



ISO New England Overview

*American Council of Engineering Companies
(ACEC) of Massachusetts*

Nicholas E. Hutchings

EXTERNAL AFFAIRS REPRESENTATIVE

NHUTCHINGS@ISO-NE.COM



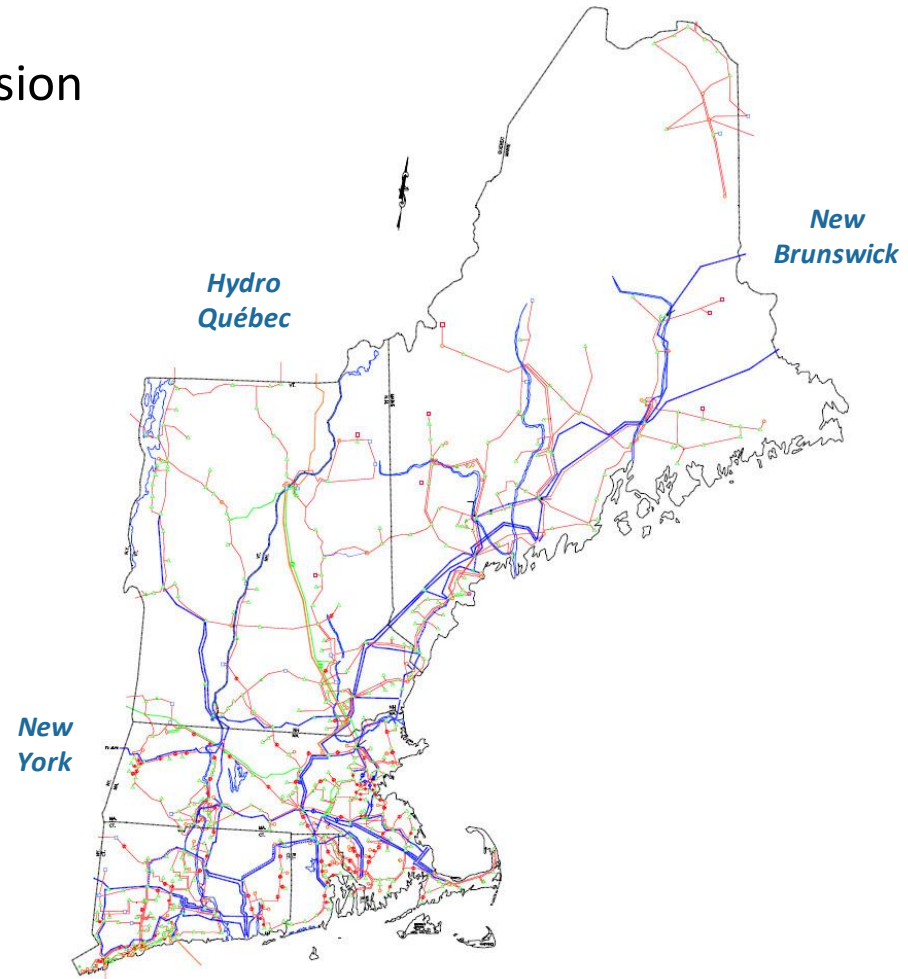
ISO New England (ISO) Has More Than Two Decades of Experience Overseeing the Region's Restructured Electric Power System

- **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



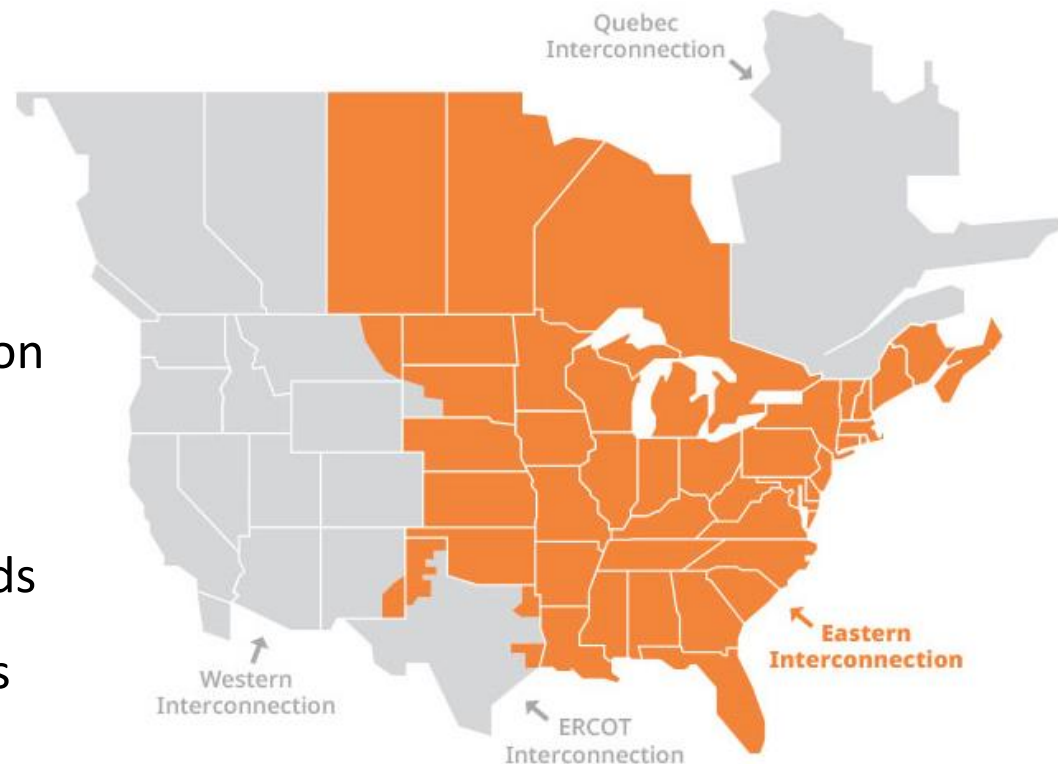
New England's Transmission Grid Is the Interstate Highway System for Electricity

- **9,000 miles** of high-voltage transmission lines (primarily 115 kV and 345 kV)
- **13 transmission interconnections** to power systems in New York and Eastern Canada
- **21%** of region's energy needs met by imports in 2020
- **\$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



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***

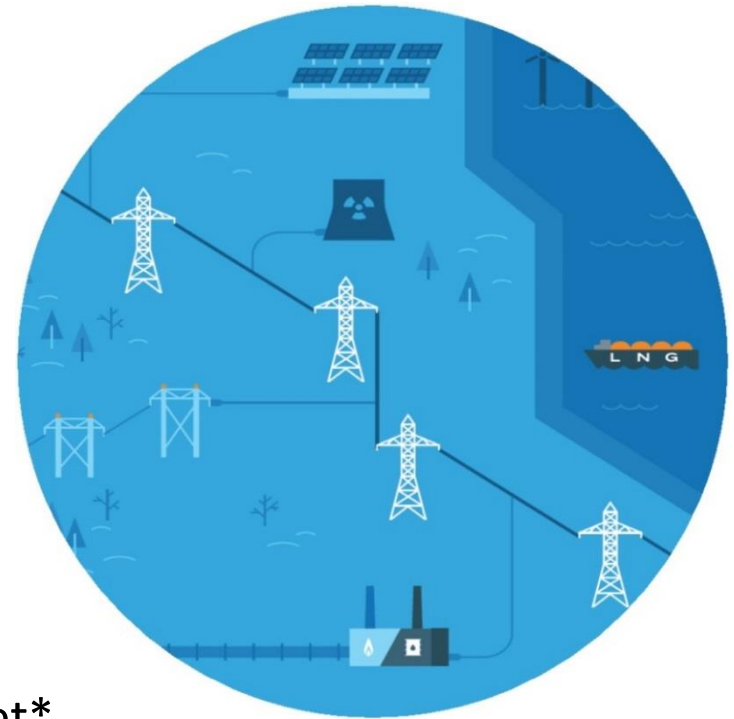


* North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council (NPCC)



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 **24,000 MW** of proposed generation in the ISO Queue
 - Mostly wind, solar, and storage proposals
- Roughly **7,000 MW** of generation have retired or will retire in the next few years
- **400 MW** of active demand response and **2,850 MW** of energy efficiency with obligations in the Forward Capacity Market*
 - Effective June 1, 2018, demand resources have further opportunities in the wholesale markets

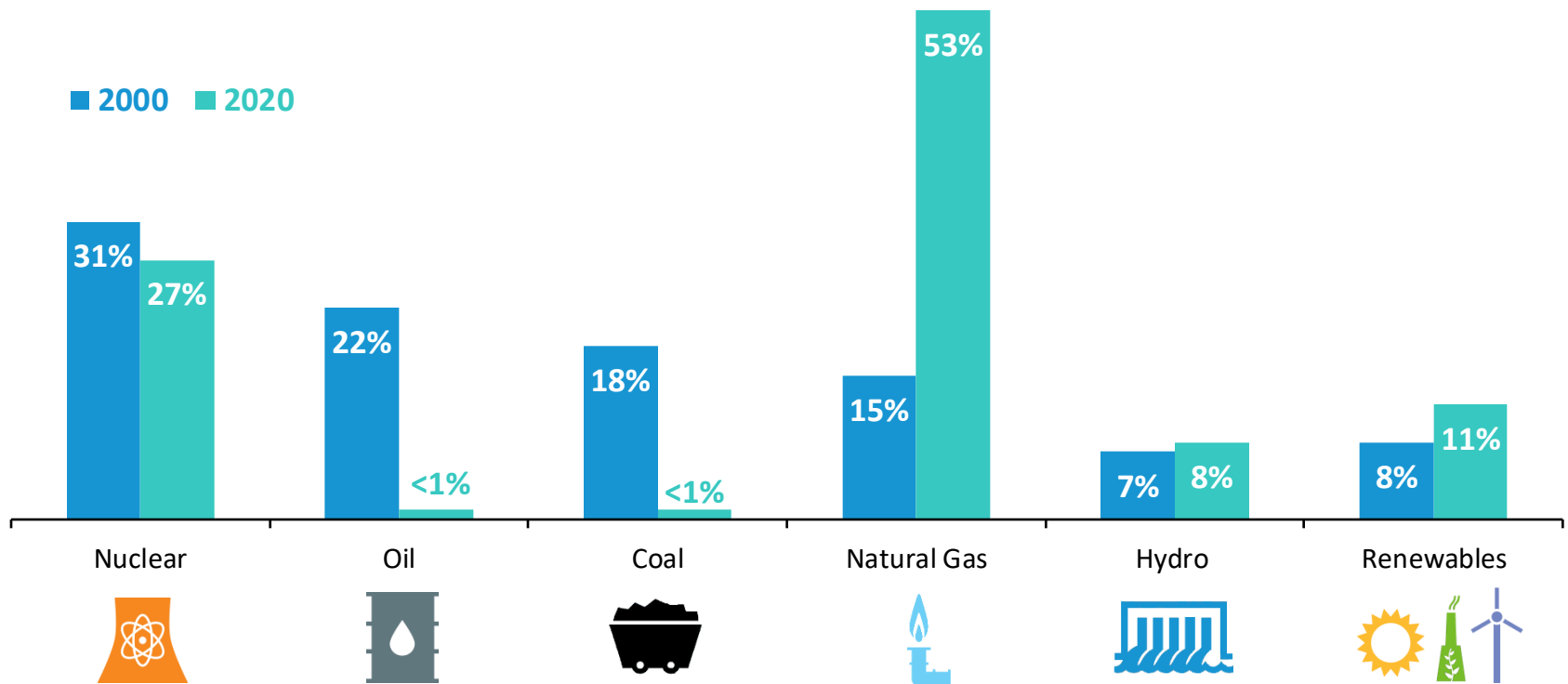


* In the Forward Capacity Market, demand-reduction resources are treated as capacity resources.

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. 2020)



Source: ISO New England [Net Energy and Peak Load by Source](#); data for 2020 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.

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

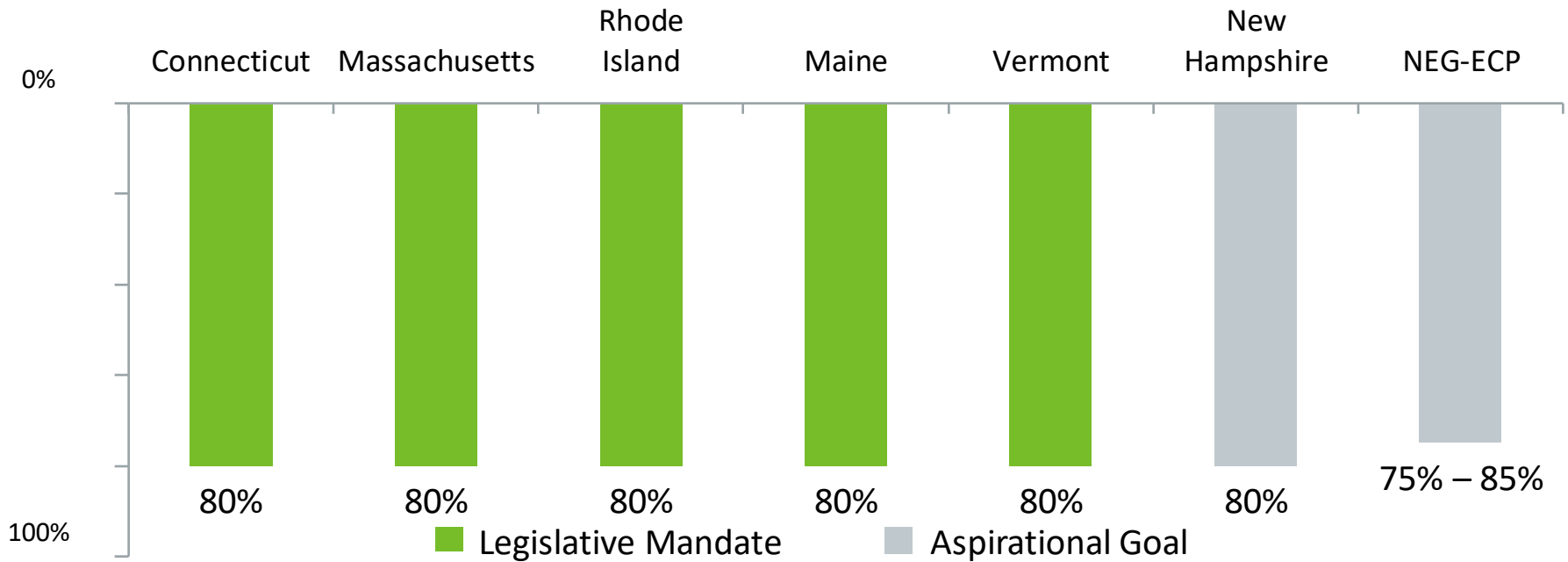
- Include predominantly coal, oil, and nuclear resources
- Another **5,000 MW** of remaining coal and oil are at risk of retirement
- These resources have played an **important** role in recent winters when natural gas supplies are constrained in New England



Source: [ISO New England Status of Non-Price Retirement Requests and Retirement De-list Bids](#) (January 2021)

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

Percent Reduction in Greenhouse Gas (GHG) Emissions Economy Wide by 2050*



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: <https://isonewswire.com/2021/01/19/the-new-england-states-frameworks-for-reducing-greenhouse-gas-emissions-continue-to-evolve/>

States Target Increases in Renewable and Clean Energy and Deep Reductions in CO₂ Emissions

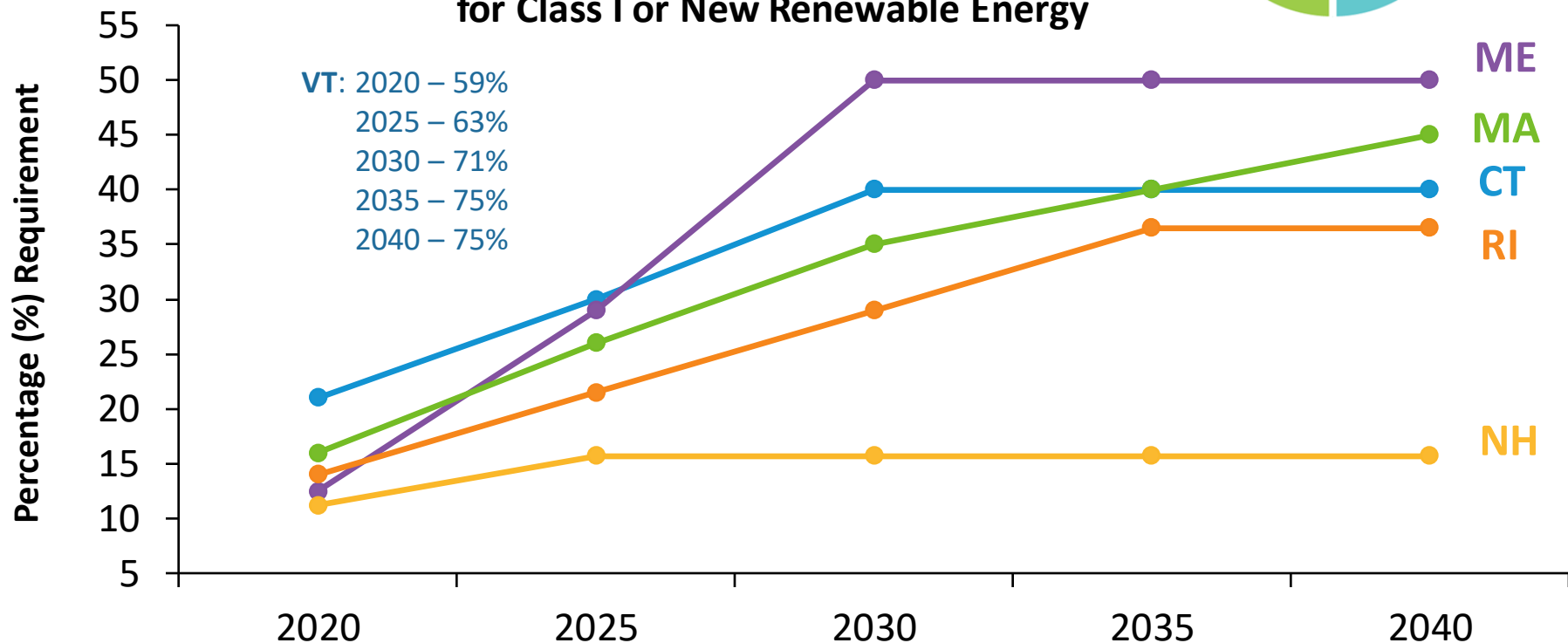
≥80% by 2050	Five states mandate greenhouse gas reductions economy wide: MA, CT, ME, RI, and VT (mostly below 1990 levels)
80% by 2050 Net-Zero by 2050	MA statewide GHG emissions limit MA clean energy standard
90% by 2050	VT renewable energy requirement
100% by 2050 Carbon-Neutral by 2045	ME renewable energy requirement ME emissions goal
100% by 2040	CT zero-carbon electricity goal
100% by 2030	RI renewable energy goal

Renewable Energy Is on the Rise

State policy requirements are a major driver



State Renewable Portfolio Standard (RPS)* for Class I or New Renewable Energy



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.

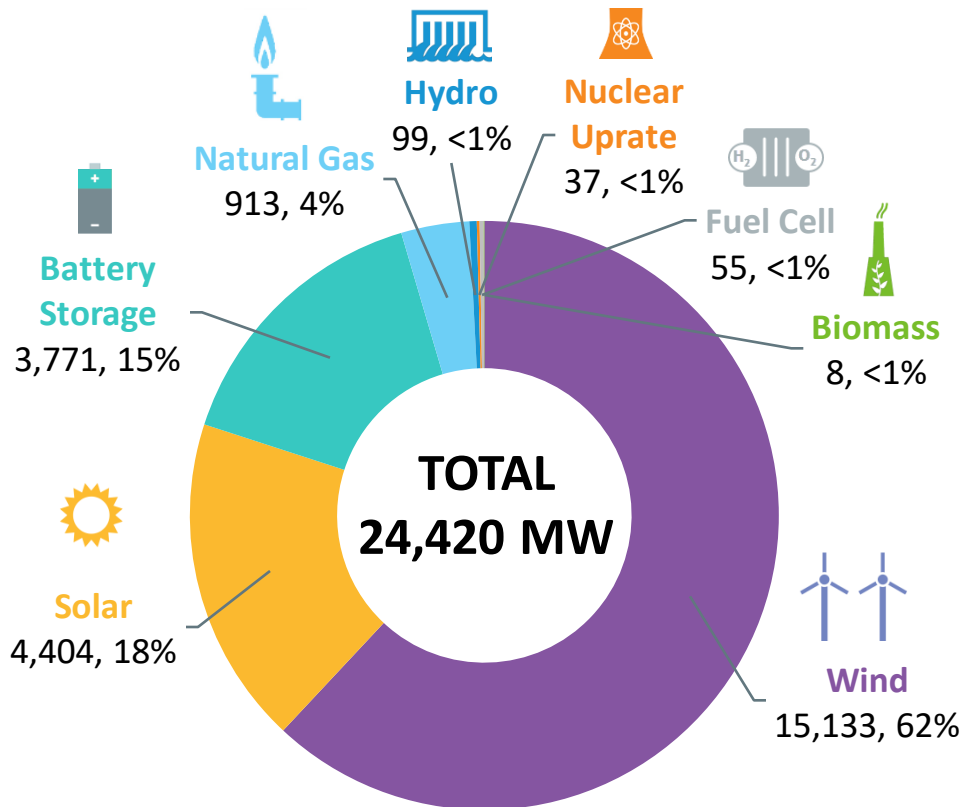
States Accelerate Clean Energy Procurements (2017-2021)



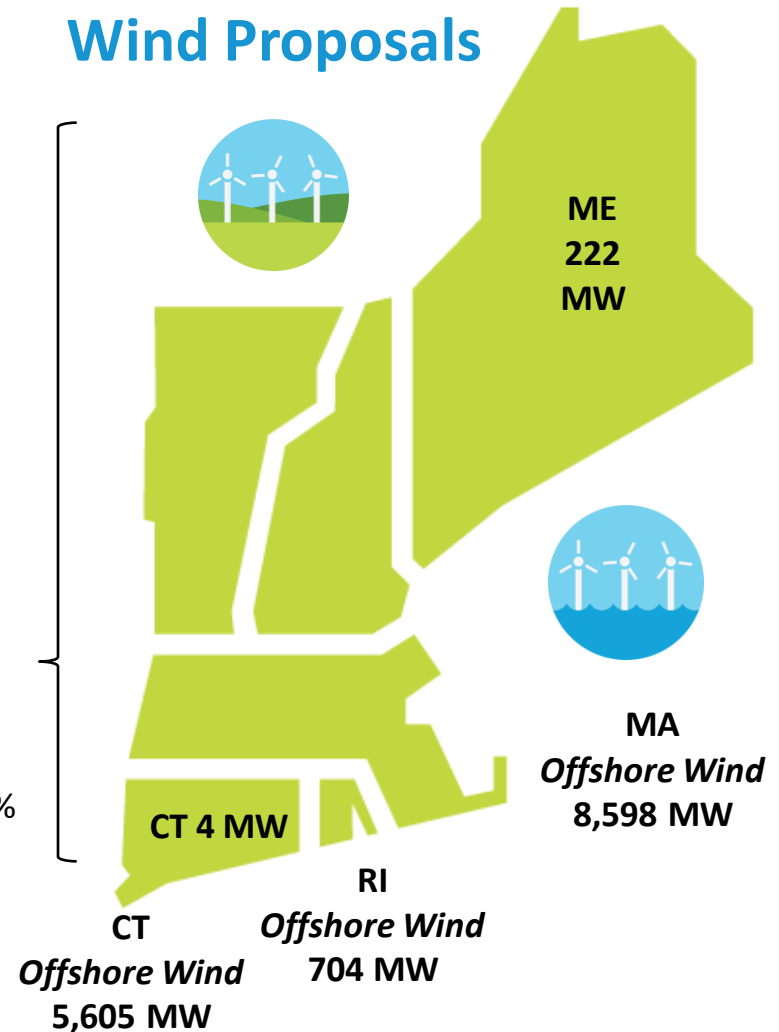
State	State Procurement Initiatives for Large-Scale Clean Energy Resources	Eligible Resources	RFP Target MW (nameplate)	Projected COD/ Selected MW
RI	2021 Offshore Wind RFP (Anticipated – Q1 2021)	Offshore Wind	600 MW	TBD
MA	2021 Offshore Wind RFP (Anticipated – May 2021)	Offshore Wind	400 to 1600 MW	TBD
ME	2020-2021 RPS RFP	ME RPS Class IA renewables	1,710,000 MWh	2022-2024
CT	2019 Offshore Wind RFP	Offshore Wind	400 – 2,000 MW	2026 804 MW
MA	2019 Section 83C II Offshore Wind RFP	Offshore Wind	800 MW	2025 804 MW
RI	2018 Renewable Energy RFP	Solar, Wind, Biomass and Other Eligible Resources	400 MW	2023 50 MW
CT	2018 Zero-Carbon Resources RFP	Nuclear, Hydro, Class I Renewables, Energy Storage	Approx. 1,400 MW (12,000,000 MWh)	2020-2026 11,658,080 MWh
CT	2018 Clean Energy RFP	Offshore Wind, Fuel Cells, Anaerobic Digestion	252 MW	2019-2023 252 MW
MA RI	2017 Section 83C I Offshore Wind RFP	Offshore Wind	800 MW (MA) 400 MW (RI)	2023 800 MW
MA	2017 Section 83D Clean Energy RFP	Hydro Import	Approx. 1,200 MW (9,554,000 MWh)	2022 9,554,940 MWh/year

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

All Proposed Resources



Wind Proposals

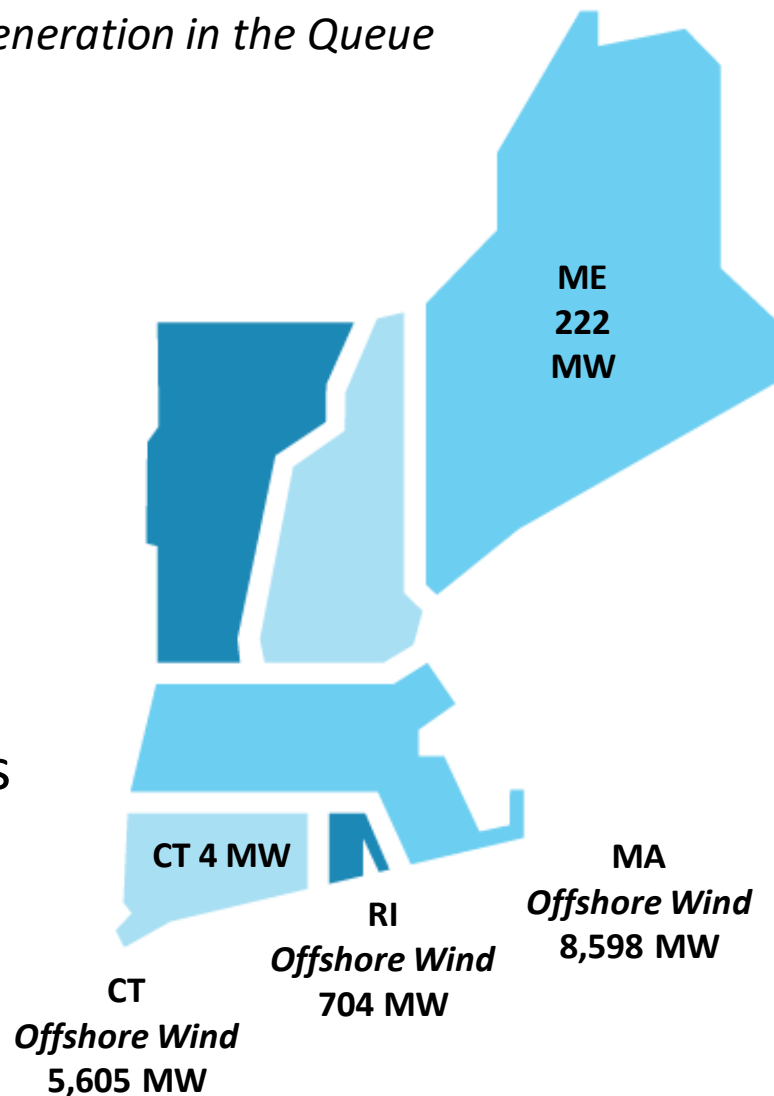


Source: ISO Generator Interconnection Queue (February 2021)
 FERC and Non-FERC Jurisdictional Proposals; Nameplate Capacity Ratings
 Note: Some natural gas proposals include dual-fuel units (with oil backup).
 Some natural gas, wind, and solar proposals include battery storage.

On- and Off-Shore Wind Is Being Proposed

Represents almost two thirds of proposed generation in the Queue

- Over **15,000 MW** of wind projects have been proposed in New England, representing **63%** of the ISO Generator Interconnection Queue
- Majority of wind proposals in Maine and off the coast of Connecticut, Massachusetts and Rhode Island



Source: ISO Generator Interconnection Queue (February 2021)
FERC and Non-FERC Jurisdictional Proposals
Nameplate Capacity Ratings

New Energy Storage Technologies Are Coming On Line

- **20 MW** of grid-scale battery storage projects have come on line since late 2015
 - 600 MW of batteries cleared in FCA #15
- Over **3,700 MW** of grid-scale stand-alone energy storage projects are requesting interconnection
- New England has a successful history of operating the region's two large pumped-storage facilities, which can supply **1,800 MW** of power within 10 minutes for up to 7 hours

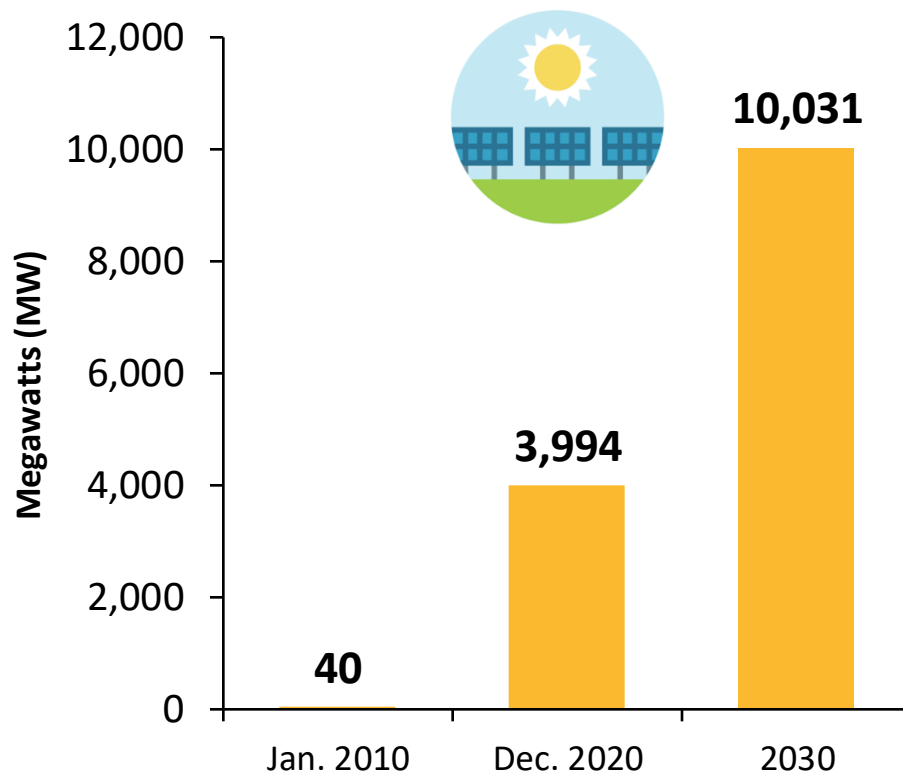


ISO New England Forecasts Strong Growth in Solar Photovoltaic (PV) Resources

December 2020 Solar PV Installed Capacity (MW_{ac})

State	Installed Capacity (MW _{ac})	No. of Installations
Connecticut	682.3	53,758
Massachusetts	2,502.3	114,487
Maine	66.9	5,591
New Hampshire	125.3	10,757
Rhode Island	223.8	9,688
Vermont	393.9	15,328
New England	3,994.4	199,868

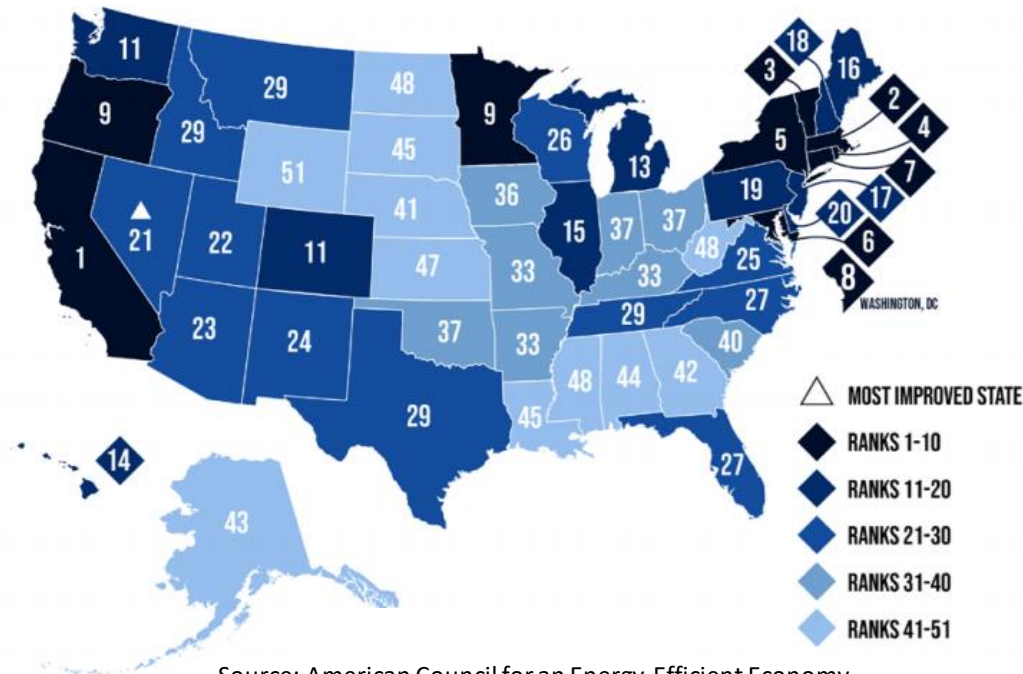
Cumulative Growth in Solar PV through 2030 (MW_{ac})



Note: The bar chart reflects the ISO's projections for nameplate capacity from PV resources participating in the region's wholesale electricity markets, as well as those connected "behind the meter." The forecast does not include forward-looking PV projects > 5 MW in nameplate capacity. Source: [Draft 2021 PV Forecast](#) (February 2021) and [December 2020 Distributed Generation Survey Results](#); MW values are AC nameplate.

Energy Efficiency Is a Priority for State Policymakers

2020 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 2
- Rhode Island 4
- Vermont 3
- Connecticut 7
- Maine 16
- New Hampshire 18

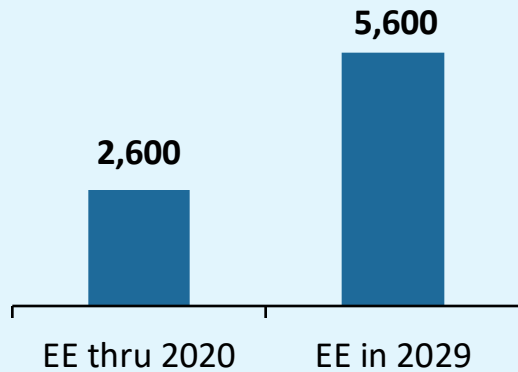
- Billions spent over the past few years and more on the horizon
 - Nearly \$5.3 billion invested from 2012 to 2017
 - ISO estimates \$10.7 billion to be invested in EE from 2021 to 2029



Source: [ISO New England Final 2020 Energy-Efficiency Forecast](#)

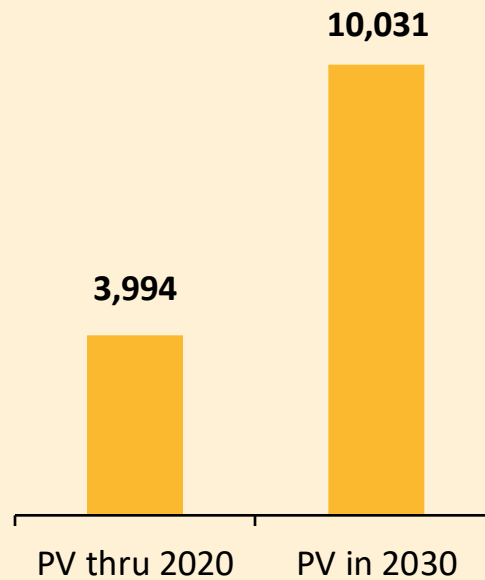
Energy-Efficiency and Renewable Resources Are Trending Up in New England

Energy Efficiency (MW)



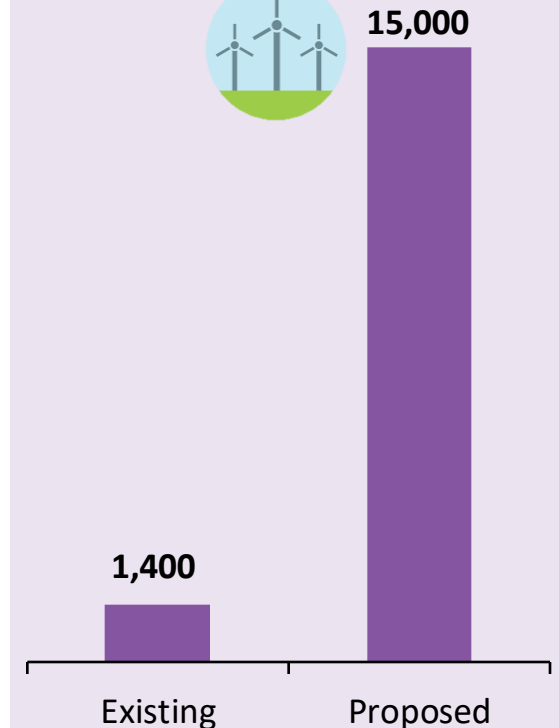
Final 2020 CELT Report, EE through 2019 includes EE resources participating in the Forward Capacity Market (FCM). EE in 2029 includes an ISO-NE forecast of incremental EE beyond the FCM.

Solar (MW)



Draft 20201 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."

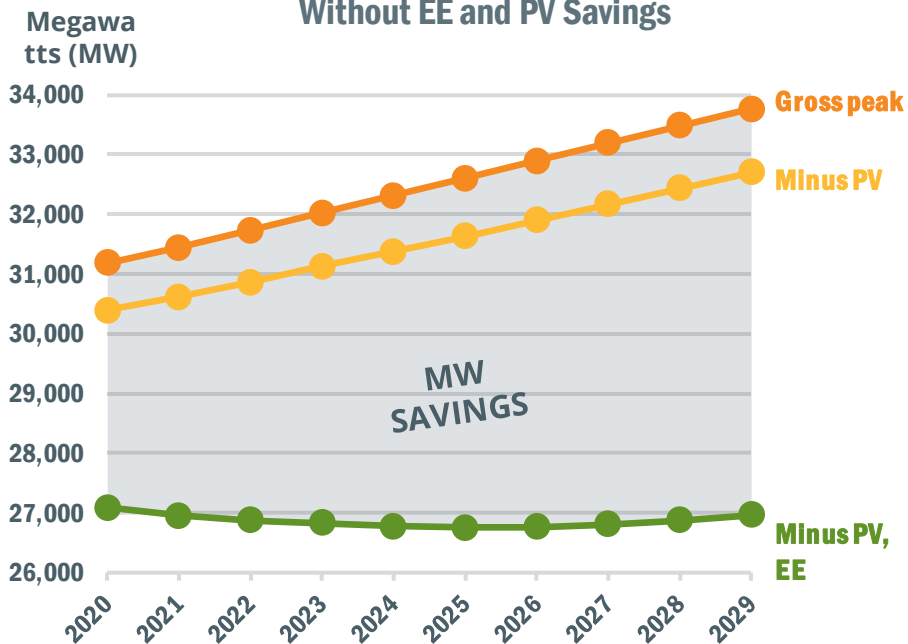
Wind (MW)



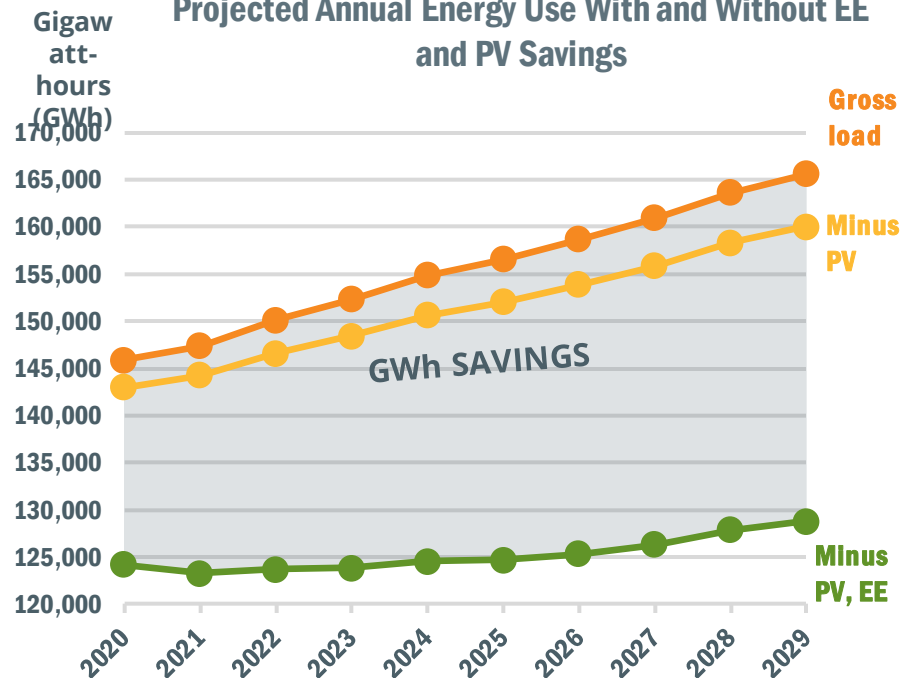
Nameplate capacity of existing wind resources and proposals in the ISO-NE Generator Interconnection Queue (February 2021)

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

Projected Summer Peak Demand With and Without EE and PV Savings



Projected Annual Energy Use With and Without EE and PV Savings



The gross load forecast (projected regional energy use)



The gross load forecast minus existing and anticipated behind-the-meter (BTM) solar photovoltaic (PV) resources

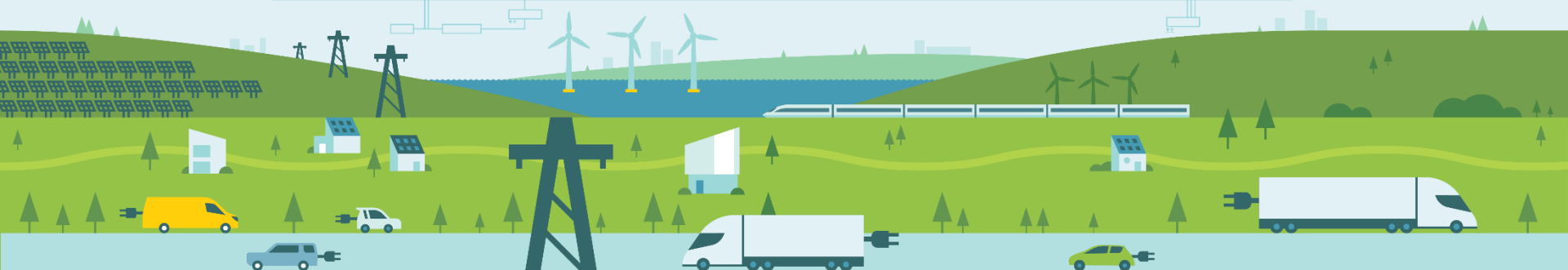


The gross load forecast minus existing and anticipated BTM PV and energy-efficiency (EE)

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)

Demand Patterns Are Changing



- **7.2 million** retail electricity customers drive the demand for electricity in New England (14.8 million population)
 - Region's all-time summer peak demand: **28,130 MW** on August 2, 2006
 - Region's all-time winter peak demand: **22,818 MW** on January 15, 2004
- Energy efficiency (EE) and behind-the-meter (BTM) solar are **reducing** peak demand growth; electrification of heating & transportation to increase load
 - **-0.2%** annual growth rate for summer peak demand (with EE and BTM solar)
 - **+0.4%** annual growth rate for overall electricity use (with EE and BTM solar)
- BTM solar is **shifting** peak demand later in the day in the summertime

Note: Without energy efficiency and solar, the region's peak demand is forecasted to grow 0.9% annually and the region's overall electricity demand is forecasted to grow 1.4% annually. Summer peak demand is based on the "50/50" forecast for typical summer weather conditions.

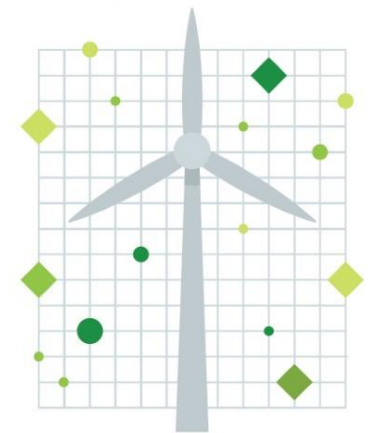
The ISO Continues FERC Order 2222 Compliance Efforts

- Conversations continue with utilities, regulators, and other stakeholders
 - The ISO released its [High-Level Market Design Approach to Compliance](#) in January
 - The ISO continues to receive and reflect on feedback from stakeholders, which may result in design modifications
 - Discussions regarding Order 2222 are expected to continue through the spring
- Issued in September, 2020, the order requires ISOs/RTOs to allow Distributed Energy Resource Aggregations (DERAs) participate in wholesale markets
- The compliance filing is due in July
- ISO has announced its intention to file an extension of the compliance filing deadline to February 1, 2022



ISO-NE Transition to the Future Grid Initiative

- Stakeholder meetings launched in 2020 started on [two tracks](#):
 - **Future Grid Reliability Study**: Stakeholder-led assessment of the future state of New England’s power system
 - **Pathways to the Future Grid**: Regional identification, exploration, and evaluation of potential market frameworks that may help support the evolution of its power grid
- In January, NEPOOL received a report exploring various pathways the region could take, focusing on two questions
 - Whether a particular pathway would support or help to advance the clean energy policies of States
 - Whether pathways garner efficiency of regional markets
 - The [report](#) is available on the ISO’s website.
- The ISO is also undertaking additional studies



The ISO Is Supporting Several Future Grid Studies in 2021

Study Name	Description
Future Grid Reliability Study (FGRS) Phase I	Stakeholder-defined scenarios examine how the power system could operate in 2040 under current energy and environmental policies
2050 Transmission Study	Transmission study (in support of the New England States' vision statement) to help states determine how to expand the system to incorporate wind, hydro, and distributed energy resources
Pathways Evaluations	Examines potential market frameworks that may help evolve the power grid to a future that reflects states' policies

Source: <https://www.iso-ne.com/static-assets/documents/2021/02/npc-20210218-chadalavada-presentation-r.pdf>

FOR MORE INFORMATION...



Subscribe to the *ISO Newswire*

[ISO Newswire](#) is your source for regular news about ISO New England and the wholesale electricity industry within the six-state region



Log on to ISO Express

[ISO Express](#) provides real-time data on New England's wholesale electricity markets and power system operations



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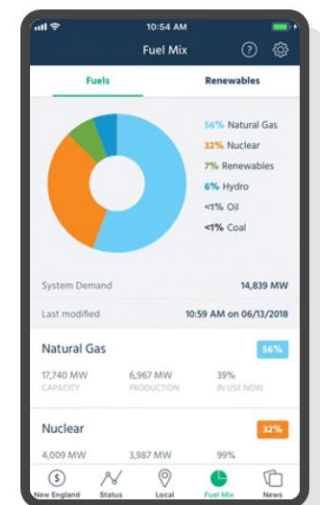
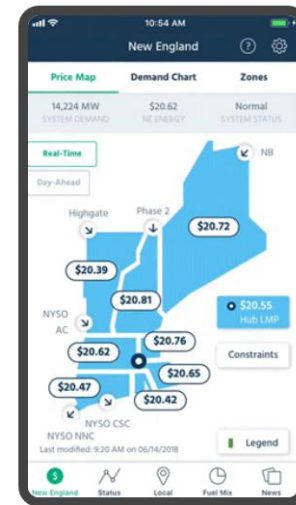


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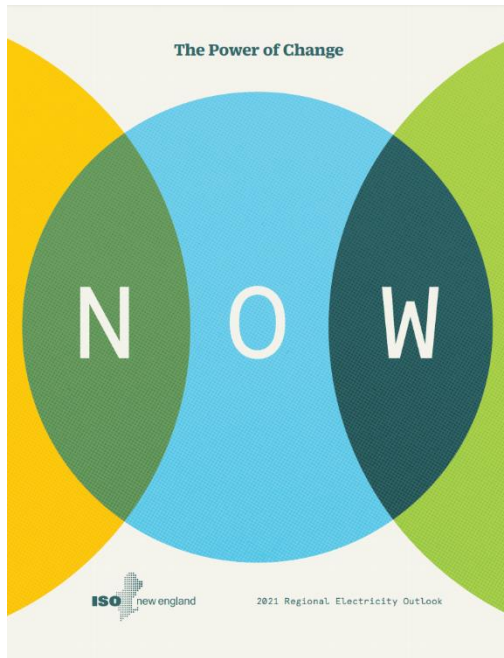
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Download the ISO to Go App

[ISO to Go](#) is a free mobile application that puts real-time wholesale electricity pricing and power grid information in the palm of your hand

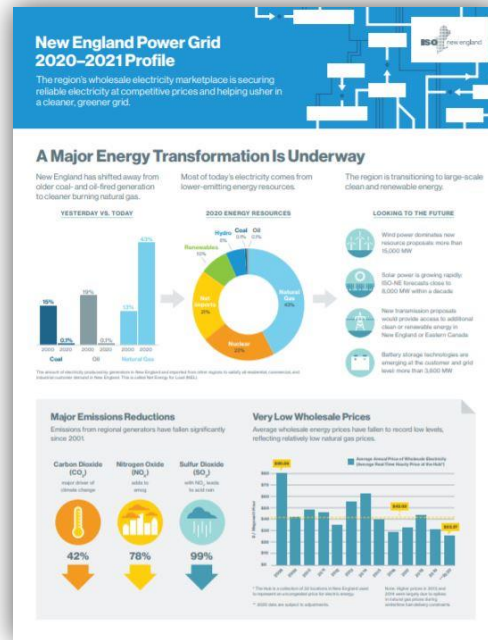


Recent ISO New England Publications



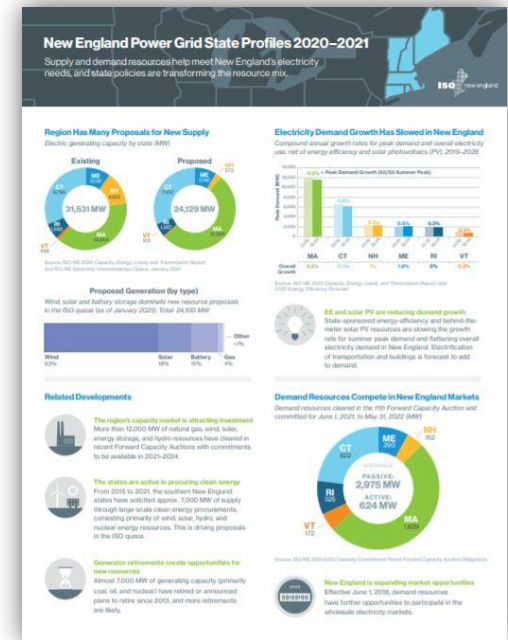
2021 Regional Electricity Outlook

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

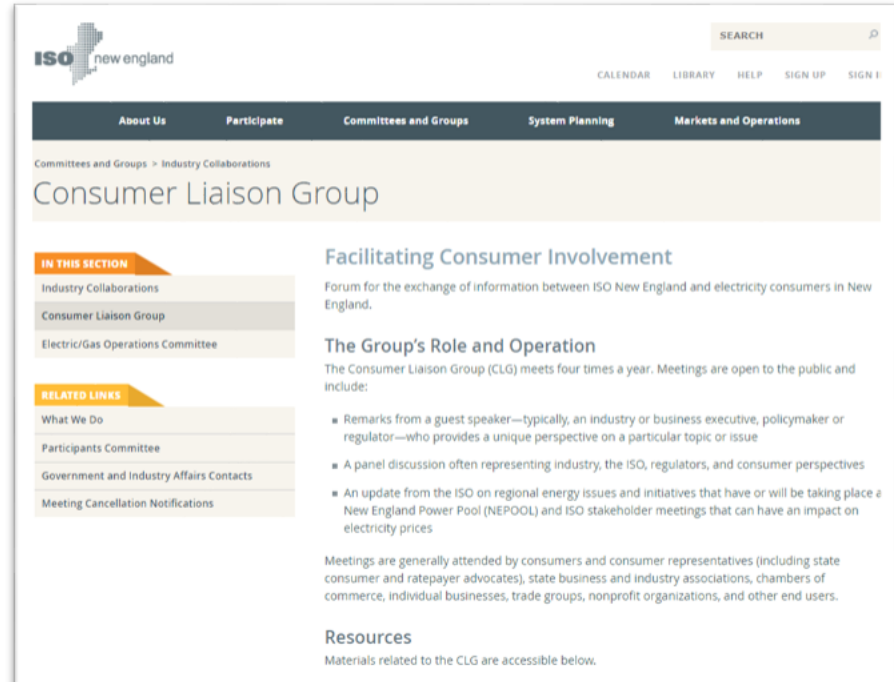


New England State Profiles

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

Join Us for a 2021 Consumer Liaison Group Meeting

- Consumer Liaison Group (CLG) meetings are:
 - A **forum** for sharing information between ISO New England and electricity consumers in the region
 - **Developed** by the CLG Coordinating Committee and **facilitated** by ISO New England
 - **Free** and **open** to the public
- Upcoming 2021 Meetings
 - Thursday, June 17
 - Thursday, September 9
 - Wednesday, December 1



The screenshot shows the ISO New England website page for the Consumer Liaison Group. The page features a navigation menu with options like 'About Us', 'Participate', 'Committees and Groups', 'System Planning', and 'Markets and Operations'. The main content area is titled 'Consumer Liaison Group' and includes sections for 'Facilitating Consumer Involvement', 'The Group's Role and Operation', and 'Resources'. The 'Facilitating Consumer Involvement' section describes the forum for information exchange. The 'The Group's Role and Operation' section states that the CLG meets four times a year and is open to the public. The 'Resources' section mentions that materials related to the CLG are accessible below.



More information on the CLG is available at: <https://www.iso-ne.com/committees/industry-collaborations/consumer-liason/>

Questions

