ISO New England Identifies Growing Energy-Security Risk as the Power System Undergoes Rapid Transformation

Consumer Liaison Group

Mark Karl

VICE PRESIDENT, MARKET DEVELOPMENT

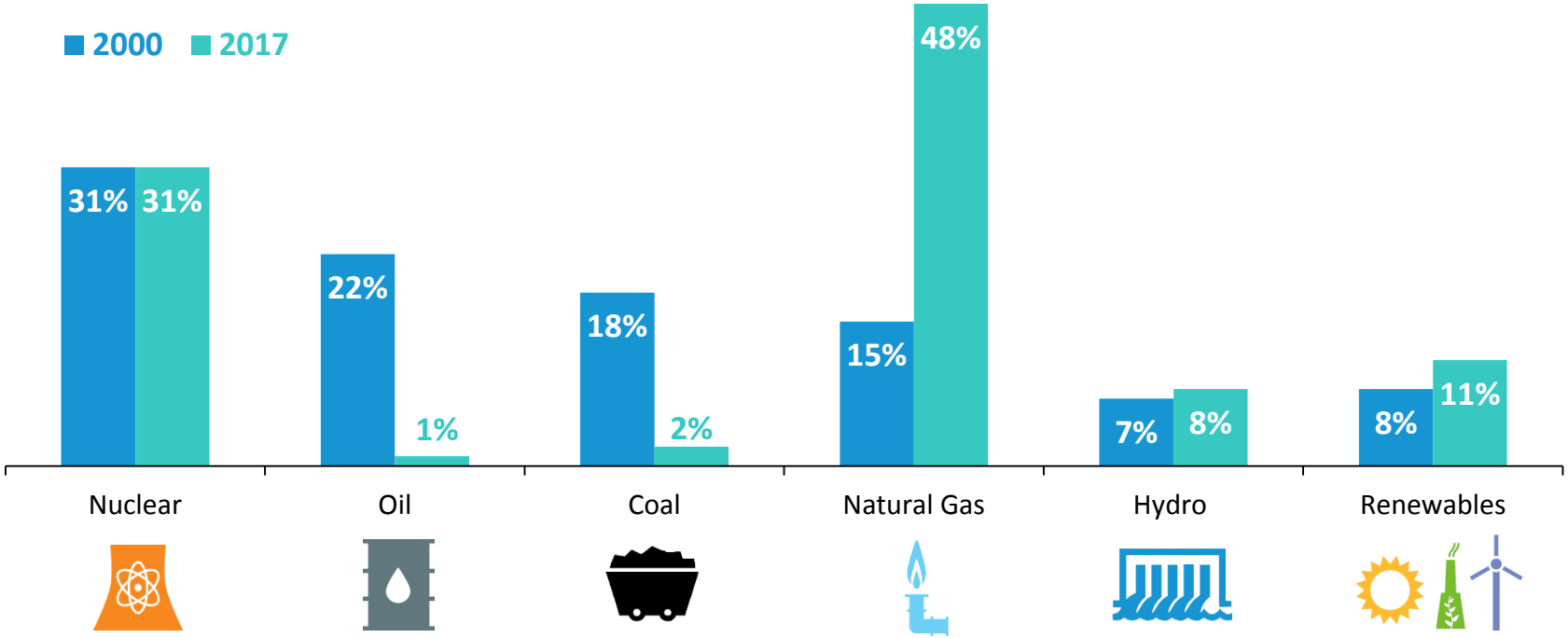
KEY MESSAGES

- New England is shifting away from resources with on-site fuel supplies (coal, oil, nuclear) toward resources with "just-in-time" fuel delivery (natural gas) and resources that are weather dependent (renewables)
- Given the system's evolving resource mix and fuel delivery infrastructure, there may be insufficient energy available to satisfy electricity demand during extended cold weather conditions
- The grid is changing dramatically—and markets must change as well
  - The current challenge is to develop a market-based mechanism to attract/retain resources that can deliver energy to the New England power system reliably

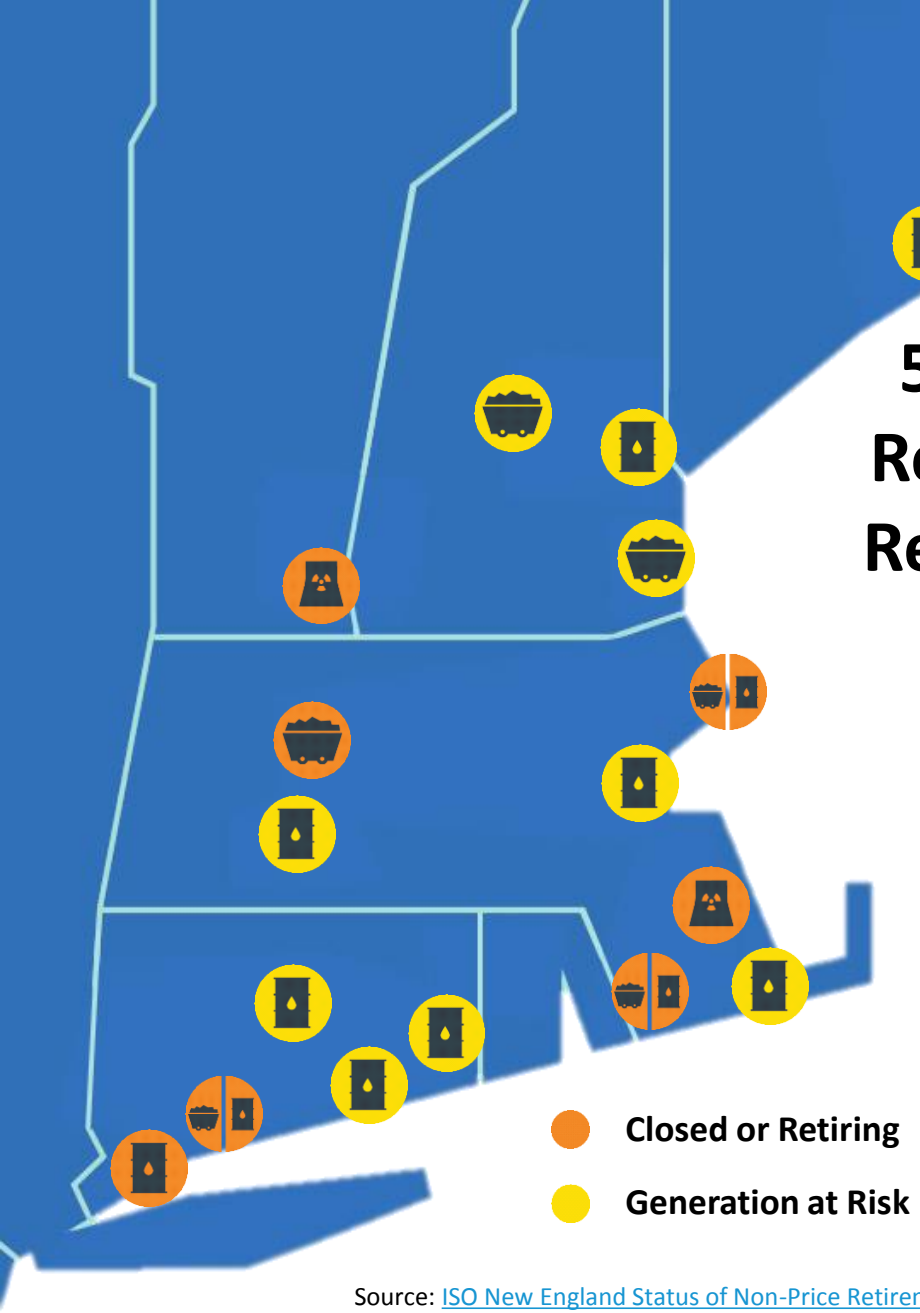
THE POWER SYSTEM IN TRANSITION

New England Has Seen Dramatic Changes in the Energy Mix: *From Coal and Oil to Natural Gas*

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2017)



Source: ISO New England Net Energy and Peak Load by Source
Renewables include landfill gas, biomass, other biomass gas, wind, solar, municipal solid waste, and miscellaneous fuels.
This data represents electric generation within New England; it does not include imports or behind-the-meter (BTM) resources, such as BTM solar.



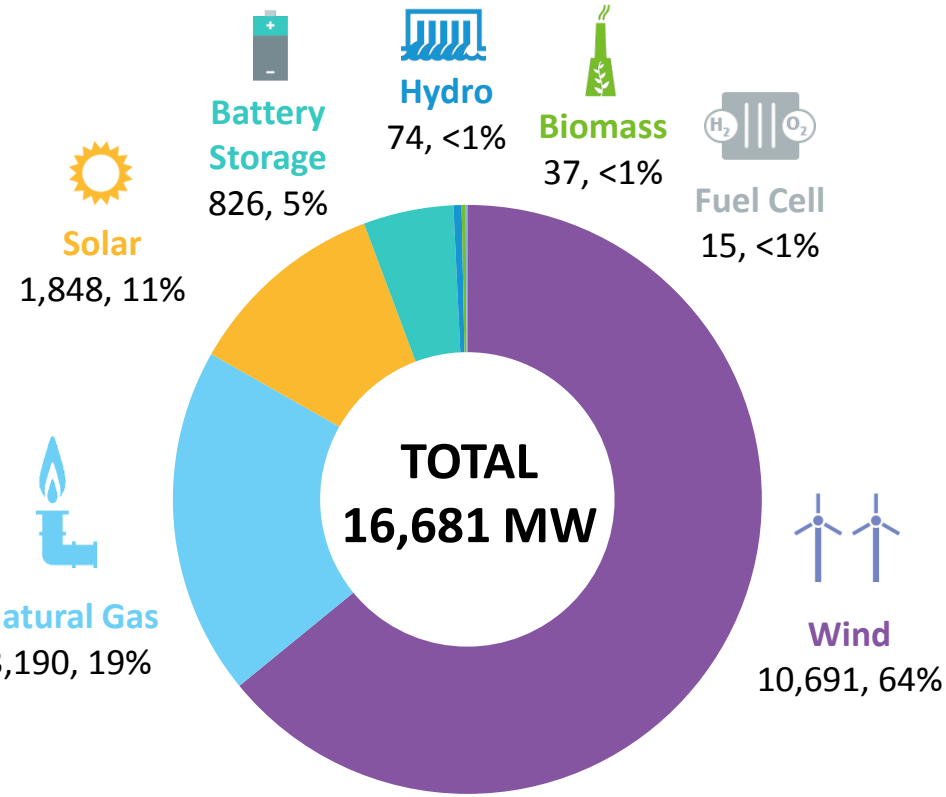
Since 2013, More Than 5,200 MW of Generation Have Retired or Announced Plans for Retirement in the Coming Years

- Include predominantly **fuel-secure** coal, oil, and nuclear resources
- Another **5,000 MW** of remaining coal and oil are at risk of retirement
- These resources have played an **important** role in recent winters when natural gas supply is constrained in New England

Source: ISO New England Status of Non-Price Retirement Requests and Retirement De-list Bids; August 17, 2018

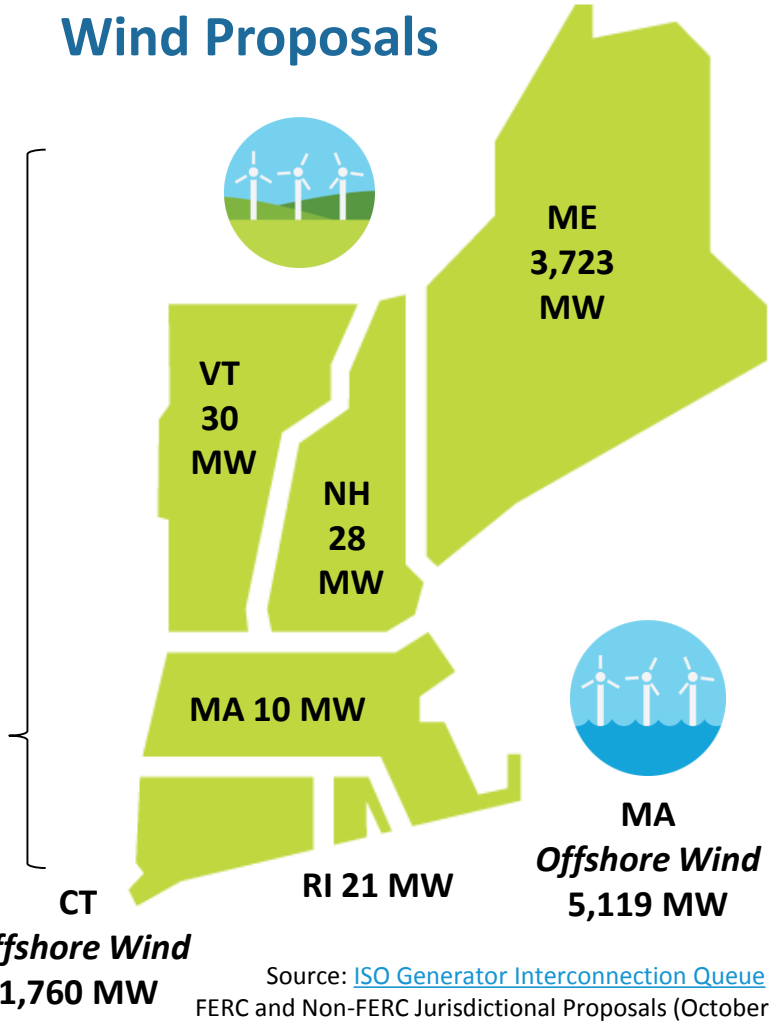
Wind Power and Other Forms of Clean Energy Dominate New Resource Proposals in the Queue

Proposals by Type



Note: Some natural gas proposals include dual-fuel units (oil); some natural gas, wind, and solar proposals include battery storage; megawatts represent nameplate capacity ratings; megawatts have been rounded.

Wind Proposals



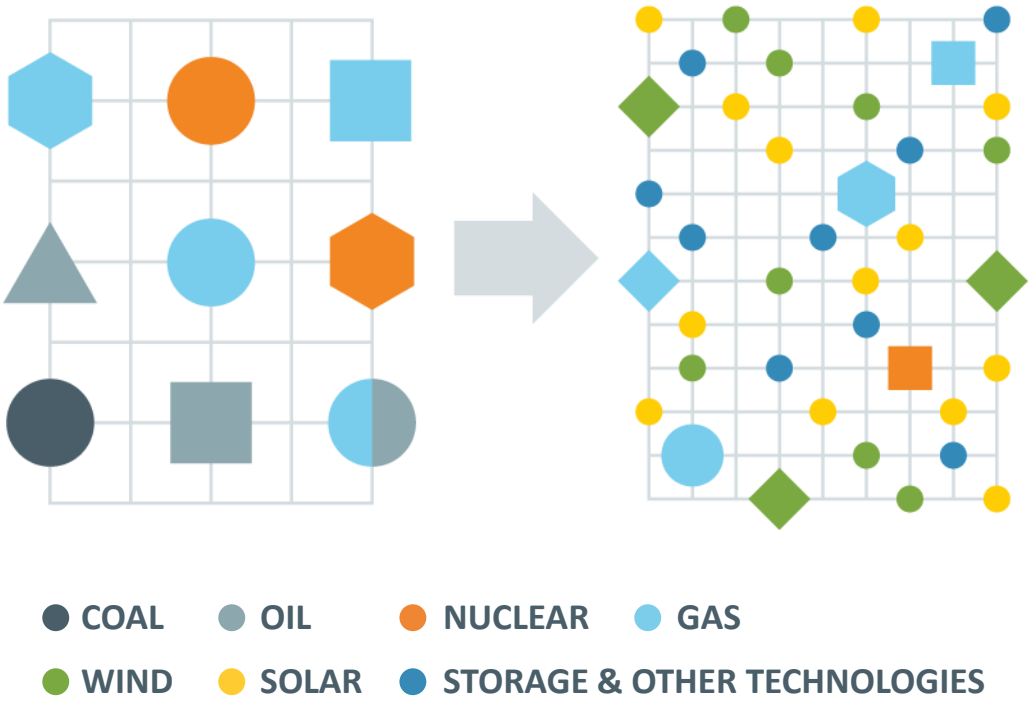
Source: ISO Generator Interconnection Queue
FERC and Non-FERC Jurisdictional Proposals (October 2018)

A Hybrid Grid Is Emerging in New England

There are two dimensions to this transition, happening simultaneously…

1. **A shift from conventional generation to renewable energy**

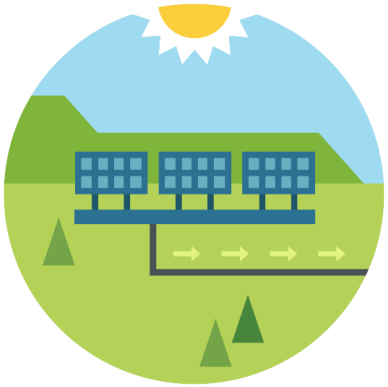
2. **A shift from centrally dispatched generation to distributed energy resources**



*Maintaining reliable power system operations becomes **more complex** with the shift to greater resources that face constraints on energy production*

Key Elements for a Reliable Transition to the Hybrid Grid: *Some Already in Place; Others in Progress*

- Maintain a **robust** transmission system
- Implement market design enhancements that **integrate** distributed energy resources
- Create a market solution to **ensure** energy security, particularly during the wintertime



WINTER ENERGY SECURITY

Winter Energy Security Is an Energy Supply Problem, Not a Capacity Shortfall Problem

- The ISO is meeting its regional resource adequacy requirement for ***capacity*** based on expected summer peak demand, but is increasingly concerned about the region's ability to overcome emerging ***energy-security*** problems during the winter
- The **challenge** is that during extended cold weather conditions, there may be ***insufficient energy*** available to the New England power system to satisfy electricity demand, given the system's evolving resource mix and fuel delivery infrastructure
- For the future hybrid grid—solving the region's energy security problem ***year-round*** will become increasingly important as the New England power system shifts toward resources that face constraints on **energy production**

Several Industry Trends Make Energy Security a Growing Concern in New England

Increase in natural-gas-fired generation relying on "just-in-time" fuel delivery

- ***Exacerbated by limited expansion of the region's underlying natural gas delivery infrastructure***

The shift to greater resources that face constraints on energy production (emerging hybrid grid)

Challenges with fuel-delivery logistics during cold weather conditions

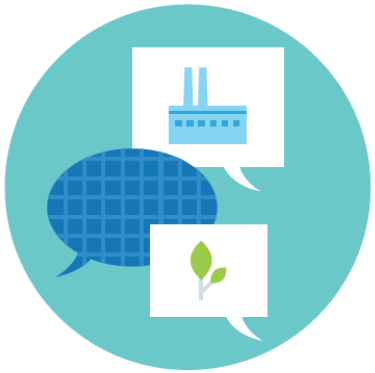
Limited dual-fuel storage and tightening emission limits on (most) oil-fired generation

Significant retirements of large, non-gas-fired generation (coal, oil, nuclear)

- ***Recent retirement announcement triggered immediate action***

ISO New England Is Pursuing Short- and Long-Term Solutions to Address Energy-Security Challenges

- **Short-term**: On December 3, 2018, the Federal Energy Regulatory Commission (FERC) accepted ISO New England's proposed tariff changes to **retain** resources seeking retirement on the basis of a fuel-security reliability need
  - Tariff changes provide for the filing of a short-term, **cost-of-service agreement** with FERC by resources retained for fuel-security reasons
  - Changes will be **in effect** for Forward Capacity Auctions #13, #14 and #15
  - In addition, the ISO is proposing an **interim** compensation mechanism for FCA #14 and #15 as a bridge to a long-term, market-based solution



- **Long-term**: Working with stakeholders, the ISO will develop a market-based mechanism to improve energy security

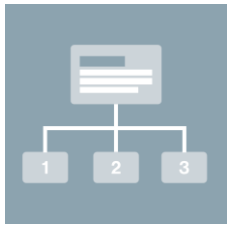
ISO New England Identified Three Broad Objectives for Improving Energy Security Over the Long Term

1. **Risk Reduction.** Minimize the heightened risk of unserved electricity demand during New England's cold winter conditions.

2. **Cost Effectiveness.** Efficiently use the region's existing assets and infrastructure to achieve this risk reduction in the most cost-effective way possible.

3. **Innovation.** Provide clear incentives for new resources and innovative technologies that can reduce this risk effectively over the long term.

Long-Term Solution Seeks to Optimize the Energy Inventory of the Region's Resources



- The ISO's conceptual approach includes three elements:

1. **Multi-Day-Ahead Energy Markets.** Run the day-ahead energy market using a rolling, six-day-ahead horizon, optimizing all energy over that timeframe.
2. **New Ancillary Service Integrated into Multi-Day-Ahead Optimization.** Provide a price signal to maintain an energy inventory that is available to be used on-demand over the six-day-ahead horizon (i.e., Energy Inventory Reserve Constraint).
3. **New (Voluntary) Seasonal Auction Ahead of the Winter Period.** Provide an incentive for resource owners to arrange energy inventory and replenishment for the coming winter.

Conceptual Approach Satisfies Several Key Design Principles and Objectives

- **Directly targets winter energy security**
  - Procures and provides, through a market-based mechanism, energy inventory to manage winter operational risks and uncertainties
- **Provides clear market price signals**
  - Directly conveys, through transparent prices, when forward-looking energy supplies become “tight” during cold winter periods
- **Provides a “risk-responsive” design**
  - The magnitude of the winter energy security problem will change over time and will be directly affected by actions taken by the region to improve energy security

Conceptual Approach Satisfies Several Key Design Principles and Objectives, *continued*

- **Provides a level playing field**
  - Enables technologies capable of providing inventoried energy to be compensated for this service, based on its aggregate supply and demand
- **Offers clear market incentives**
  - Pricing informs and incents participants to acquire, maintain, and replenish energy inventories whenever valuable (over the relevant product's horizon)
- **Mirrors existing market structures**
  - Uses the same principles and concepts as the existing energy markets and real-time reserve constraints, providing a framework that is conceptually accessible

Next Steps: Further Stakeholder Discussions and Quantitative and Qualitative Analysis

- ISO New England will continue to discuss and gather feedback on its proposed approach with stakeholders
- In 2019, ISO New England plans to launch a formal quantitative and qualitative analysis on its proposal
  - This will include analysis on potential cost impacts
- The ISO plans to file a formal proposal with the Federal Energy Regulatory Commission for review by July 1, 2019
  - The ISO anticipates a multi-year implementation effort

Questions