Overview of Wholesale Electricity Markets

New England Energy Vision

Wholesale Markets Design Technical Forum

Eric Johnson
DIRECTOR, EXTERNAL AFFAIRS
Overview of “ISO 101”

- About ISO New England
- Markets Overview
- Regional Update
- Resources
ABOUT ISO NEW ENGLAND
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
- **Private, not-for-profit** company
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
ISO New England Keeps Power Flowing Across the Region Every Minute of Every Day
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
Numerous Entities Including an Independent Board Provide Oversight of and Input on ISO’s Responsibilities
• **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.
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
- 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.
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
Natural Gas and Wholesale Electricity Prices Are Linked

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

Hurricanes hit the Gulf

Before the Recession and Marcellus Shale gas boom

Winter 2012/2013

Winter 2013/2014

Winter 2014/2015

Winter 2017/2018

Underlying natural gas data furnished by:
Why Competitive Markets?
New England restructured its power industry and launched competitive wholesale electricity markets in the late 1990s based on several key principles.

**Competition** among wholesale electricity buyers and sellers yield prices that accurately reflect a resource’s true operating costs.

**Efficiency and transparency** spur innovation and investment in new technologies and power resources to ensure power system reliability.

**Investment risk** associated with developing new power resources shifts from consumers to private investors.
Markets Select the Most Cost-Efficient Resources to Meet Current and Future Electricity Needs

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.

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.

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.
Energy Market Values Vary with Fuel Prices, While Capacity Market Values Vary with Changes in Supply

Annual Value of Wholesale Electricity Markets
(in billions)

Source: 2019 Report of the Consumer Liaison Group; 2020 data are subject to adjustment.
Note: Forward Capacity Market values shown are based on auctions held roughly three years prior to each calendar year. The 2020 projection is the sum of preliminary 2020 January-October actuals and November-December projected values. The November-December projected values were derived as follows: on average, over the last two years (2018-2019), the value of the Energy Market accrued over the first ten months of the year was approximately 80.90% of the annual total. This percentage was applied to the total from the first ten months of 2020 to produce the November-December Energy Market projections. An analysis of the historical relationship between the Energy Market totals and the Ancillary Services Market totals suggests that the total for the Ancillary Services Market is approximately 2.23% of the Energy Market total. The November-December projections for the Ancillary Services Market represent the value needed to bring the 2020 ten month total to the expected annual total. The Forward Capacity Market values reflect the October 2020 value held constant for the remainder of the year. Please note that this projection is for illustrative purposes only. Data are preliminary and subject to reconciliation.
Transmission and Resource Developments Have Reduced Energy and Reliability Costs

New England Costs for Congestion, Uplift, and Reliability Agreements

DOE Highlights New England’s Progress

In the Energy Policy Act of 2005, Congress directed the U.S. Department of Energy (DOE) to conduct a study every three years on electric transmission congestion and constraints.

In its 2009 study, DOE dropped New England from its list of “Congestion Areas of Concern” citing the region’s success in developing transmission, generation, and demand-side resources.

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.
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
The Forward Capacity Market Is Attracting New Resources Amid Retirements

- **Demand Resources**: energy-efficiency and active demand response resources
- **Natural Gas Resources**: efficient and fast-starting gas resources, many with dual-fuel capability
- **Renewable Resources**: onshore and offshore wind, solar photovoltaics, and fuel cells
### Recent Forward Capacity Auction Results

<table>
<thead>
<tr>
<th>Auction Commitment Period</th>
<th>Total Capacity Acquired (MW)</th>
<th>Capacity Target (MW)</th>
<th>Surplus/Deficit (MW)</th>
<th>New Demand Resources(^1) (MW)</th>
<th>New Generation (MW)</th>
<th>Auction Zones(^2)</th>
<th>Clearing Price ($/kW-month)(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FCA 9 2018/2019</strong></td>
<td>34,695</td>
<td>34,189</td>
<td>506</td>
<td>367</td>
<td>1,060</td>
<td>ROP</td>
<td>$9.55</td>
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<td>$17.73/new</td>
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<td></td>
<td>NEMA/Boston</td>
<td>$11.08/existing</td>
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<tr>
<td><strong>FCA 10 2019/2020</strong></td>
<td>35,567</td>
<td>34,151</td>
<td>1,416</td>
<td>371</td>
<td>1,459</td>
<td>ROP</td>
<td>$7.03</td>
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<td>SENE</td>
<td>$6.26</td>
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<td>Quebec imports</td>
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<td></td>
<td>New Brunswick imports</td>
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<tr>
<td><strong>FCA 11 2020/2021</strong></td>
<td>35,835</td>
<td>34,075</td>
<td>1,760</td>
<td>640</td>
<td>264</td>
<td>SENE, NNE, ROP, and NY imports</td>
<td>$5.30</td>
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<td>SENE</td>
<td>$3.38</td>
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<td>Quebec imports</td>
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<td></td>
<td>New Brunswick imports</td>
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<tr>
<td><strong>FCA 12 2021/2022</strong></td>
<td>34,828</td>
<td>33,725</td>
<td>1,103</td>
<td>514</td>
<td>174</td>
<td>SENE, NNE, ROP, and NY imports</td>
<td>$4.63</td>
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<td>Quebec imports</td>
<td>$4.63 for 54 MW $3.70 for 442 MW</td>
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<td></td>
<td>New Brunswick imports</td>
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<tr>
<td><strong>FCA 13 2022/2023</strong></td>
<td>34,839</td>
<td>33,750</td>
<td>1,089</td>
<td>654</td>
<td>837</td>
<td>SENE, NNE, ROP, and NY imports</td>
<td>$3.80</td>
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<td></td>
<td>New Brunswick imports</td>
<td></td>
</tr>
<tr>
<td><strong>FCA 14 2023/2024</strong></td>
<td>33,956</td>
<td>32,490</td>
<td>1,466</td>
<td>323</td>
<td>335</td>
<td>SENE, NNE, Maine, ROP, and NY, New Brunswick, and Quebec imports</td>
<td>$2.00</td>
</tr>
</tbody>
</table>

\(^1\) 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 WCMMA, 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 WCMMA. 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.
Capacity Market Costs Reflect Changing Supply Outlook

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

Total Capacity Market Costs

Capacity prices peaked when significant generator retirements signaled a need for investment in new resources.

Capacity prices reach their lowest level in the auction’s history.

Capacity prices in the most recent auction will show up three years into the future in the commitment period for June 1, 2023 – May 31, 2024.

Range: ~$1.1B to $1.8B

Capacity prices for each commitment period (June 1 – May 31) are set in an annual auction held three years earlier.

Commitment periods:
- FCA 1–7: 2010–2017
- FCA 8: 2017–2018
- FCA 9: 2018–2019
- FCA 10: 2019–2020
- FCA 11: 2020–2021
- FCA 12: 2021–2022
- FCA 13: 2022–2023
- FCA 14: 2023–2024

Auction years:
- 2008–2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020

Est. Dollars per kilowatt-month:
- FCA 1–7: $2.95 – $4.50
- FCA 8: $7.03**
- FCA 9: $9.55**
- FCA 10: $7.03
- FCA 11: $5.30
- FCA 12: $4.63
- FCA 13: $3.80
- FCA 14: $2.00

*Preliminary estimate ** Prices may be higher for some capacity zones.
Forward Capacity Auction #15 Is Scheduled to Take Place in February 2021

• **FCA #15** will procure the resources needed to meet the demand for electricity, plus reserve requirements, during the June 1, 2024 to May 31, 2025 capacity commitment period.

• In **November**, the ISO submitted a pre-FCA informational filing with the Federal Energy Regulatory Commission (FERC) for review. The filing includes:
  – Capacity zones to be modeled in the auction
  – Resources qualified to participate in the auction

• All other FCA-related **calculations** and **determinations** were included in a separate filing for FERC review.
Four Capacity Zones Will Be Modeled in FCA #15

*Maine will be modeled as a “nested” capacity zone within Northern New England*

- ISO New England has a process for determining the appropriate **number** and **boundaries** of capacity zones over time as conditions change in the region
  - The ISO studied **constraints** on the transmission system to determine which capacity zones would be modeled in FCA #15

- The ISO will model **four** capacity zones in FCA #15
  - Northern New England Capacity Zone
    - Export-Constrained
  - Maine “Nested” Capacity Zone
    - Export-Constrained
  - Southeast New England Capacity Zone
    - Import-Constrained
  - Rest-of-Pool Capacity Zone

FCA #15: Other Important Auction Inputs

• The ISO qualified a total of 33,662 MW of existing capacity resources to participate in the auction, including:
  – 29,800 MW from existing generating resources (intermittent and non-intermittent)
  – 82 MW from existing import resources, and
  – 3,780 MW from existing demand resources

• The ISO qualified 219 new capacity resources totaling 7,030 MW, to participate in the auction

• The net Installed Capacity Requirement is 33,270 MW

• The ISO qualified 13 demand bids, totaling 196 MW, and 116 supply offers, totaling 463 MW, to participate in the substitution auction under the Competitive Auctions with Sponsored Policy Resources (CASPR) framework
REGIONAL UPDATE
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)

- **Nuclear**: 31% (2000) vs. 30% (2019)
- **Oil**: 22% (2000) vs. <1% (2019)
- **Coal**: 18% (2000) vs. <1% (2019)
- **Natural Gas**: 48% (2000) vs. 7% (2019)
- **Hydro**: 9% (2000) vs. 11% (2019)
- **Renewables**: 8% (2000) vs. 11% (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, municipals 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.

2019* Net Energy for Load: 119,122 GWh

- Natural Gas, 40%
- Nuclear, 25%
- Imports, 19%
- Renewables, 9%
- Hydro, 7%
- Coal, <1%
- Oil, <1%

Note: Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, municipal solid waste, and miscellaneous fuels.

*Data is subject to adjustment
Power Plant Emissions Have Declined with Changes in the Fuel Mix

New England Generator Air Emissions - 2001 vs. 2018

<table>
<thead>
<tr>
<th>Emission</th>
<th>2001 Emissions</th>
<th>2018 Emissions</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide (CO₂)</td>
<td></td>
<td></td>
<td>36%</td>
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<tr>
<td>Nitrogen Oxide (NO₅)</td>
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<td></td>
<td>74%</td>
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<tr>
<td>Sulfur Dioxide (SO₂)</td>
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<td>98%</td>
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Carbon Dioxide (CO₂) is the major driver of climate change. Nitrogen Oxide (NO₅) adds to smog, and Sulfur Dioxide (SO₂) with NO₅ leads to acid rain.

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

<table>
<thead>
<tr>
<th>State</th>
<th>Legislative Mandate</th>
<th>Aspirational Goal</th>
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<tbody>
<tr>
<td>Connecticut</td>
<td>80%</td>
<td></td>
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<tr>
<td>Massachusetts</td>
<td>80%</td>
<td></td>
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<tr>
<td>Rhode Island</td>
<td>80%</td>
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<tr>
<td>Maine</td>
<td>80%</td>
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<td>Vermont</td>
<td>80%</td>
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<td>New Hampshire</td>
<td>80%</td>
<td>75% – 85%</td>
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<tr>
<td>NEG-ECP</td>
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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](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

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

<table>
<thead>
<tr>
<th>State</th>
<th>2018</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
</tr>
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<tbody>
<tr>
<td>VT</td>
<td>2018</td>
<td>55%</td>
<td>2020</td>
<td>59%</td>
<td>2025</td>
<td>63%</td>
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<td></td>
<td></td>
<td></td>
<td>2030</td>
<td>71%</td>
<td>2035</td>
<td>75%</td>
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<td>2040</td>
<td>75%</td>
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<td>ME</td>
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<td>CT</td>
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<td>RI</td>
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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.
# New England States’ Goals to Reduce GHG Emissions and Increase Renewable and Clean Energy

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<tbody>
<tr>
<td>VT</td>
<td>75.0%</td>
<td>80%</td>
<td>90% of total energy from renewables by 2050 (Comprehensive Energy Plan)</td>
</tr>
<tr>
<td>ME</td>
<td>50.0%</td>
<td>80%</td>
<td>RPS: 100% renewable energy by 2050 (statute)</td>
</tr>
<tr>
<td>MA</td>
<td>45.0%</td>
<td>80%</td>
<td>Clean energy standard: 80% by 2050 (regulation)</td>
</tr>
<tr>
<td>CT</td>
<td>40.0%</td>
<td>80%</td>
<td>100% zero-carbon electric supply by 2040 (Governor Lamont Administration goal)</td>
</tr>
<tr>
<td>RI</td>
<td>36.5%</td>
<td>80%</td>
<td>100% renewable energy by 2030 (Governor Raimondo Administration goal)</td>
</tr>
<tr>
<td>NH</td>
<td>15.7%</td>
<td>-</td>
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Notes: Renewable Portfolio Standard percentages include Class I or new renewable energy. Vermont adopted a Renewable Energy Standard. The renewable resources eligible to meet these standards varies by state. MA, RI, ME, and VT seek GHG reductions from 1990 baseline year; CT from 2001.
Wind Power Comprises Two Thirds of New Resource Proposals in the ISO Interconnection Queue

All Proposed Resources

- **Wind** 15,133, 63%
- **Solar** 4,248, 18%
- **Battery Storage** 3,635, 15%
- **Natural Gas** 914, 4%
- **Hydro** 99, <1%
- **Nuclear Uprate** 37, <1%
- **Fuel Cell** 55, <1%
- **Biomass** 8, <1%

**TOTAL 24,129 MW**

Wind Proposals

- **Offshore Wind** 8,598 MW
- **CT** Offshore Wind 5,605 MW
- **CT 4 MW**
- **RI Offshore Wind** 704 MW
- **MA Offshore Wind** 222 MW

Source: ISO Generator Interconnection Queue (January 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.
Energy-Efficiency and Renewable Resources Are Trending Up in New England

**Energy Efficiency**

*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.*

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE thru 2020</td>
<td>2,600</td>
</tr>
<tr>
<td>EE in 2029</td>
<td>5,600</td>
</tr>
</tbody>
</table>

**Solar**

*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.”*

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV thru 2020</td>
<td>3,965</td>
</tr>
<tr>
<td>PV in 2029</td>
<td>7,800</td>
</tr>
</tbody>
</table>

**Wind**

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>1,400</td>
</tr>
<tr>
<td>Proposed</td>
<td>15,000</td>
</tr>
</tbody>
</table>
Energy Efficiency Is a Priority for State Policymakers

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

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).

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

### December 2019 Solar PV Installed Capacity (MW$_{ac}$)

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

### Cumulative Growth in Solar PV through 2029 (MW$_{ac}$)

- January 2010: 40 MW
- Thru 2019: 3,432 MW
- 2029: 7,795 MW

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](https://example.com) (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
Developers Are Proposing Large-Scale Transmission Projects to Deliver Clean Energy to Load Centers

- Developers are proposing roughly 9 elective transmission upgrades (ETUs) to help deliver about **3,400 MW** of clean energy to New England load centers.

- Wind projects make up roughly **63%** 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.

Source: [ISO Interconnection Queue](https://www.iso-ne.com) (January 2021)
New England is Moving to a Hybrid Grid

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’s Vision

The ISO’s Vision for the future represents our long-term intent and guides the formulation of our Strategic Goals

Vision Statement:

*To harness the power of competition and advanced technologies to reliably plan and operate the grid as the region transitions to clean energy*
RESOURCES
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

• 2021 Meetings
  – Thursday, March 11
  – Thursday, June 17
  – Thursday, September 9
  – Wednesday, December 1

More information on the CLG is available at: https://www.iso-ne.com/committees/industry-collaborations/consumer-liaison/
ISO Website: New Information and New Look

The New iso-ne.com Homepage

- Sidel-by-side fuel mix and renewables
- Up-front regional price map
- Updated newsfeed
- Highlighted featured content
- NEW Document Library
- Most popular pages
- System demand, actual and projected
- Other data at-a-glance
- Upcoming events and current notices
- Recently published content
- More latest published

The New isonenewswire.com

- Featured posts are pulled to the top of the homepage
- New posts are listed by date
- Search articles or browse by category, date, and tag
- All posts are tagged and categorized
- Explore older posts
- Ways to follow the ISO Newswire
Wholesale Electricity Markets Operated Competitively Last Year, According to 2019 Annual Markets Report

• In May 2020, ISO New England’s **Internal Market Monitor** (IMM) issued the **2019 Annual Markets Report** (AMR)
  – The IMM functions **independently** of ISO management and reports directly to the ISO Board of Directors

• The AMR assesses the **state of competition** in the wholesale electricity markets administered by the ISO during the most recent operating year

• The AMR also presents the **most important findings, market outcomes, and market design changes** of New England’s wholesale electricity markets for 2019

ISO New England Releases Several 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.

2021 profiles coming soon
FOR MORE INFORMATION...

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*ISO Express* provides real-time data on New England’s wholesale electricity markets and power system operations.

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*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.

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Questions