



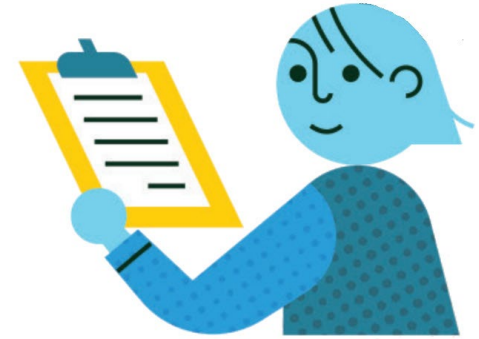
ISO New England Regional Update

*Vermont System Planning Committee
April 2024 Quarterly Meeting*

Sarah Adams
STATE POLICY ADVISOR



Today's Updates



- Operations Update
 - 2023 Net Energy for Load
- Markets Update
 - Monthly Market Highlights
 - Forward Capacity Auction #18
 - 2023 Wholesale Market Costs
- System Planning Update
 - ISO Generator Interconnection Study Queue Snapshot
 - FERC Order 2023
 - Longer-Term Transmission Planning
 - Plan for Needs Assessments in 2024



OPERATIONS UPDATE

2023 Net Energy for Load



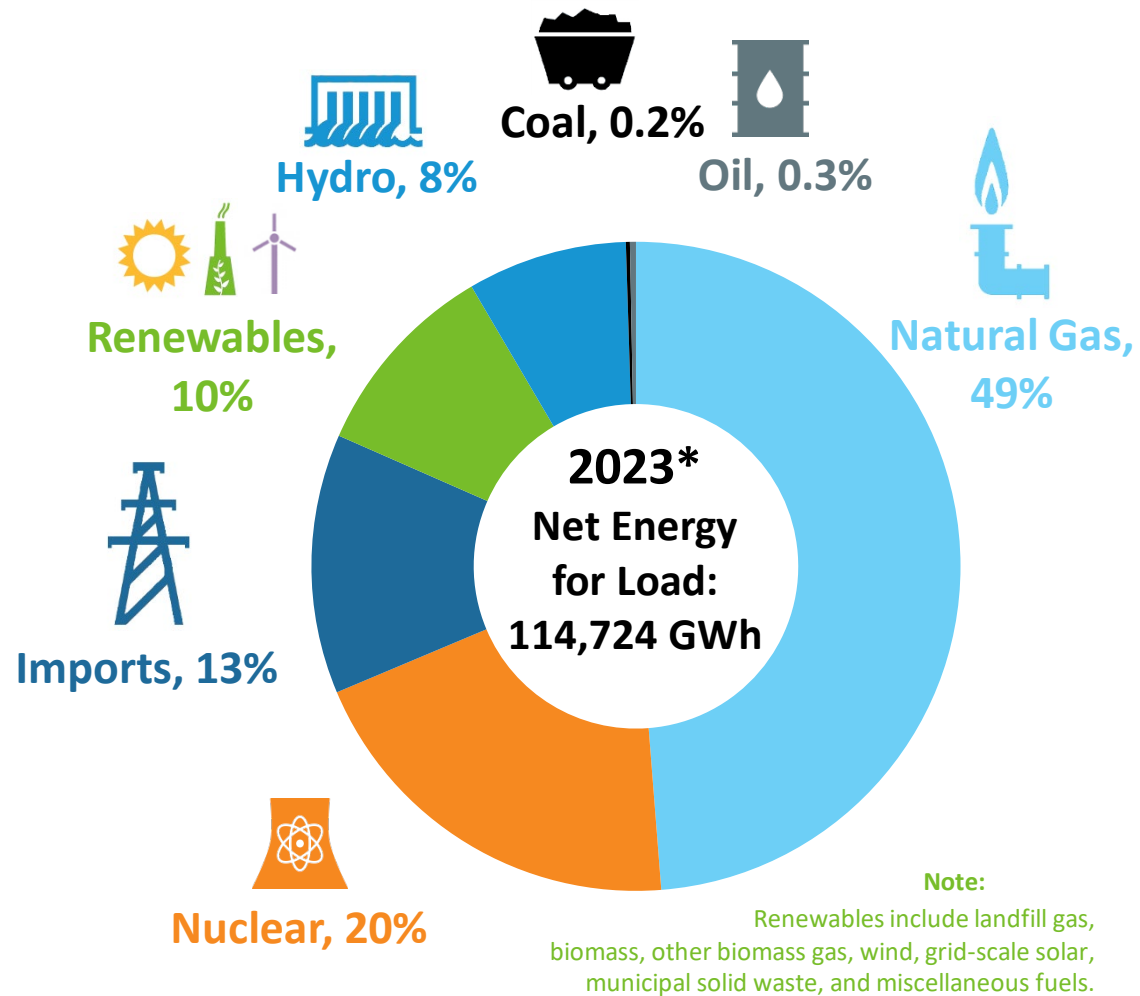
ISO New England Publishes 2023 Net Energy for Load Report

- The ISO [recently published](#) a breakdown of the amount of electricity produced by generators in New England and imported from other regions to satisfy demand in 2023
 - Total production for the year is known as net energy for load (NEL)
- Highlights of the NEL Report include*:
 - NEL amounted to **114,727 gigawatt-hours** in 2023 (down 3.5% from 2022)
 - Output from solar installations increased by 6% from 2022 to 2023, **rising to 3,851 GWh or 3% of NEL**
 - Oil-fired resources produced less electricity in 2023 than in 2022, accounting for **322 GWh, or 0.32% of NEL** (down 83% from 2022)
 - Wind power was relatively steady from year to year at **3% of NEL**
 - Coal's contribution to NEL continues to decrease, down to **0.16% of NEL**

*Data is preliminary and subject to adjustment

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

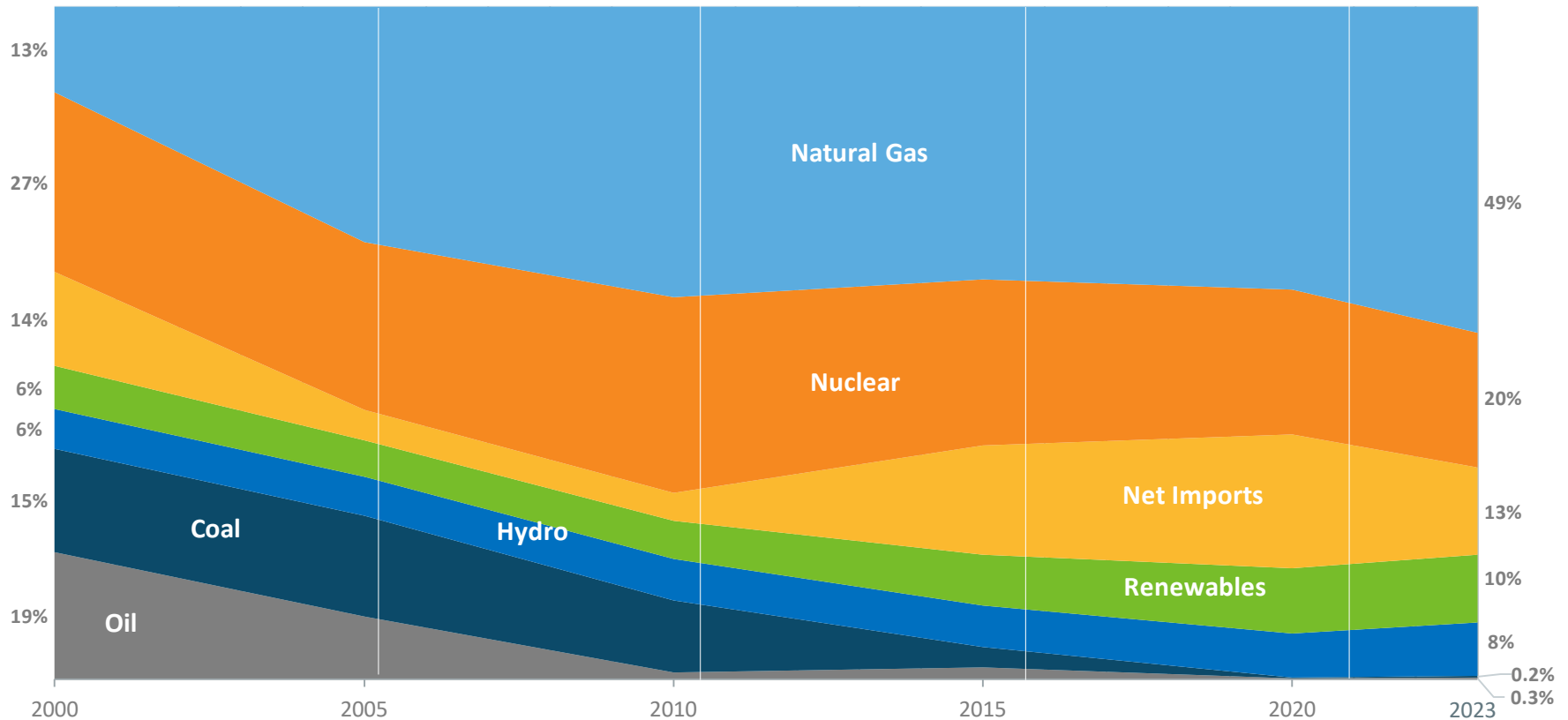
- In 2023, most of the region's energy needs were met by natural gas, nuclear, imported electricity (mostly hydropower from Eastern Canada), renewables, and other low- or non-carbon-emitting resources
- Region is transitioning away from older coal and oil resources



*Data is subject to adjustment. Source: 2023 Net Energy and Peak Load by Source
<https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load>

Dramatic Changes in the Energy Mix

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



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



MARKETS UPDATE

Monthly Market Highlights

Forward Capacity Auction #18

2023 Wholesale Market Costs

MONTHLY MARKET HIGHLIGHTS



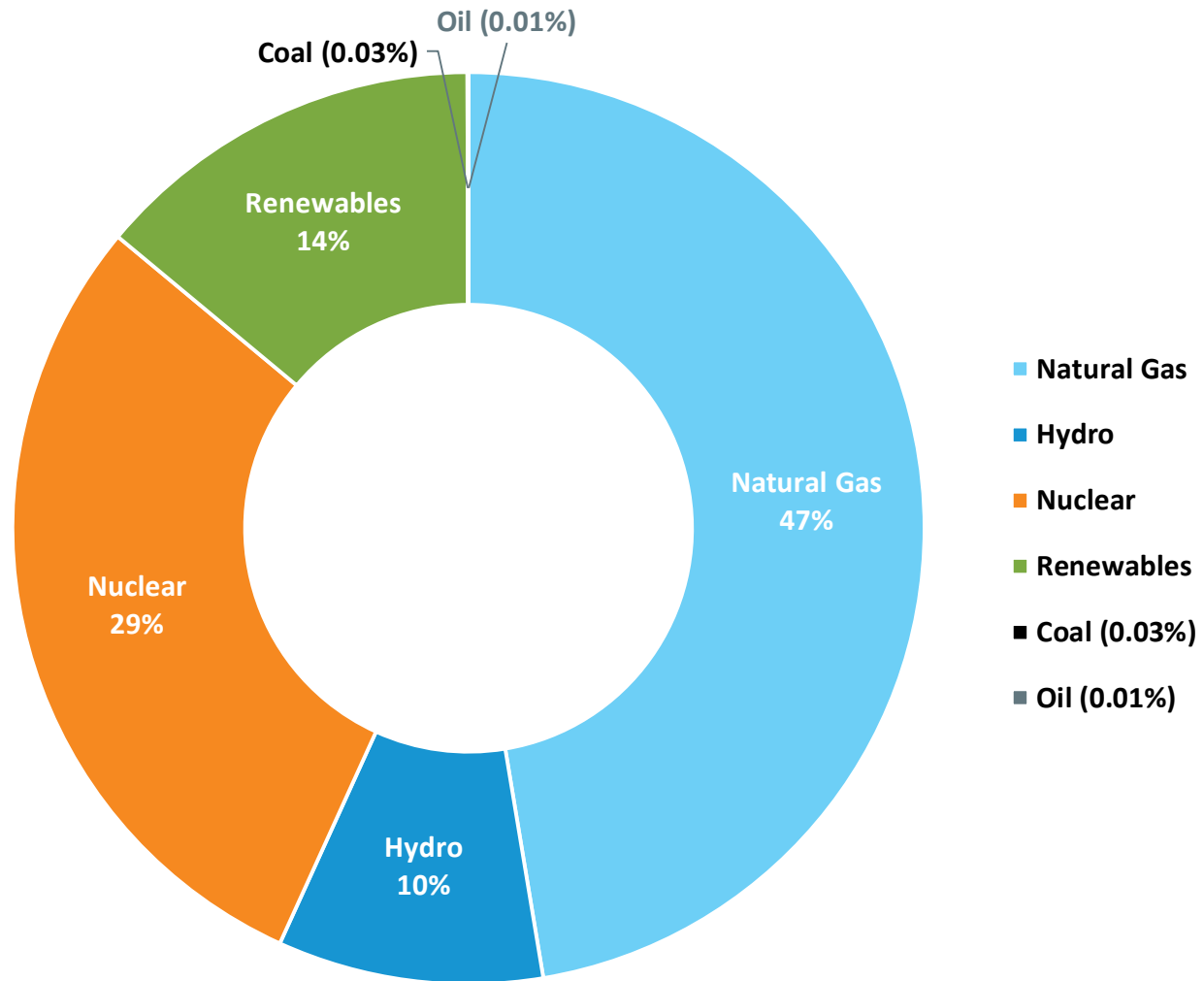
Monthly Wholesale Electricity Prices and Demand in New England, January 2024

February 2024 and Percent Change from February 2023 and January 2024	February 2024	Change from February 2023	Change from January 2024
Average Real-Time Electricity Price (\$/megawatt-hour)	\$31.52	-51.7%	-50.5%
Average Natural Gas Price (\$/MMBtu)	\$3.49	-57.1%	-54.6%
Peak Demand	17,199 MW	-12.5%	-6.7%
Total Electricity Use	9,496 GWh	1.8%	-12.7%
Weather-Normalized Use*	9,484 GWh	-2.4%	-15.3%

*Weather-normalized demand indicates how much electricity would have been consumed if the weather had been the same as the average weather over the last 20 years.



February 2024 Generation in New England, by Source

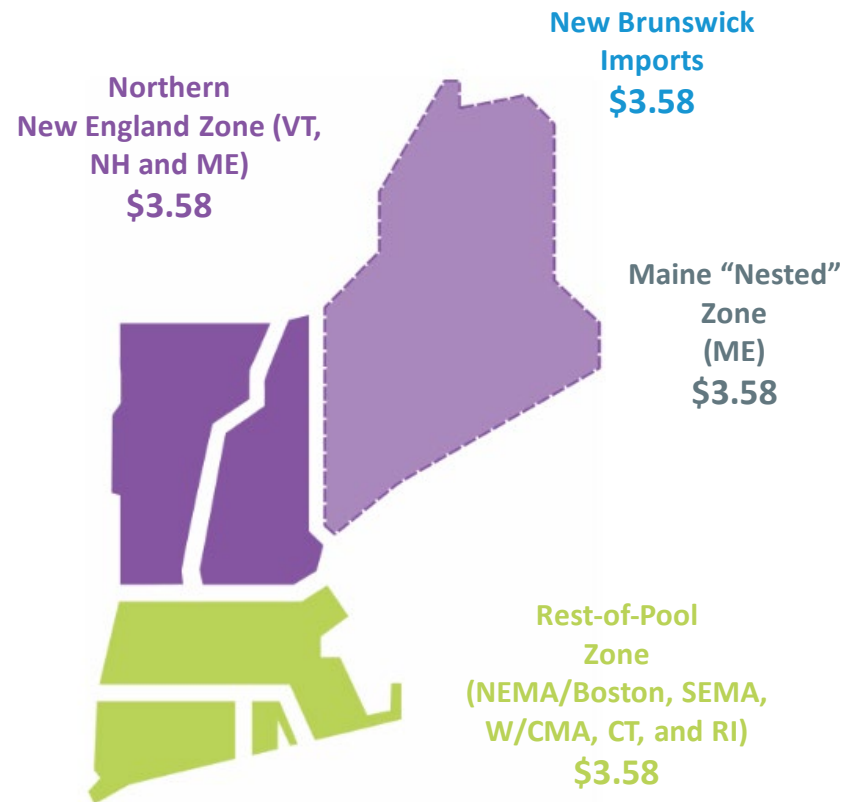


Source: [2024 Net Energy and Peak Load by Source](#)

FORWARD CAPACITY AUCTION 18

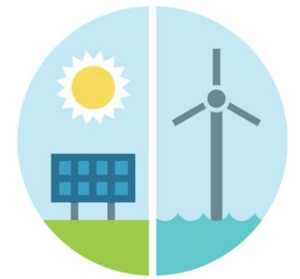
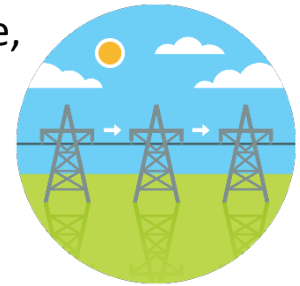
ISO New England Administered the Eighteenth Forward Capacity Auction (FCA 18) in February 2024

- FCA 18 was held on February 5, 2024 to procure the capacity resources needed to meet demand for electricity, plus reserve requirements, during the **June 1, 2027 to May 31, 2028** capacity commitment period
- The auction concluded with **sufficient resources** to meet the installed capacity target of 30,550 MW
- **Clearing prices** in the auction were \$3.58 per kilowatt-month (kW-mo.) in all zones and import interfaces, compared to last year's range of \$2.55 to \$2.59 per kW-mo.



FCA 18 Attracted and Retained a Variety of Resources to Ensure Resource Adequacy in 2027-2028

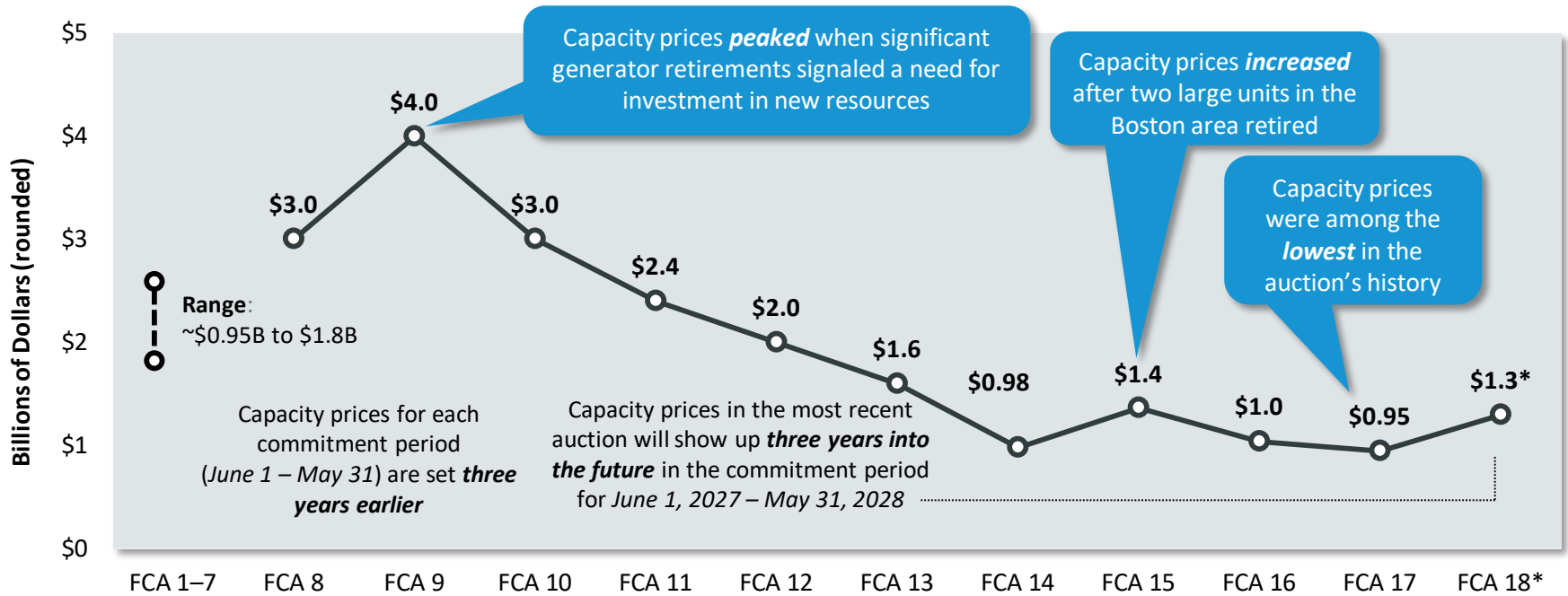
- The auction concluded with commitments from **31,556 MW** of capacity to be available during the 2027-2028 capacity commitment period
 - **28,478 MW** of generation, including:
 - Nearly **1,100 MW** of new renewable energy, energy storage, and demand-reducing resources secured obligations
 - More than **5,500 MW** of solar and wind generation, energy storage, and demand response resources
 - More than **550 MW** of new and existing wind resource cleared the auction
 - **2,614 MW** of energy-efficiency and demand-reduction measures, including **105 MW** of new demand resources
 - **465 MW** of total imports from New York, Québec and New Brunswick
- Solar and wind generation, energy storage, and demand response resources accounted for 18% of all capacity clearing the FCA 18



Capacity Market Costs Reflect Changing Supply Outlook

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

Total Capacity Market Costs



	FCA 1-7	FCA 8	FCA 9	FCA 10	FCA 11	FCA 12	FCA 13	FCA 14	FCA 15	FCA 16	FCA 17	FCA 18*
Commitment periods:	2010-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028*
Auction years:	2008-2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Est. Dollars per kilowatt-month:	\$2.95- \$4.50	\$7.03**	\$9.55**	\$7.03	\$5.30	\$4.63	\$3.80	\$2.00	\$2.48- \$3.98**	\$2.53- \$2.64**	\$2.55- \$2.59**	\$3.58

* Data is preliminary and subject to change. ** Prices are different across some capacity zones.

2023 WHOLESALE MARKET COSTS

Preliminary Cost Information

New England Wholesale Electricity Costs^(a)

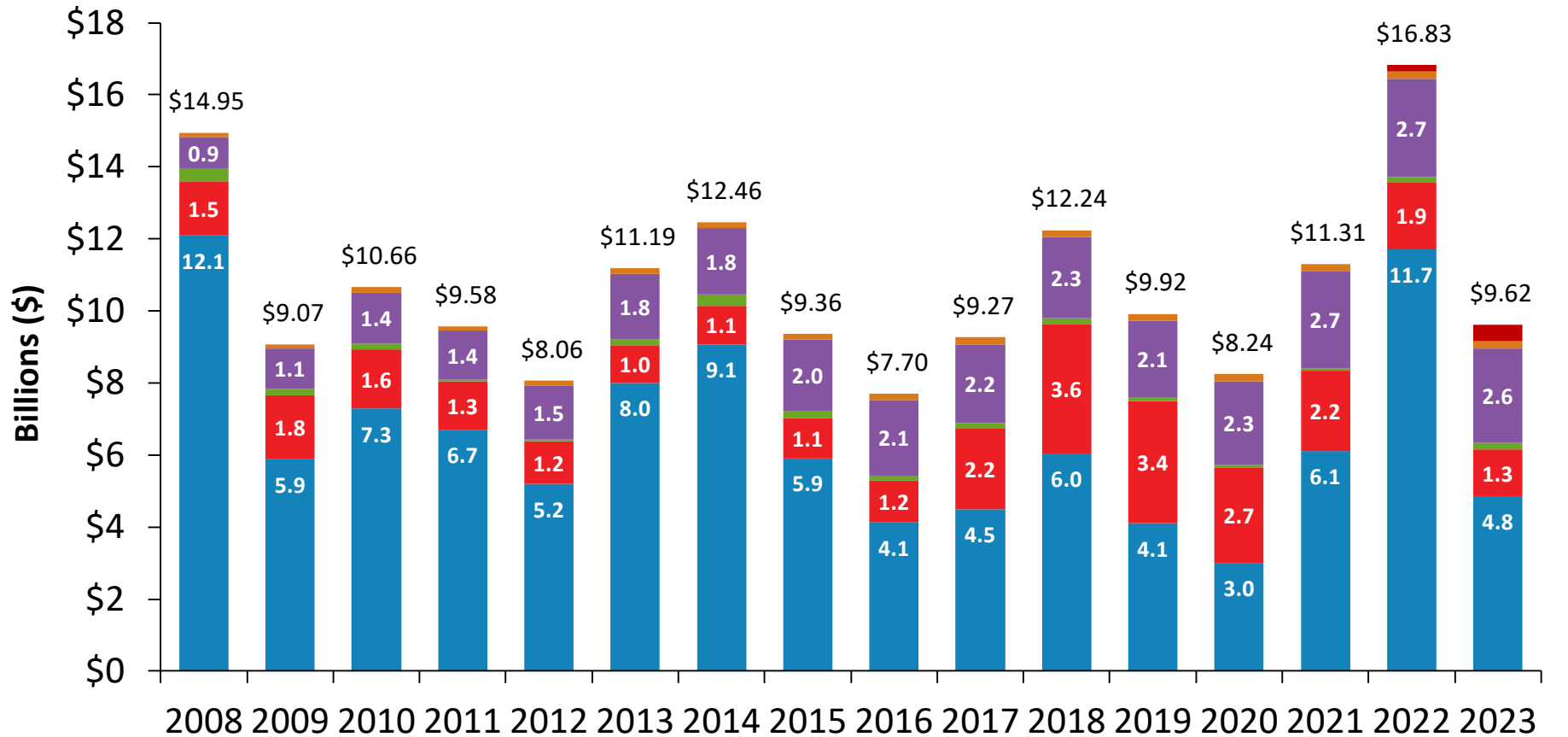
	2018		2019		2020		2021		2022		2023**	
	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh
Wholesale Market Costs												
Energy (LMPs)^(b)	\$6,041	4.7	\$4,105	3.3	\$2,996	2.4	\$6,101	4.8	\$11,712	9.0	\$4,847	3.9
Ancillaries^(c)	\$147	0.1	\$83	0.1	\$62	0.1	\$52	0.0	\$124	0.1	\$182	0.1
Capacity^(d)	\$3,606	2.8	\$3,401	2.7	\$2,662	2.2	\$2,243	1.8	\$1,864	1.4	\$1,308	1.1
Subtotal	\$9,794	7.6	\$7,589	6.0	\$5,720	4.7	\$8,404	6.6	\$13,701	10.5	\$6,338	5.1
Transmission charges^(e)	\$2,250	1.7	\$2,146	1.7	\$2,331	1.9	\$2,688	2.1	\$2,739	2.1	\$2,612	2.1
RTO costs^(f)	\$196	0.2	\$184	0.1	\$191	0.2	\$216	0.2	\$214	0.2	\$214	0.2
Mystic Cost of Service Agreement									\$173	0.1	\$460	0.4
Total	\$12,240	9.4	\$9,918	7.9	\$8,242	6.7	\$11,308	8.9	\$16,828	13.0	\$9,624	7.7

- (a) Average annual costs are based on the 12 months beginning January 1 and ending December 31. Costs in millions = the dollar value of the costs to New England wholesale market load servers for ISO-administered services. Cents/kWh = the value derived by dividing the dollar value (indicated above) by the real-time load obligation. These values are presented for illustrative purposes only and do not reflect actual charge methodologies. ***The wholesale values for 2023 are preliminary and subject to resettlement.**
- (b) Energy values are derived from wholesale market pricing and represent the results of the Day-Ahead Energy Market plus deviations from the Day-Ahead Energy Market reflected in the Real-Time Energy Market.
- (c) Ancillaries include first- and second-contingency Net Commitment-Period Compensation (NCPC), forward reserves, real-time reserves, regulation service, and a reduction for the Marginal Loss Revenue Fund.
- (d) Capacity charges are those associated with the Forward Capacity Market (FCM).
- (e) Transmission charges reflect the collection of transmission owners' revenue requirements and tariff-based reliability services, including black-start capability, voltage support, and FCM reliability.
- (f) RTO costs are the costs to run and operate ISO New England and are based on actual collections, as determined under Section IV of the *ISO New England Inc. Transmission, Markets, and Services Tariff*.

** 2023 figures are preliminary

New England Wholesale Electricity Costs*

Annual wholesale electricity costs have ranged from \$7.7 billion to \$16.8 billion



■ Energy Market
 ■ Forward Capacity Market
 ■ Ancillary Services
 ■ Transmission Charges
 ■ RTO Costs
 ■ Mystic COS
 (The total costs for each year include Ancillary Services and RTO costs)

Source: ISO New England; *2023 data is preliminary and subject to resettlement

Note: Forward Capacity Market values shown are based on auctions held roughly three years prior to each calendar year.

SYSTEM PLANNING UPDATE

ISO Generator Interconnection Study Queue Snapshot

FERC Order 2023

Longer-Term Transmission Planning

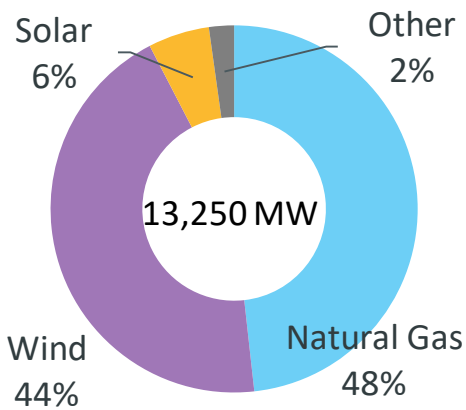
ISO GENERATOR INTERCONNECTION QUEUE SNAPSHOT



The ISO Generator Interconnection Queue Provides a Snapshot of Resource Proposals

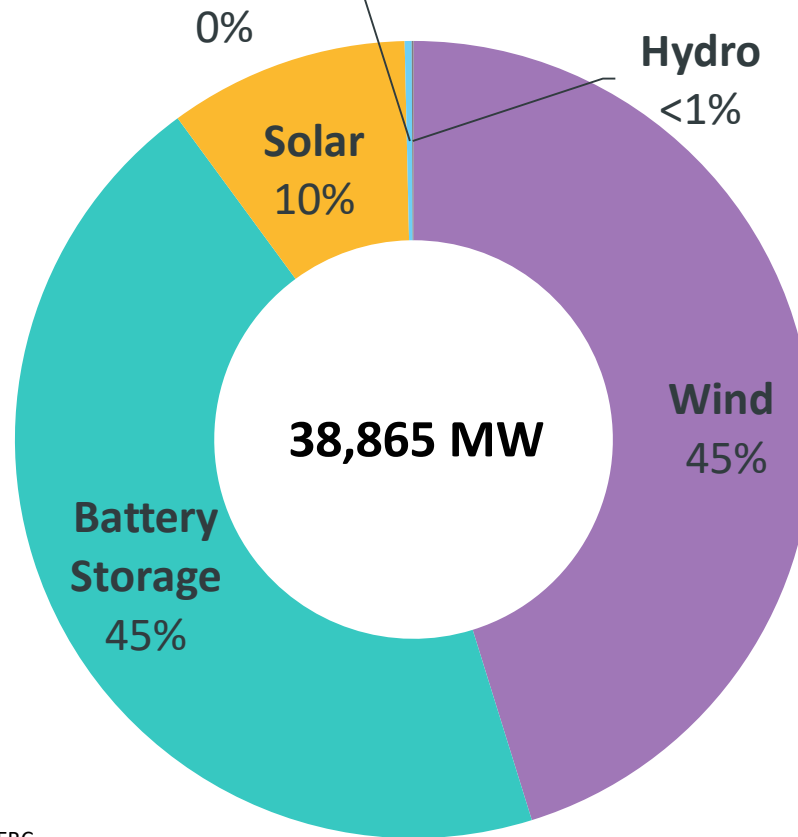
Dramatic shift in proposed resources from natural gas to battery storage and renewables

Then

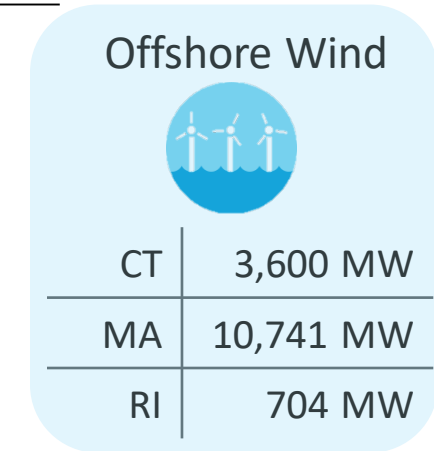


June 2017

Now



March 2024

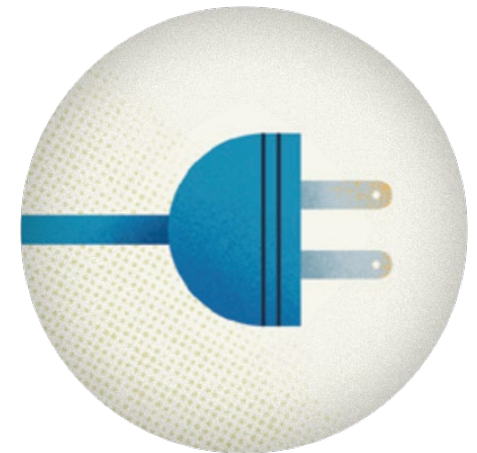


Source: ISO Generator Interconnection Queue, FERC Jurisdictional Proposals; Nameplate Capacity Ratings.

FERC ORDER 2023

Background on FERC Order 2023

- In July 2023, FERC issued [Order No. 2023](#)
- ISO-NE is proposing to adopt the large majority of the requirements of Order No. 2023 **to address queue backlogs, improve certainty, and prevent undue discrimination of new technologies** through its incorporation of improved processes, deadlines, and penalties
- ISO-NE's compliance proposal adopts Order No. 2023's pro forma (standard forms) to the greatest extent possible for New England
- ISO-NE has overhauled its interconnection processes to incorporate the **first-ready, first-served** clustering process



On March 26, ISO hosted a virtual informational webinar on FERC Order No. 2023 and Affected System Operator Studies. The [presentation materials](#) and a [recording of the webinar](#) are available on the ISO website.

Primary Elements of the Order

- Transition to First-Ready First-Served Cluster Process
 - Requires that transmission providers make several changes to transition to a **first-ready, first-served** cluster study process, rather than the current serial first-come, first-served study process
- Increase the Speed of Interconnection Processing
 - Eliminates the “reasonable efforts” standard for completing interconnection studies, and establishes **firm study deadlines** and **financial penalties** on transmission providers that fail to meet them
 - Adopts a uniform approach to Affected System coordination
- Incorporate Technological Advancements, including:
 - Allows **co-location** of multiple generating facilities behind a single POI
 - Updates to the study of proposed **charging behavior**
 - Incorporates specific **alternative transmission technologies** for study during the interconnection study process
 - Incorporates **modeling and ride-through requirements** for non-synchronous generating facilities

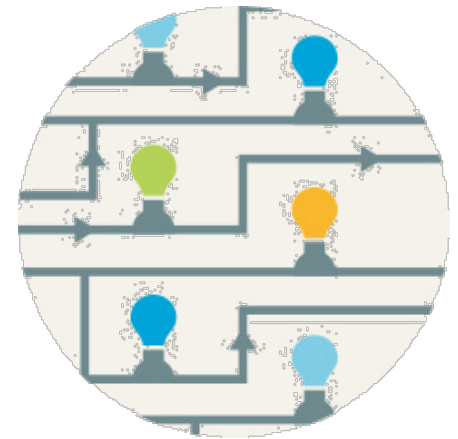
Order No. 2023 Transition Process and Timeline

- The ISO's Compliance Filing will be due 30 days after publication of Order No. 2023-A in the Federal Register
- Eligibility date will be 30 days after the Compliance Filing
 - ISO interconnection requests (IRs) that do not have a completed System Impact Study (SIS) must **withdraw** from the ISO queue or **proceed** to a **Transitional Cluster Study**
- ISO is expecting to propose an Effective Date of 60 days after the date of the Compliance Filing
 - The final Effective Date is subject to FERC's approval of ISO's filing
 - On the Effective Date, the ISO will issue a Transitional Serial Interconnection Facilities Study Agreement or a Transitional Cluster Study Agreement to Interconnection Customers with eligible IRs
 - Execution of Transitional Serial Interconnection Facilities or Transitional Cluster Study Agreement is due within 60 calendar days from Effective Date



Affected System Operator Study Coordination

- The ISO serves as the **affected party** to Distributed Energy Resource-ASO studies, and helps **coordinate** project approval
- ISO's role in these studies is to provide **hands-on guidance** on study practices and modeling methods
- ASO studies and FERC studies will be coordinated with the changes from FERC Order No. 2023
- At the beginning of the **Transition Cluster Study** phase
 - ISO will make the study case and modeling information available to TOs to conduct ASO studies
 - TOs can conduct ASO studies concurrent with Transition Cluster Study
- Post-Transition Cluster Study same as the Transition Study coordination
 - The first post-transition Cluster Study is expected to **begin in 2025**
 - The first **Cluster Restudy**, if one is needed, will not take place until 2026



Next Steps

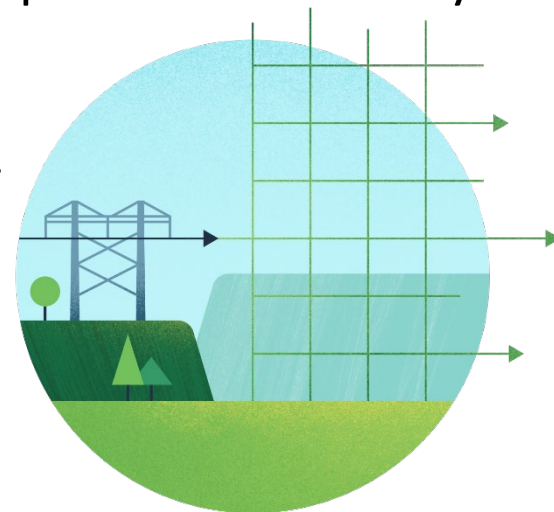
- The ISO has initiated discussions with the [NEPOOL Reliability Committee](#) to develop **Planning Procedure updates** to
 - Incorporate several conforming details regarding Order No. 2023 implementation
 - Update model submittal guidance
 - Incorporate implementation details regarding ASO study coordination
- Targeting to complete this effort by **Summer 2024**



LONGER-TERM TRANSMISSION PLANNING

Longer-Term Transmission Planning Update

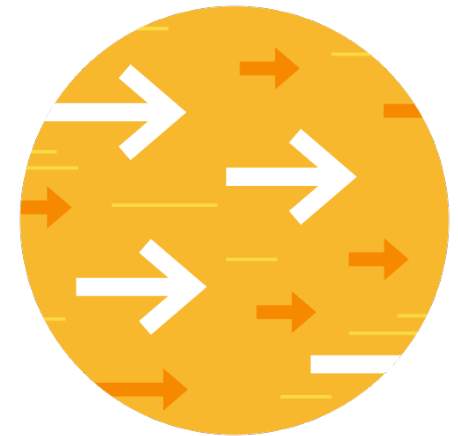
- ISO will host a [virtual public webinar](#) on May 1 to present its recently released [Final 2050 Transmission Study](#) report
 - The results, driven by future resource mix and demand assumptions provided by the New England states, offer an overview of regional transmission system investments needed to ensure reliability throughout the clean energy transition
 - The report includes sets of potential solutions, or roadmaps, designed to assist stakeholders in their efforts to facilitate the clean energy transition
- Phase 2 of the Longer-Term Transmission Planning effort is ongoing
 - Will establish the rules to enable the states to achieve their policies through the development of transmission to address anticipated system concerns and the associated cost allocation method
 - Tariff changes have been discussed at the Transmission and Reliability Committees, and the Participants Committee has considered and approved the proposals, which are anticipated to be filed with FERC in Q2 2024



PLAN FOR NEEDS ASSESSMENTS IN 2024

Plan for Needs Assessments in 2024

- The Boston and Vermont study area Needs Assessments are expected to be completed by Q2 of 2024
 - The analysis also identified a need to assess legacy DER tripping in an independent [New England 2034 Daytime Minimum Load Needs Assessment](#)
- The ISO initiated the New England 2028 Short Circuit Needs Assessment in [July 2023](#)
 - Time-sensitive needs were identified in SEMA, RI, Maine and WCMA
 - The solution studies for these time-sensitive needs will be completed by Q2 of 2024
- The ISO has proposed the following roadmap for 2024 study initiation:
 - New England 2034 Daytime Minimum Load Needs Assessment (Q2 2024)
 - Connecticut 2034 Needs Assessment (Q2 of 2024)
 - SEMA/RI 2034 Needs Assessment (Q4 of 2024)
 - *After these study areas are evaluated, the ISO will establish timelines for the remaining study areas like Maine, New Hampshire and WCMA*



ISO NEW ENGLAND PUBLICATIONS AND RESOURCES

ISO New England Releases Several Publications

2024 Regional Electricity Outlook | The Four Pillars

Introduction

The clean energy transition is accelerating, but there are challenges. The four pillars provide a framework for talking about what we need to get to a reliable clean energy future.

THE FOUR PILLARS

- PILLAR ONE: Clean Energy** - Significant amounts of clean energy to power the economy with a greener grid.
- PILLAR TWO: Balancing Resources** - Resources that can supply electricity, reduce demand, or provide other services to maintain power system equilibrium.
- PILLAR THREE: Energy Adequacy** - A dependable energy supply means to manage through extended periods of severe weather or energy supply constraints.
- PILLAR FOUR: Robust Transmission** - To integrate renewable resources and move clean energy to load centers across New England.

New England's electric power grid is undergoing a tremendous transformation. Public policy aimed at fighting climate change by decarbonizing all sectors of the economy is ushering in a new era in our energy history. This era will be marked by rapid and

2024 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 2023-2024 Profile

The region's wholesale electricity marketplace is securing reliable electricity at competitive prices and helping usher in a cleaner, greener grid.

A Major Energy Transformation Is Underway

New England has shifted away from older coal- and oil-fired generation to cleaner burning natural gas. Most of today's electricity production comes from lower-emitting energy resources. The region is transitioning to large-scale clean and renewable energy.

2023 ENERGY RESOURCES

YESTERDAY VS. TODAY

Year	Coal	Oil	Natural Gas	Renewable	Net Imports
2000	58%	0.2%	0.2%	0.3%	36%
2023	0%	0%	64%	12%	24%

LOOKING TO THE FUTURE

- Wind power new resource proposals continue to account for nearly half of the interconnection request queue (nearly 17,600 MW).
- Solar power is growing rapidly: ISO-NE forecasts nearly 12,000 MW within a decade.
- Battery storage technologies dominate new resource proposals more than 10,000 MW proposed.
- New transmission proposals would provide access to additional clean or renewable energy in New England or Eastern Canada.

Major Emissions Reductions

CO₂ emissions declined with shift from coal and oil to natural gas generation.

Wholesale Prices Drop Sharply After Historic High

Average Wholesale Cost and Average Annual Price of Wholesale Energy (2016-2023)

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 Power Grid State Profiles 2023-2024

Supply and demand resources help meet New England's electricity needs, and state policies are transforming the resource mix.

Region Has Many Proposals for New Supply

Electric generating capacity by state (MW)

State	Existing	Proposed
VT	1,065	4,455
NH	1,181	1,151
ME	1,181	1,151
RI	1,181	1,151
MA	39,700	39,863
CT	1,181	1,151
NY	1,181	1,151

ISO's Electrification Forecast Shows Demand Growth

Combined annual growth rates for peak demand and overall electricity use, net of energy efficiency and solar photovoltaics (PV), 2023-2022

Category	2023-2022
Overall Demand	1.2%
Peak Demand	1.7%
MA	1.2%
CT	1.4%
NH	1.3%
ME	0.4%
RI	0.4%
VT	1.1%

Proposed Generation (by type)

Wind, solar and battery storage dominate new resource proposals at the ISO queue (as of January 2024). Total: 39,863 MW

Resource Type	Percentage
Battery	61%
Wind	44%
Solar	9%

EE and solar PV are reducing demand growth

While state-sponsored energy efficiency and behind-the-meter solar PV resources are driving down light electricity use and flattening overall electricity demand in New England, the ISO forecasts that both energy usage and peak demand will increase slightly over the next 10 years. Electrification of transportation and buildings are the primary factors for this increase.

Related Developments

- The region's capacity market is attracting investment. Around 1,800 MW of new natural gas, wind, solar, energy storage, and hydro resources have cleared in recent Forward Capacity Auctions with commitments to be available in 2024-2027.
- The states are active in procuring clean energy. From 2016 to 2024, Connecticut, Maine, Massachusetts, and Rhode Island have solicited more than 44,600 MW of supply through large-scale clean energy procurements, consisting primarily of wind, solar, hydro, and nuclear energy resources. This is driving proposals in the ISO queue.

Demand Resources Compete in New England Markets

Demand resources cleared in the 10th Forward Capacity Auction and committed for June 1, 2024, to May 31, 2025 (MW)

State	Active	Passive	Subtotal
VT	910	0	910
NH	183	0	183
ME	324	0	324
RI	350	0	350
MA	1,349	0	1,349
CT	0	3,213	3,213
TOTAL	6,786	3,213	10,000

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

Consumer Liaison Group Provides a Forum for Consumers to Learn about Regional Electricity Issues

- A forum for sharing information between the ISO and electricity consumers in New England
- The CLG Coordinating Committee consists of 12 members who represent various stakeholder groups
- Quarterly meetings are free and open to the public, with in-person and virtual options to participate
- Upcoming 2024 CLG Meeting Dates:
 - Tuesday, June 4
 - Thursday, September 12
 - Wednesday, December 4



[2022 CLG Annual Report](#)

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

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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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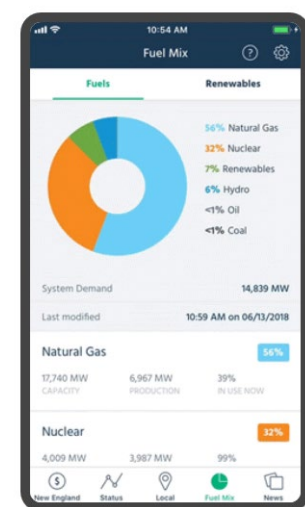
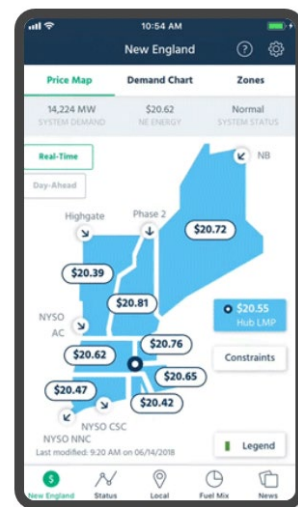


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Questions

