Building An Integrated Grid:
Achieving Renewable Energy and Climate Goals In New England and Beyond

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Connecticut Public Utilities Regulatory Authority

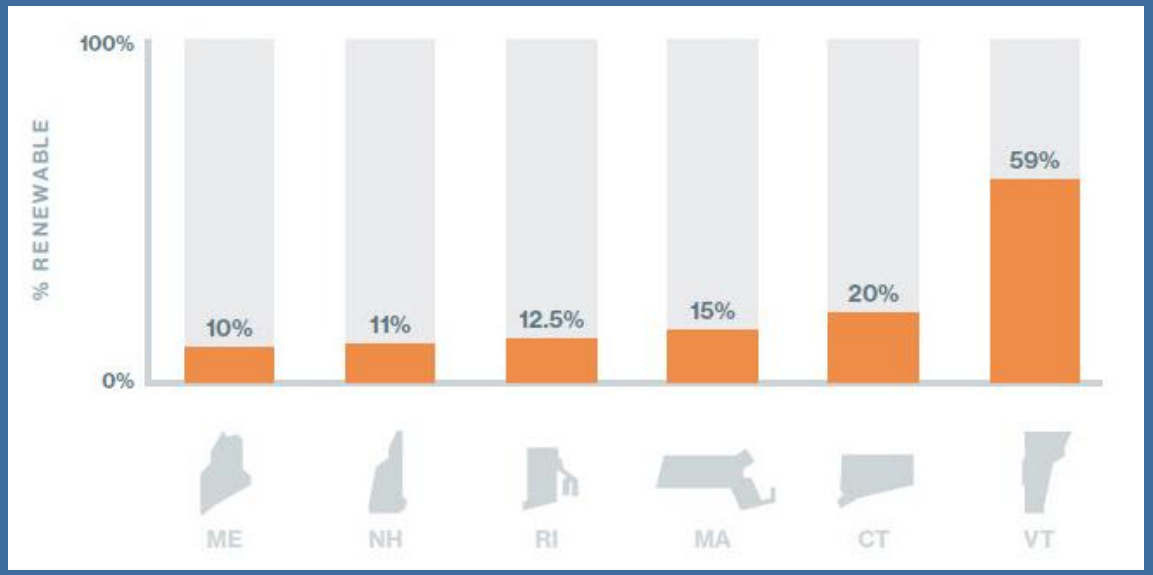
National Association of Regulatory Utility Commissioners

New England: Background

- 1999: FERC encourages voluntary formation of RTOs
- New England deregulated since 2000
- Independent System Operator – New England (ISO-NE)
- Wholesale Energy Market System since 2003
- Six States

Ambitious Multi-level Policy Goals

State Renewable Portfolio Standards for New Renewable Energy by 2020



Source: ISO New England, *2016 Regional Electricity Outlook*

Connecticut

- GWSA (1998)
- RPS
- RGGI and EEF

New England

- NEG/ECP Interim Target

United States

- Clean Power Plan

International

- COP21 – Paris

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Current Regulatory Landscape

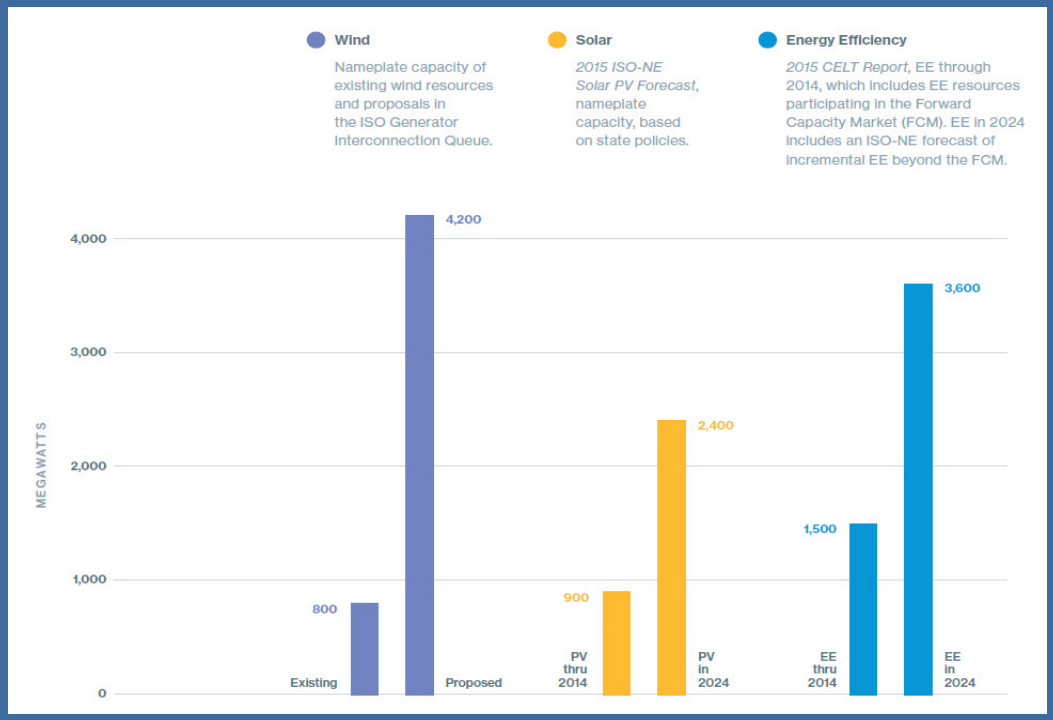
"Cleaner, Cheaper and More Reliable"

Connecticut

- Microgrids
- LREC/ZREC
- Connecticut Green Bank
- Net Metering
- Shared Solar

New England

- Three State Procurement



Source: ISO New England, *2016 Regional Electricity Outlook*

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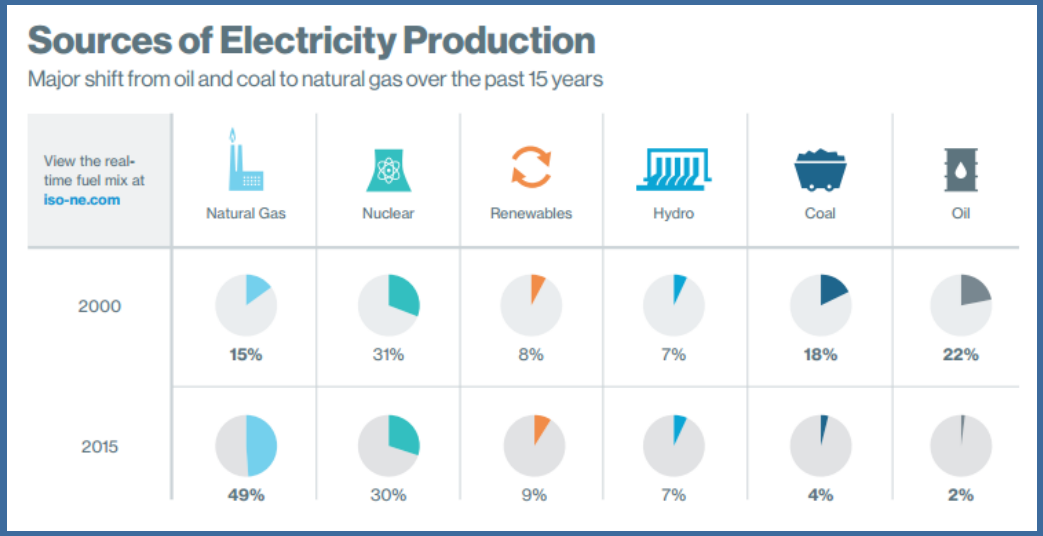
Grid in Transition: Challenges

- Inadequate natural gas pipeline infrastructure
- Significant retirements
- Integration of intermittent resources while maintaining reliability
- Expensive transmission infrastructure upgrades



Source: ISO New England, *New England Power Grid 2015–2016 Profile*

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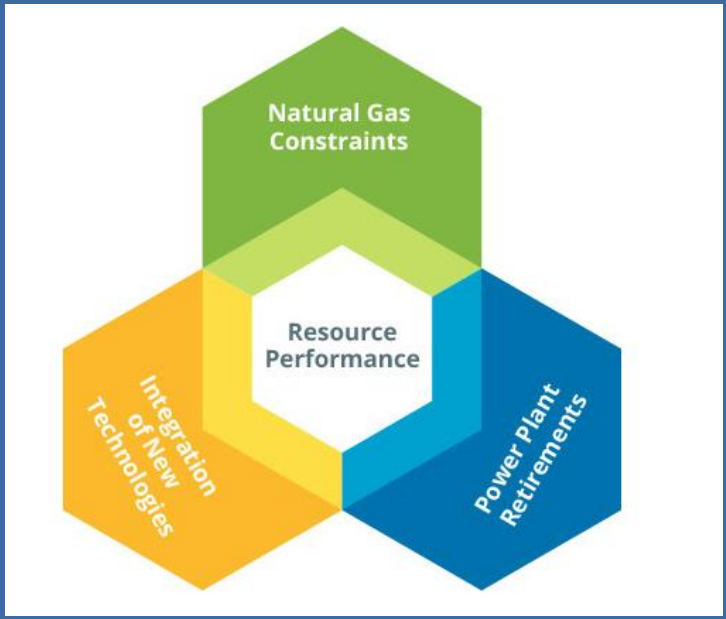
Grid in Transition: Opportunities

- Nuclear – low carbon
- States procuring small traunches of renewables in long-term contracts
- Natural gas as a bridge
- Coal/Oil Gone in CT as of 2019



Source: ISO New England, *2016 Regional Electricity Outlook*

Energy Market Design for Solar PV

Solar Resources

- Forecasting Long-Term Solar PV Growth
- Forecasting Short-Term Solar Performance Improving
- Interconnection Rules

Intermittent Resources in Wholesale Markets

ISO-NE Market Refinements:

- Flexibility to Offer Negative Prices
- Updated Elective Transmission Upgrade (ETU) Rules
- Flexibility to Operate Up to a Certain Level
  - "Do-not-Exceed Dispatch Order"

Conclusion

- The New England system is decreasing traditional resources (coal, oil, nuclear) and increasing amounts of renewable energy
- Transmission investments will be required
- Improved access to data is needed for operations and operations forecasting
- Enhanced interconnection standards are needed
- Deliberate and methodical implementation is key to a stable and gradual transition