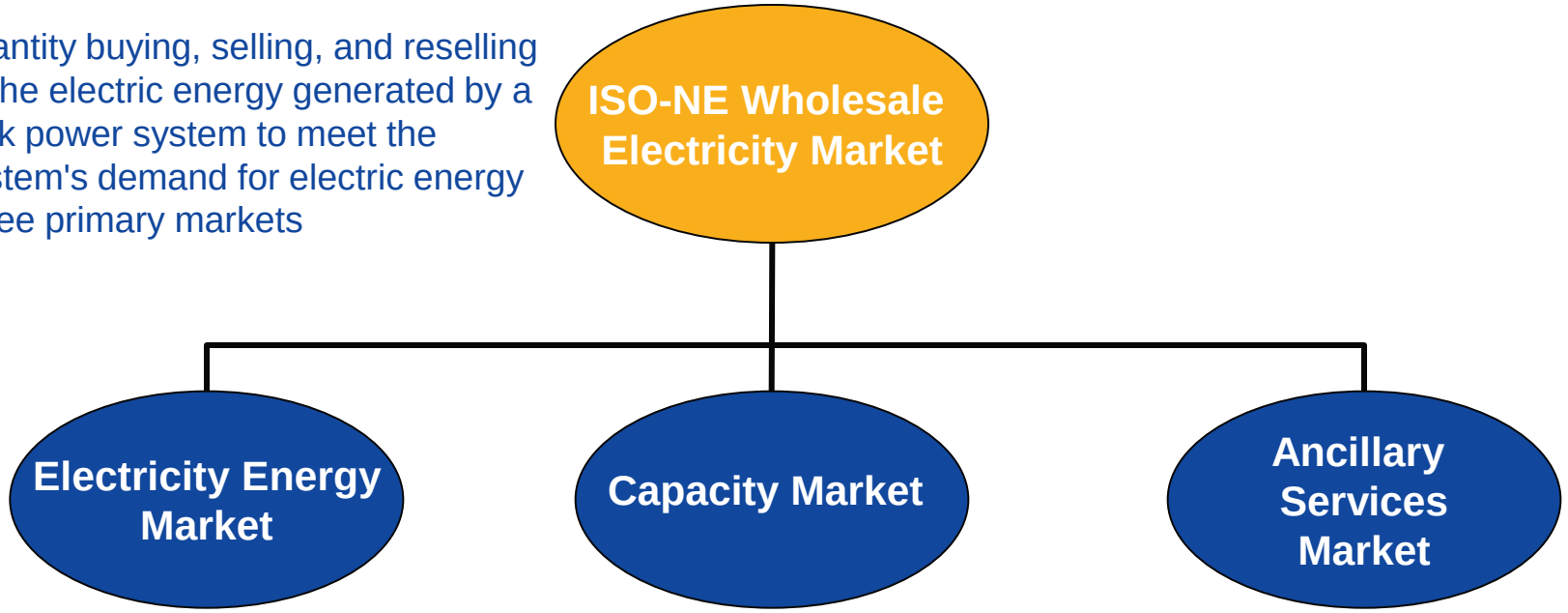




Overview of New England Wholesale Electricity Markets

ISO-NE Wholesale Electricity Market

- Quantity buying, selling, and reselling of the electric energy generated by a bulk power system to meet the system's demand for electric energy
- Three primary markets

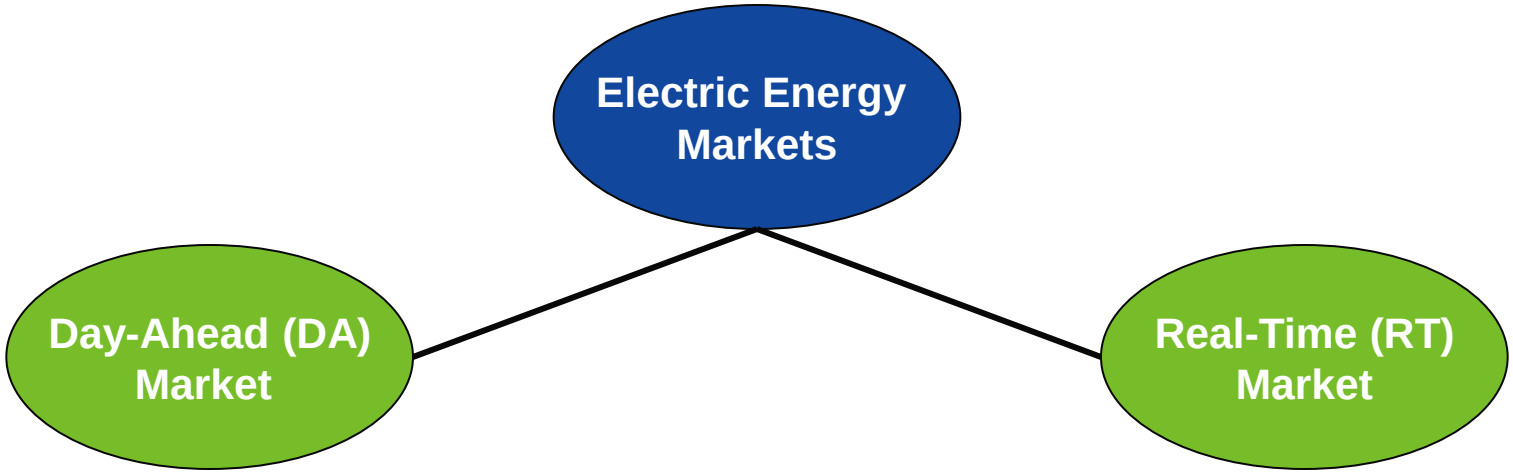


System for purchasing and selling electric energy using supply and demand to set the price

Market where generators receive compensation for investing in generating capacity

Services that ensure the reliability of and support for the transmission of electricity

ISO-NE Electric Energy Markets



DA Market produces financially binding schedules for the production and consumption of electricity one day before the operating day

RT Market balances differences between the DA scheduled amounts of electricity needed and the actual RT load requirements

Locational Marginal Pricing (LMP)

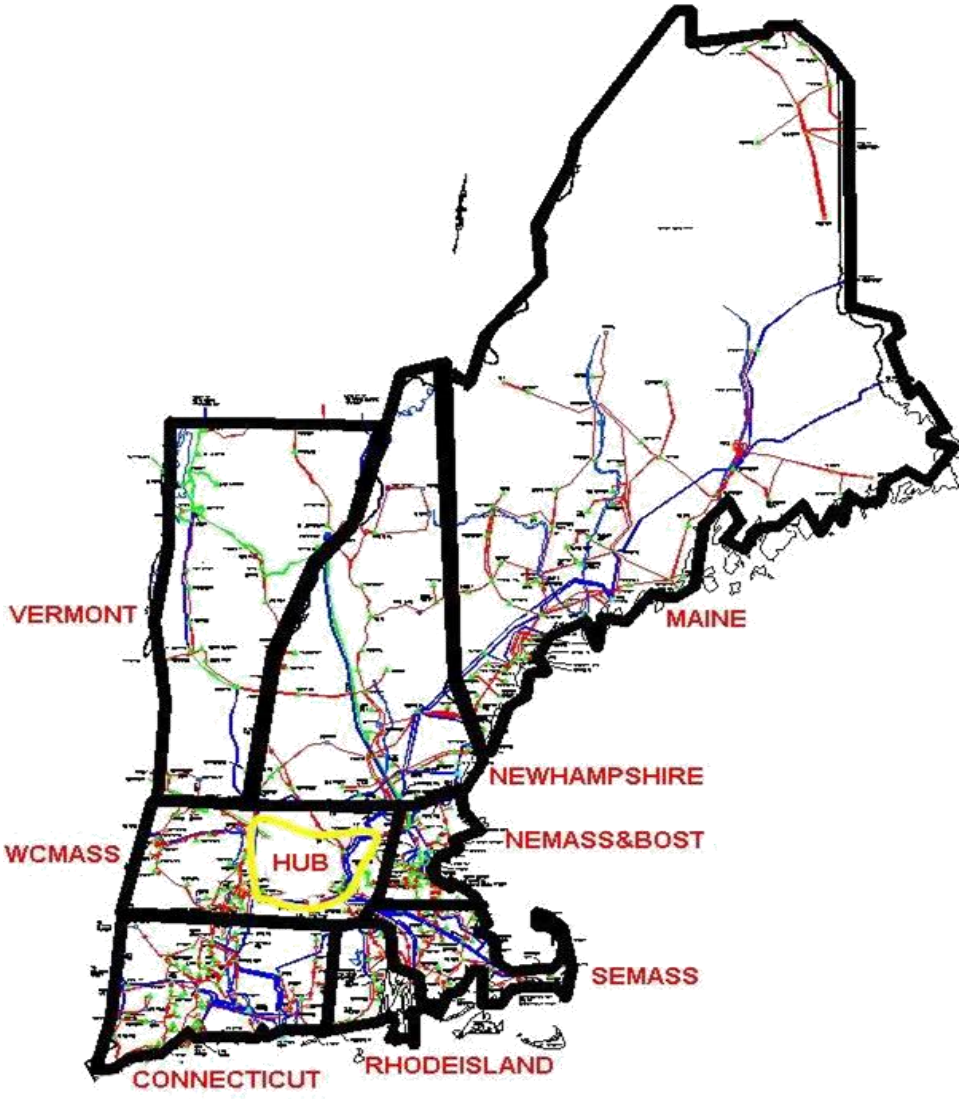
Essential Features of New England Wholesale Electricity Markets, *cont.*

- LMP
  - Pricing of electricity that includes three components: Energy, Congestion, and Losses
  - Listed as Price & MW
- Nodes (pricing node, pnode)
  - Points on the New England Transmission System at which LMPs are calculated
  - 900+ in New England
  - Generation is paid at their Node - Nodal Price

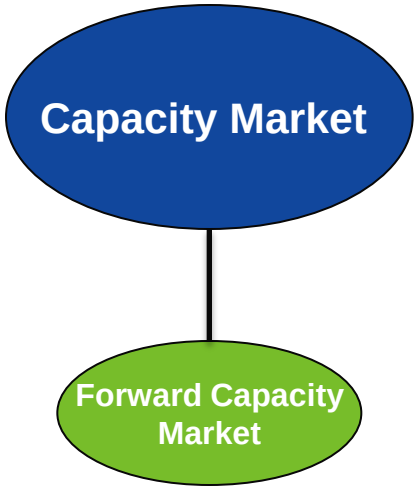
Essential Features of New England Wholesale Electricity Markets, *cont.*

- Zones
  - Load-weighted average of Nodal prices in a Zone
  - Load settles at Zonal price
  - 8 Load Zones
- Hub
  - Predefined Nodes; straight average of 32 Nodal prices
  - Cost of congestion is typically minimal
  - Hub was created to support bilateral trading

Load Zones and Pricing Hub



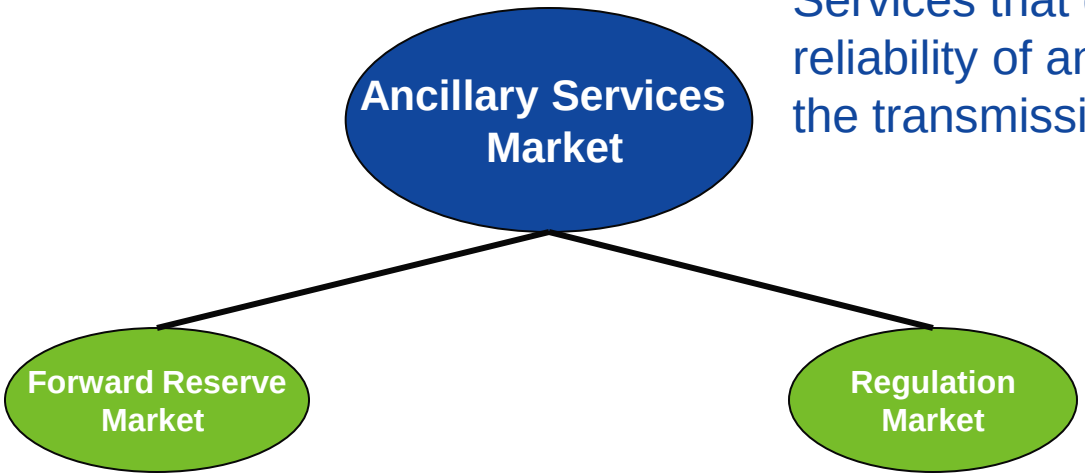
Capacity Market



Market where generators receive compensation for investing in generating capacity

Locational capacity market whereby the ISO will project the needs of the power system three years in advance and then hold an annual auction to purchase power resources to satisfy the region's future needs. Capacity zones can vary from auction to auction but reflect areas that are import or export constrained

Ancillary Services Market



Services that ensure the reliability of and support for the transmission of electricity

Market used for acquiring the generating resources needed to satisfy the requirements for Ten-Minute Spinning Reserves, Ten-Minute Non-Spinning Reserves and Thirty Minute Operating Reserves

Market in which load-serving entities pay for regulation service and market participants satisfy regulation requirements by providing the service