

ISO New England Overview and Regional Update



Rhode Island Special Legislative Commission

Eric Johnson

DIRECTOR, EXTERNAL AFFAIRS

Kerry Schlichting

EXTERNAL AFFAIRS



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

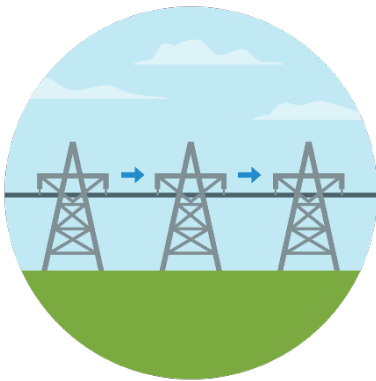
- **Regulated** by the Federal Energy Regulatory Commission
- **Reliability Coordinator** for New England under the North American Electric Reliability Corporation
- **Independent** of companies in the marketplace and **neutral** on technology



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

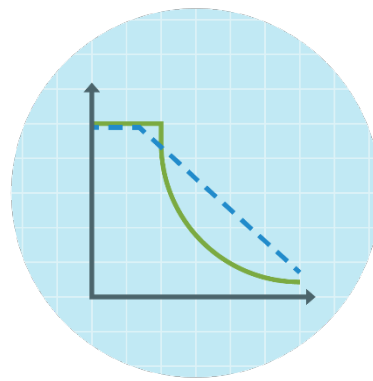
Grid Operation

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



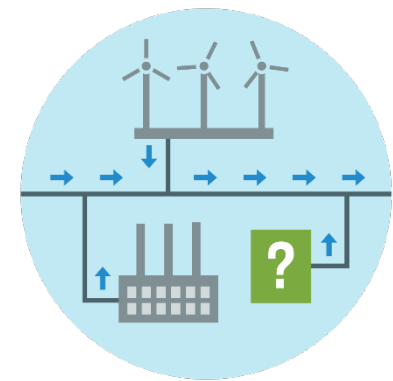
Market Administration

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

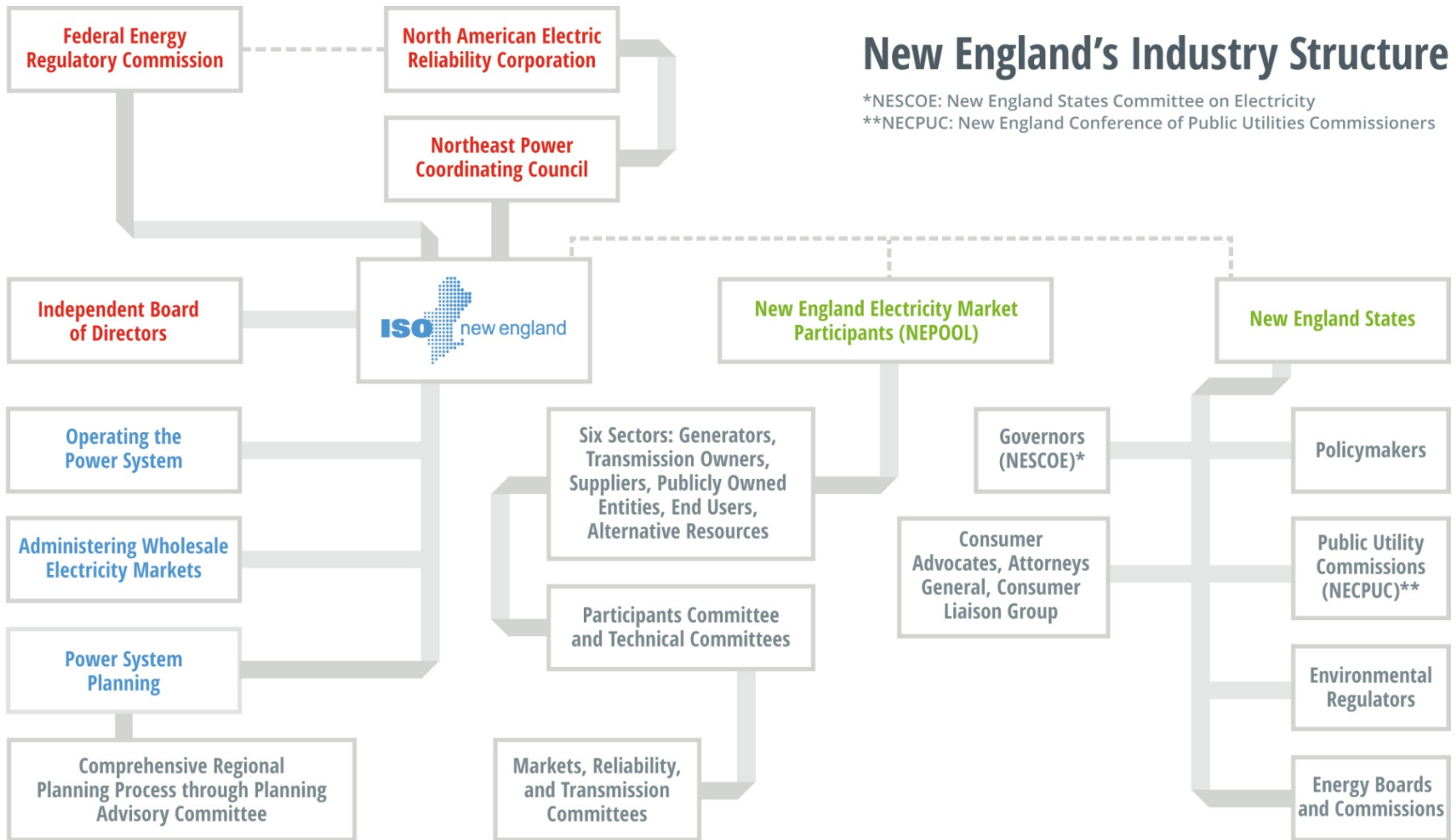


Power System Planning

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



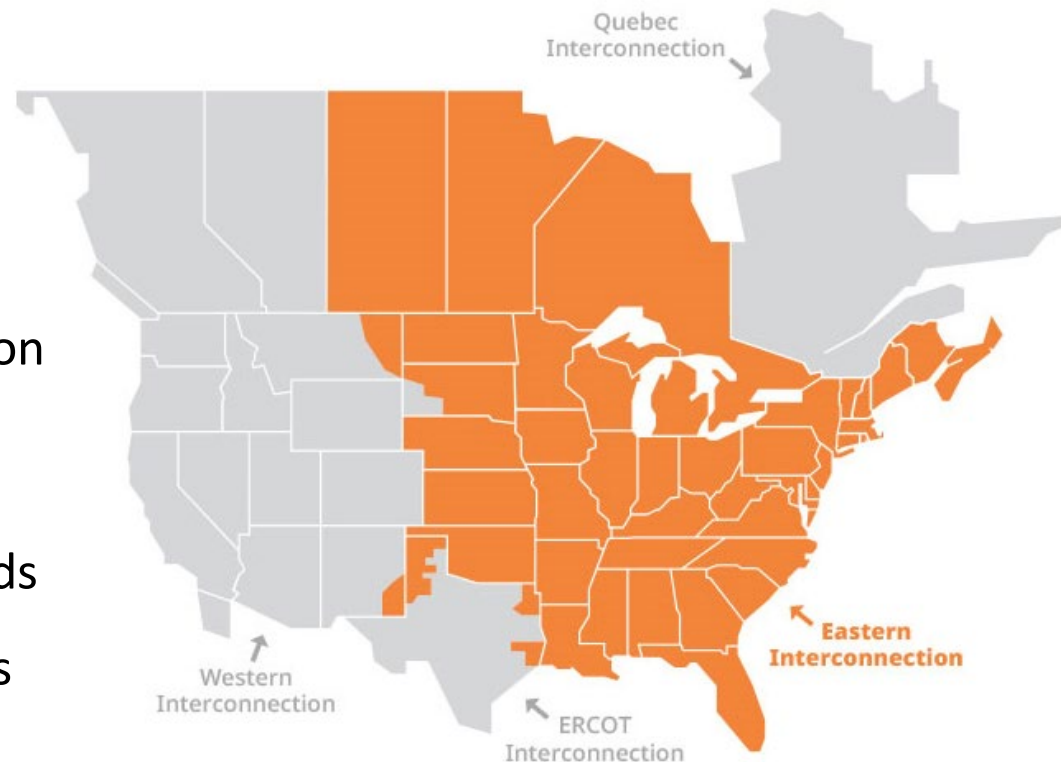
ISO New England Keeps Power Flowing Across the Region Every Minute of Every Day

Area	ACE	Area	ACE
750	103	PJM	-105
850	1	MISO	-7
ISO	-136	TVA	-134



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***

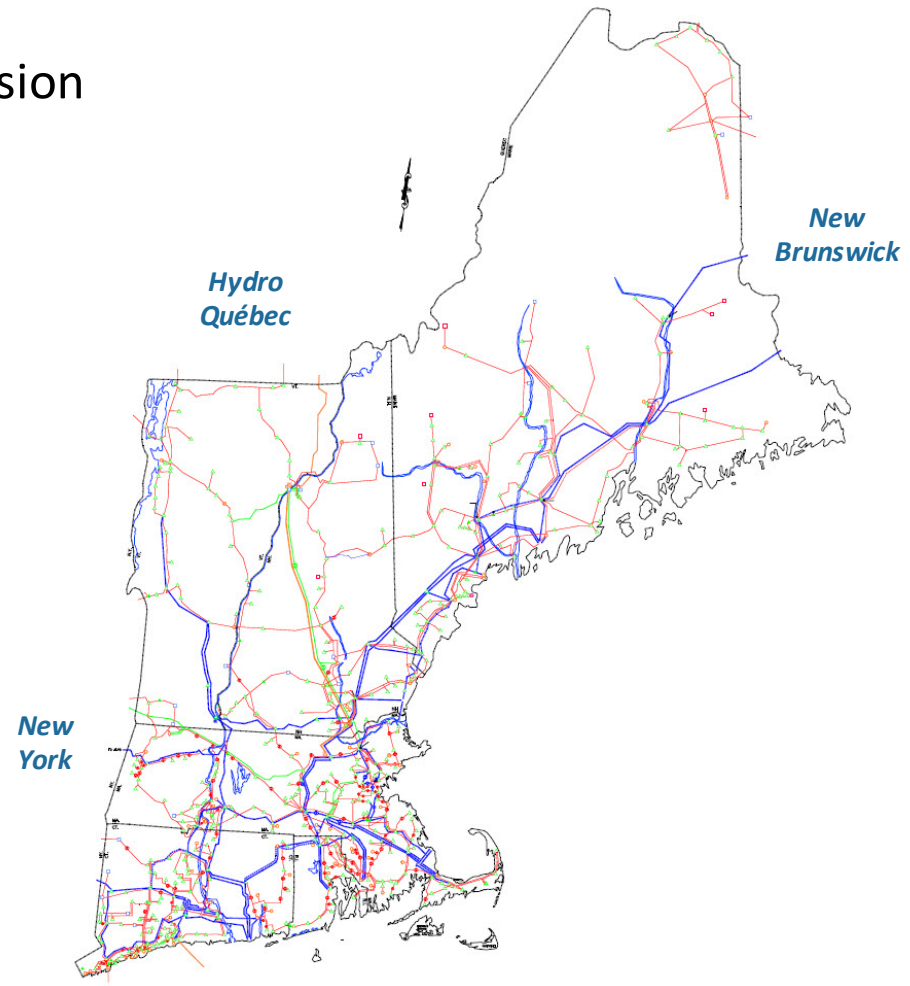


* North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council (NPCC)



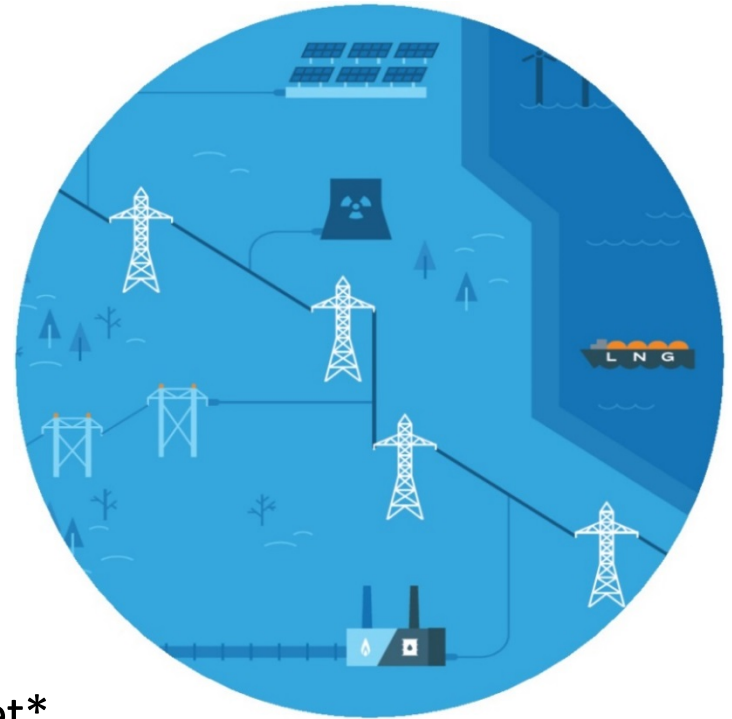
New England's Transmission Grid Is the Interstate Highway System for Electricity

- **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 **24,000 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.

Demand Patterns Are Changing

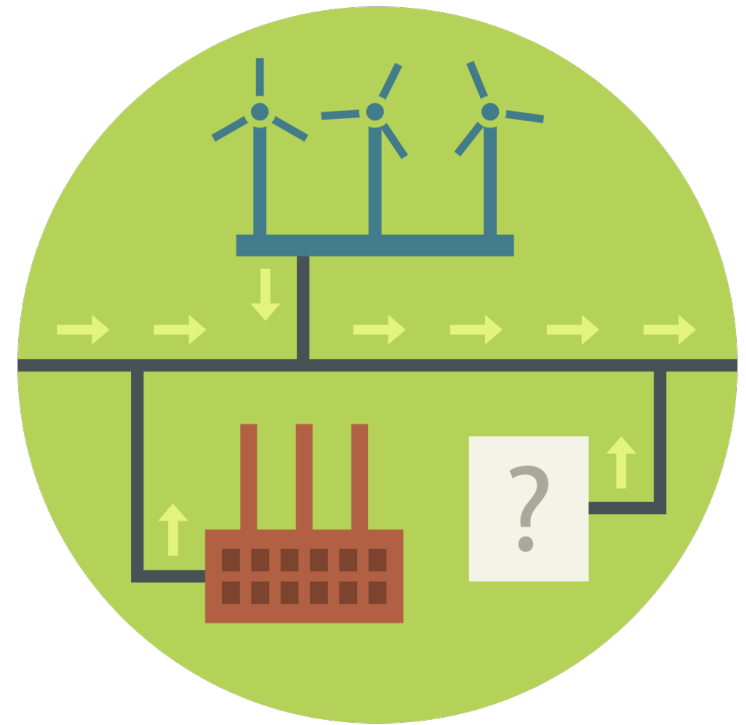


- **7.2 million** retail electricity customers drive the demand for electricity in New England (14.8 million population)
 - Region's all-time summer peak demand: **28,130 MW** on August 2, 2006
 - Region's all-time winter peak demand: **22,818 MW** on January 15, 2004
- Energy efficiency (EE) and behind-the-meter (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.

ISO New England Manages Regional Power System Planning to Meet Future Electricity Needs

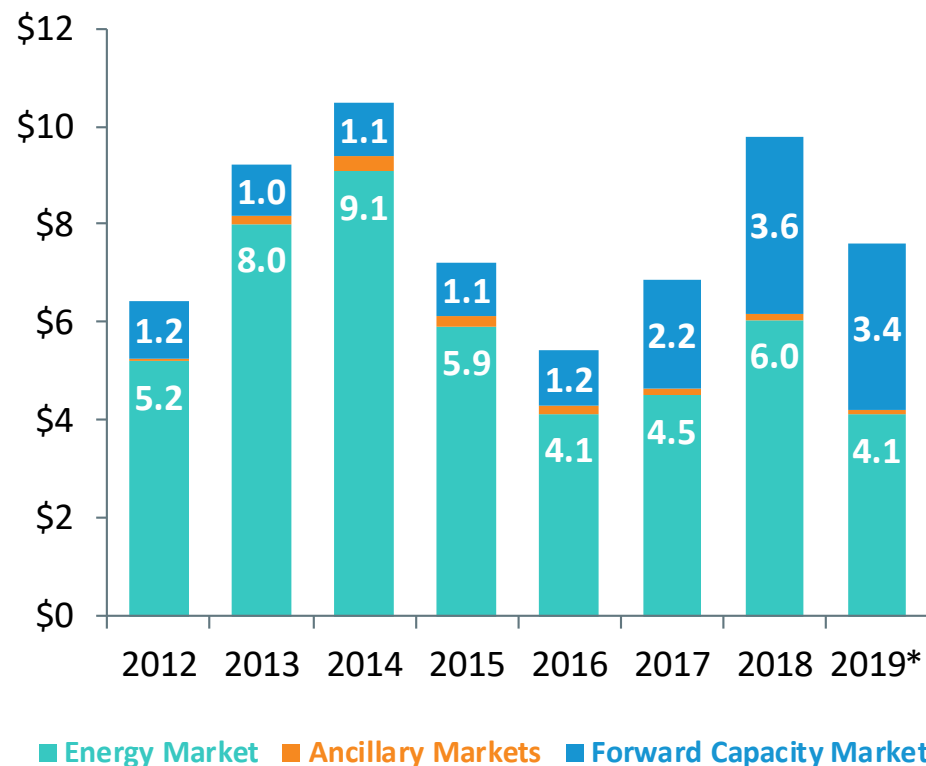
- Manage regional power system planning in accordance with mandatory reliability standards
- Administer requests for interconnection of generation and regional transmission system access
- Conduct transmission system needs assessments
- Plan regional transmission system to provide regional network service
- Develop Regional System Plan (RSP) with a ten-year planning horizon



Many Resources Compete to Supply Electricity in New England's Wholesale Markets

- Close to **500** buyers and sellers in the markets
- **\$7.6 billion** in wholesale electricity market transactions in 2019
 - **\$4.1 billion** in the energy market
 - **\$100 million** in the ancillary services markets
 - **\$3.4 billion** in the capacity market
- Extensive analysis and reporting of market results

Annual Value of Wholesale Electricity Markets
(in billions)

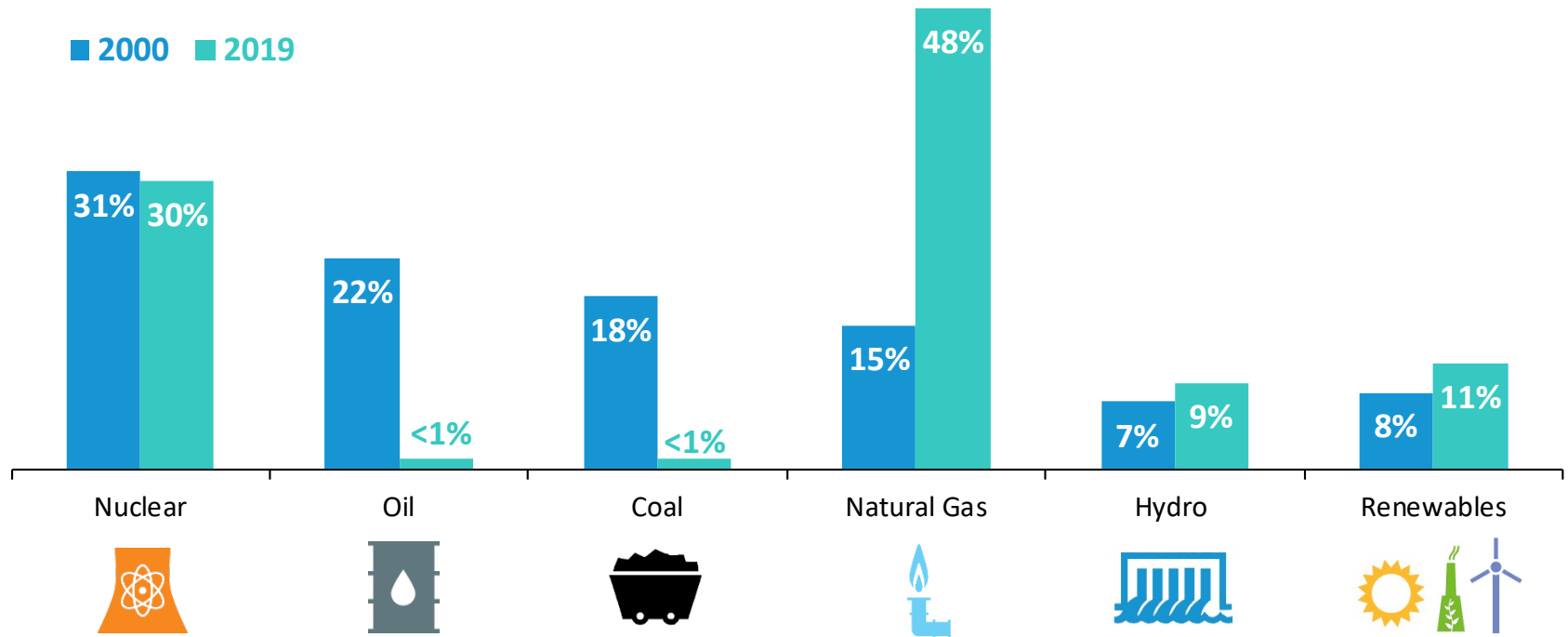


* 2019 data are subject to adjustment

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)



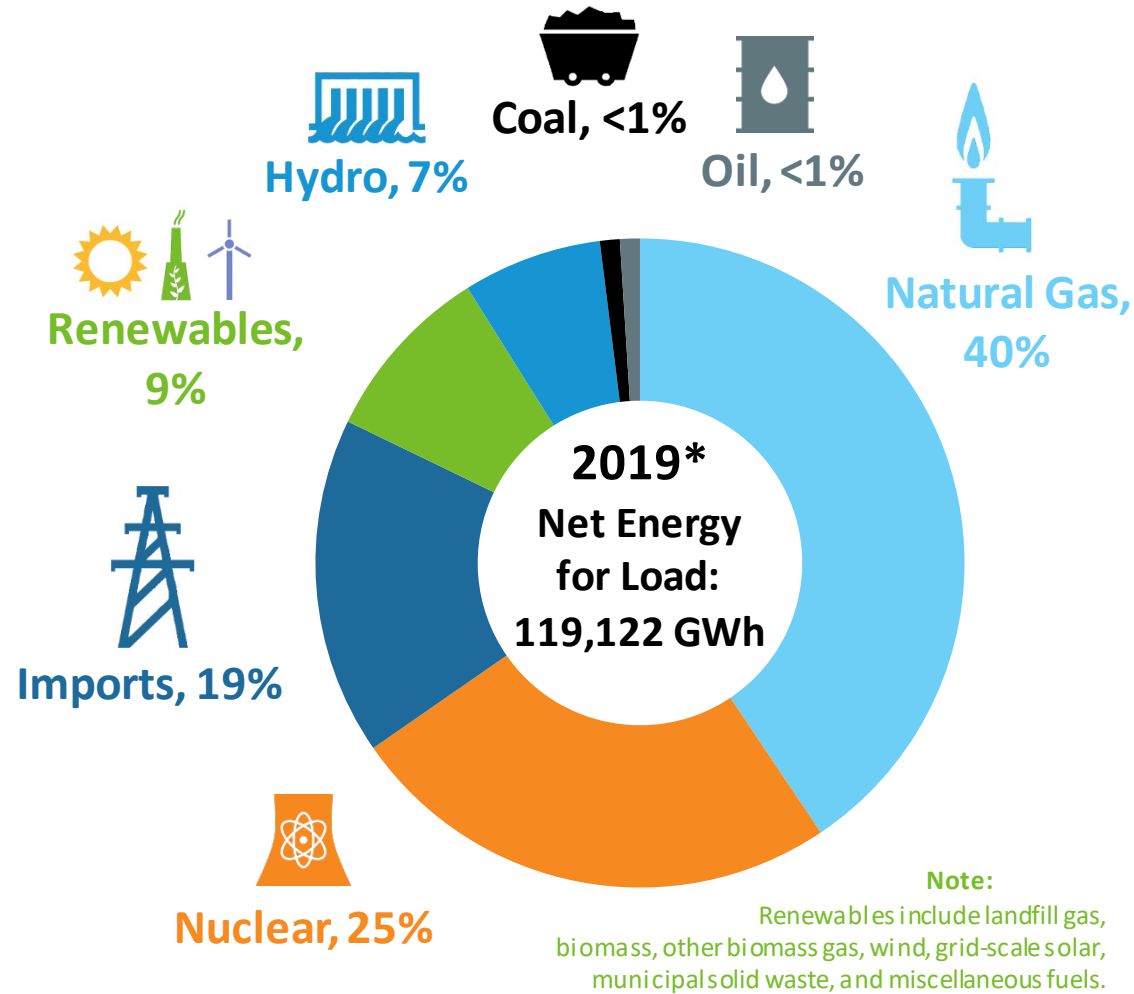
Source: ISO New England [Net Energy and Peak Load by Source](#); data for 2019 is preliminary and subject to resettlement

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.

Lower-Emitting Sources of Energy Supply Most of New England's Electricity

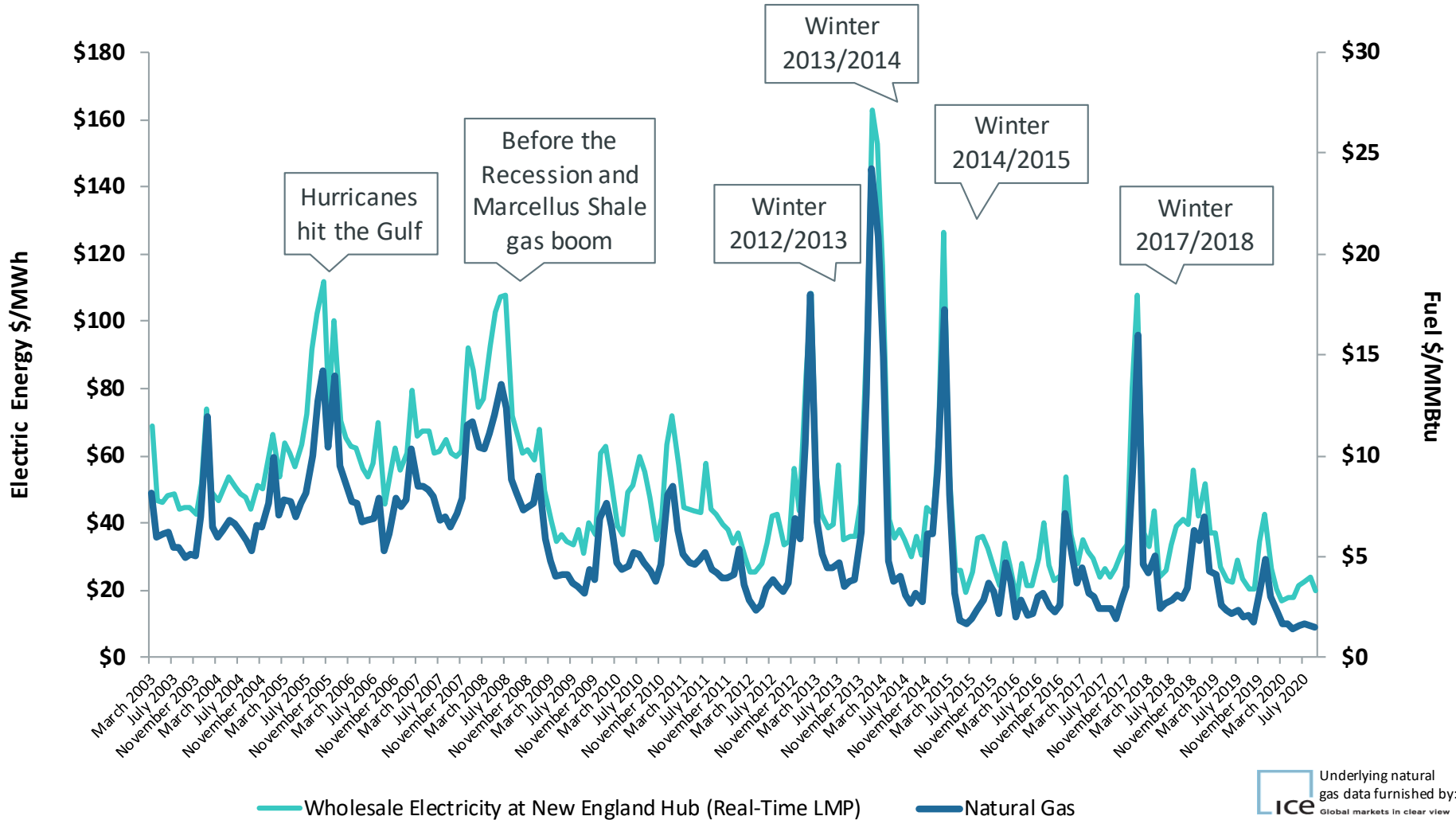
- In 2019, most of the region's energy needs were met by natural gas, nuclear, imported electricity (mostly hydropower from Eastern Canada), renewables, and other low- or non-carbon-emitting resources
- Region is transitioning away from older coal and oil resources



*Data is subject to adjustment

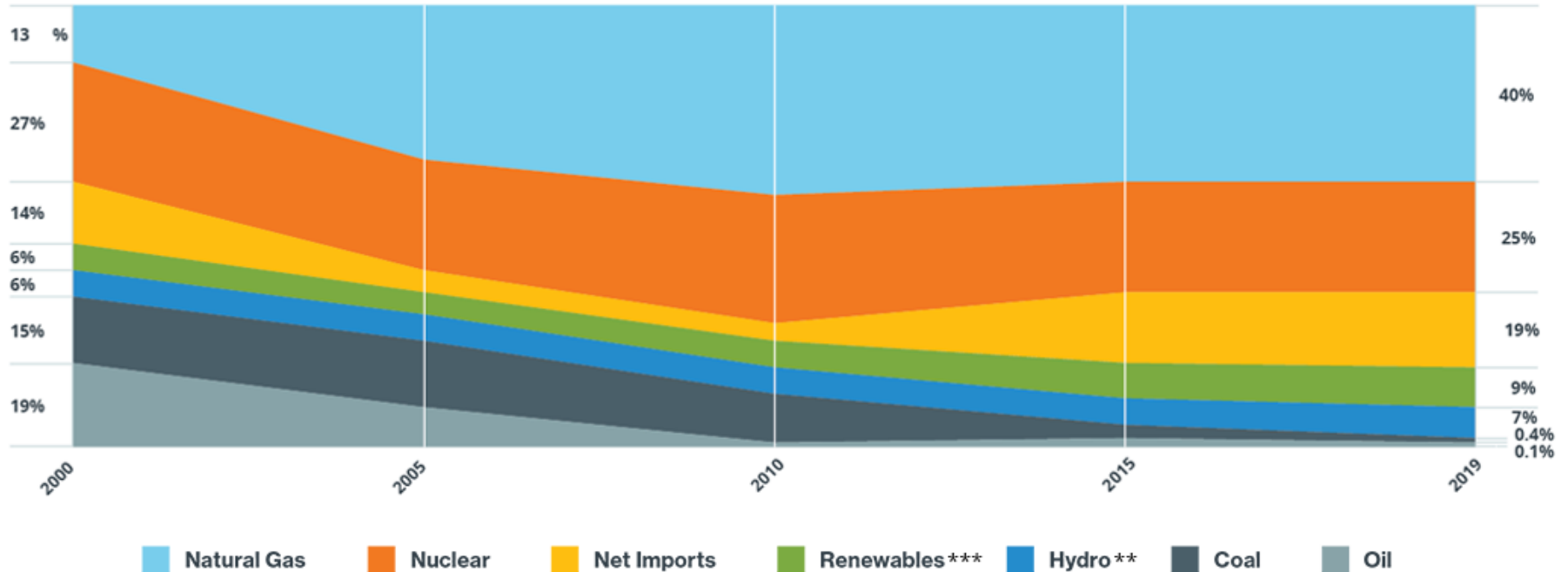
Natural Gas and Wholesale Electricity Prices Are Linked

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



Lower-Emitting Sources of Energy Supply Most of New England's Electricity

Sources of Grid Electricity in New England (Annual Net Energy for Load)



*Data are subject to adjustments. This chart approximates the amount of generation by individual fuels used by dual-fuel units, such as natural-gas-fired generators that can switch to run on oil and vice versa. Before 2016, generation from such units was attributed only to the primary fuel type registered for the unit.

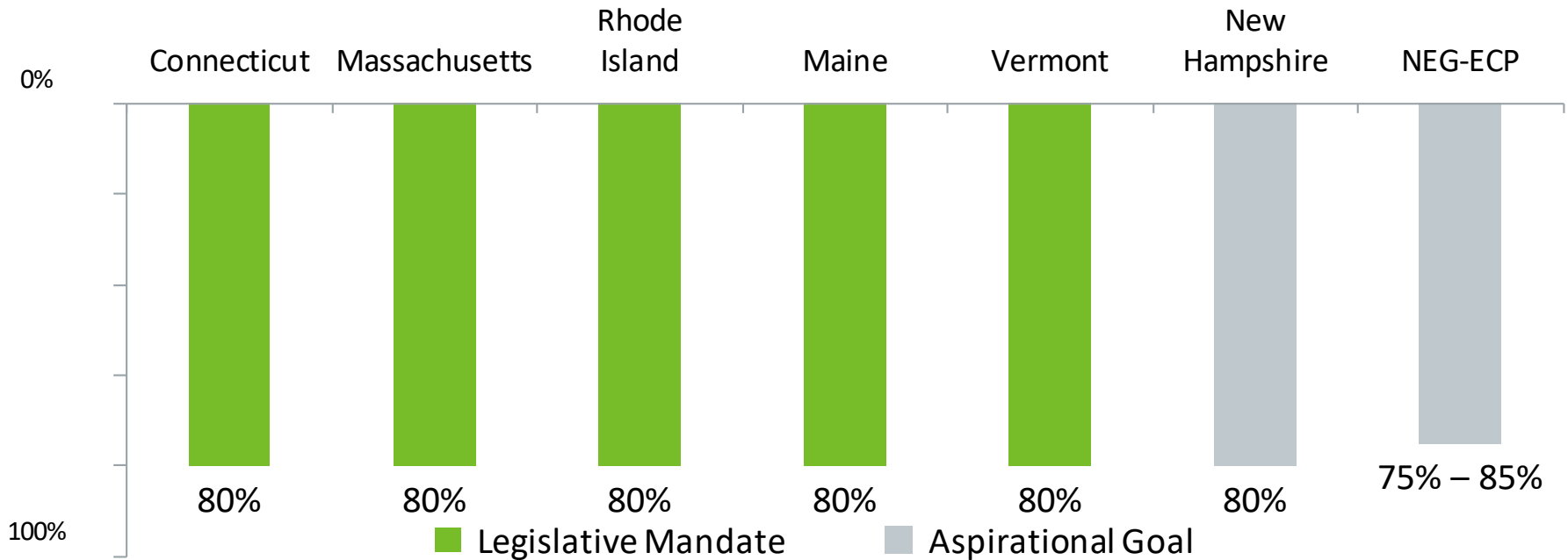
**Includes pondage, run-of-river, and pumped storage.

***Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, municipal solid waste, and miscellaneous fuels. Hydro is not included in this category primarily because the various sources that make up hydroelectric generation (i.e., conventional hydroelectric, run-of-river, pumped storage) are not universally defined as renewable in the six New England states.

Source: ISO New England, generation data and *Net Energy and Peak Load by Source Report*

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: <http://isonewswire.com/updates/2019/10/2/the-new-england-states-frameworks-for-reducing-greenhouse-ga.html>

Power Plant Emissions Have Declined with Changes in the Fuel Mix

New England Generator Air Emissions - 2001 vs. 2018

Carbon Dioxide (CO₂)
major driver of
climate change ↓ **36%**



Nitrogen Oxide (NO_x)
adds to smog ↓ **74%**



Sulfur Dioxide (SO₂)
with NO_x, leads
to acid rain ↓ **98%**



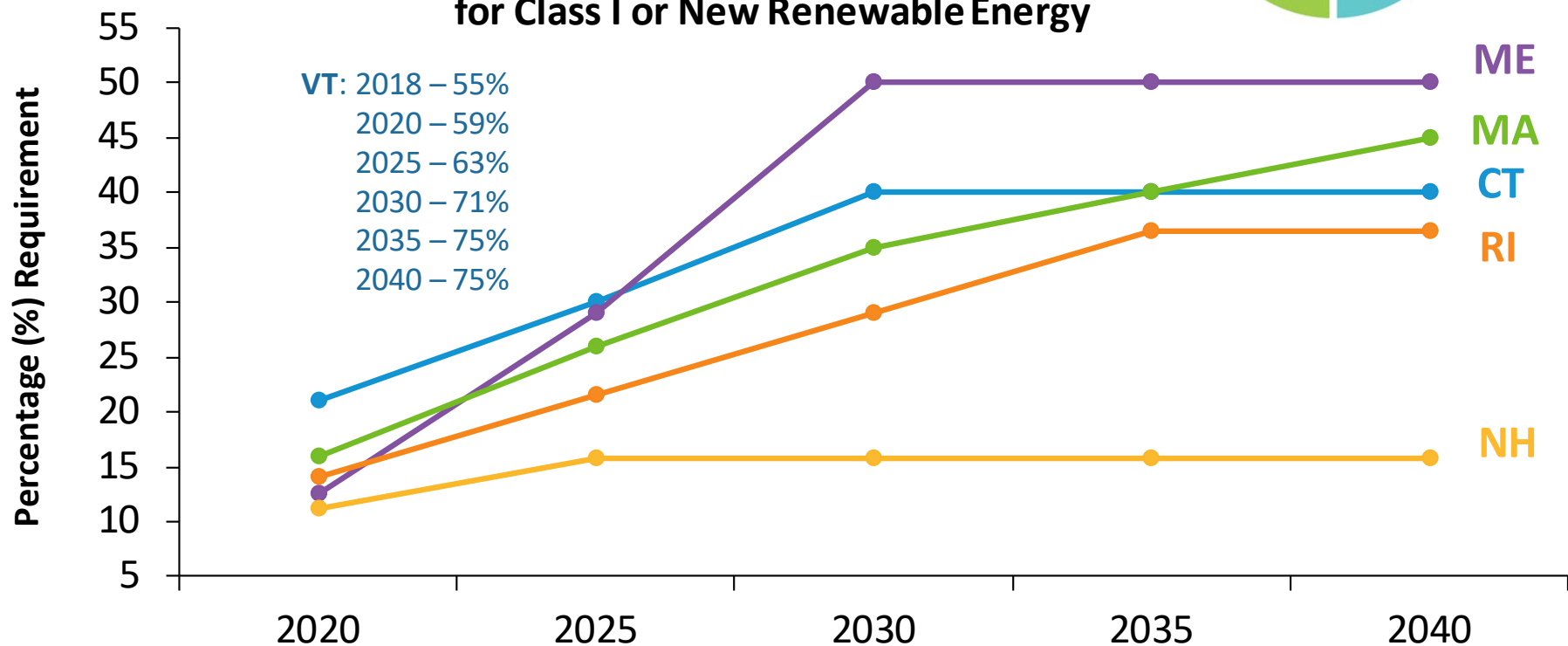
Source: ISO New England [2020 Regional Electricity Outlook](#) (February 2020)

Renewable Energy Is on the Rise

State policy requirements are a major driver



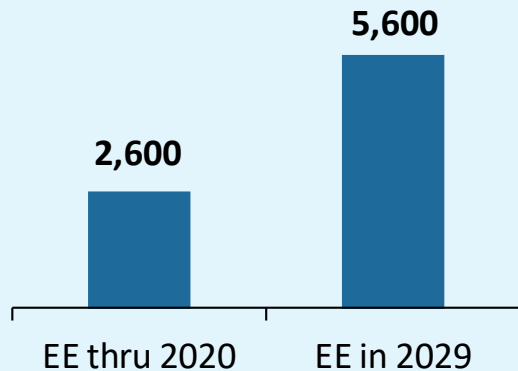
State Renewable Portfolio Standard (RPS)* for Class I or New Renewable Energy



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.

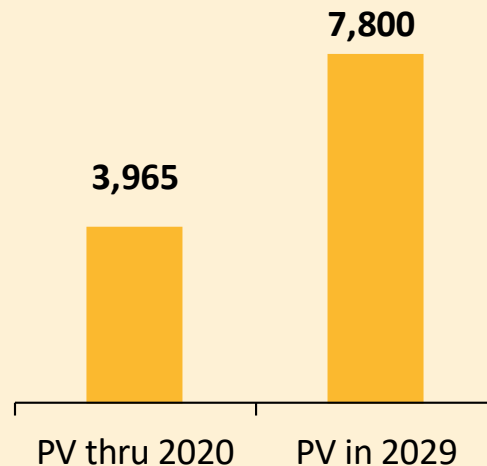
Energy-Efficiency and Renewable Resources Are Trending Up in New England

Energy Efficiency (MW)



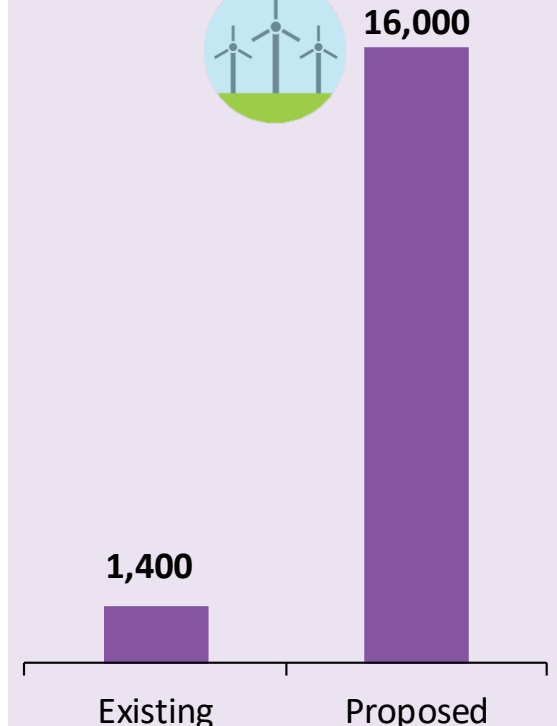
Final 2020 CELT Report, EE through 2019 includes EE resources participating in the Forward Capacity Market (FCM). EE in 2029 includes an ISO-NE forecast of incremental EE beyond the FCM.

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."

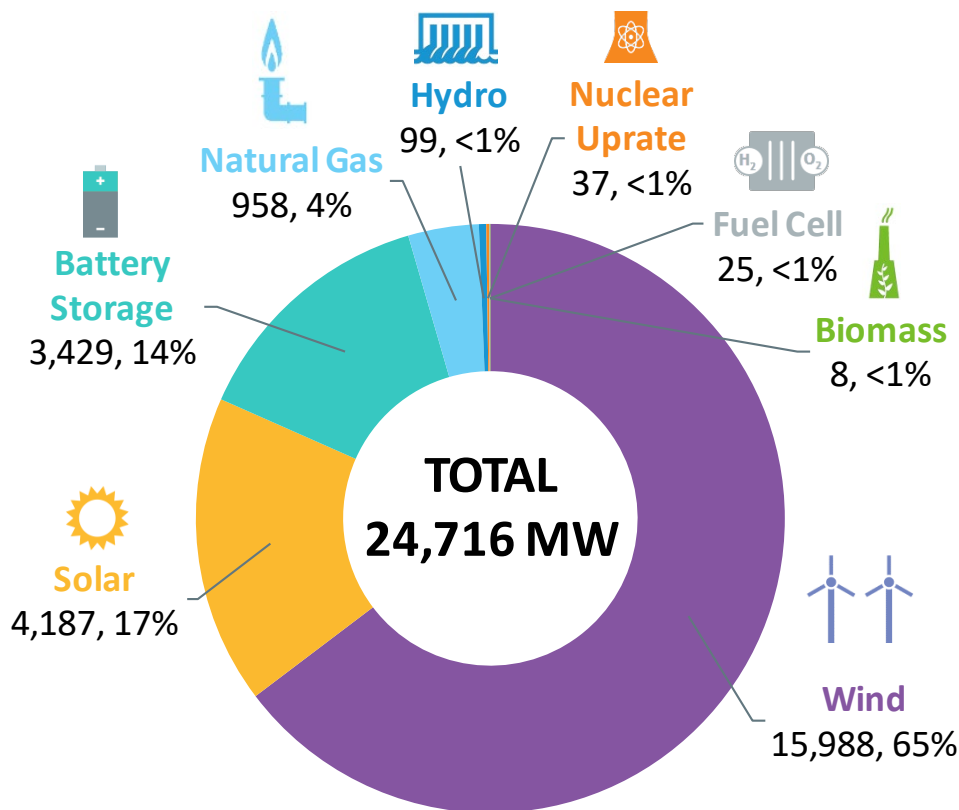
Wind (MW)



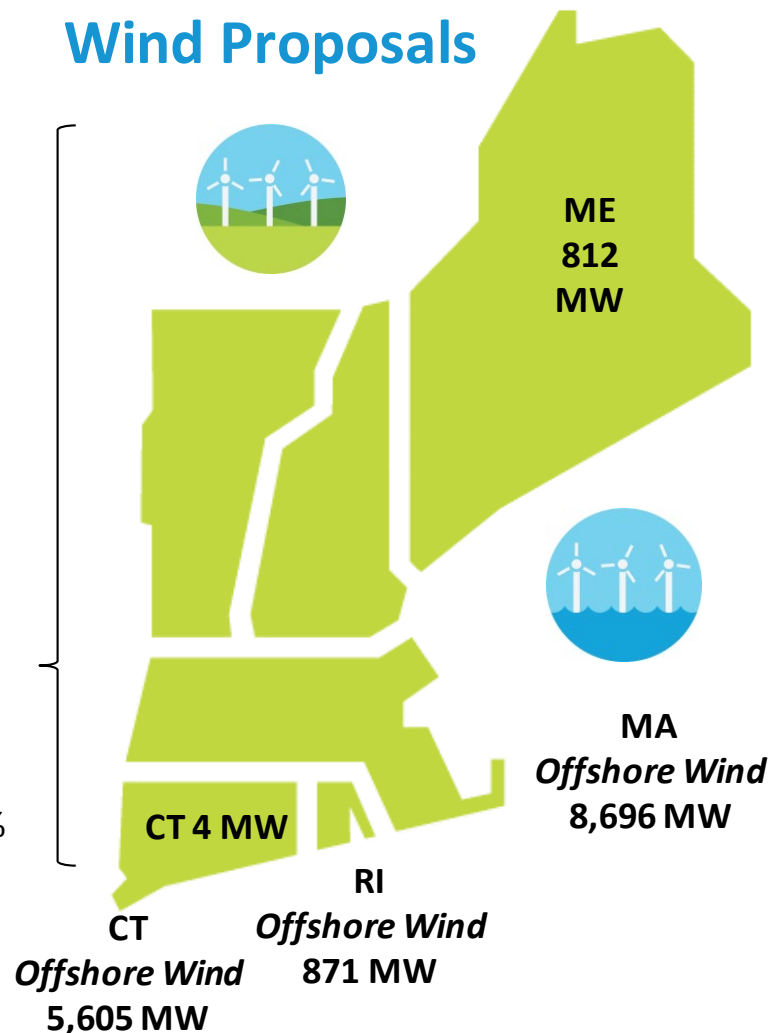
Nameplate capacity of existing wind resources and proposals in the ISO-NE Generator Interconnection Queue (October 2020)

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

All Proposed Resources



Wind Proposals

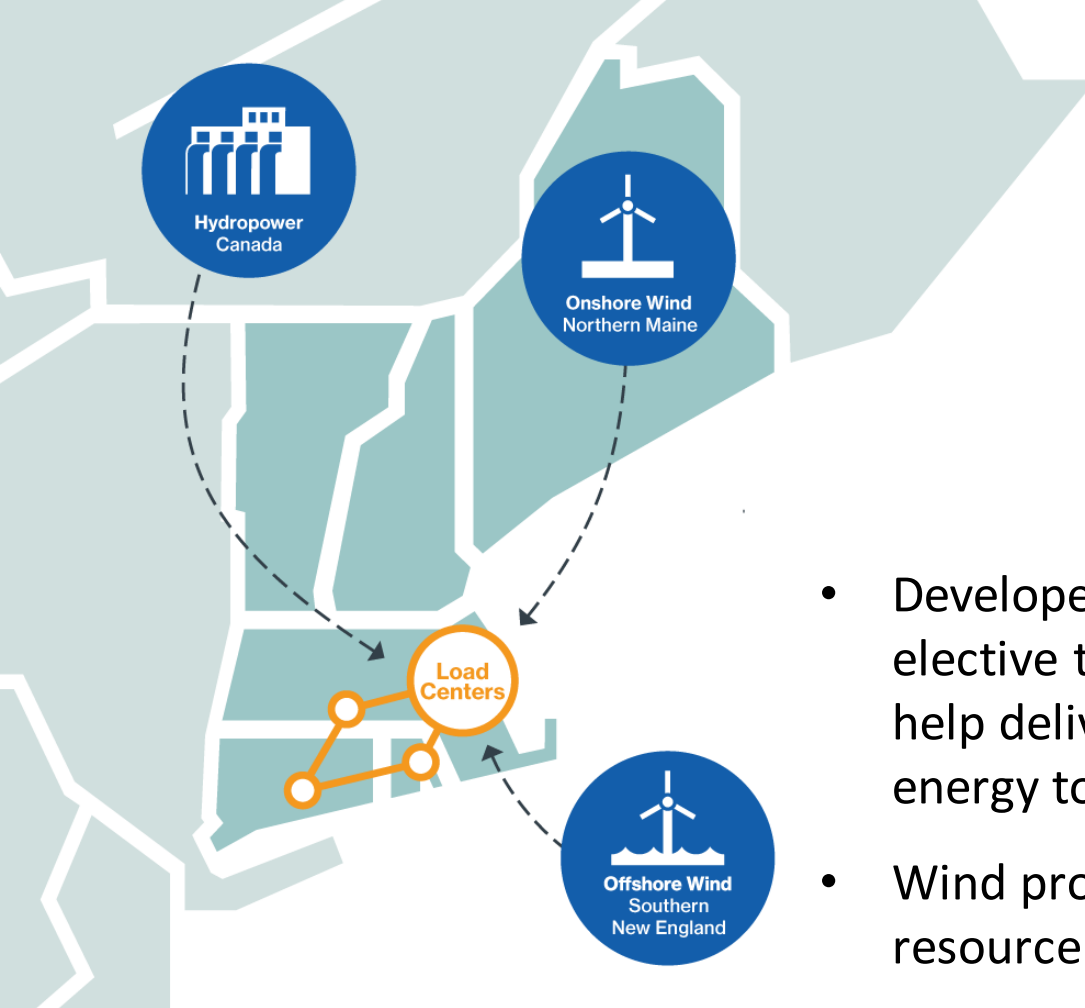


Source: ISO Generator Interconnection Queue (October 2020)

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.



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

Source: [ISO Interconnection Queue](#) (October 2020)

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

- Developers are proposing roughly **15** elective transmission upgrades (ETUs) to help deliver about **6,000 MW** of clean energy to New England load centers
- Wind projects make up roughly **65%** 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

New Energy Storage Technologies Are Coming On Line

- **20 MW** of grid-scale battery storage projects have come on line since late 2015
- Over **3,000 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

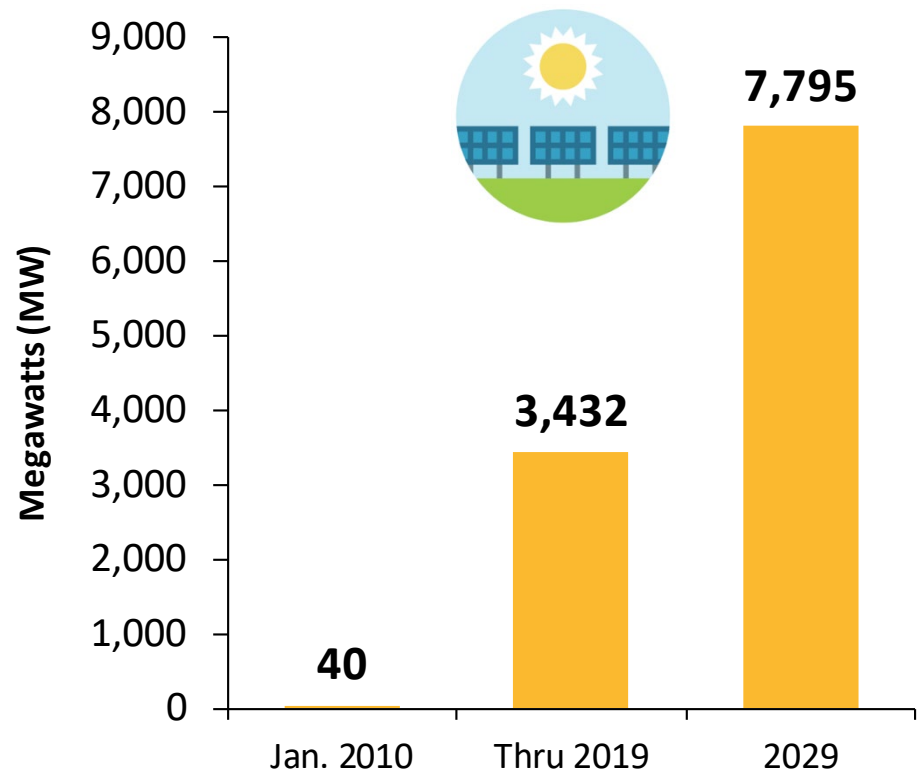


ISO New England Forecasts Strong Growth in Solar Photovoltaic (PV) Resources

December 2019 Solar PV Installed Capacity (MW_{ac})

State	Installed Capacity (MW _{ac})	No. of Installations
Connecticut	566.53	44,514
Massachusetts	2,180.45	102,381
Maine	56.32	5,387
New Hampshire	105.24	9,587
Rhode Island	159.75	7,776
Vermont	364.24	13,863
New England	3,432.53	183,508

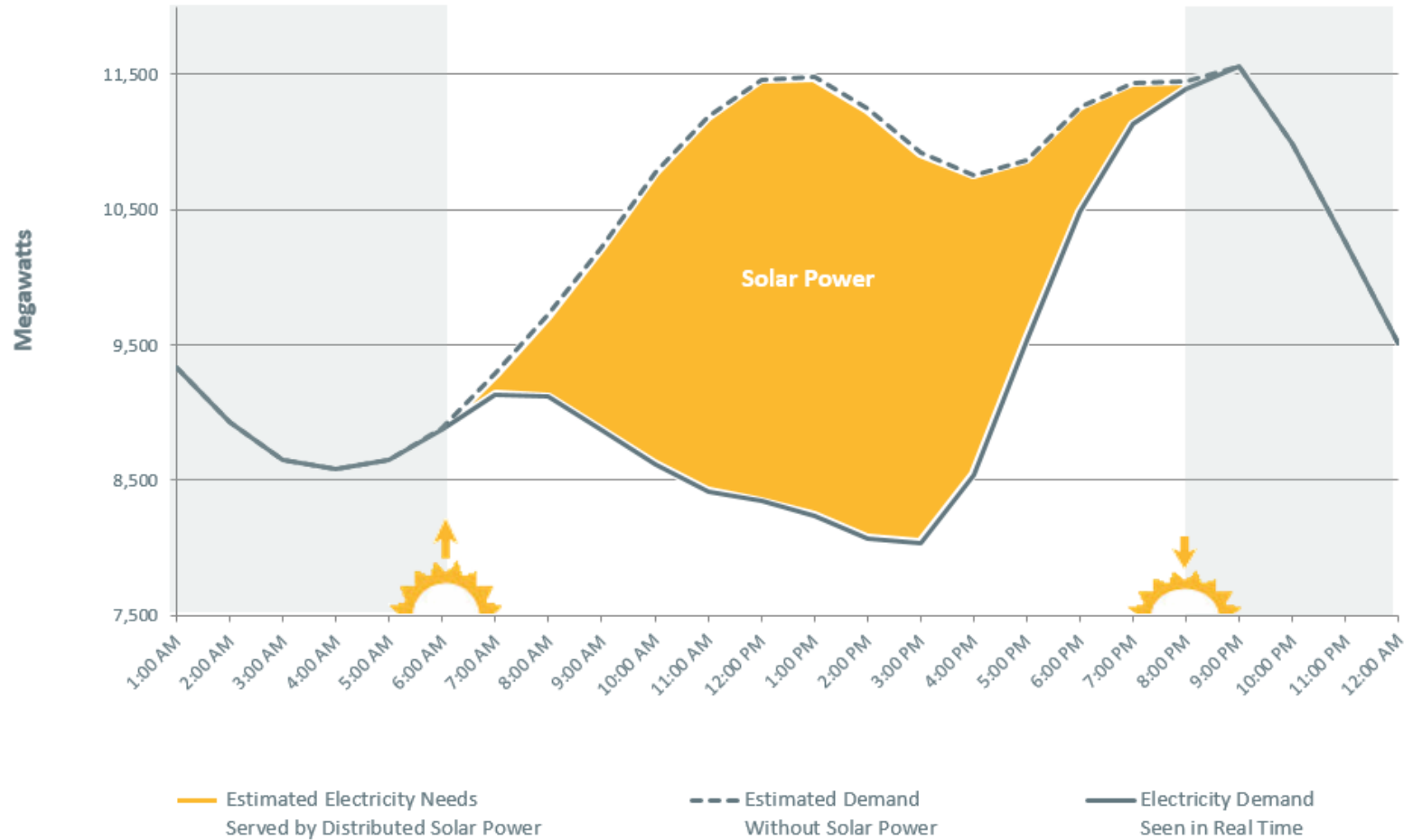
Cumulative Growth in Solar PV through 2029 (MW_{ac})



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: [Final 2020 PV Forecast](#) (March 2020); MW values are AC nameplate.

Historic Dip in Midday Demand with Record-High Solar Power Output on May 2, 2020

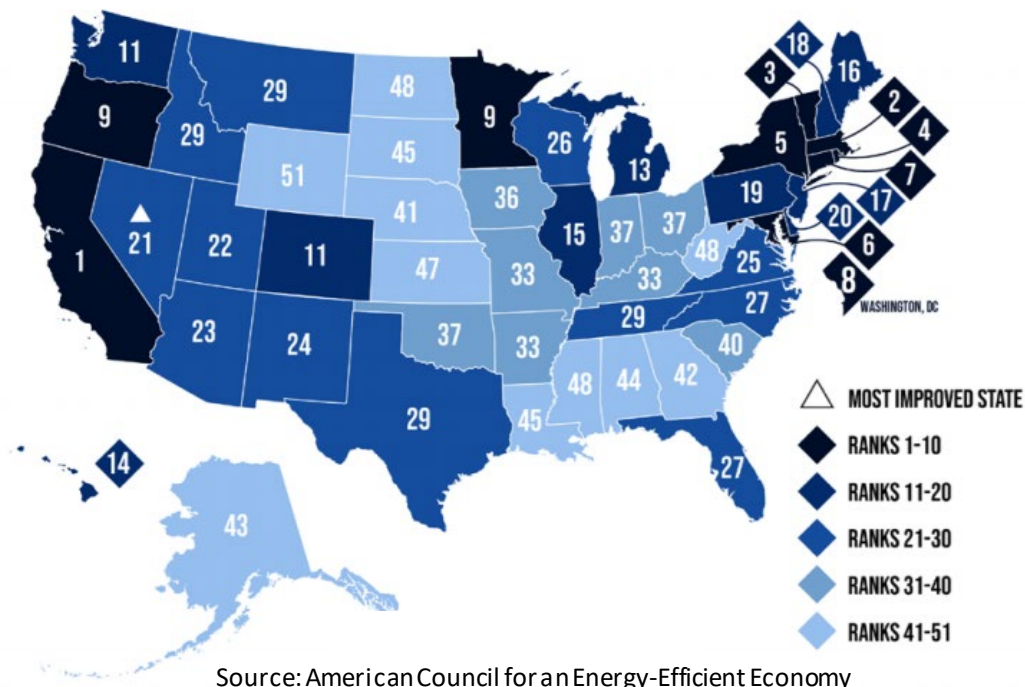
In Hour Ending 13, behind-the-meter solar reduced grid demand by more than 3,200 MW



Source: ISO New England

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

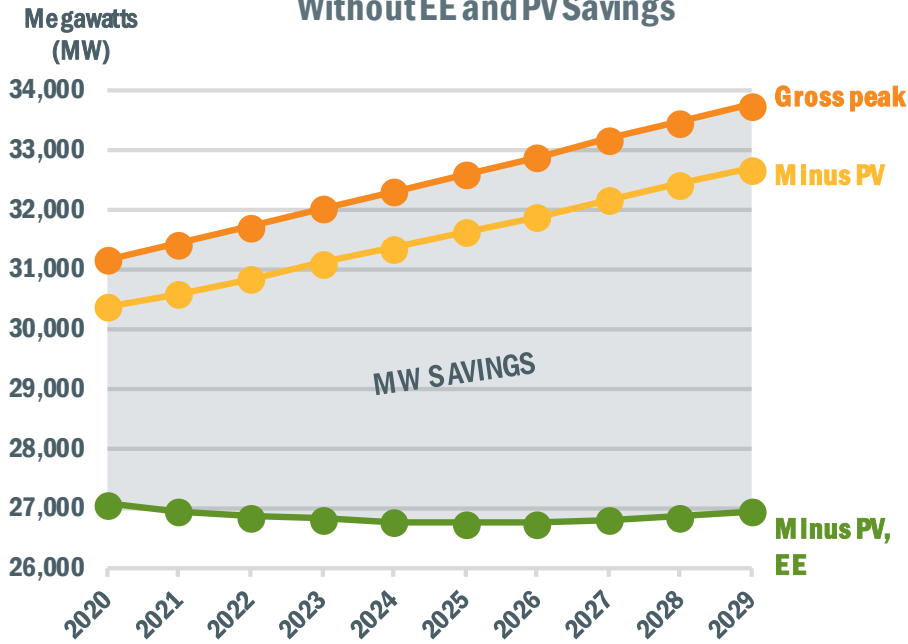
- Billions spent over the past few years and more on the horizon
 - Nearly \$5.3 billion invested from 2012 to 2017
 - ISO estimates \$10.7 billion to be invested in EE from 2021 to 2029



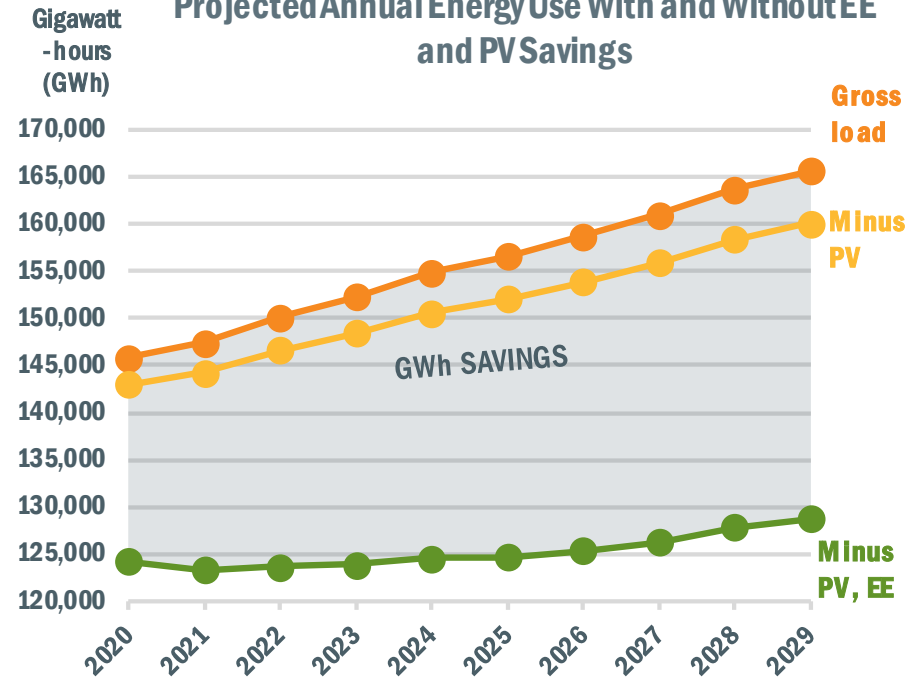
Source: [ISO New England Final 2020 Energy-Efficiency Forecast](#)

Energy Efficiency and 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



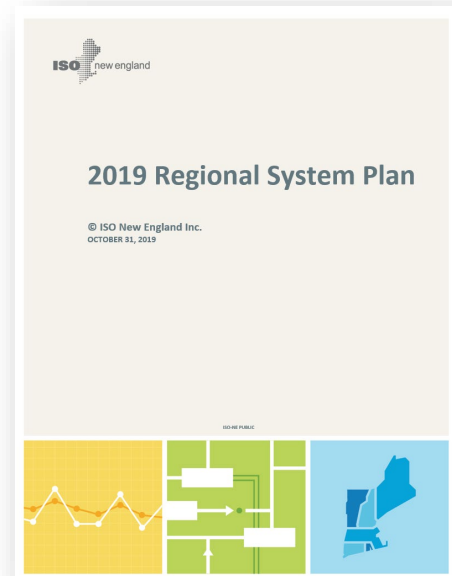
- The gross load forecast (projected regional energy use)
- The gross load forecast minus existing and anticipated behind-the-meter (BTM) solar photovoltaic (PV) resources

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

Overview of Transmission Planning

- As the **Regional Transmission Organization**, the ISO is required to identify transmission infrastructure solutions that are essential for maintaining power system reliability in New England
- Through an **open stakeholder process**, the ISO is responsible for the development of long-range plans to address future system needs over the ten-year planning horizon
 - Summarized in a **Regional System Plan (RSP)**
- The transmission planning process is governed by a **FERC-approved tariff**
- The transmission planning process has been revised to comply with the Federal Energy Regulatory Commission's (FERC) **Order No. 1000**



ISO New England 2019 Regional System Plan: https://www.iso-ne.com/static-assets/documents/2019/10/rsp19_final.docx

Transmission Projects to Maintain Reliability Have Progressed throughout New England

Major 345 kV Projects

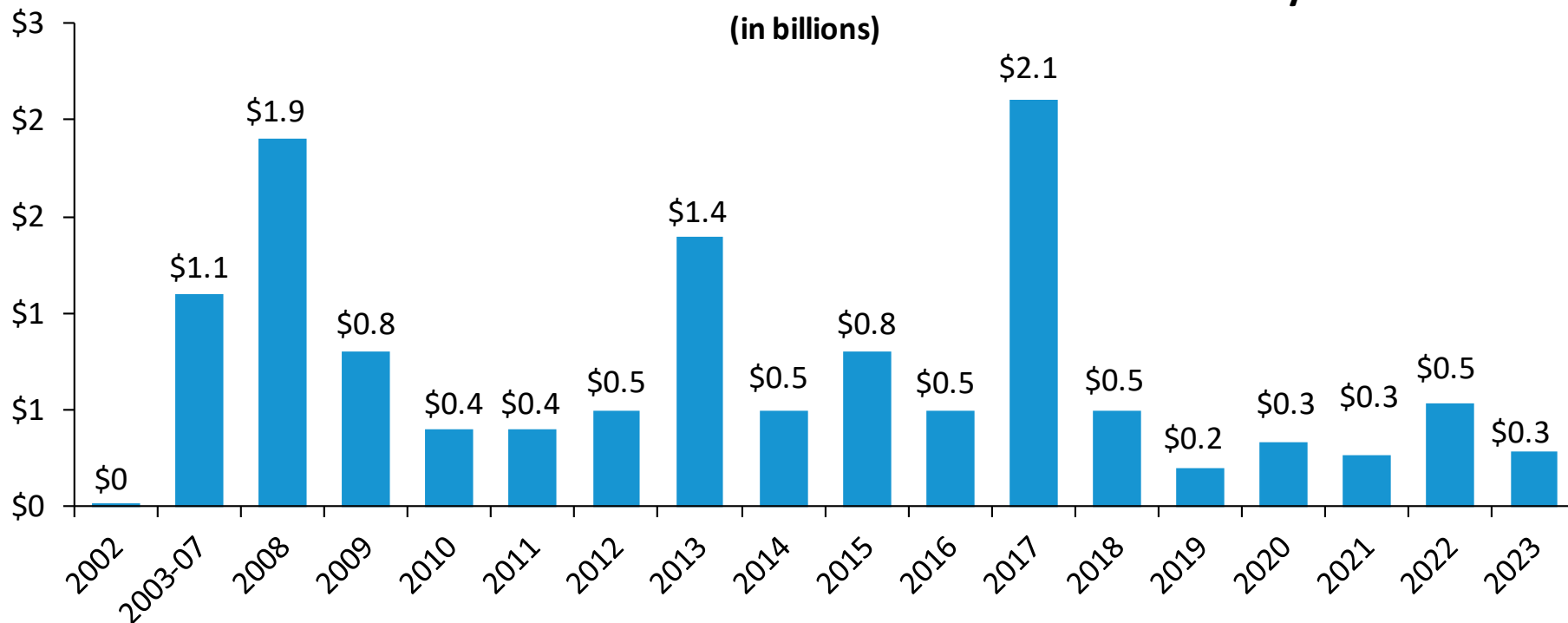
- Southwest Connecticut Reliability Project, Phases 1 & 2
- Boston 345 kV Transmission Reliability Project, Phases 1 & 2
- Northwest Vermont Reliability Project and Vermont Southern Loop Project
- New England East-West Solution
 - Greater Springfield Reliability Project
 - Rhode Island Reliability Project
 - Interstate Reliability Project
- Southeast Massachusetts
 - Short-term Lower SEMA Upgrades
 - Long-term Lower SEMA Project
- Maine Power Reliability Program
- Greater Boston Project



Source: RSP Transmission Project List, October 2019; RSP Transmission Project List also includes 115kV projects

Region Has Made Major Investments in Transmission Infrastructure to Ensure a Reliable Electric Grid

Annual Investment in Transmission to Maintain Reliability
(in billions)

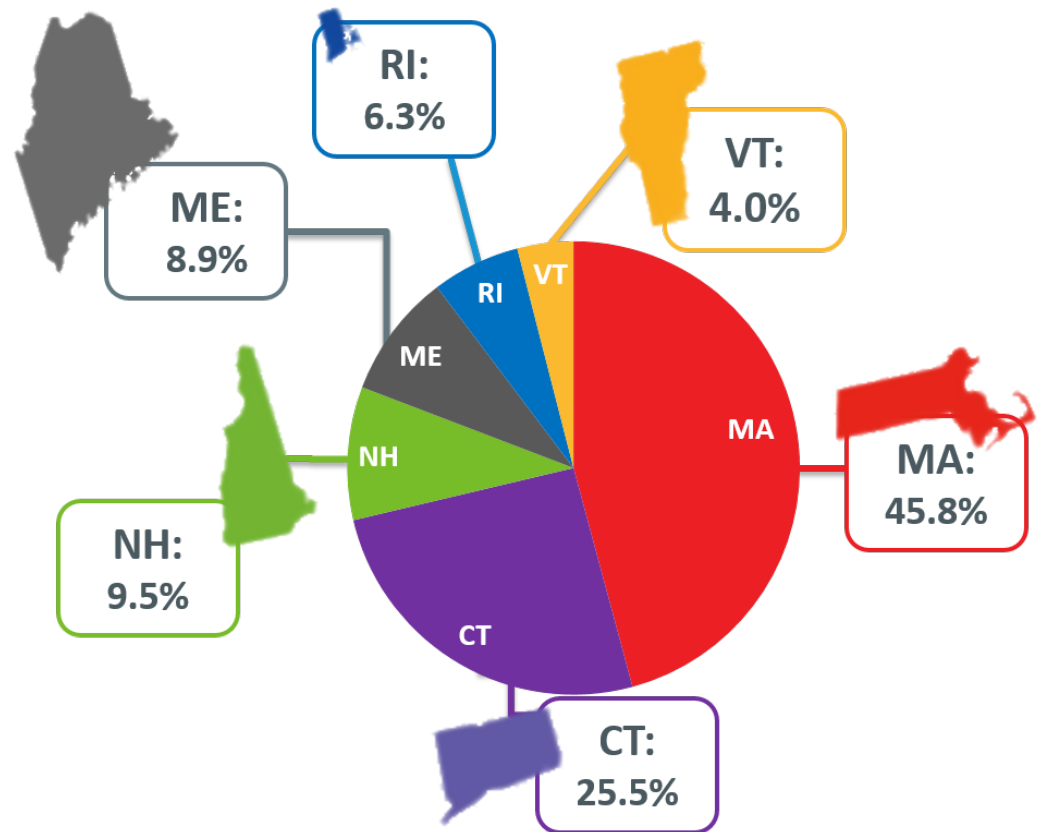


Cumulative Investment through October 2020	\$11.3 billion
Estimated Future Investment through 2023	\$1.1 billion

Source: ISO New England RSP Transmission Project Listing, October 2020
Estimated future investment includes projects under construction, planned and proposed.

How Are Transmission Costs Allocated?

- The New England electric grid is a **tightly interconnected** system; each state shares in the benefits of reliability upgrades
- The amount of electricity demand in an area determines its **share** of the cost of new or upgraded transmission facilities needed for reliability



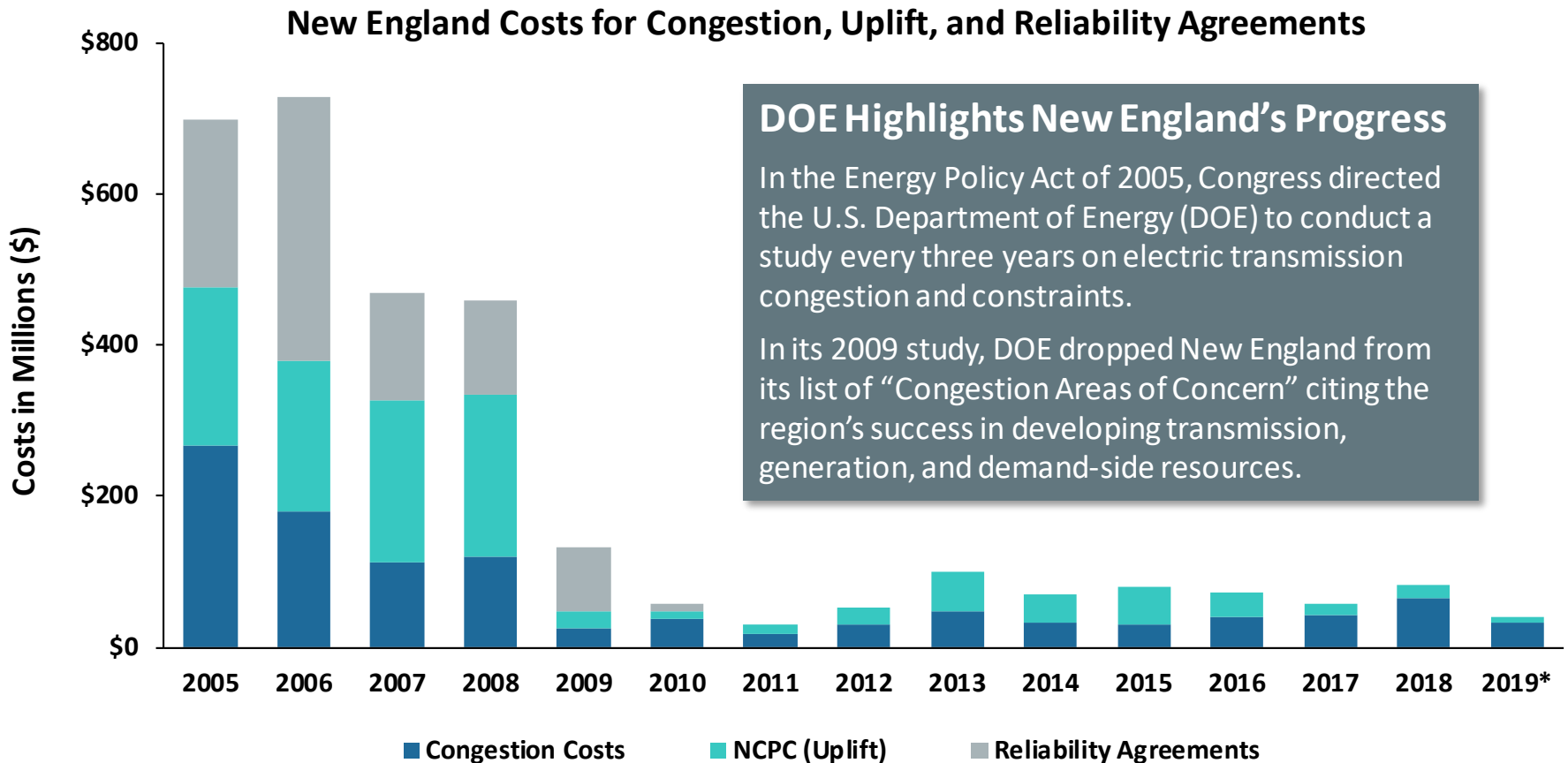
2019 Network Load by State

Transmission Provides Benefits Beyond Reliability

- **Transmission has reduced or eliminated out-of-market costs:**
 - Reliability agreements with certain generators that were needed to provide transmission support in weak areas of the electric grid
 - These often were older, less-efficient generating resources
 - Uplift charges to run specific generators to meet local reliability needs
- **The markets are increasingly competitive:** Easing transmission constraints into import-constrained areas has enabled the ISO to dispatch the most economic resources throughout the region to meet customer demands for electricity
- **Transmission congestion has been nearly eliminated**
- **Transmission facilitates resource transformation:** Transmission upgrades have allowed older, less efficient resources to retire, which helps the states achieve their environmental objectives



Transmission and Resource Developments Have Reduced Energy and Reliability Costs



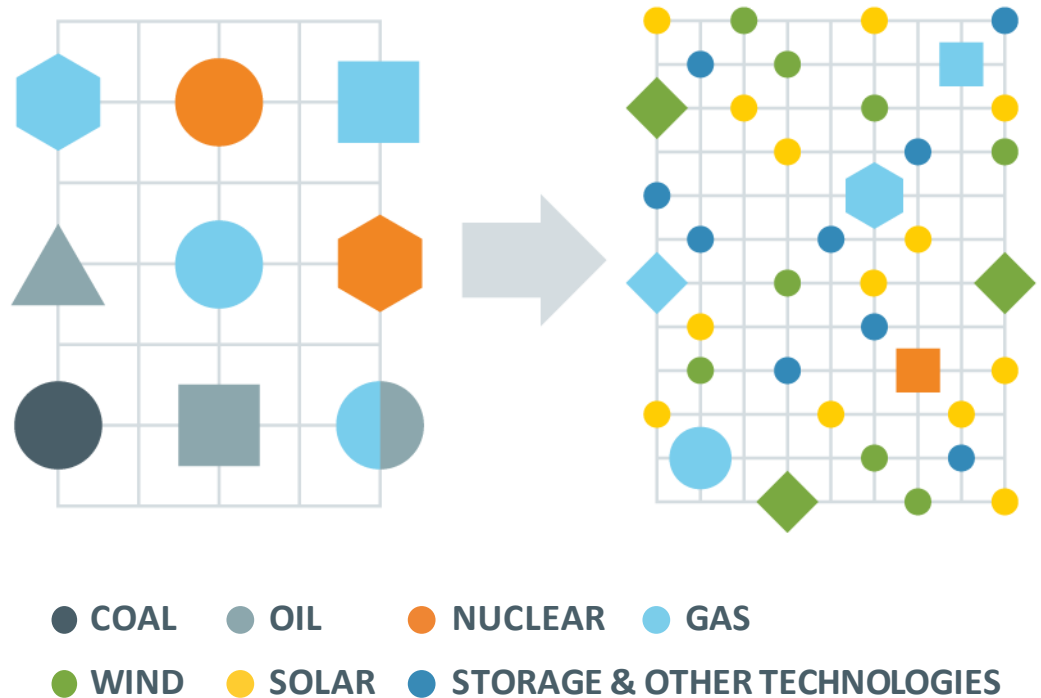
Note: Congestion is a condition that arises on the transmission system when one or more restrictions prevents the economic dispatch of electric energy from serving load. Net Commitment-Period Compensation is a payment to an eligible resource that operated out of merit and did not fully recover its costs in the energy market. Reliability Agreements are special reliability contracts between the ISO and an approved generator whereby the generator continues to operate, even when it is not economical to do so, to ensure transmission system reliability. Sources: Regional System Plans, ISO-NE Annual Markets Reports. *2019 data subject to adjustment.

A Hybrid Grid Is Emerging in New England

There are two dimensions to the transition, happening simultaneously...

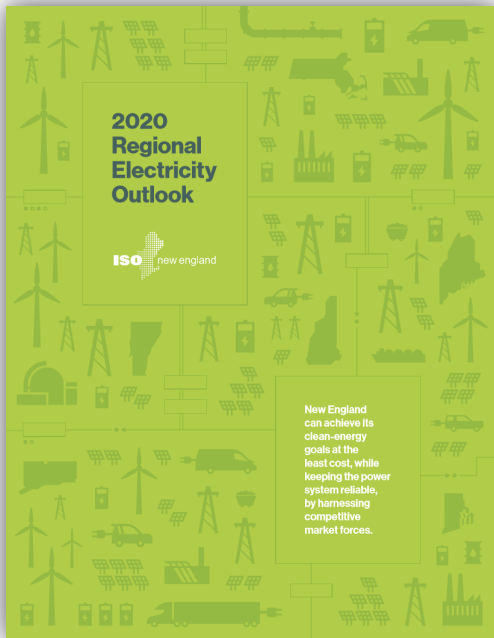
1 A shift from conventional generation to renewable energy

2 A shift from centrally dispatched generation to distributed energy resources



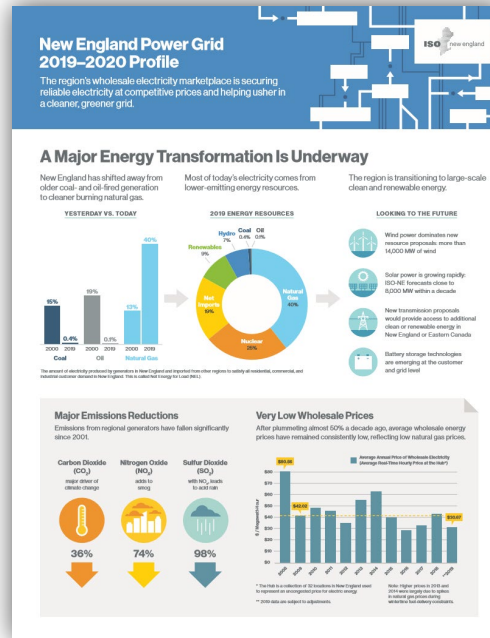
*Maintaining reliable power system operations becomes **more complex** with the shift to greater resources that face constraints on energy production*

ISO New England Releases Several New Publications



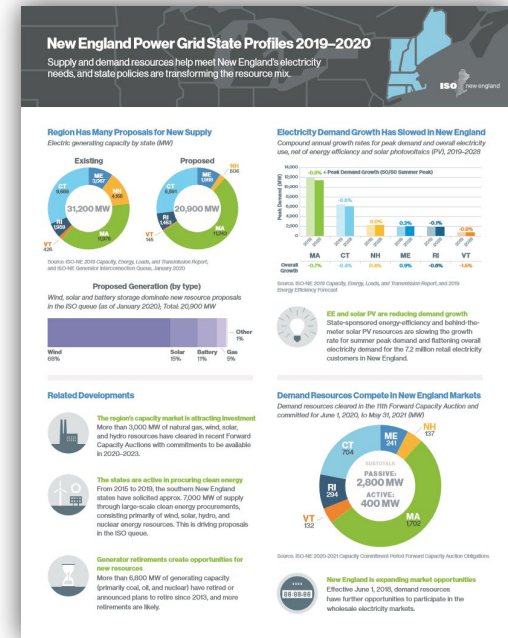
2020 Regional Electricity Outlook

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

ISO Website: New Information and New Look

The New [iso-ne.com](https://www.iso-ne.com) Homepage



The New [isonenewswire.com](https://www.isone.com)



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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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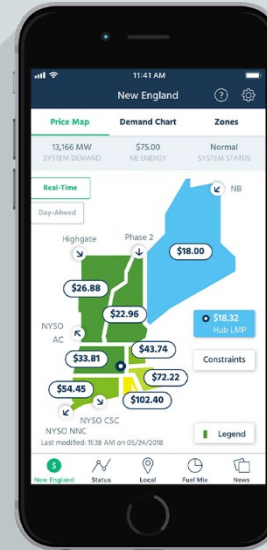


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Download the ISO to Go App

[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



Questions



APPENDIX: BACKGROUND INFORMATION

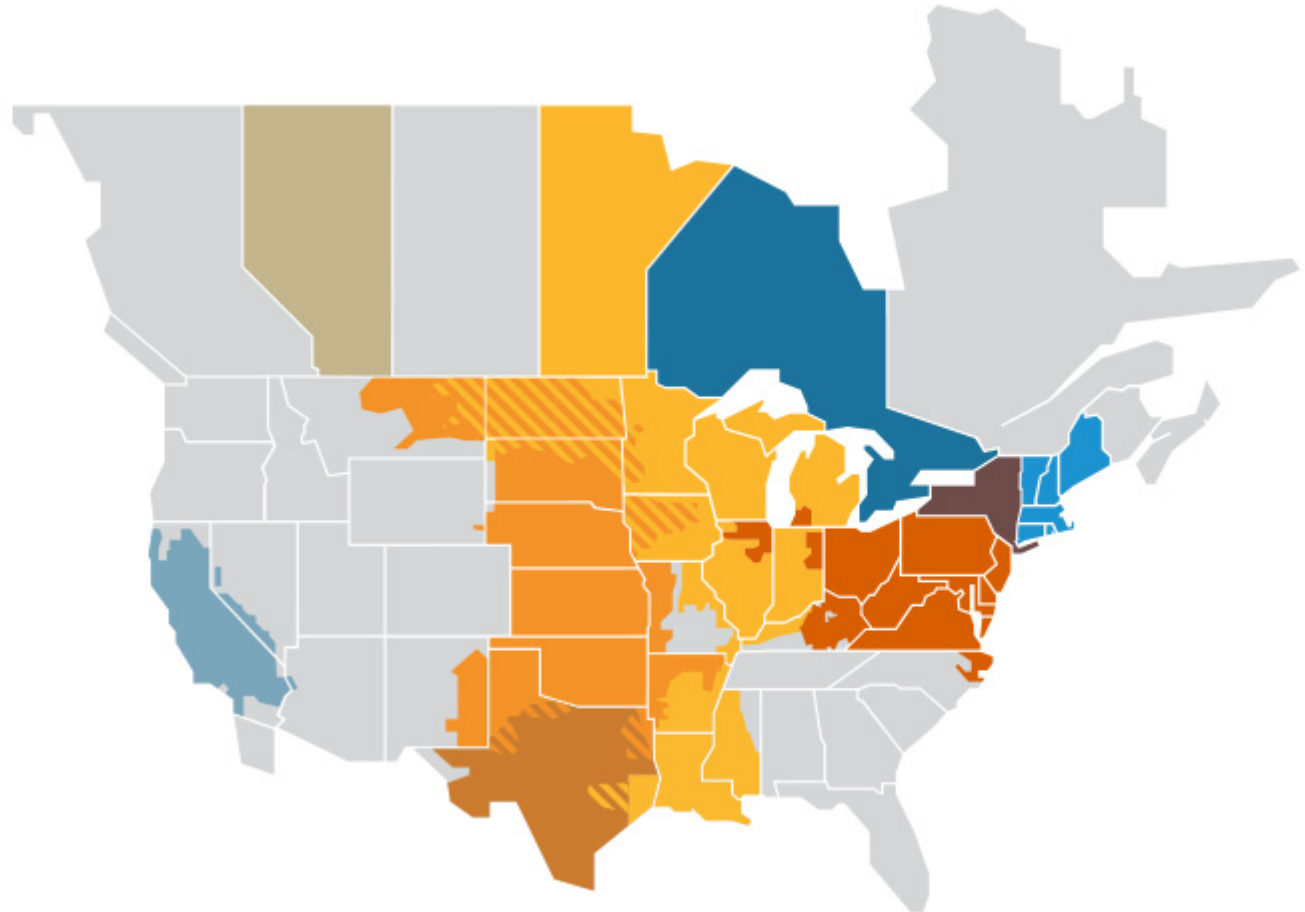


ISO New England Is Part of the ISO/RTO Council

There Are Nine ISOs and RTOs in North America

ISO New England covers the six states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

- California ISO
- Alberta Electric System Operator
- Electricity Reliability Council of Texas
- Southwest Power Pool
- Midcontinent ISO
- Ontario Independent Electricity System Operator
- PJM Interconnection
- New York ISO
- ISO New England



Markets Select the Most Cost-Efficient Resources to Meet Current and Future Electricity Needs

Energy Market

Electric Energy: The Day-Ahead and Real-Time Energy Markets are forward and spot markets for trading **electric energy**. Energy prices **fluctuate** throughout the day and at different locations in New England, reflecting the amount of consumer demand, constraints on the system, and the price of fuel that resources use to generate electricity.

Ancillary Markets

Short-Term Reliability Services: Resources compete in the ancillary markets to provide backup electricity as well as services needed to support the physical operation of the system, such as frequency regulation and voltage support. These services are **critical** during periods of heavy demand or system emergencies.

Forward Capacity Market

Long-Term Reliability Services: Resources compete to sell **capacity** to the system in three years' time through annual Forward Capacity Auctions. The Forward Capacity Market works in tandem with the Energy Markets to **attract** and **sustain** needed power resources today and into the future.

Wholesale Markets Have Resulted in Efficiency Gains in New England's Power Generation Fleet

- Markets reveal a resource's **true operating cost**
 - Fuel is the primary driver of operating costs
 - The dollar value of New England's energy markets fell from 2008 to 2016 as low-cost natural gas displaced older, fossil fuel-fired units
- Gas-fired generators are becoming **more efficient**
 - Improvements in technology have made newer generators more economic than older generators
- Region has invested in **cleaner technologies** ahead of much of the rest of the country and has seen regional air emissions decline significantly over the past decade



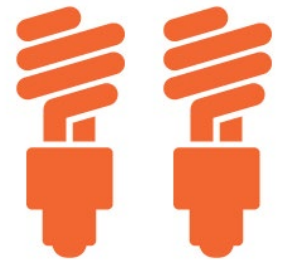
Forward Capacity Market Overview



- Procures resources to meet New England's forecasted capacity needs three years in the future
- Selects a portfolio of **supply** and **demand** resources through a competitive Forward Capacity Auction (FCA) process
 - Resources must be pre-qualified to participate in the auction
 - Resources must participate and clear in the auction to be paid for capacity during the capacity commitment period
- Allows **new capacity projects** to compete in the market and set the price for capacity in the region
- Provides a long-term commitment to new supply and demand resources to encourage **investment**

Forward Capacity Market Objectives and Results

- New England's capacity market has **two main objectives**:
 1. Ensure sufficient resources to meet New England's electricity demand and reliability standards, and
 2. Ensure that sufficient resources are procured in a cost-effective manner
- Capacity market aims to foster **competition** by creating a level playing field with respect to technology, investors, and existing versus new entrants
- Fourteen Forward Capacity Auctions have been conducted and nine commitment periods completed
 - Market has generated participation from **diverse** types of resources, including demand-response and energy-efficiency resources
 - Lowest-cost resources have been developed and brought to market
 - Capacity market has eliminated reliance on reliability arrangements with generators



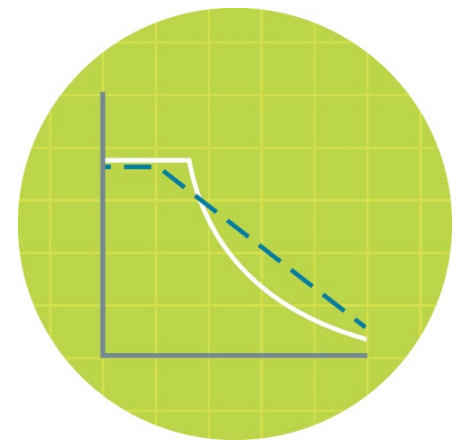
Recent Forward Capacity Auction Results

Auction Commitment Period	Total Capacity Acquired (MW)	Capacity Target (MW)	Surplus/Deficit (MW)	New Demand Resources ¹ (MW)	New Generation (MW)	Auction Zones ²	Clearing Price (\$/kW-month) ³
FCA 9 2018/2019	34,695	34,189	506	367	1,060	ROP	\$9.55
						CT	
						NEMA/Boston	
						SEMA/RI	
FCA 10 2019/2020	35,567	34,151	1,416	371	1,459	ROP	\$7.03
						SENE	
						Quebec imports	
						New York imports	
						New Brunswick imports	
FCA 11 2020/2021	35,835	34,075	1,760	640	264	SENE, NNE, ROP, and NY and Quebec imports	\$5.30
						New Brunswick imports	\$3.38
						SENE, NNE, ROP and NY imports	\$4.63
FCA 12 2021/2022	34,828	33,725	1,103	514	174	Quebec imports	\$4.63 for 54 MW \$3.70 for 442 MW
						New Brunswick imports	\$3.16
						SENE, NNE, ROP, and NY and Quebec imports	\$3.80
FCA 13 2022/2023	34,839	33,750	1,089	654	837	New Brunswick imports	\$2.68
						SENE, NNE, Maine, ROP, and NY, New Brunswick, and Quebec imports	\$2.00
FCA 14 2023/2024	33,956	32,490	1,466	323	335		

¹ Demand resources include energy efficiency, demand-response resources, and real-time emergency generation (RTEG). ² Capacity pricing zones: In **FCA 9**, Rest-of-Pool (ROP) included WCMA, VT, NH, and ME. In **FCA 10**, Rest-of-Pool (ROP) included Western/Central MA, CT, ME, NH, and VT; the new Southeast New England (SENE) zone combined Northeastern MA/Boston and Southeastern MA/RI. In **FCA 11**, Northern New England (NNE) comprised of ME, NH, VT; Southeast New England (SENE) including NEMA/Boston, SEMA, and RI; and ROP including CT and WCMA. In **FCA 12** Southeast New England (SENE) included Southeastern MA, RI and Northeastern MA/Boston, Northern New England (NNE) included ME, NH and VT; Rest-of-Pool (ROP) included CT, Western/Central MA. In **FCA 13**, the same zones were modeled as FCA 12. In **FCA 14**, Southeast New England (SENE) included Southeastern MA, RI and Northeastern MA/Boston load zones; the Northern New England (NNE) included NH, VT and ME; Maine is a separate nested zone; Rest-of-Pool (ROP) included CT and Western/Central MA. ³ From **FCA 9** on, a sloped demand curve has been used, allowing more or less than the capacity requirement to be procured, depending on price and reliability needs.

ISO New England Administered the Fourteenth Forward Capacity Auction (FCA #14) in February 2020

- FCA #14 was held on February 3, 2020 to procure the capacity resources needed to meet demand for electricity, plus reserve requirements, during the **June 1, 2023 to May 31, 2024** capacity commitment period
- The auction concluded with **sufficient resources** to meet the installed capacity target of 32,490 MW, with the lowest clearing price in the auction's history
- The **clearing price** in the auction was \$2.00 per kilowatt-month (kW-month) across all of New England, compared to \$3.80/kW-month in last year's auction
 - No price separation among the capacity zones



FCA #14 Attracted and Retained a Variety of Resources to Ensure Resource Adequacy in 2023-2024

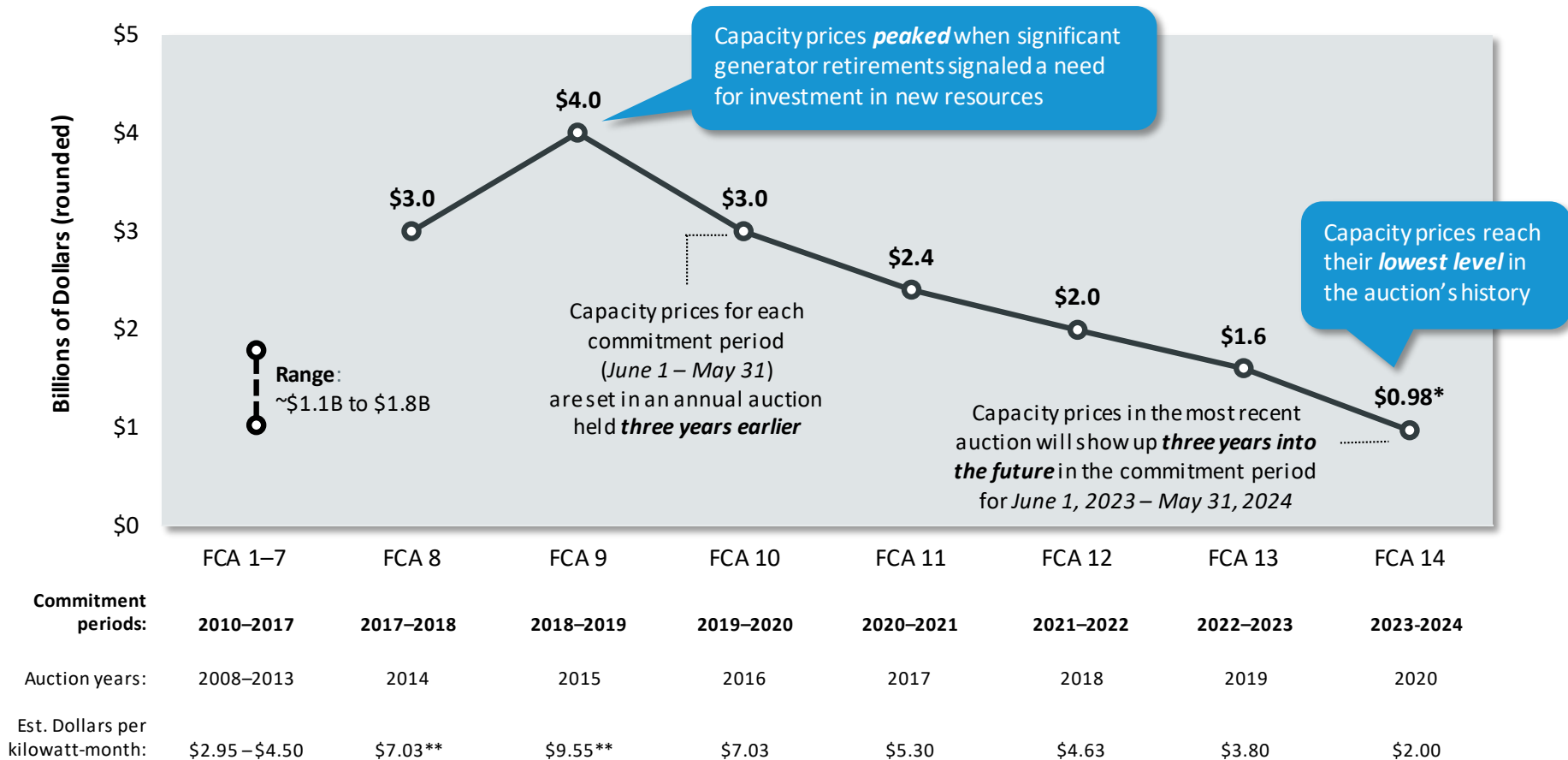
- The auction concluded with commitments from **33,956 MW** of capacity to be available during the 2023-2024 capacity commitment period
 - **28,978 MW** of generation, including 335 MW of new generating resources
 - **3,919 MW** of energy-efficiency and demand-reduction measures, including 323 MW of new demand resources
 - **1,059 MW** of total imports from New York, Québec and New Brunswick
- Prior to the auction, ISO New England retained two units, Mystic Generating Station Units 8 and 9, needed for fuel security in 2023-2024



Capacity Market Costs Reflect Changing Supply Outlook

As a “forward” market, consumers can anticipate future changes in capacity costs

Total Capacity Market Costs



*Preliminary estimate ** Prices may be higher for some capacity zones.

Changes to ISO New England's Transmission Planning Process Pursuant to FERC Order No. 1000

- Changes to intra- and interregional transmission planning and cost-allocation practices to:
 - Add a process where **developers submit project proposals** rather than the ISO leading the development of transmission solutions
 - The ISO selects the most cost-effective proposal that addresses the need from those submitted
 - Incumbent transmission owners provide backstop transmission solutions, but may not necessarily be selected to provide ultimate solution
 - Add a transmission planning process to meet **public policy** objectives
 - The ISO selects from developer proposals to meet identified federal, state, and local public policy goals
 - Update existing **interregional planning** and transmission development protocols with neighboring power systems (PJM and NYISO)



Major Components of Transmission Planning*

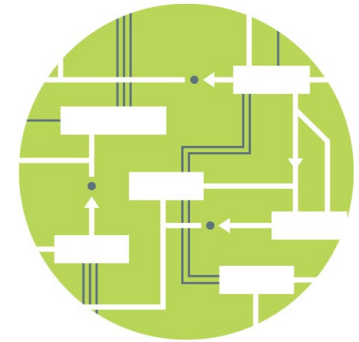


- The transmission planning study process begins by developing a **Study Scope** and identifying all key inputs for a Needs Assessment
- A **Needs Assessment** identifies transmission system needs to maintain the reliability of the facilities while promoting the operation of efficient wholesale electric markets
 - Reliability Needs
 - Market Efficiency Needs
 - Public Policy Transmission Needs*
- If the Needs Assessment reveals violations of reliability standards or criteria during the study period, **potential solutions** must be developed to address the identified needs

* Reflective of changes under FERC Order No. 1000

Major Components of Transmission Planning*

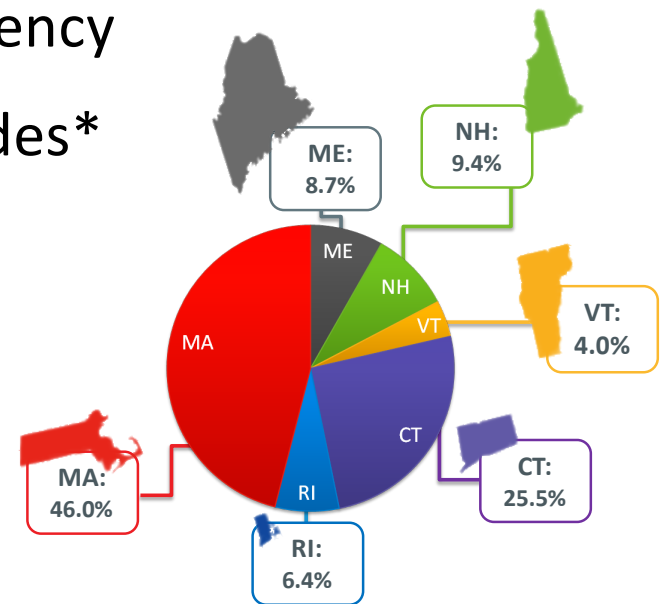
- If the identified reliability-based transmission need is **less than or equal to three years out**, the ISO will develop solution alternatives, in coordination with the transmission owner(s) and stakeholders
- If the identified reliability-based transmission need is **more than three years out**, a Request for Proposals (RFPs) for competitive solutions will be issued by the ISO
 - Public Policy and Market Efficiency Transmission Upgrades are developed **only** through a competitive RFP process
- The ISO, working with the New England states and stakeholders, is responsible for **identifying** public policies that are driving transmission needs
- If there are identified public policies that are driving transmission needs, the ISO is responsible for **selecting** the most cost-effective transmission project to address those public policies



* Reflective of changes under FERC Order No. 1000

How Are Transmission Costs Allocated?

- The New England electric grid is a **tightly interconnected system**; each state shares in the benefits of reliability and market efficiency upgrades
- The amount of electricity demand in an area determines its **share** of the cost of new or upgraded transmission facilities needed for reliability or market efficiency
- For Public Policy Transmission Upgrades*
 - **70%** of the costs of upgrades are spread throughout the region
 - **30%** of the costs are allocated on a load ratio basis among states with a public policy planning need that the particular project addresses

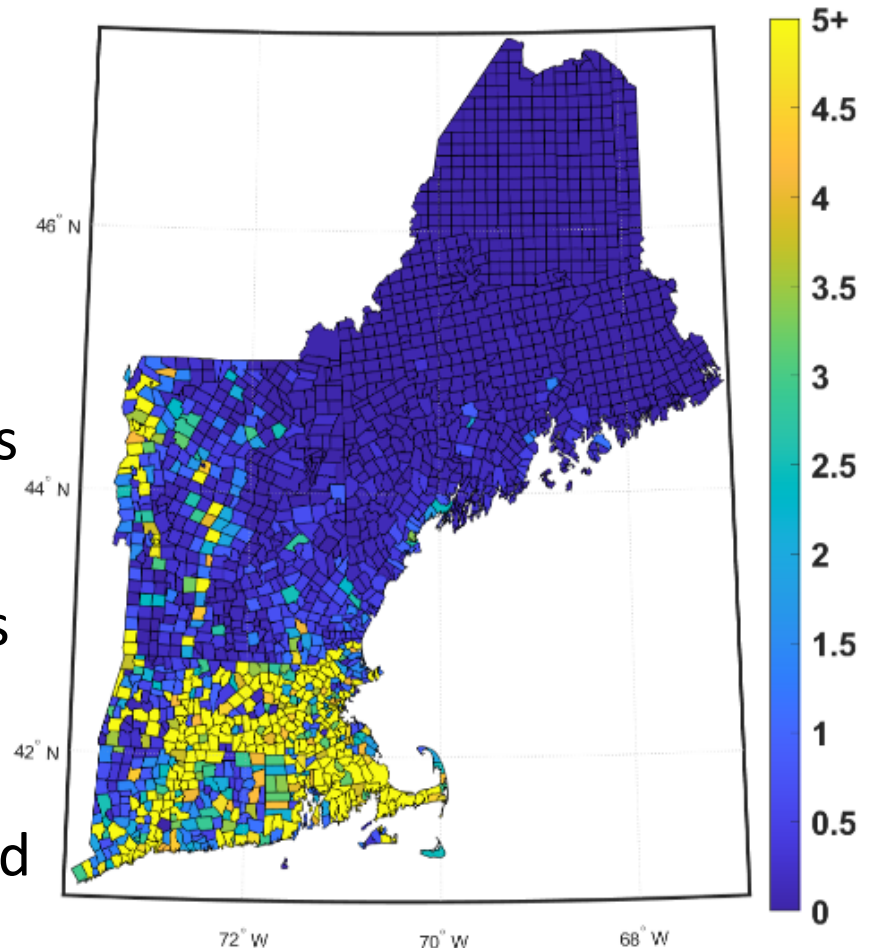


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2018 Network Load by State

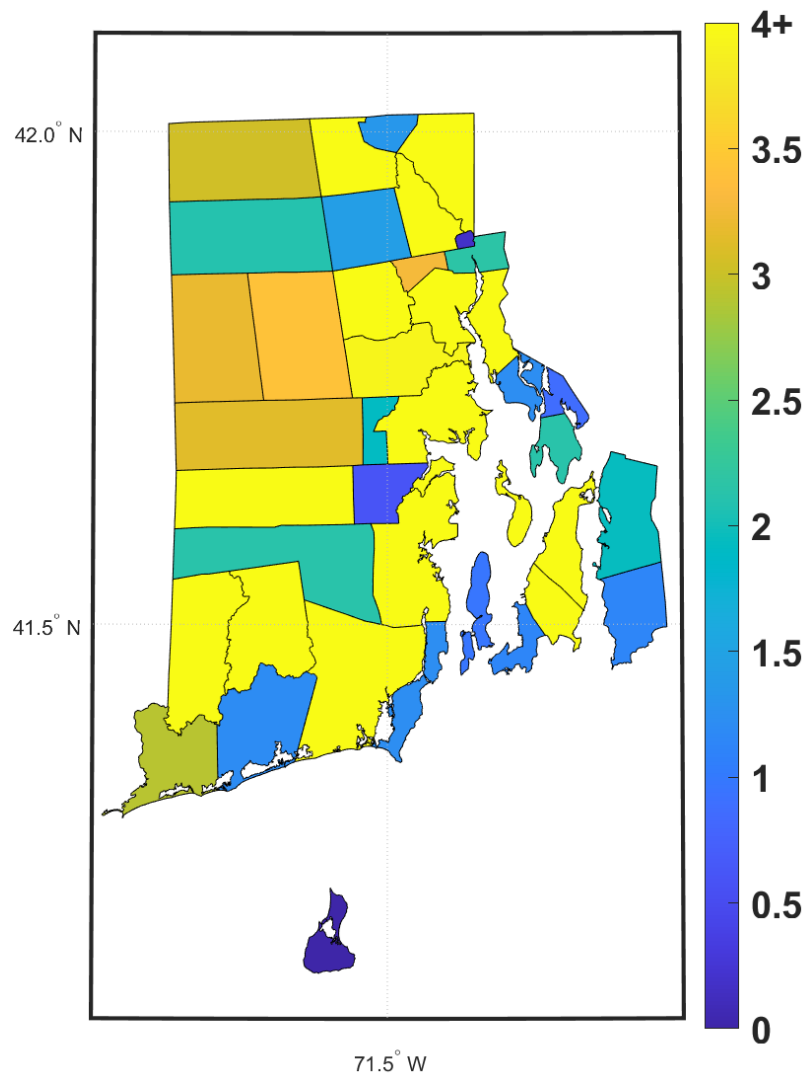
State Installed Solar PV “Heat Maps”

- Understanding the spatial distribution of existing solar PV resources will be critical to the ISO’s ongoing integration activities within both System Planning and System Operations
- Based on the data provided by distribution owners, the ISO has aggregated the installed nameplate capacity by town within each state, and generated heat maps showing the results



Note: Heat map reflects MW of solar PV installed through December 2019.

Rhode Island Installed Solar PV “Heat Map”



Note: Heat map reflects MW of solar PV installed through December 2019.
Legend shows color scale of nameplate megawatts per town.