

ISO New England Overview: Presentation to the Northeast Chapter of the National Hydro Association

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The People Behind New England's Power

- Private, not-for-profit corporation created in 1997 to oversee New England's restructured electric power system and bulk power grid
 - Independent of companies doing business in the market
 - Regulated by the Federal Energy Regulatory Commission (FERC)
- 400 employees headquartered in Holyoke, Massachusetts



New England's Electric Power Grid at a Glance

- 6.5 million customer meters
 - Population 14 million
- 300+ generators
- 8,000+ miles of high voltage transmission lines
- 12 interconnections to three neighboring systems:
 - New York, New Brunswick, Quebec
- 32,000 megawatts (MW) of installed generating capacity
 - Includes 1,700 MW demand response
- 300+ market participants (NEPOOL)
- System peak:
 - Summer: 28,130 MW (August 2006)
 - Winter: 22,818 MW (January 2004)



ISO New England's Role – Three Responsibilities

- Maintain day-to-day bulk power generation and transmission system reliability
 - Provide centrally dispatched direction for the generation and flow of electricity across the region's interstate high-voltage transmission lines
- Oversee and administer New England's wholesale electricity marketplace, through which bulk electric power is bought, sold, and traded
 - Similar to a “stock exchange” for wholesale electricity purchases and sales
- Plan and ensure the development of a reliable and efficient bulk power system to meet New England's current and future power needs

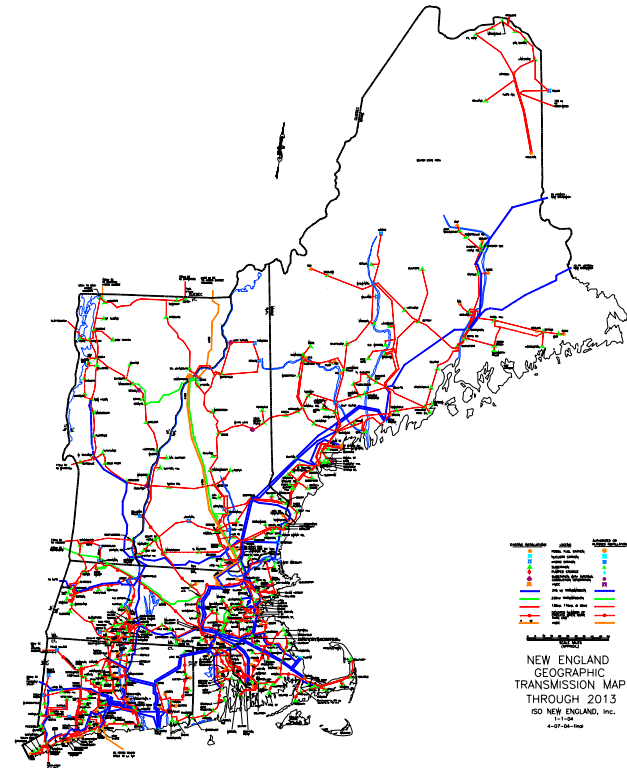
RTO Governance Documents

- **Transmission, Markets and Services Tariff** defines the rates, terms and conditions for transmission, market, and other services provided by ISO-NE.
 - Market Rule 1
 - Market Participant Service Agreement (MPSA)
- **Participants Agreement** provides overall governance structure and defines relationship with the New England Power Pool (NEPOOL).
- **Transmission Operating Agreements** provides the terms under which Transmission Owners transfer operational authority of their facilities to ISO-NE in its role as the RTO.
- Any changes must go through an extensive stakeholder process with NEPOOL and its six sectors.
 - End User, Publicly-Owned Entity, Supplier, Transmission, Generation, Alternative Resources

Operating the Bulk Power Grid

Operating the Bulk Power System

- From its central location, ISO-NE:
 - Dispatches and commits generating, demand response, and external purchases to meet expected load and reserve requirements
 - Coordinates and approves generating and transmission facilities' outage requests to assure reliable system operation
- ISO-NE operates the grid as a single system to:
 - Maintain short- and long-term reliability throughout the region
 - Operate the system in the most reliable and efficient manner
 - Minimize cost of electricity production



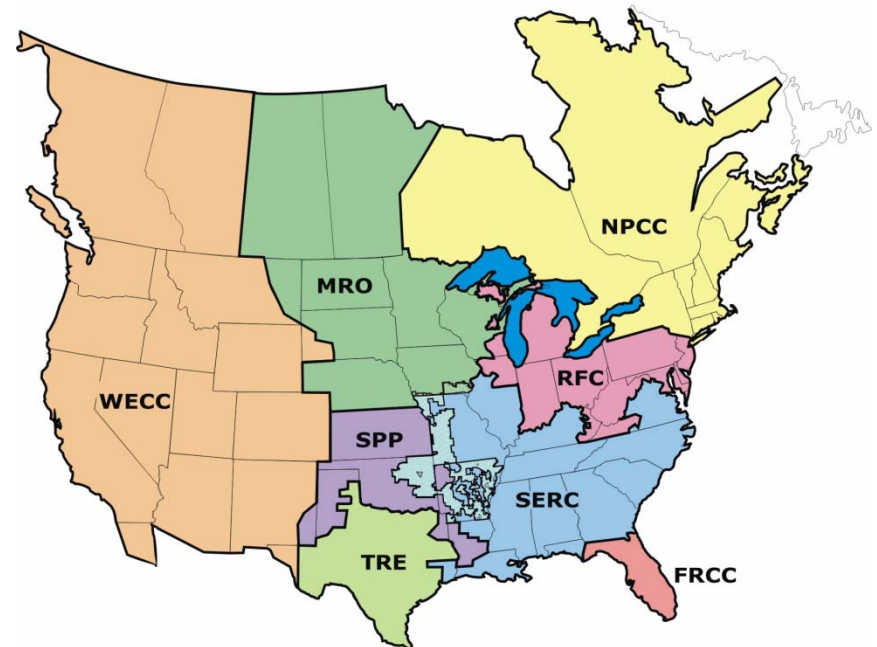
ISO New England's Control Room

- State-of-the-art control room opened in 2007
- Centerpiece is the 12 ft. x 47 ft. dynamic display board
- Allows wide-area dynamic view of neighboring operating areas in the Northeast
- Dynamic visualization tools for monitoring the health of the power system



Reliability and Performance Standards

- Bulk power system is designed, built, and operated to reliably meet power needs in accordance with established industry criteria
- Since the passage of the 2005 Federal Energy Policy Act, reliability standards are mandatory and non-compliance is subject to penalty
 - North American Electric Reliability Corporation (NERC) establishes reliability and performance standards
 - ISO-NE is a member of the Northeast Power Coordinating Council (NPCC)



Overseeing and Administering New England's Wholesale Electricity Markets

Buying and Selling Electricity

Wholesale to Retail Connection



- **Wholesale electricity**

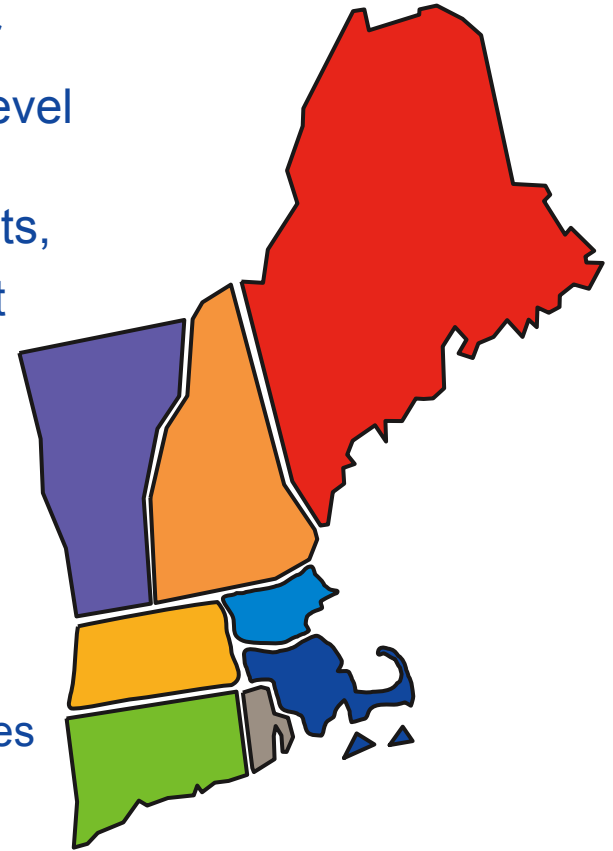
- Generators sell the electricity through either wholesale markets or contracts with utilities and competitive suppliers
- Wholesale costs/prices result from the production (generation) and transmission of the product of electricity
- Federal regulation (FERC)

- **Retail electricity**

- Electric utilities and competitive suppliers buy electricity through markets or contracts with power producers
- Households and businesses bills include both wholesale and retail costs of producing and delivering electricity
- State regulation

Running the Wholesale Electricity Markets

- ISO-NE acts as an electronic auction house for buying and selling electricity at the wholesale level
- New England's first wholesale electricity markets, launched in 1999, were built upon historic "tight power pool" operating infrastructure with uniform pricing for region
- Since 2003, Energy Market features Locational Marginal Pricing (LMP)
 - 900+ nodes or points on the system at which prices are calculated; generation is priced nodally
 - Nodes prices are averaged into eight pricing zones. Load pays zonal price for wholesale electricity.
 - Prices are made up of energy, congestion, and losses

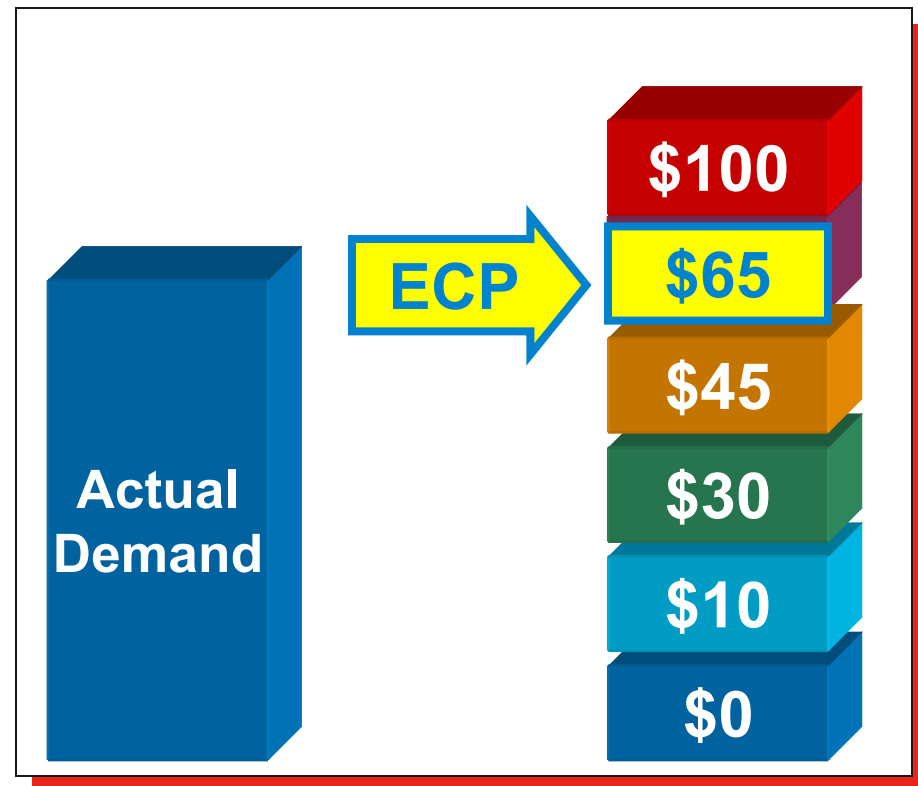


Since 2003

"LMP"

Dispatching Resources

- ISO-NE uses least expensive resources to meet minute-to-minute power needs of the region, accounting for transmission constraints and potential outages (Schedule Constrained Economic Dispatch)
- ISO New England operates electricity markets with uniform clearing prices
 - Sellers have incentive to bid operating costs, which drives efficiencies and lowers the cost of power for the entire region



Wholesale Electricity Markets Administered by ISO-NE

| Physical & Reliability | Market Tools |
|---|---|
| Electricity – Day-to-day power | Electric Energy Market – Day-Ahead Energy Market & Real-Time Energy Market |
| Reliability – Reserve Power – Frequency | Ancillary Services Market – Forward Reserve Market (FRM) – Regulation |
| Assure long-term power | Capacity Market – Forward Capacity Market for both supply- and demand-side resources |
| Congestion Management | Financial Transmission Rights |
| Reduce Peaking Demand | Demand-Response Program |

The New Forward Capacity Market (FCM)

- Procure enough capacity to meet New England's forecasted Installed Capacity Requirements three years in the future
- Select a portfolio of supply and demand resources through a competitive **Forward Capacity Auction (FCA)** process
 - Proposed resources must be pre-qualified to participate in the auction
 - Proposed resources must participate and clear in the auction to be paid
- Provides a long-term (up to 5 year) commitment to new supply and demand resources to encourage investment
- First auction held February 4-8, 2008
 - 32,305 megawatts needed for 2010-11 timeframe
 - New generating supplies: 626 megawatts
 - New demand-side resources: 1,188 megawatts
 - Rest from existing resources, including imports
- Second auction to be held on December 8, 2008
 - Proposed new generating supplies: 6,251 megawatts
 - Proposed new demand-side resources: 1,254 megawatts

FCM: Eligible Resources

- **Supply Resources**
 - Traditional Generation
 - Oil, Coal, Natural Gas
 - Intermittent/Renewable Generation
 - Hydro, Wind, Solar
- **Demand Resources**
 - Installed measures that result in additional and verifiable reductions in end-use demand
 - Energy Efficiency, Load Management, Distributed Generation
 - Demand-resource types
 - On-Peak, Seasonal Peak, Critical Peak, Real-Time Demand Response, and Real-Time Emergency Generation

Planning for the Future

System Planning for the Six States

- Planning ensures the development of a reliable and efficient bulk power system to meet New England's current and future power needs
- Process is open and ongoing
 - Stakeholders provide input
- Planning process identifies system needs and provides opportunities for market solutions (e.g. generation, demand-side measures, and transmission)
 - Regional System Plan (RSP) published annually
- Mandatory reliability standards reinforce importance of planning

Progress to Date

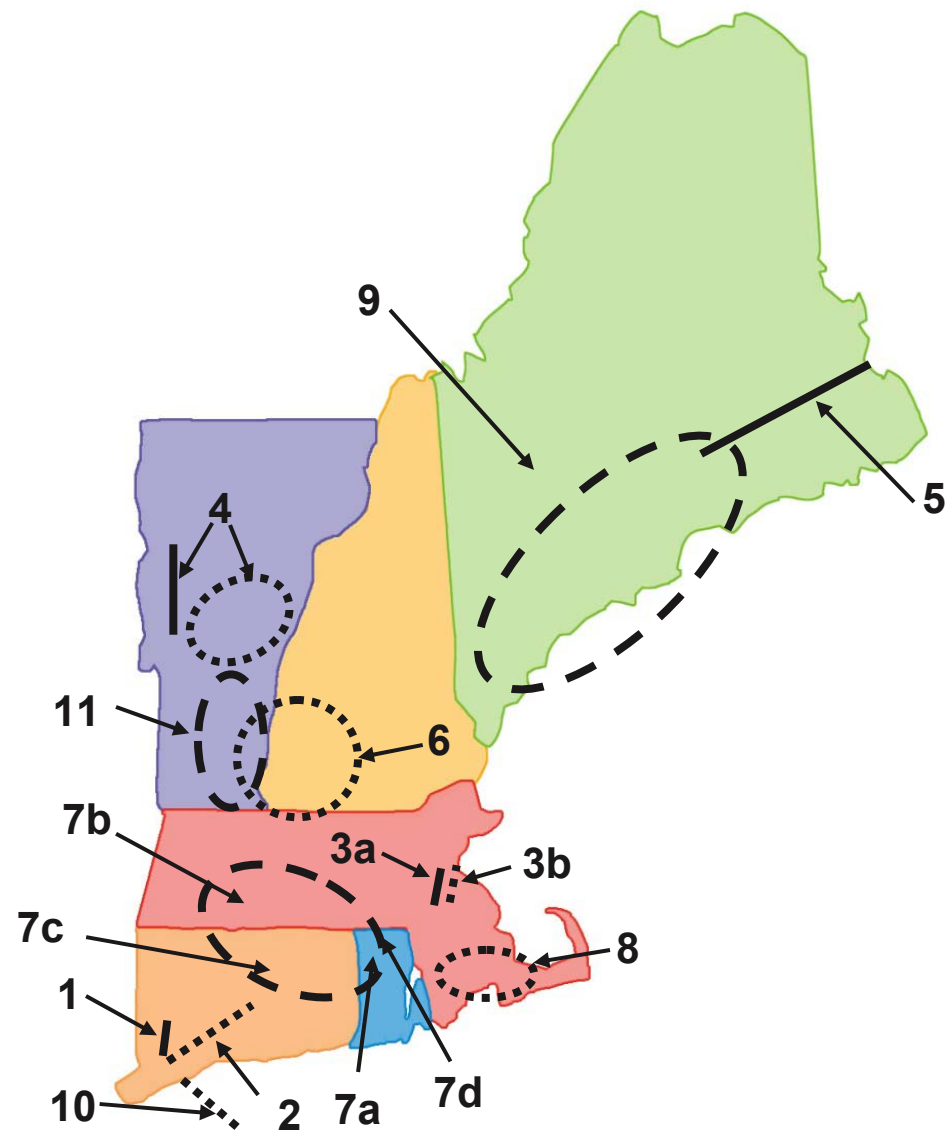
Electricity System Is More Reliable Efficient, and Environmentally Friendly

- Lights stayed on during record breaking consumer demand
- More than 9,000 megawatts of new generation added to the grid between 1999-2004, totaling \$10 billion in private investment
- Consumers shielded from investment risk
- New wholesale market attracting demand-side and renewable resources
- Cleaner plants have resulted in environmental benefits
- Major transmission projects have been developed
 - More than \$1.0 billion in transmission investment since 2002 to enhance system reliability; another \$4.0 to \$7.0 billion planned over the next 10 years
 - Approximately \$1.0 to \$2.0 billion of economic transmission investment under study for development of renewable resources

Major Transmission Projects

1. Southwest Connecticut Phase I
2. Southwest Connecticut Phase II
3. NSTAR 345 kV Project
 - a. Phase I
 - b. Phase II
4. Northwest Vermont
5. Northeast Reliability Interconnect
6. Monadnock Area
7. New England East-West Solution
 - a. Greater Rhode Island
 - b. Springfield 115 kV Reinforcements
 - c. Central Connecticut
 - d. Interstate
8. Southeast Massachusetts
9. Maine Power Reliability Program
10. 1385 Replacement
11. Vermont Southern Loop

- In service
 Under construction
 Under study



Addressing Key Challenges: Regional Reliability, Economic, and Environmental Concerns

Key Challenges for New England

- **Meeting peak demand for electricity**
 - Peak demand is growing faster than overall demand
 - Creates need for additional, costly power system infrastructure and an overall inefficient system
 - Siting is an issue
 - Increases need for energy efficiency and stronger wholesale/retail linkages

Peak Demand Is on the Rise

- **New England set new record for electricity use in 2006**
 - 28,130 MW—all-time peak
 - New England is summer peaking system
- **Projected annual growth 2008-2017:**
 - Average demand: 0.8%
 - Peak demand: 1.2% (400 MW per year)
 - Equivalent of needing to build a good-sized power plant every year just to maintain current capacity reserve margins; creates inefficient system



Peak Demand Is on the Rise, contd.

Approx. 400 MW per year of resources needed over the next decade

1991-2007 History, 2008-2017 RSP08 50/50 Forecast

