ISO New England Update

Consumer Liaison Group Meeting

Eric Johnson

EXECUTIVE DIRECTOR, EXTERNAL AFFAIRS

TODAY'S UPDATES

- Monthly Market Highlights
- Markets Update
- Operations Update
- System Planning Update
- Demand Response in New England
- Consumer Liaison Group Resources and Announcements

An Ongoing Dialogue: ISO's External Affairs Team

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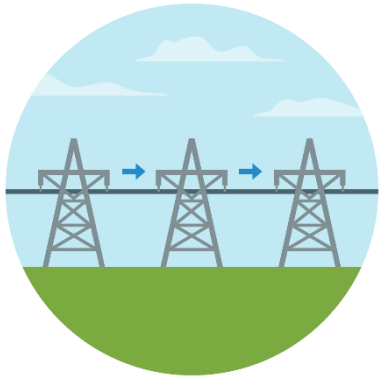
ISO New England Performs Three Critical Roles to Ensure Reliable Electricity at Competitive Prices

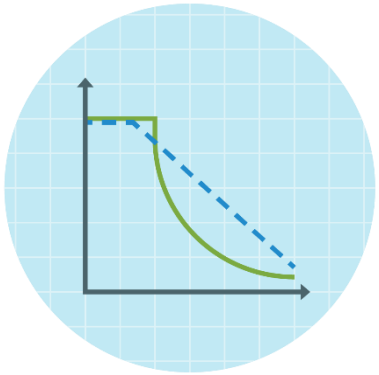
Grid Operation

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



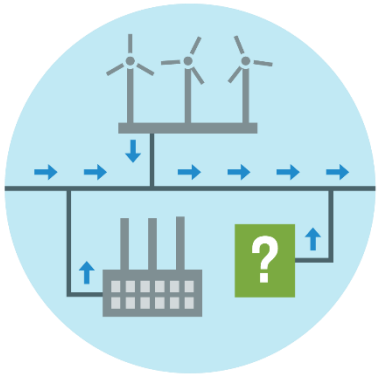
Market Administration

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



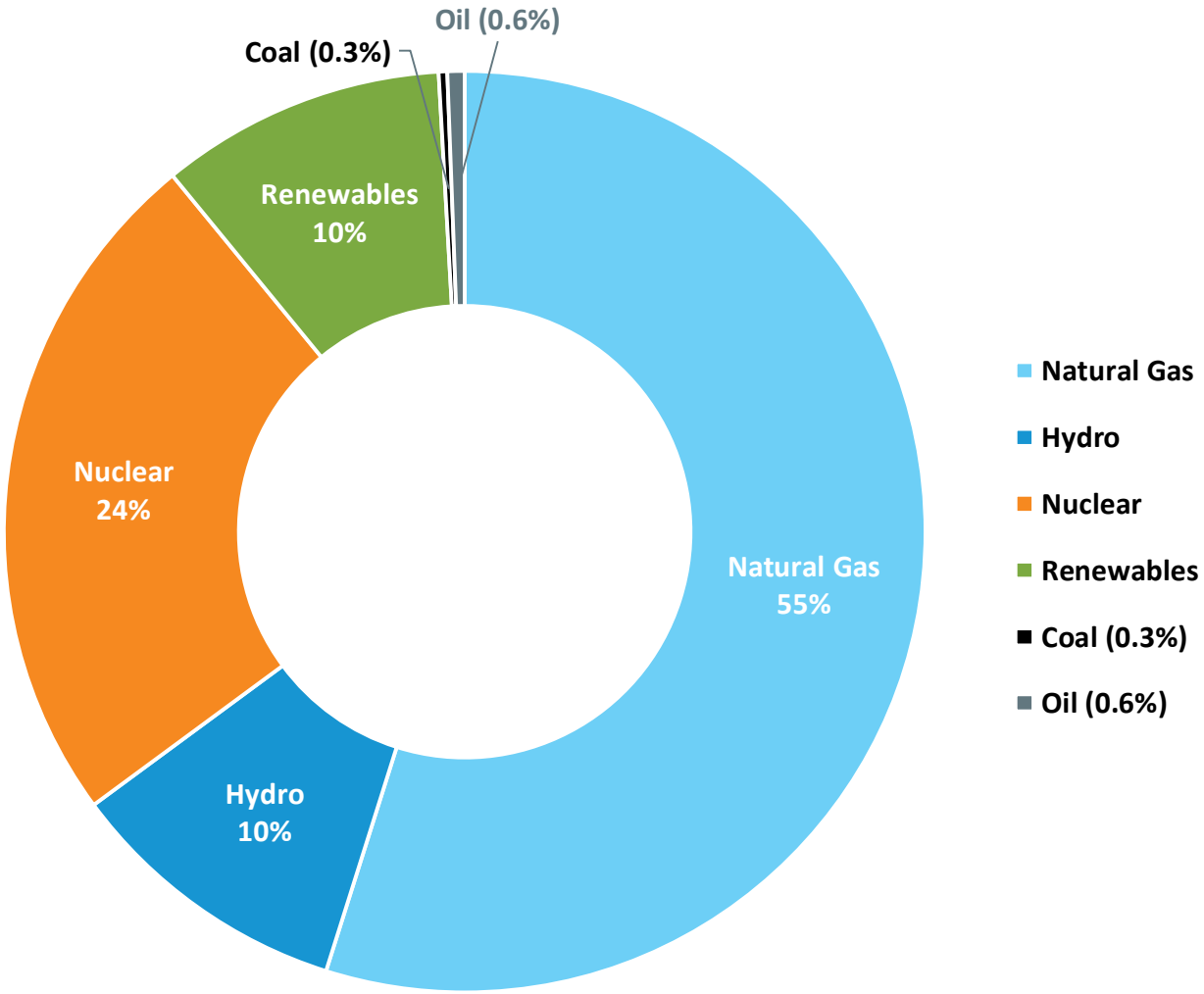
MONTHLY MARKET HIGHLIGHTS

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

January 2024 and Percent Change from January 2023 and December 2023	January 2024	Change from January 2023	Change from December 2023
Average Real-Time Electricity Price ($/megawatt-hour)	$63.67	26%	71%
Average Natural Gas Price ($/MMBtu)	$7.68	63%	139%
Peak Demand	18,431 MW	6.5%	4.1%
Total Electricity Use	10,883 GWh	6.4%	8.6%
Weather-Normalized Use*	11,195 GWh	1.7%	5.9%

*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.

January 2024 Generation in New England, by Source



Source: 2024 Net Energy and Peak Load by Source

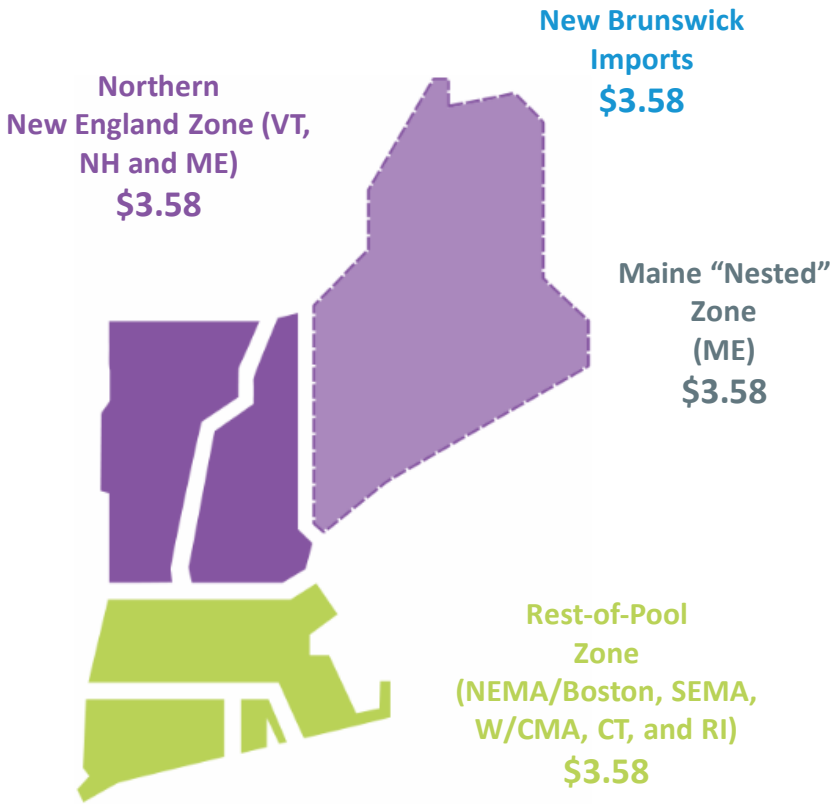
MARKETS UPDATE

Forward Capacity Auction 18

2023 Wholesale Market Costs

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.



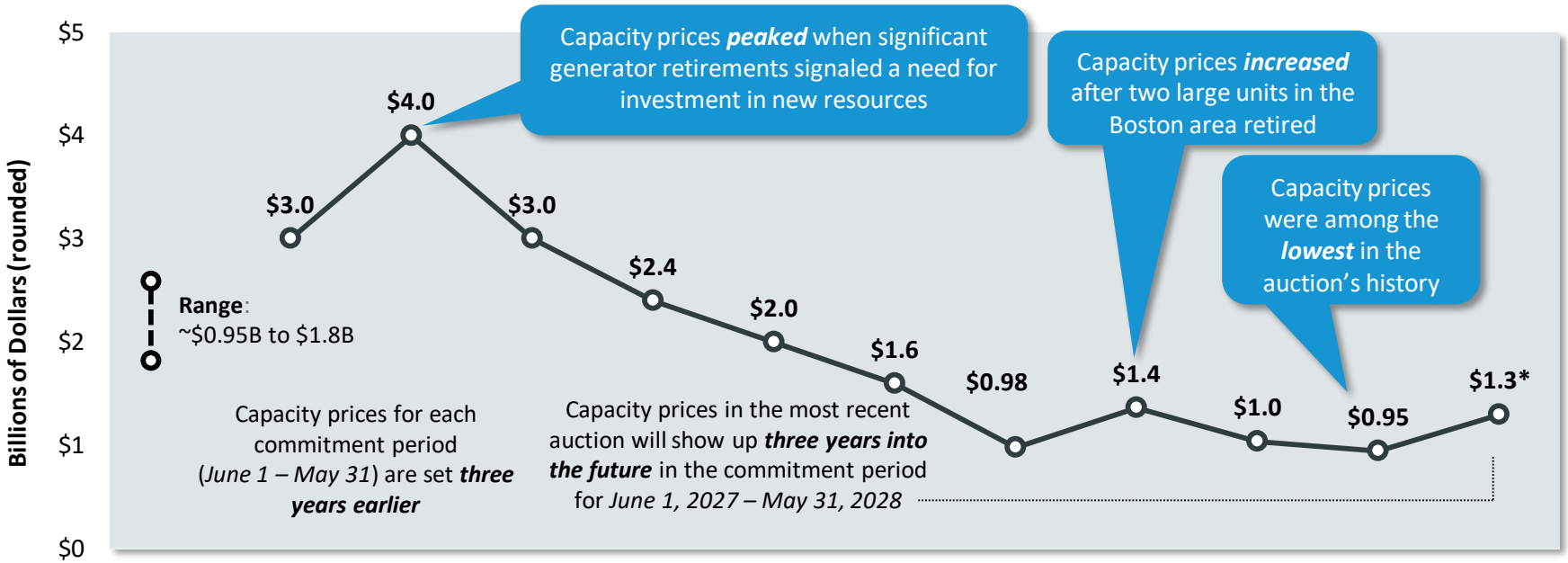
FCA 18 Attracted and Retained a Variety of Resources to Ensure Resource Adequacy in 2027-2028

- 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.

ISO Summarizes Forward Capacity Auction Results on *ISO Newswire*

- *ISO Newswire* is a comprehensive resource for news and information about ISO New England and the wholesale electricity industry within New England
- The site is regularly updated with timely stories of interest and importance to those in the industry, government regulators and legislators, the media, and the general public

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).

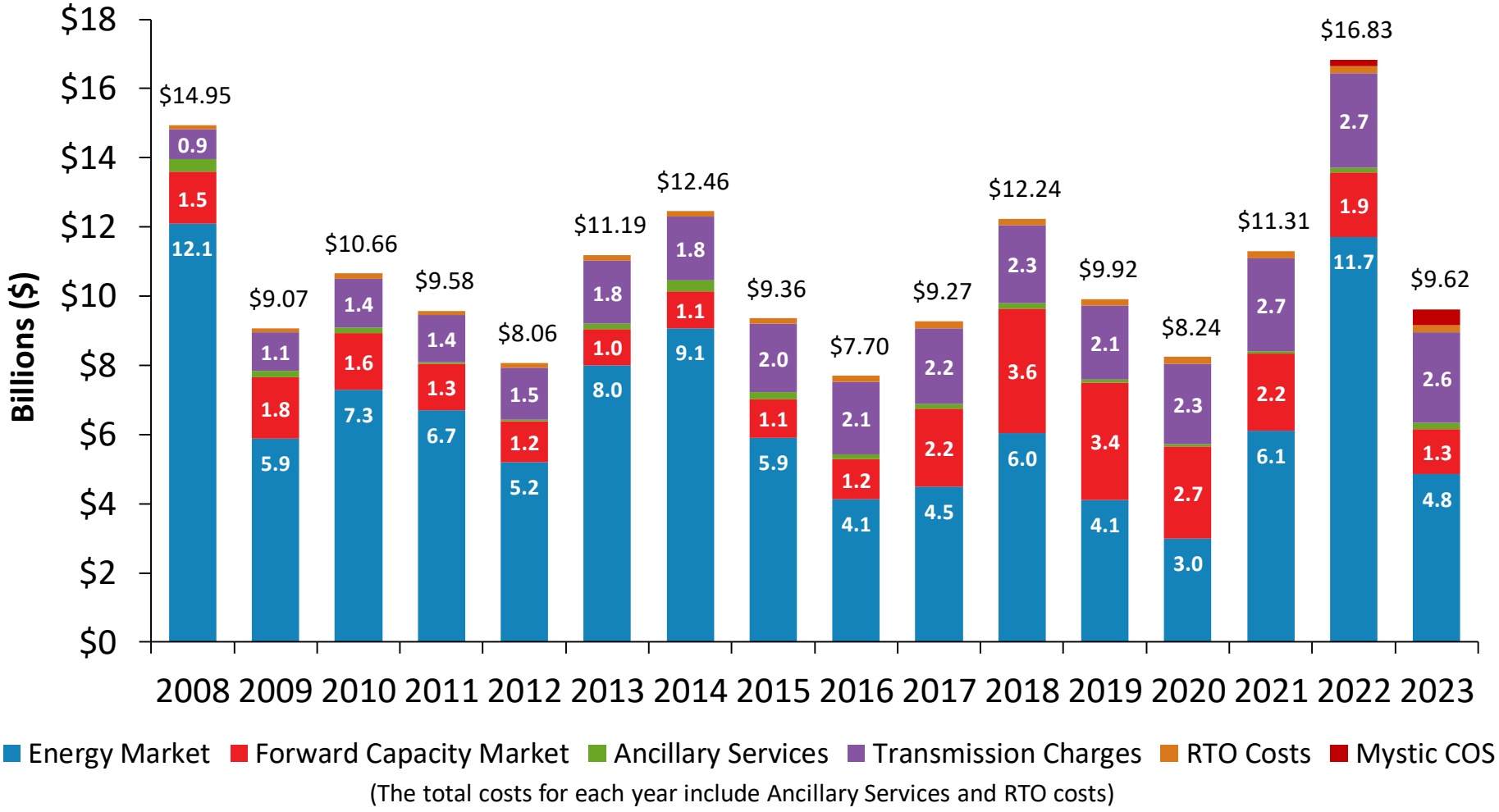
(e) Transmission charges reflect the collection of transmission owners' revenue requirements and tariff-based reliability services, including black-start capability, voltage support, and FCM reliability.

(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



(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.

OPERATIONS UPDATE

2023 Net Energy for Load

2022 ISO New England Electric Generator Air Emissions Report

NET ENERGY FOR LOAD

2023 Report

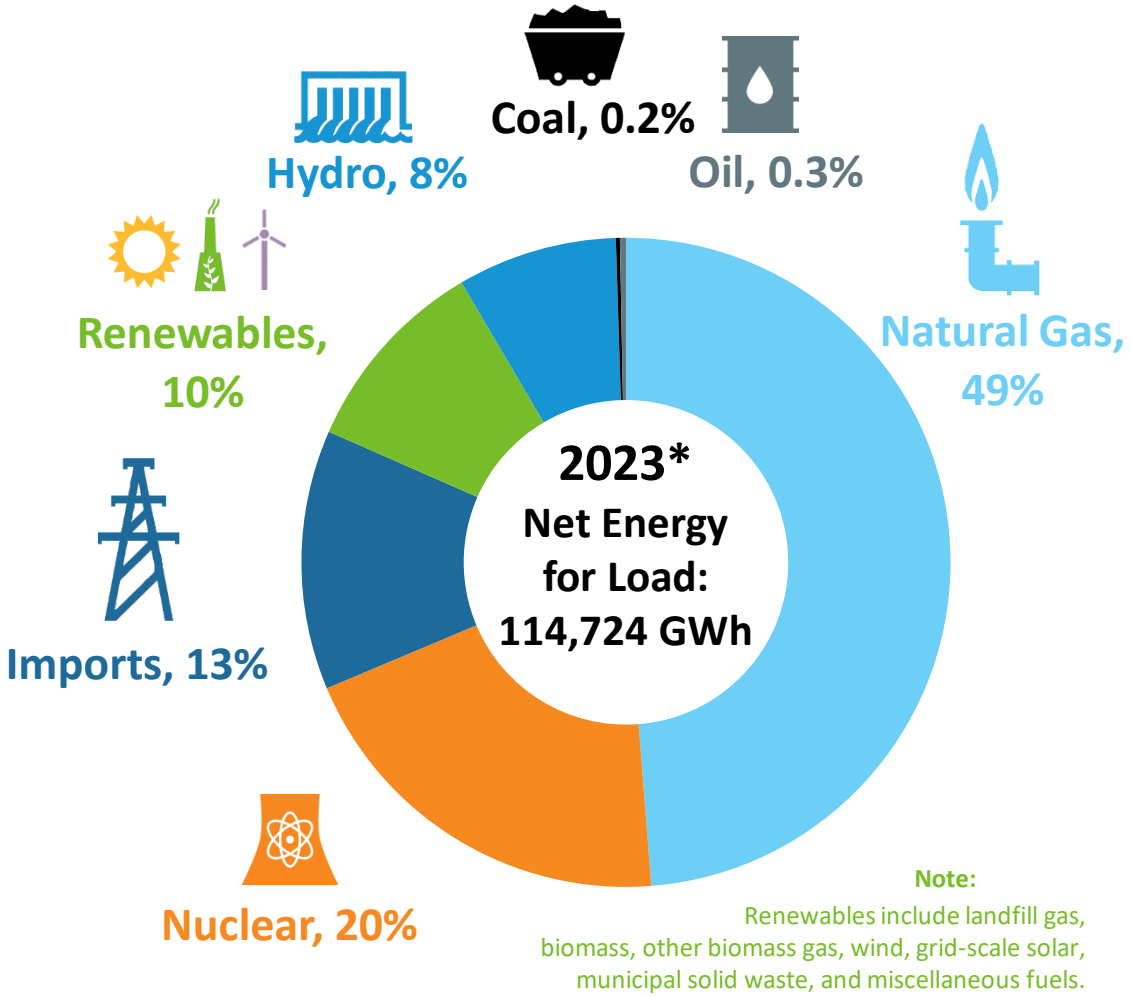
ISO New England Publishes 2023 Net Energy for Load Report

- 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 know 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

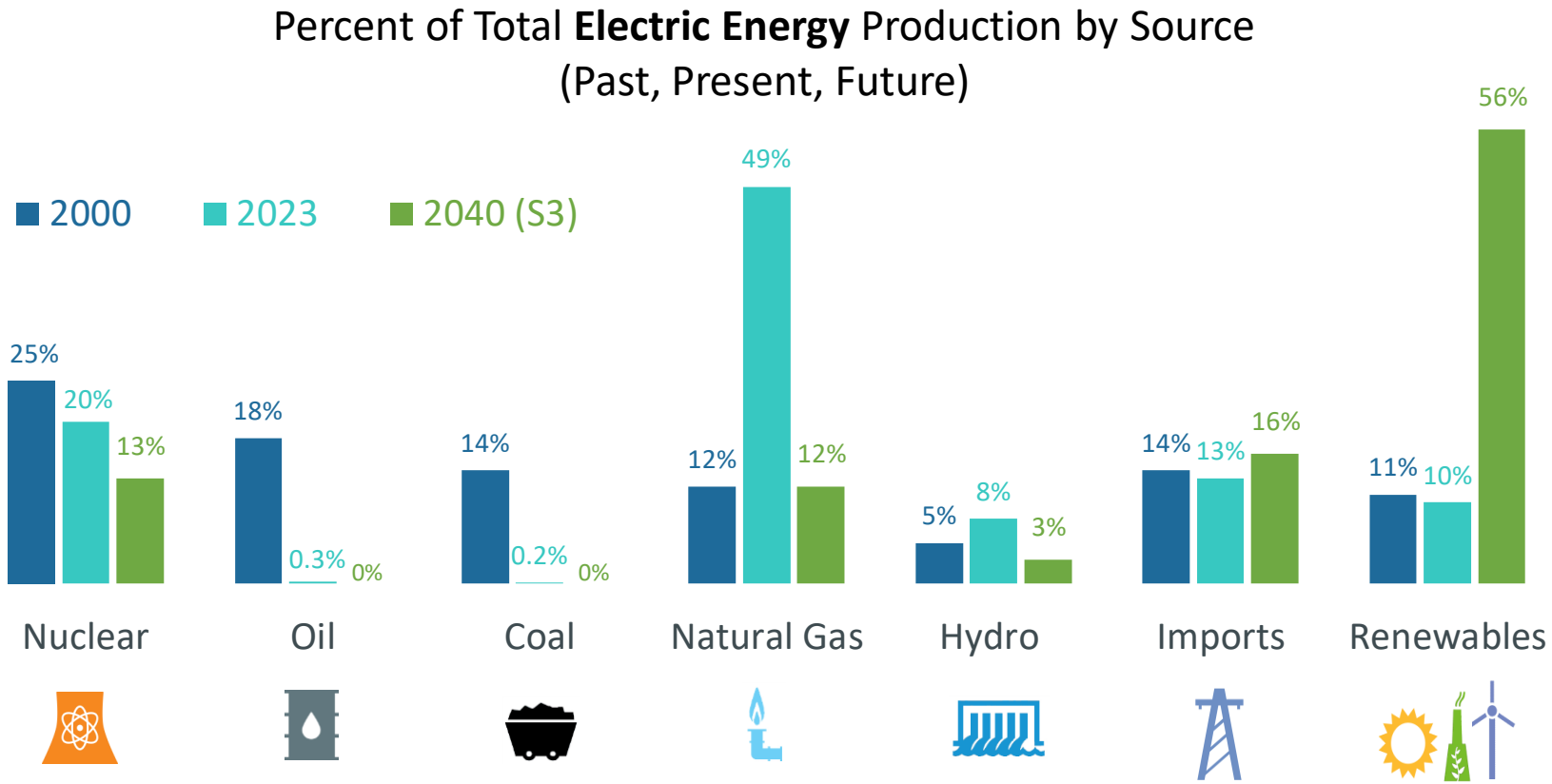
- In 2023, most of the region's energy needs were met by natural gas, nuclear, imported electricity (mostly hydropower from Eastern Canada), renewables, and other low- or non-carbon-emitting resources
- Region is transitioning away from older coal and oil resources



*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

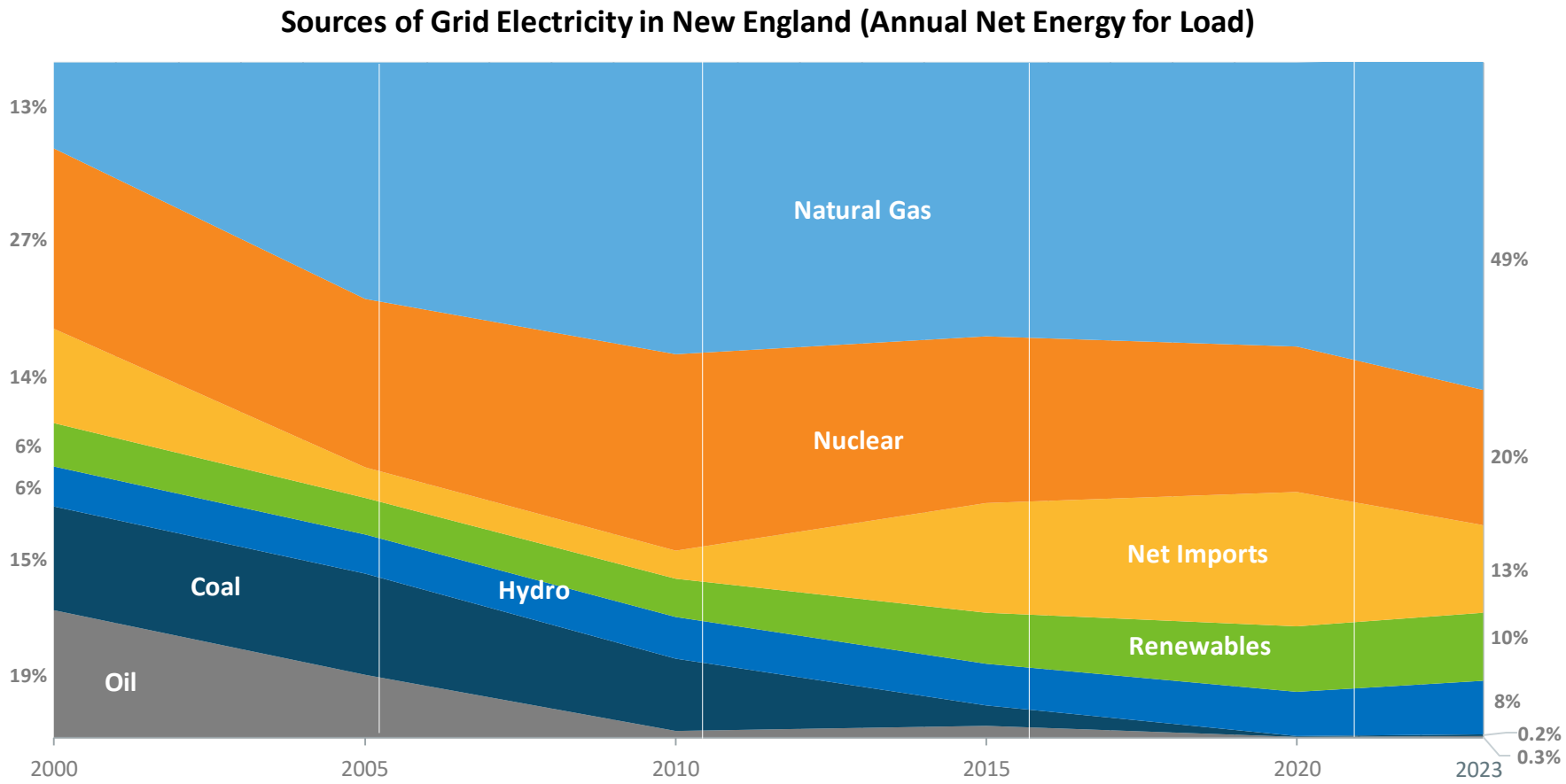
New England made a major shift from coal and oil to natural gas over the past two decades, and is shifting to renewable energy in the coming decades



Source: ISO New England Net Energy and Peak Load by Source; data for 2023 is preliminary and subject to resettlement; data for 2040 is based on Scenario 3 of the ISO New England 2021 Economic Study: Future Grid Reliability Study Phase 1.

Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, behind-the-meter solar, municipal solid waste, and miscellaneous fuels.

Dramatic Changes in the Energy Mix



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

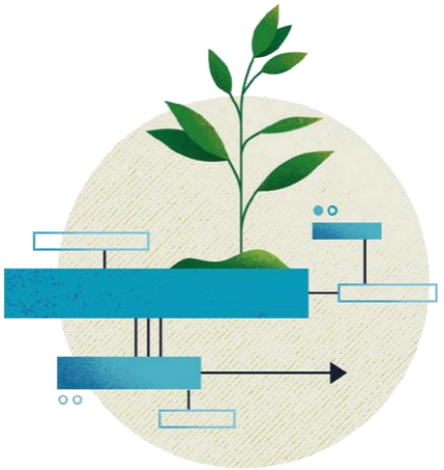
2022 ISO NEW ENGLAND ELECTRIC GENERATOR AIR EMISSIONS REPORT

Carbon Emissions from New England Power Generation Continue Downward Trend

- The 2022 ISO New England Electric Generator Air Emissions Report found that from 2001 through 2022, **CO_2 emissions fell by 37%, NO_x emissions fell by 79%**, and **SO_2 emissions fell by 98%**
  - The report's emissions estimates for generation within New England are based on information from Environmental Protection Agency databases and other sources

- Other report takeaways include:
  - Electricity generation increased by 2% but produced less CO_2 in 2022 than 2021
  - Higher production by oil-fired resources in 2022 led to a spike in SO_2 emissions
    - Higher prices for the region's main energy fuel, natural gas, made oil more economical at certain times of the year in 2022
  - The increase in CO_2 emissions from oil generators was offset by a 43% year-over-year decrease in coal-fired generation

- In addition to the annual analysis, the ISO publishes data on estimated CO_2 emissions from New England power plants in a monthly recap of the wholesale electricity markets, and real-time estimates are available on ISO Express

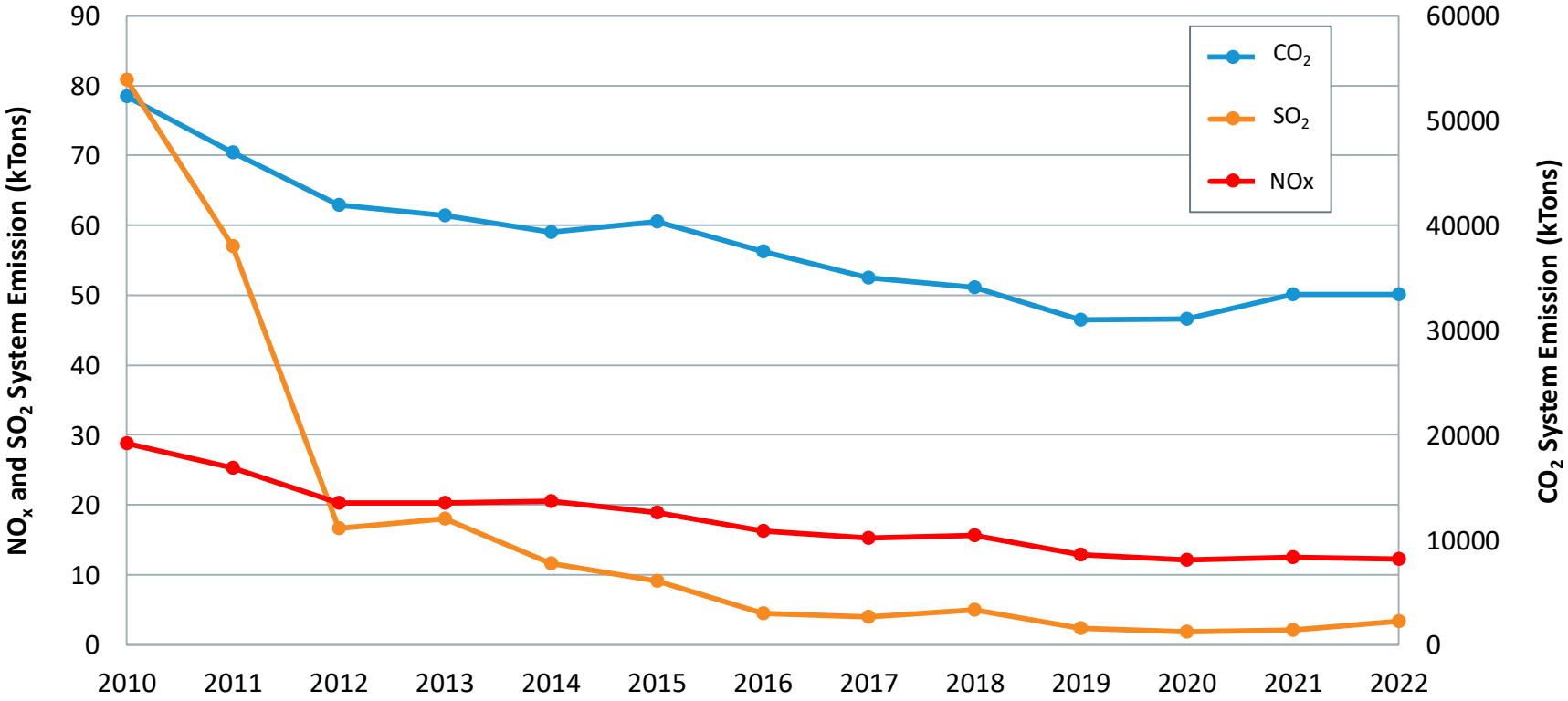


Source: ISO New England, *New England Electric Generators Air Emissions Report*

Major Emissions Reductions

Emissions from regional generators have fallen significantly since 2001

Annual New England System Generator Emissions, 2010-2022 (Thousand Short Tons)



Carbon Dioxide (CO_2) ↓36% **Nitrogen Oxide (NOx) ↓57%** **Sulfur Dioxide (SO_2) ↓96%**

Source: ISO New England, *New England Electric Generators Air Emissions Report*

SYSTEM PLANNING UPDATE

2050 Transmission Study

FERC Order 2023

2050 Transmission Study

A High-Level Study for the Years 2035, 2040, and 2050

- In February, the ISO released the Final 2050 Transmission Study report
  - Initial study scope and assumptions developed **in conjunction with the states**
  - Aims to **inform the region** of the amount, type, and high-level cost estimates of **transmission infrastructure** that would be *needed to cost-effectively and reliably serve peak loads*, including electrified transportation and heating, in a clean-energy future
  - Study looks beyond the ISO's typical 10-year horizon

- 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
- *The ISO will host a public webinar on the study later this spring*

Informational Webinar: FERC Order No. 2023 and Affected System Operator Studies

- ISO New England is hosting an educational webinar next month on our plans to comply with a FERC order on changes to the generator interconnection process (Order 2023)
- State officials asked for the webinar to help educate developers of distributed energy resources (DERs) about the ISO's compliance proposal and the impact on Affected System Operator (ASO) studies
- **Webinar**: March 26th at 10:30 a.m.
  - Free and open to the public
  - Registration is now open on ISO-TEN
  - There will be an opportunity for attendees to ask clarifying questions about the ISO's proposal
- ISO plans to submit a compliance filing to FERC by April 1, which will be subject to approval by the Commission

DEMAND RESPONSE IN NEW ENGLAND

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

- Nearly **400** dispatchable generators in the region
- **31,500 MW** of generating capacity
- Nearly **40,000 MW** of proposed generation in the ISO Queue
  - Mostly wind, storage, and solar proposals
- Nearly **4,000 MW** of demand resources committed for June 1, 2023, to May 31, 2024 *, including energy efficiency, load management, and distributed generation resources
  - Demand resources have had further opportunities in the wholesale markets since 2018
  - Includes traditional energy efficiency and demand response programs, as well as aggregations of residential homes that agree to reduce grid demand during peak summer hours through a combination of solar panels and batteries

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

Electricity Pricing Dynamics in a De-carbonized Economy

- To de-carbonize the economy, electricity will be generated by renewable resources (e.g., solar, wind), and end-uses (e.g., transportation and space-heating) will be electrified
- Renewable resources like solar and wind do not respond to supply/demand conditions as reflected in market prices, leading to periods of over- and under-generation and increased price volatility
  - Periods of zero or negative Locational Marginal Prices (LMPs) resulting from renewable resource over-generation, and periods of high LMPs resulting from renewable resource under-generation

Price Volatility Provides Opportunities

- Price volatility provides an opportunity for energy storage and “demand flexibility”
  - *Increase demand* during periods of renewable resource over-generation with low prices
  - *Decrease demand* during periods of renewable resource under-generation with high prices
  - Such demand flexibility reduces overall system costs and carbon emissions, and helps address system reliability from renewable generation intermittency

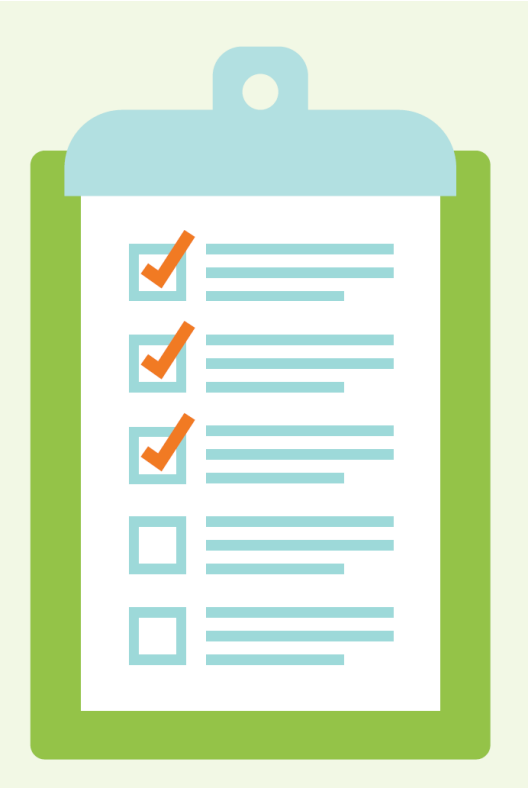
States Have An Opportunity to Leverage Demand Flexibility if Consumers are Given the Tools to Act

- Retail rates that reflect time-varying costs can enable demand flexibility
  - Prices will be high when marginal costs are high
  - Prices will be low when marginal costs are low
- While **real-time pricing** is most efficient, **time-of-use** and **critical peak pricing** have other desirable rate design properties – i.e., price predictability and bill stability
- Rate designs that encourage demand flexibility require **advanced metering functionality** so that real-time hourly usage can be measured and used by customers or their aggregators to adjust load as renewable generation (and the associated retail rate) fluctuates

CONSUMER LIAISON GROUP RESOURCES AND ANNOUNCEMENTS

ISO Hiring New Policy Advisor for Environmental and Community Affairs

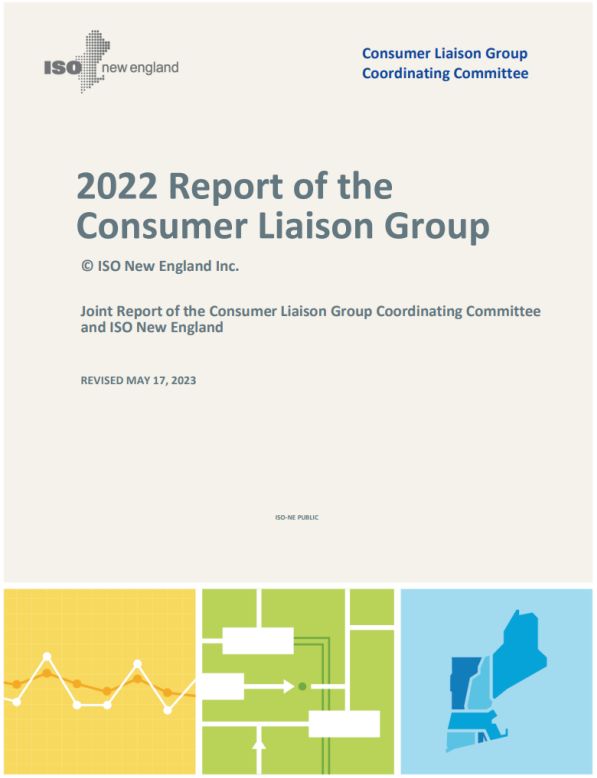
- The ISO is hiring a Policy Advisor for Environmental and Community Affairs
  - The successful candidate will be responsible for monitoring and analyzing federal and state public policies related to energy and environmental affairs with a focus on engagement with regulators, policymakers, and the public on environmental justice and community energy issues
- The full job description can be viewed on the ISO website



Annual Report of the Consumer Liaison Group

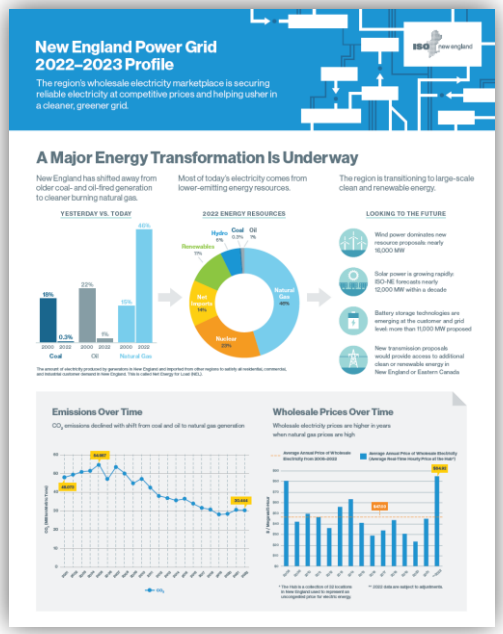
2023 Report Coming Soon!

- The CLG Report is a joint publication of the ISO and the CLG Coordinating Committee (CLGCC)
- The report will provide summaries of the 2023 meetings; updates on ISO initiatives previously discussed at 2023 meetings; analysis of regional wholesale costs and retail rates; and states priorities and planned initiatives of the CLGCC
- The 2023 Report will be posted to the Consumer Liaison Group webpage shortly!



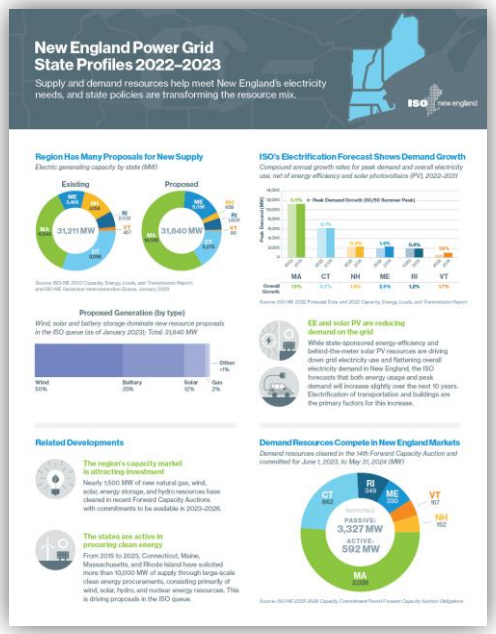
2022 CLG Annual Report

ISO New England Releases Several Publications



[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

Other ISO New England Publications and Resources

- ISO Newswire
  - a source for regular news about ISO New England and the wholesale electricity industry within the six-state region
- ISO Press Releases
  - Access current and archived press releases detailing significant developments at the ISO and in New England's power system and wholesale electricity markets
- Government and Industry Affairs Presentations, Speeches, Papers, and Other Materials
  - Presentations and speeches delivered by our technical experts, senior management, and External Affairs team at industry events in New England and across the nation
  - Includes the monthly issues memo—a rundown of federal, regional, and state issues that the ISO provides to the New England Conference of Public Utilities Commissioners (NECPUC) and state consumer advocates

FOR MORE INFORMATION…

Subscribe to the *ISO Newswire*

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

Log on to ISO Express

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

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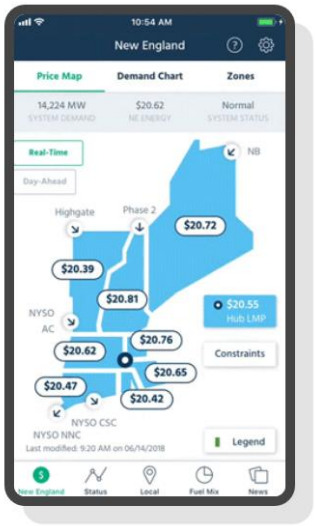
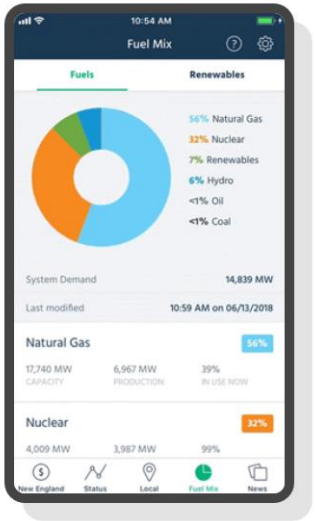
Download the ISO to Go App

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





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