OCTOBER 19, 2020 | VIRTUAL MEETING

The Role of ISO New England and the Region's Rapidly Changing Energy Resource Mix

Plymouth Board of Selectmen

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DIRECTOR, EXTERNAL AFFAIRS

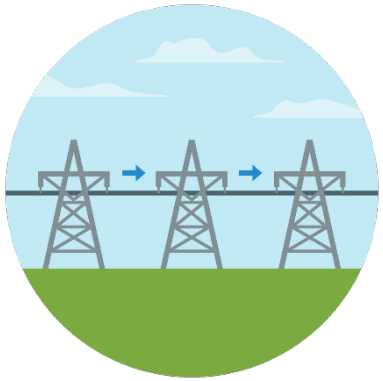
ISO New England (ISO) Has More Than Two Decades of Experience Overseeing the Region's Restructured Electric Power System

- **Regulated** by the Federal Energy Regulatory Commission
- **Reliability Coordinator** for New England under the North American Electric Reliability Corporation
- **Independent** of companies in the marketplace and **neutral** on technology

ISO New England Performs Three Critical Roles to Ensure Reliable Electricity at Competitive Prices

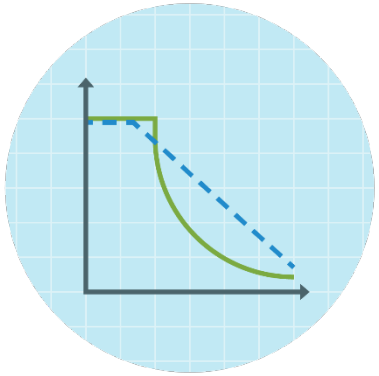
Grid Operation

Coordinate and direct the flow of electricity over the region's high-voltage transmission system



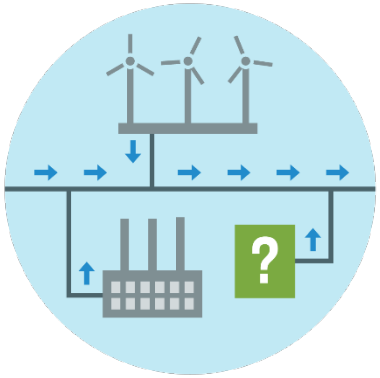
Market Administration

Design, run, and oversee the markets where wholesale electricity is bought and sold

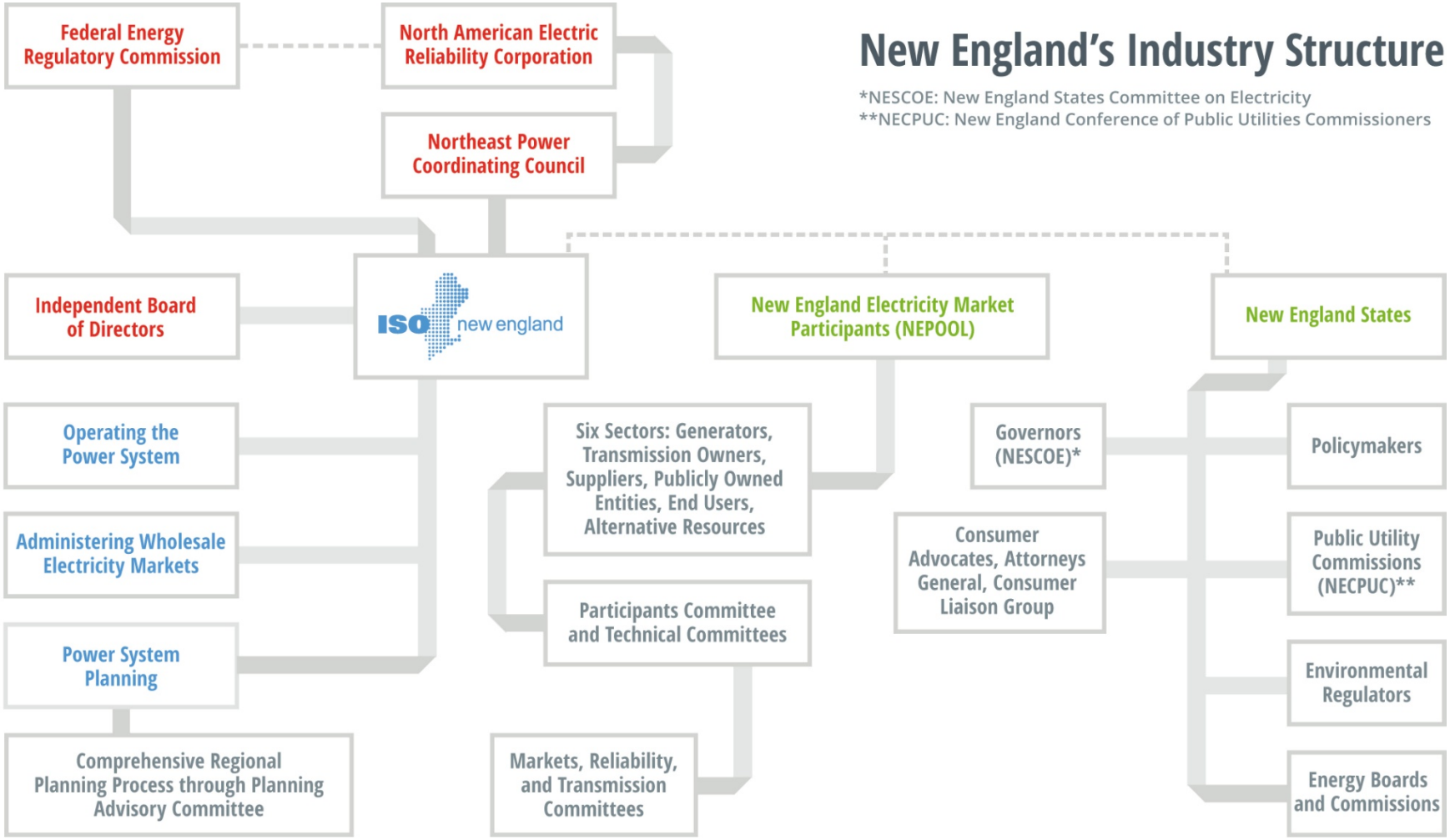


Power System Planning

Study, analyze, and plan to make sure New England's electricity needs will be met over the next 10 years

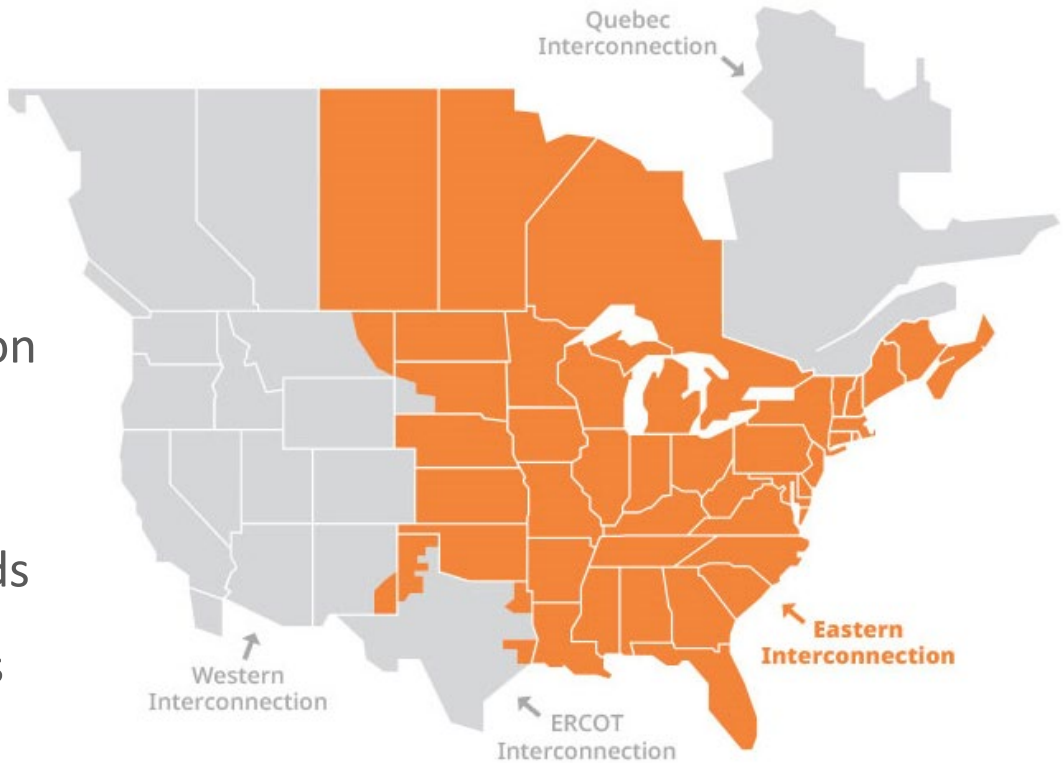


Numerous Entities Including an Independent Board Provide Oversight of and Input on ISO's Responsibilities



New England's Power Grid Is Part of a Larger Electric Power System

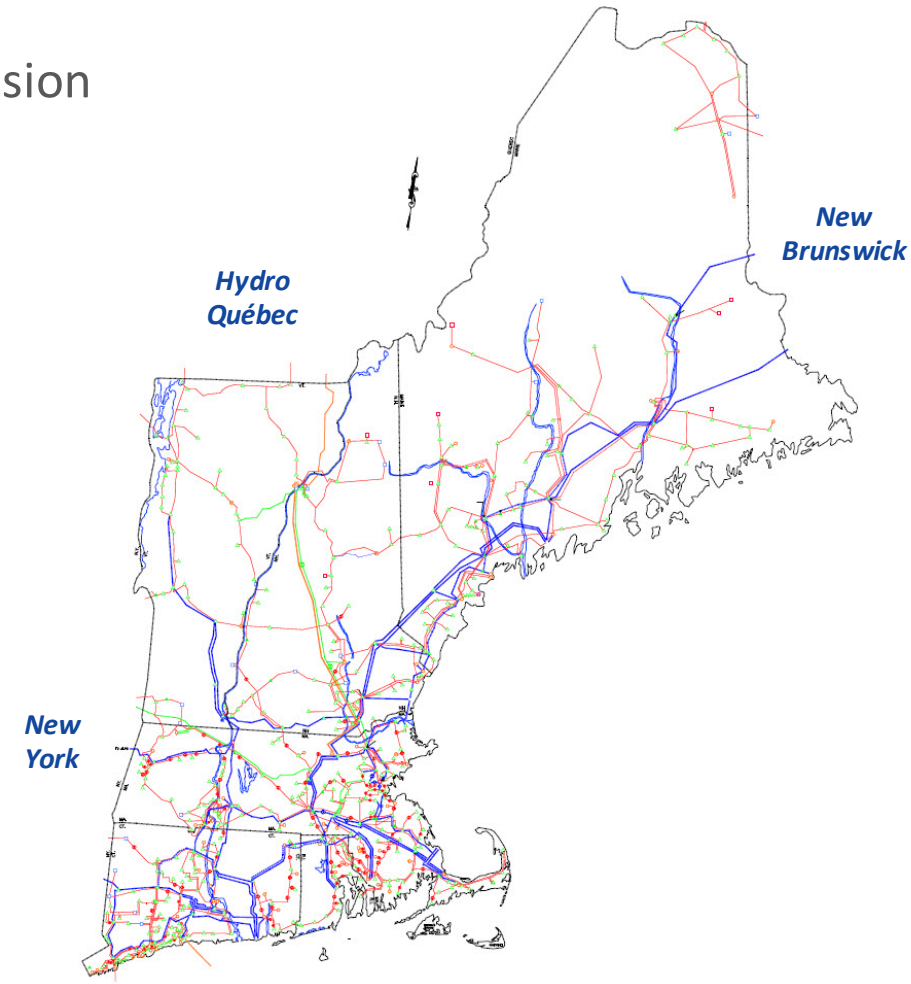
- Part of the **Eastern Interconnection**, one of four large power grids in North America
  - Interconnected through primarily alternating current (AC) transmission
- Tied to **Québec** only through direct current (DC) transmission
- 2003 blackout ushered in wide-area monitoring and **mandatory** reliability standards
- Subject to reliability standards set by **NERC** and **NPCC***



* North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council (NPCC)

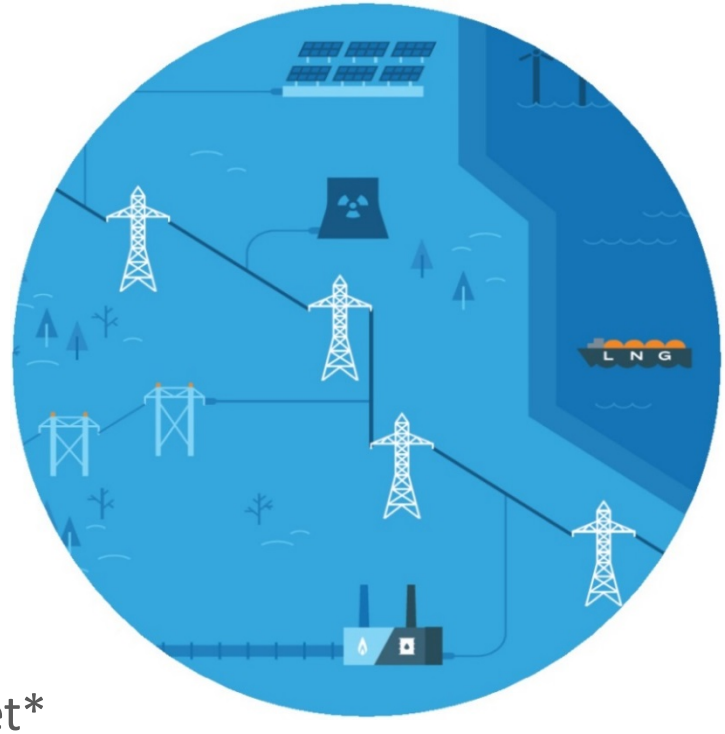
New England's Transmission Grid Is the Interstate Highway System for Electricity

- **9,000 miles** of high-voltage transmission lines (115 kV and above)
- **13 transmission interconnections** to power systems in New York and Eastern Canada
- **19%** of region's energy needs met by imports in 2019
- **$11 billion** invested to strengthen transmission system reliability since 2002; **$1.6 billion** planned
- Developers have proposed multiple transmission projects to access **non-carbon-emitting resources** inside and outside the region



Generation and Demand Resources Are Used to Meet New England's Energy Needs

- **350** dispatchable generators in the region
- **31,500 MW** of generating capacity
- Over **20,000 MW** of proposed generation in the ISO Queue
  - Mostly wind proposals
- Roughly **7,000 MW** of generation have retired or will retire in the next few years
- **580 MW** of active demand response and **2,630 MW** of energy efficiency with obligations in the Forward Capacity Market*
  - Effective June 1, 2018, demand resources have further opportunities in the wholesale markets

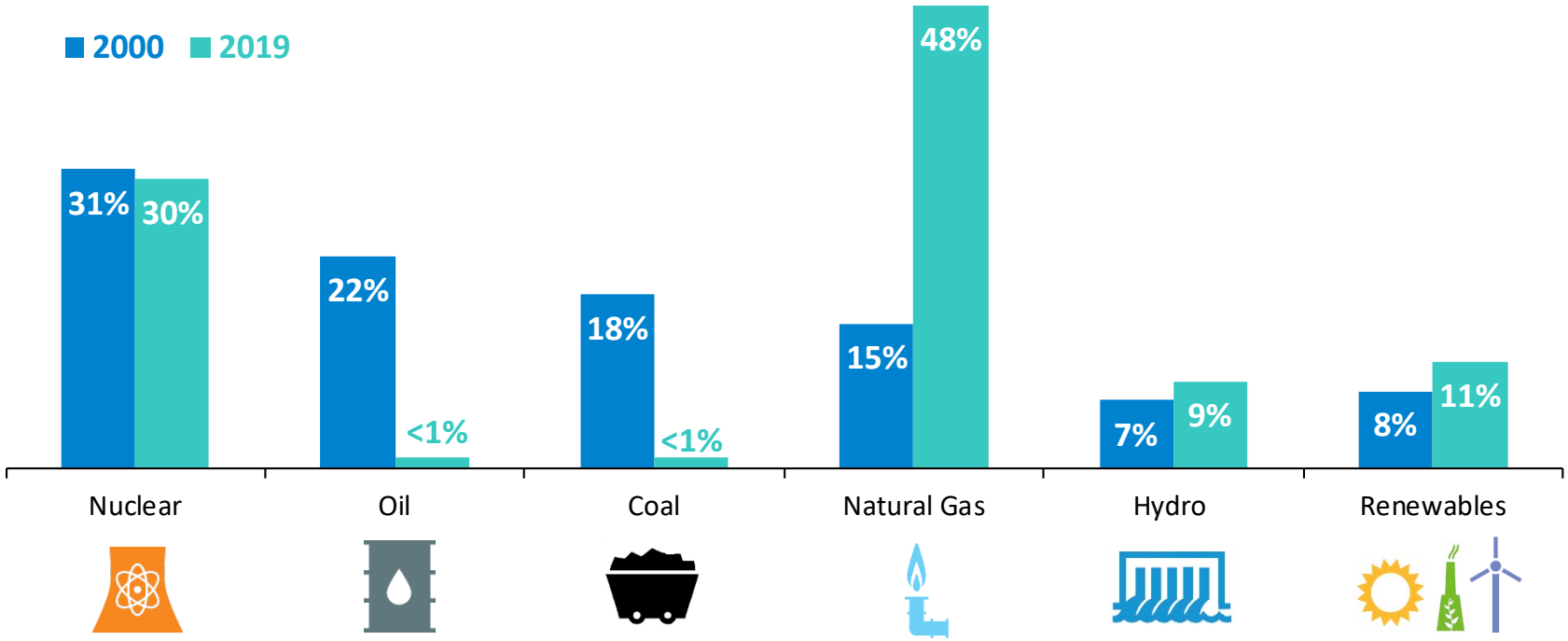


* In the Forward Capacity Market, demand-reduction resources are treated as capacity resources.

Dramatic Changes in the Energy Mix

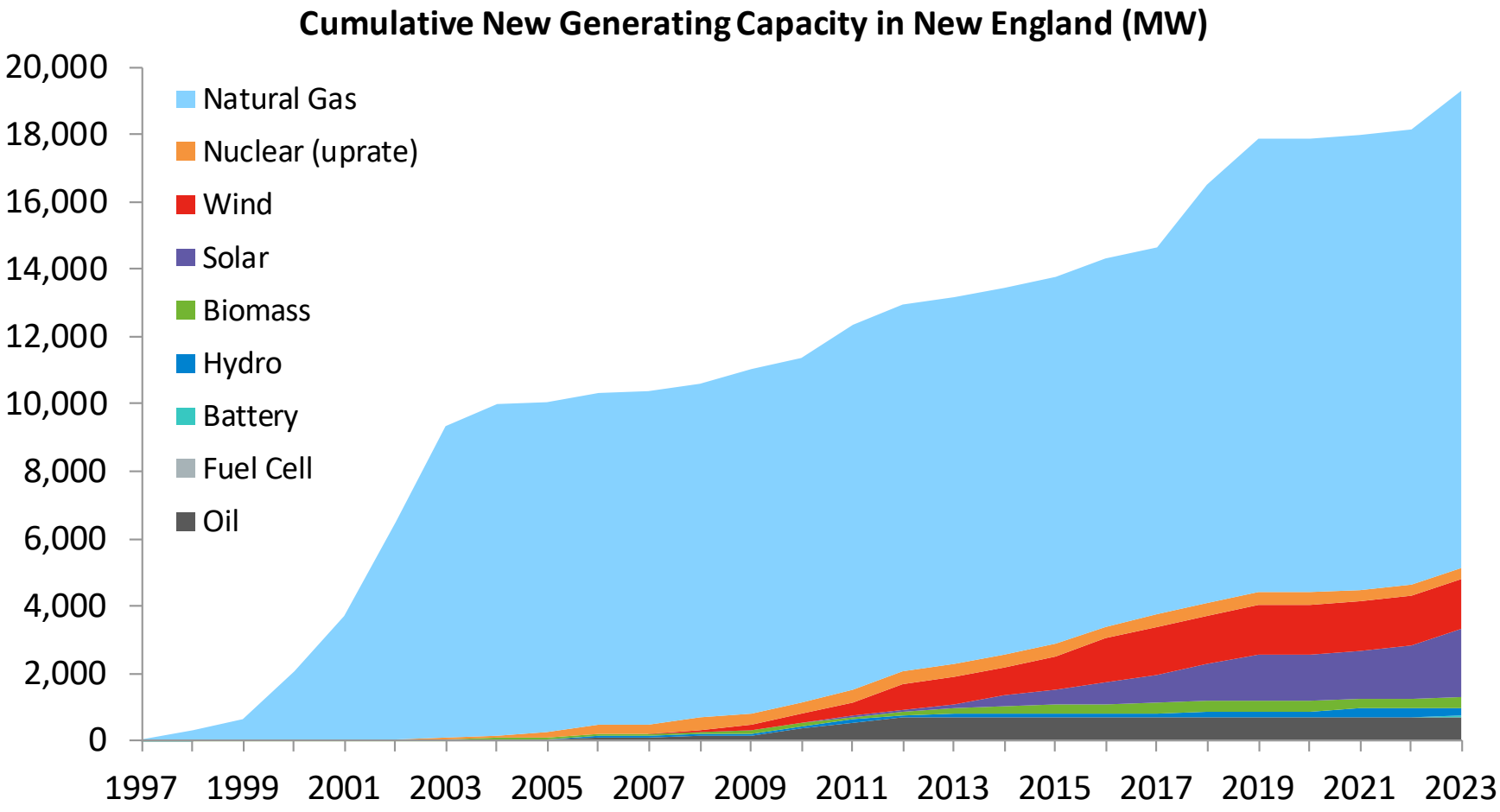
The fuels used to produce the region's electric energy have shifted as a result of economic and environmental factors

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2019)



Source: ISO New England Net Energy and Peak Load by Source; data for 2019 is preliminary and subject to resettlement
Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale 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.

Natural Gas Has Been the Dominant Fuel Source for New Generating Capacity in New England



Note: New generating capacity for years 2020–2023 includes resources clearing in recent Forward Capacity Auctions.

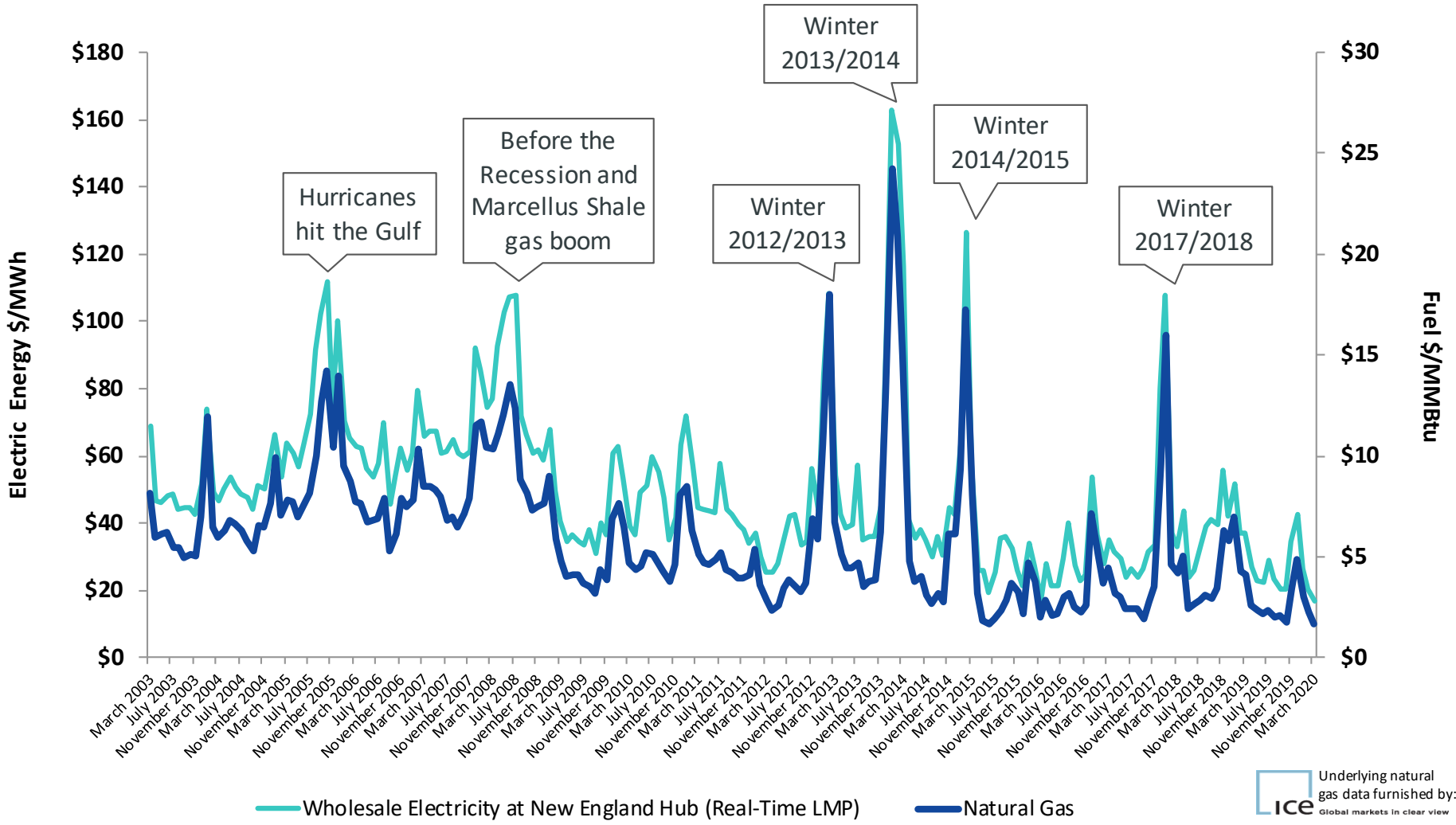
Source: ISO New England Status of Non-Price Retirement Requests and Retirement De-list Bids (April 2020)

Since 2013, Roughly 7,000 MW of Generation Have Retired or Announced Plans for Retirement in the Coming Years

- Include predominantly 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 supplies are constrained in New England

Natural Gas and Wholesale Electricity Prices Are Linked

Monthly average natural gas and wholesale electricity prices at the New England hub



Underlying natural gas data furnished by: ICE Global markets in clear view

Power Plant Emissions Have Declined with Changes in the Fuel Mix

New England Generator Air Emissions - 2001 vs. 2018

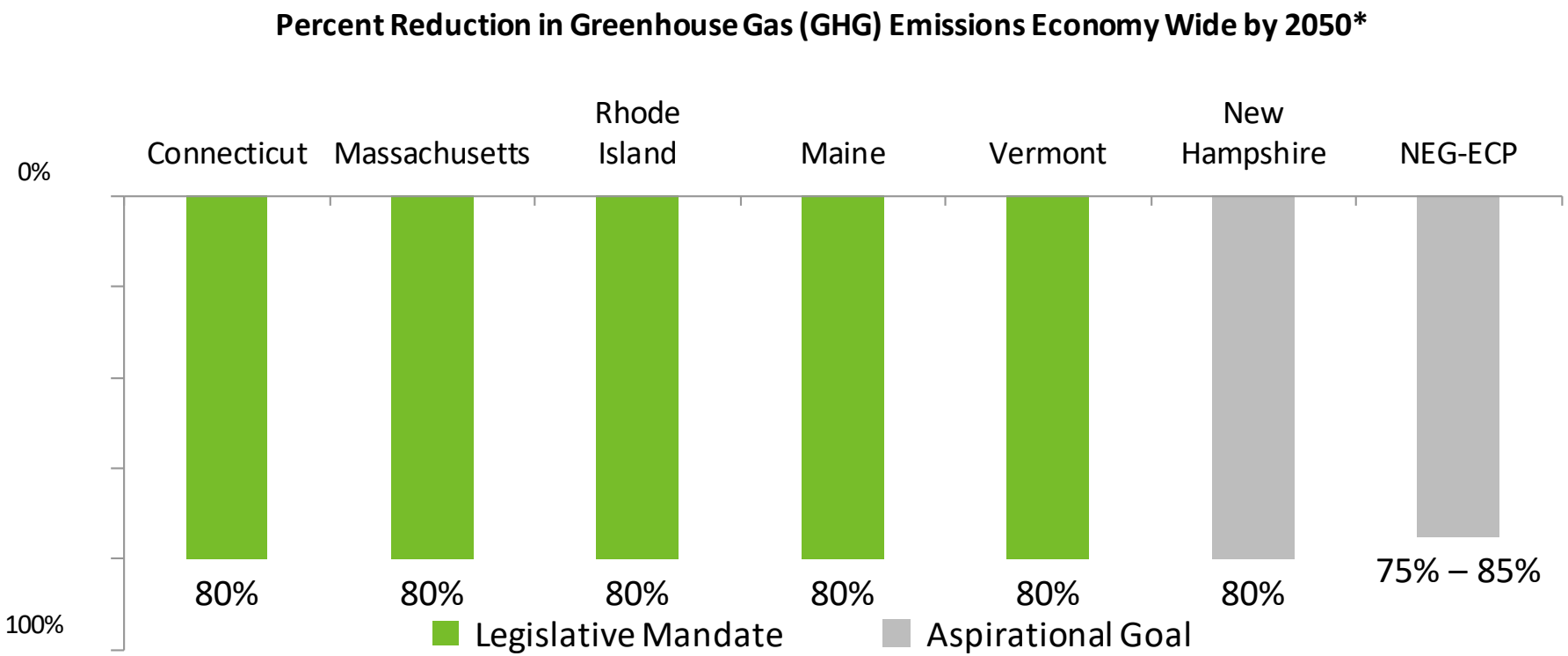
Carbon Dioxide (CO_2)
major driver of climate change
36%

Nitrogen Oxide (NO_X)
adds to smog
74%

Sulfur Dioxide (SO_2)
with NO_x, leads to acid rain
98%

Source: ISO New England 2020 Regional Electricity Outlook (February 2020)

States Have Set Goals for Reductions in Greenhouse Gas Emissions: *Some Mandated, Some Aspirational*

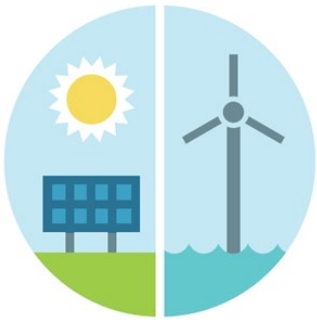


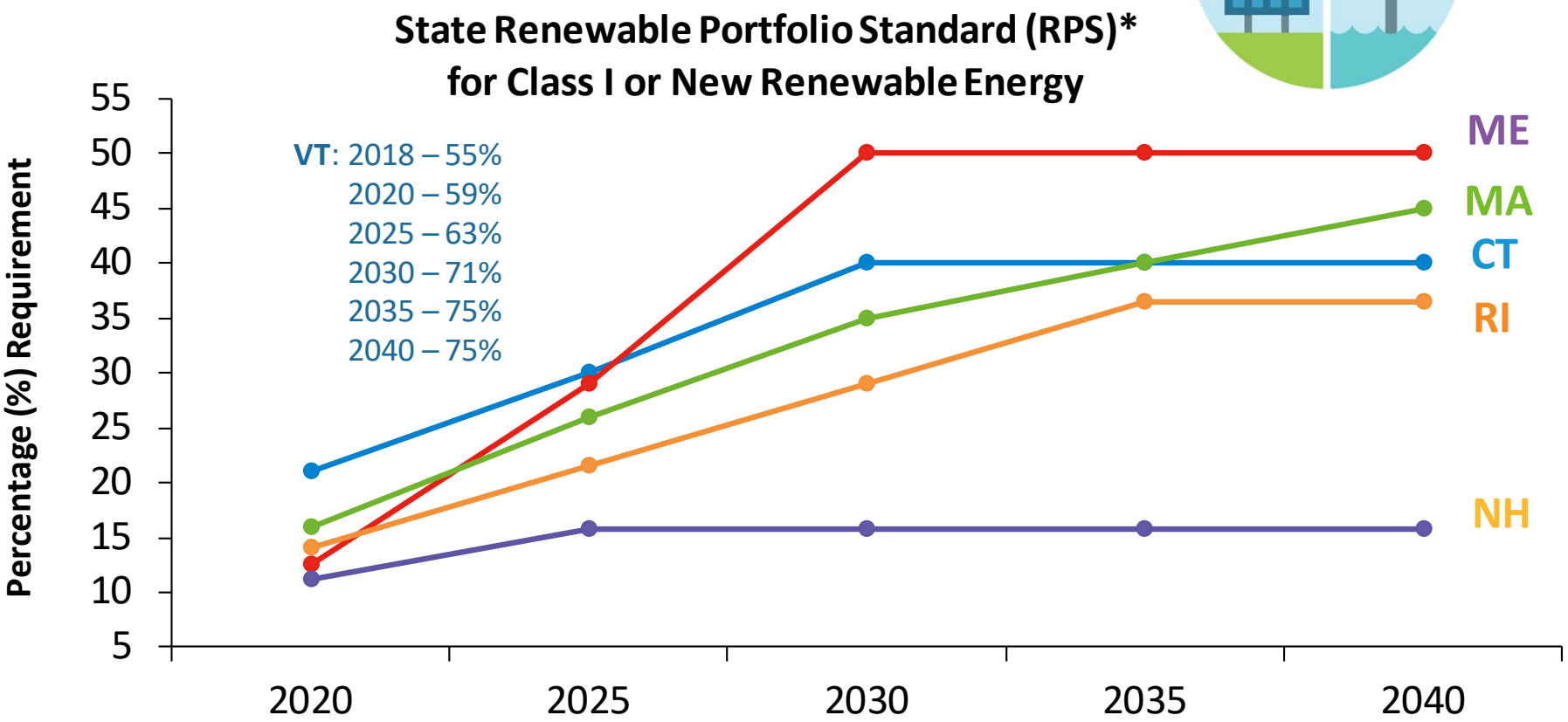
The New England states are promoting GHG reductions on a state-by-state basis, and at the regional level, through a combination of legislative mandates (e.g., CT, MA, RI, ME, and VT) and aspirational, non-binding goals (e.g., NH and the New England Governors and Eastern Canadian Premiers)

MA, RI, NH, ME, and VT use a 1990 baseline year for emissions reductions. CT and the NEG-ECP use a 2001 baseline. For more information, see the following ISO Newswire article: http://isonewswire.com/updates/2019/10/2/the-new-england-states-frameworks-for-reducing-greenhouse-ga.html

Renewable Energy Is on the Rise

State policy requirements are a major driver

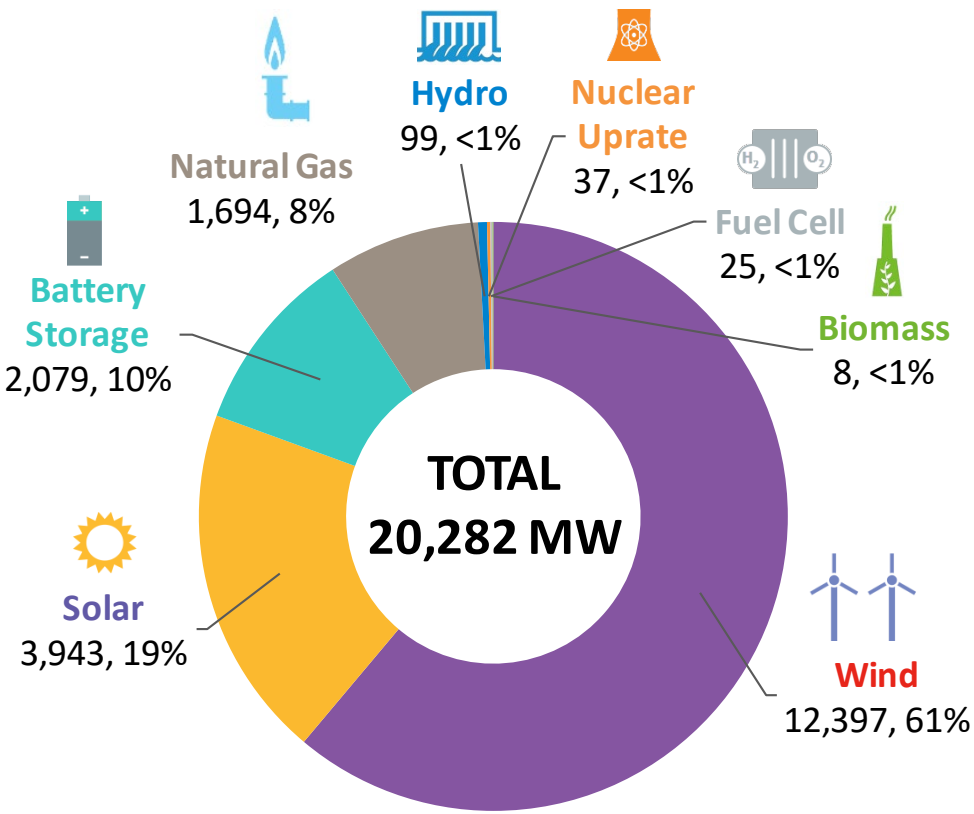




Notes: State RPS requirements promote the development of renewable energy resources by requiring electricity providers (electric distribution companies and competitive suppliers) to serve a minimum percentage of their retail load using renewable energy. Connecticut's Class I RPS requirement plateaus at 40% in 2030. Maine's Class I/IA RPS requirement increases to 50% in 2030 and remains at that level each year thereafter. Massachusetts' Class I RPS requirement increases by 2% each year between 2020 and 2030, reverting back to 1% each year thereafter, with no stated expiration date. New Hampshire's percentages include the requirements for both Class I and Class II resources (Class II resources are new solar technologies beginning operation after January 1, 2006). New Hampshire's Class I and Class II RPS requirements plateau at 15.7% in 2025. Rhode Island's requirement for 'new' renewable energy plateaus at 36.5% in 2035. Vermont's 'total renewable energy' requirement plateaus at 75% in 2032; it recognizes all forms of new and existing renewable energy and is unique in classifying large-scale hydropower as renewable.

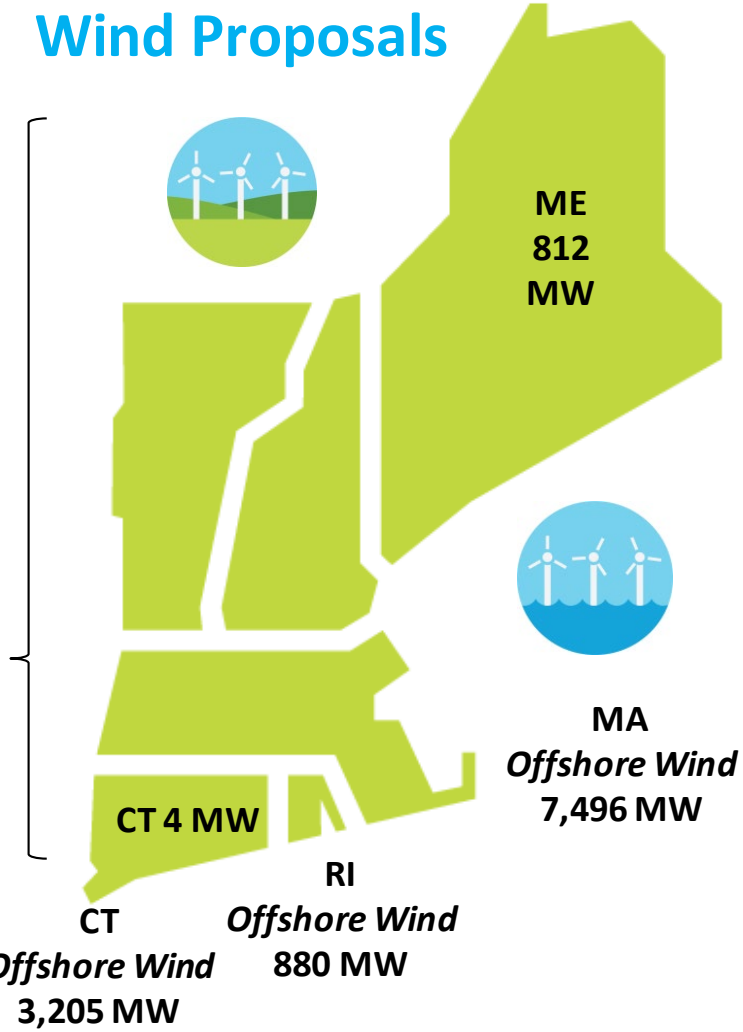
Wind Power Comprises Two Thirds of New Resource Proposals in the ISO Interconnection Queue

All Proposed Resources



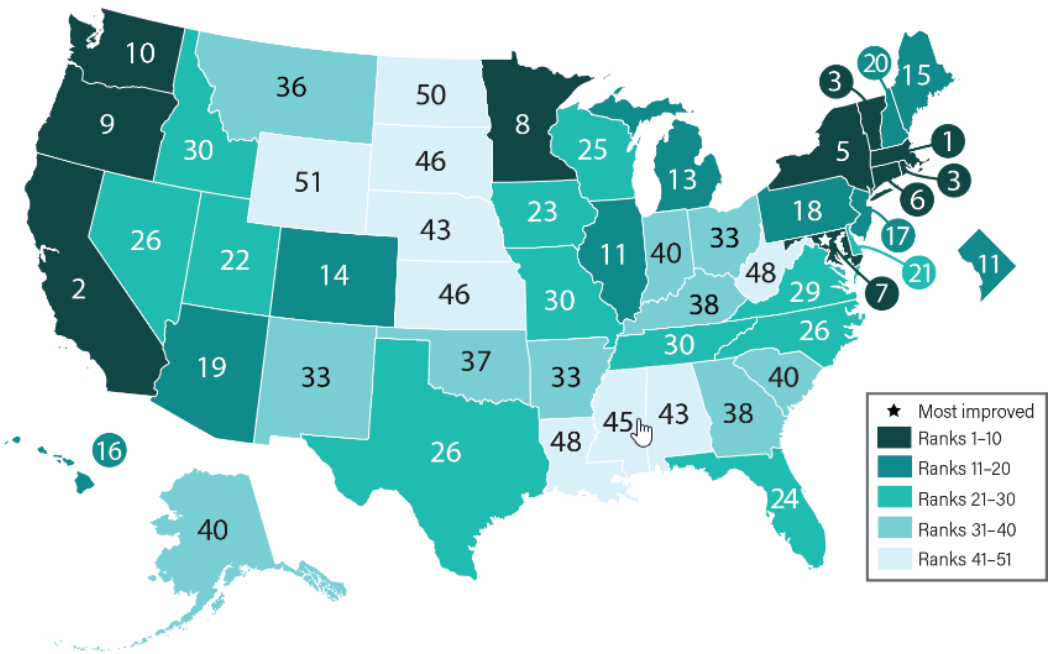
Source: ISO Generator Interconnection Queue (July 2020)
FERC and Non-FERC Jurisdictional Proposals; Nameplate Capacity Ratings
Note: Some natural gas proposals include dual-fuel units (with oil backup).
Some natural gas, wind, and solar proposals include battery storage.

Wind Proposals



Energy Efficiency Is a Priority for State Policymakers

2019 State Energy-Efficiency Scorecard



Source: American Council for an Energy-Efficient Economy

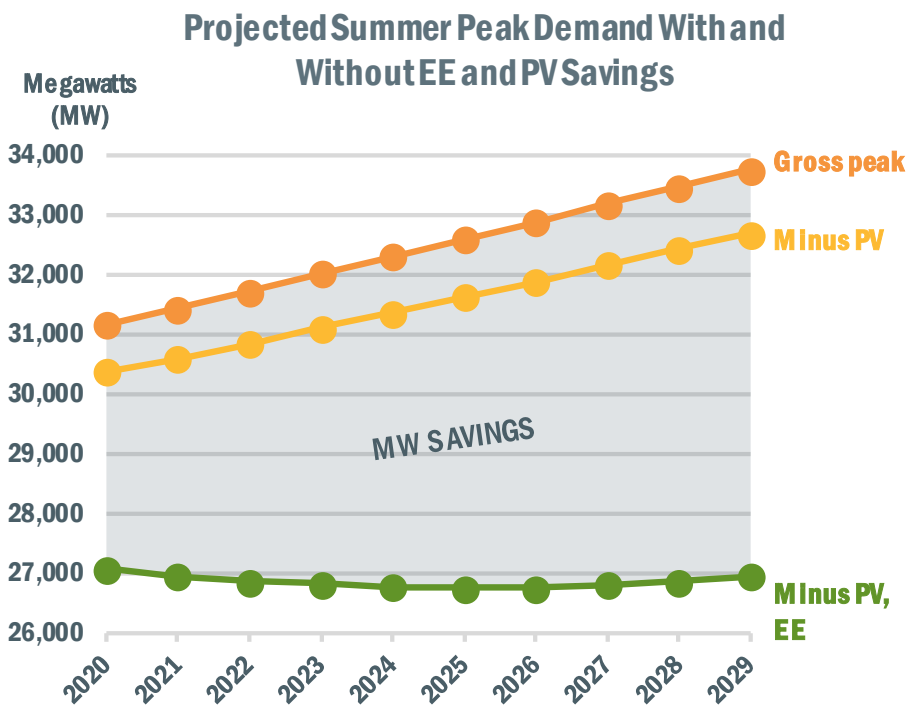
Ranking of state EE efforts by the *American Council for an Energy-Efficient Economy*:

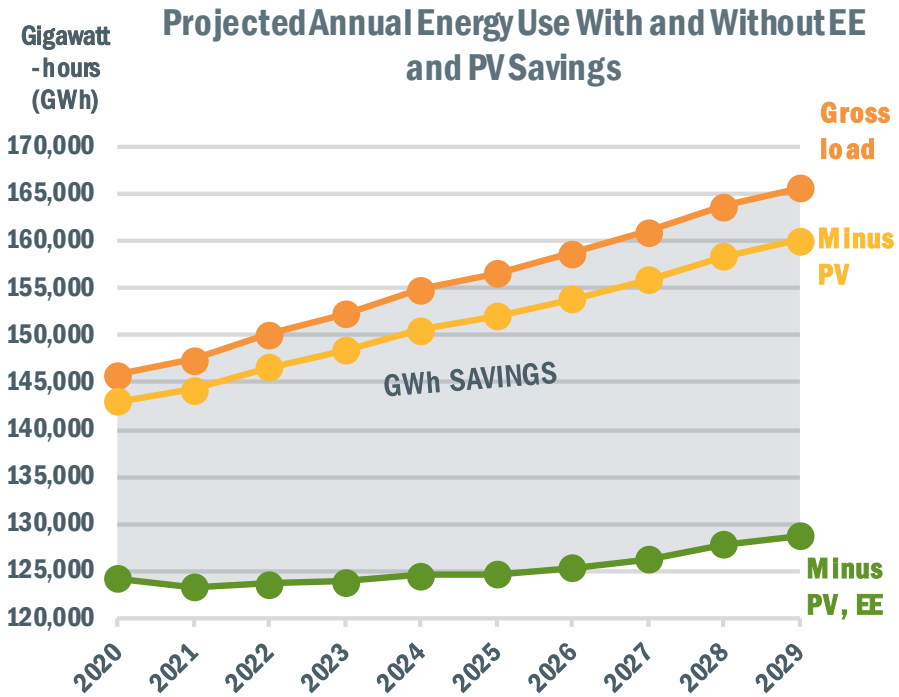
– Massachusetts	1
– Rhode Island	3
– Vermont	3
– Connecticut	6
– Maine	15
– New Hampshire	20

- Billions spent over the past few years and more on the horizon
  - Nearly $5.3 billion invested from 2012 to 2017
  - ISO estimates $10.7 billion to be invested in EE from 2021 to 2029

Source: ISO New England Final 2020 Energy-Efficiency Forecast

Energy Efficiency and Behind-the-Meter Solar Are Reducing Peak Demand and Annual Energy Use



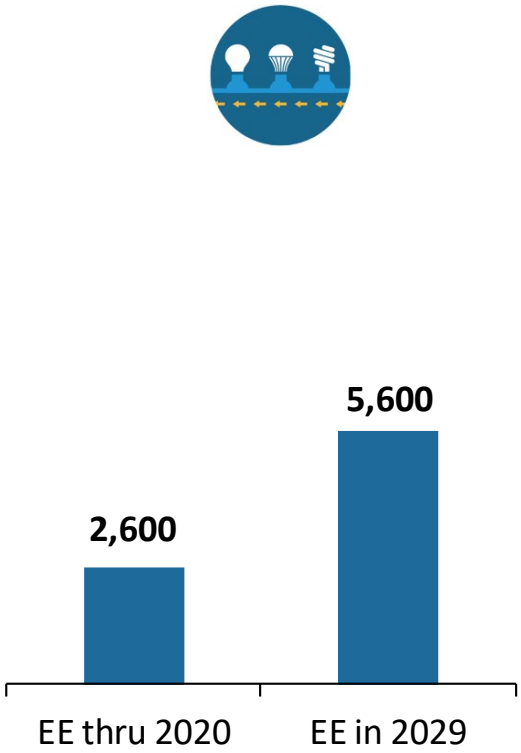


- The gross load forecast (projected regional energy use)
- The gross load forecast minus existing and anticipated behind-the-meter (BTM) solar photovoltaic (PV) resources
- The gross load forecast minus existing and anticipated BTM PV and energy-efficiency (EE) resources

Note: Summer peak demand is based on the "90/10" forecast, which accounts for the possibility of extreme summer weather (temperatures of about 94°F).
Source: ISO New England 2020-2029 Forecast Report of Capacity, Energy, Loads, and Transmission (2020 CELT Report) (May 2020)

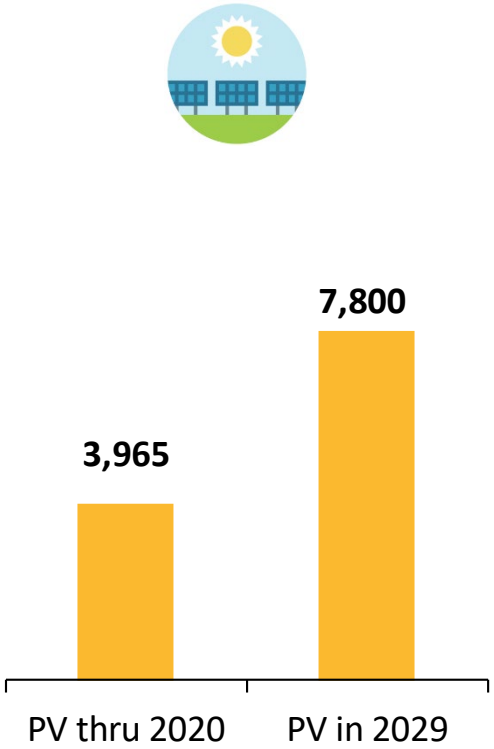
Energy-Efficiency and Renewable Resources Are Trending Up in New England

Energy Efficiency
(MW)



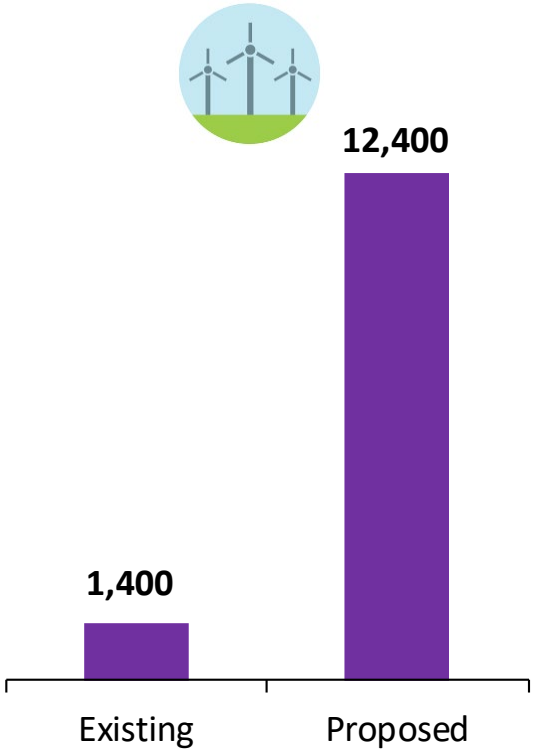
Final 2020 CELT Report, EE through 2019 includes EE resources participating in the Forward Capacity Market (FCM). EE in 2029 includes an ISO-NE forecast of incremental EE beyond the FCM.

Solar
(MW)



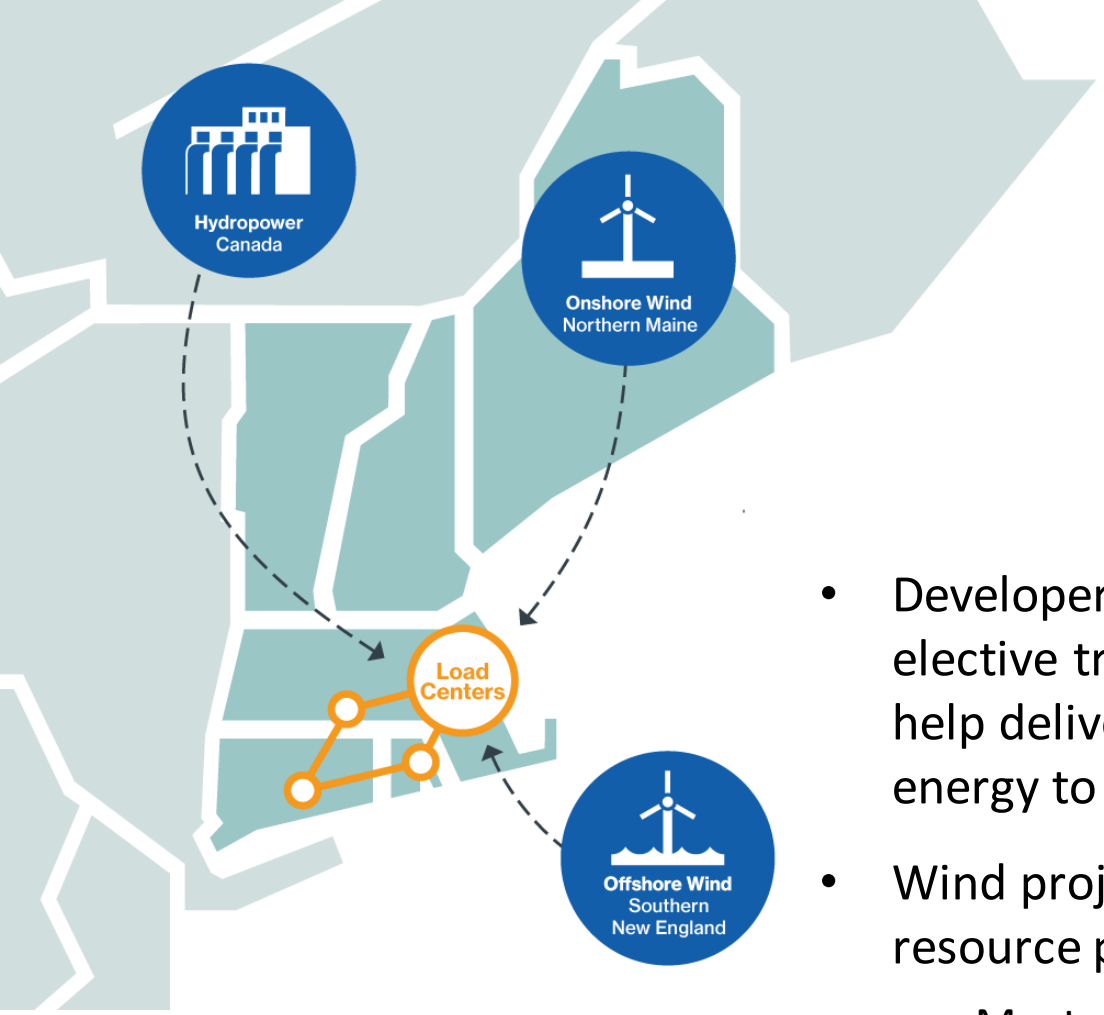
Final 2020 ISO-NE PV Forecast, AC nameplate capacity from PV resources participating in the region's wholesale electricity markets, as well as those connected "behind the meter."

Wind
(MW)



Nameplate capacity of existing wind resources and proposals in the ISO-NE Generator Interconnection Queue (July 2020)

Developers Are Proposing Large-Scale Transmission Projects to Deliver Clean Energy to Load Centers



Lines represent types of ETUs private developers have proposed in recent years

Source: ISO Interconnection Queue (July 2020)

- Developers are proposing roughly **15** elective transmission upgrades (ETUs) to help deliver about **7,200 MW** of clean energy to New England load centers
- Wind projects make up roughly **61%** of new resource proposals in the ISO Queue
  - Most are offshore wind proposals in southern New England, but some are onshore wind proposals in northern New England and **would require transmission** to deliver the energy to load centers

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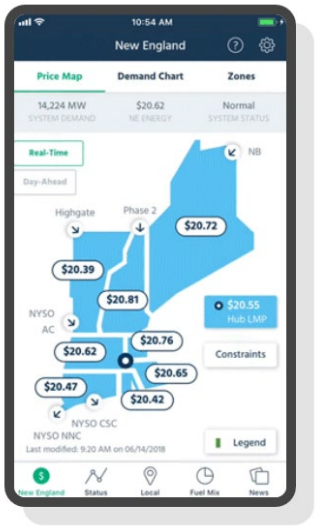

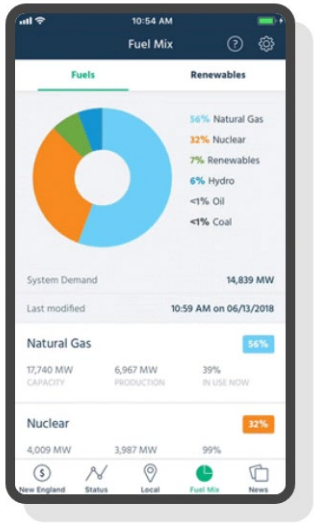

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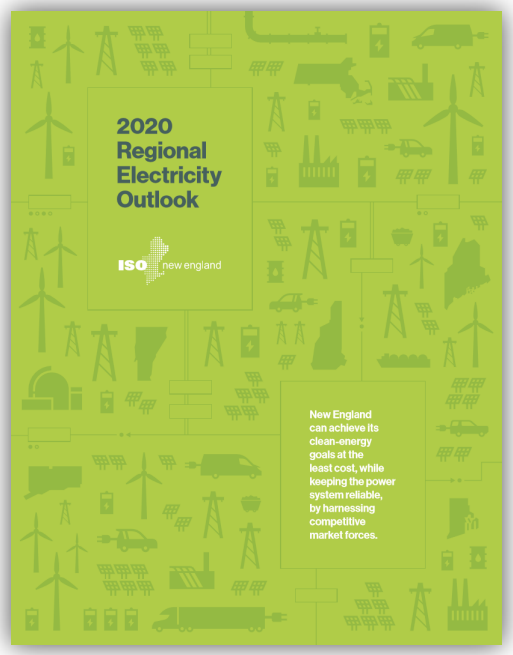
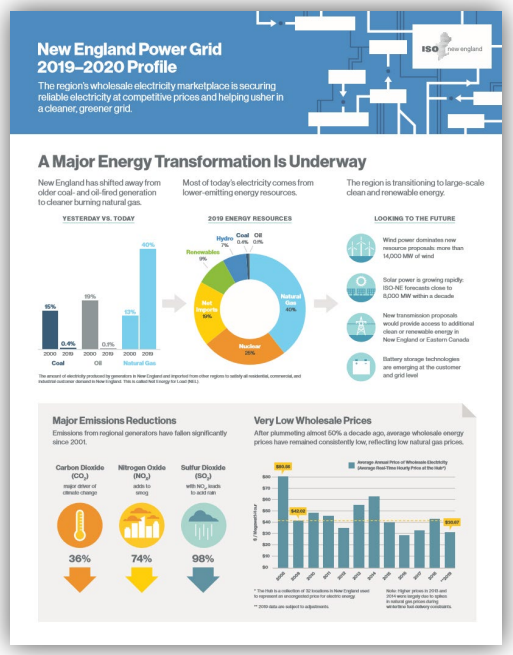


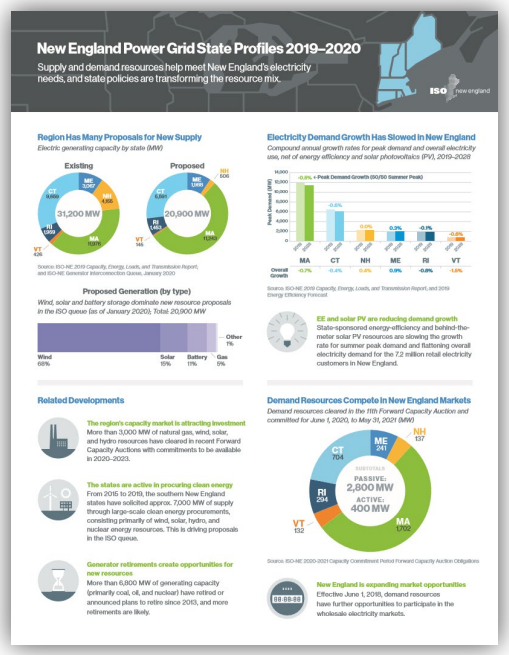
2020 Regional Electricity Outlook

Provides an in-depth look at New England's biggest challenges to power system reliability, the solutions the region is pursuing, and other ISO New England efforts to improve services and performance



New England Power Grid Profile

Provides key grid and market stats on how New England's wholesale electricity markets are securing reliable electricity at competitive prices and helping usher in a cleaner, greener grid



New England State Profiles

Provides state-specific facts and figures relating to supply and demand resources tied into the New England electric grid and state policies transforming the resource mix in the region