ISO New England Overview and Regional Update

Maine Legislature Joint Standing Committee on Energy, Utilities and Technology (EUT)

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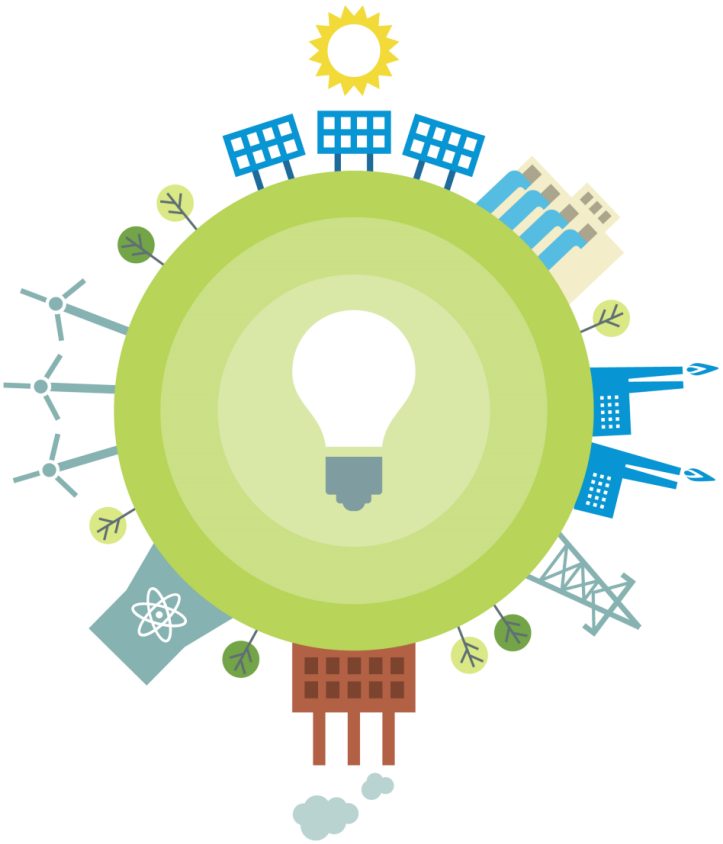
Overview of Presentation

- About ISO New England
- Major Responsibilities
- New England Power System
- Wholesale Electricity Markets
- Grid Transformation
- System Planning



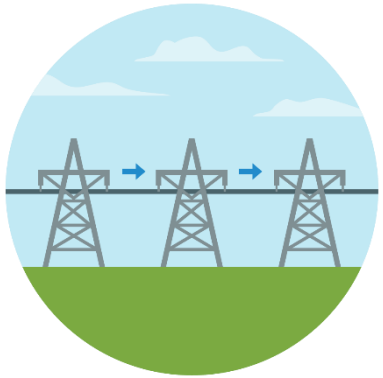
ISO New England (ISO) Has More Than Two Decades of Experience Overseeing the Region's Restructured Electric Power System

- **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

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

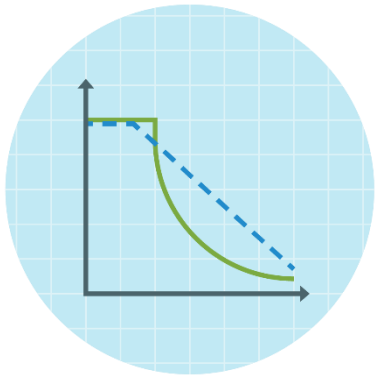
Grid Operation

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



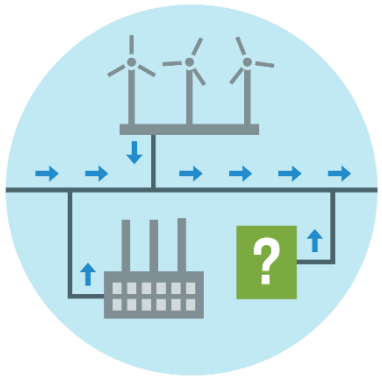
Market Administration

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's *Mission and Vision*

Mission: *What we do*

Through collaboration and innovation,
ISO New England plans the transmission system, administers the region's wholesale markets, and operates the power system to ensure reliable and competitively priced wholesale electricity

Vision: *Where we're going*

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

Things We Don’t Do

Handle retail electricity

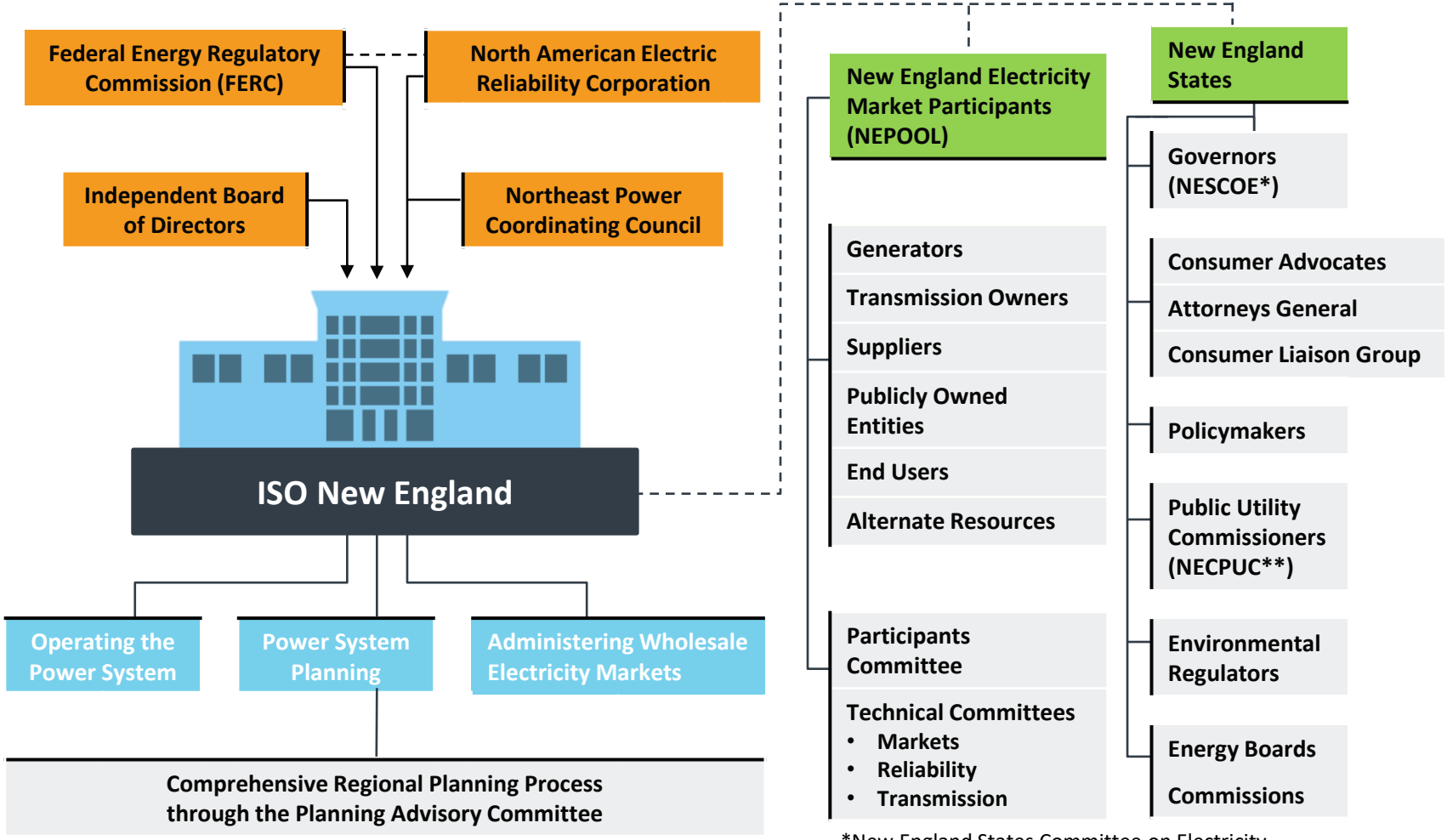
Own power grid infrastructure

Have a stake in companies that own grid infrastructure

Have jurisdiction over fuel infrastructure

Have control over siting decisions

Numerous Entities Including an Independent Board Provide Oversight of and Input on ISO's Responsibilities

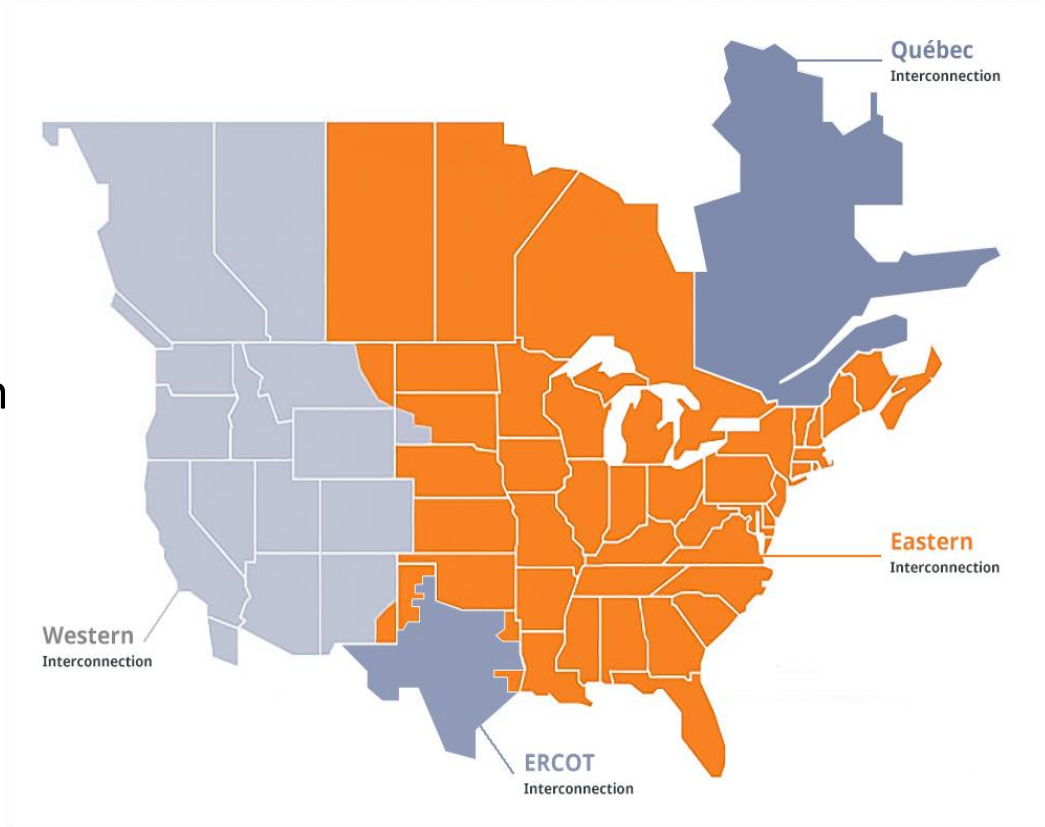


*New England States Committee on Electricity
**New England Conference of Public Utilities Commissioners

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

New England's Power Grid Is Part of a Larger Electric Power System

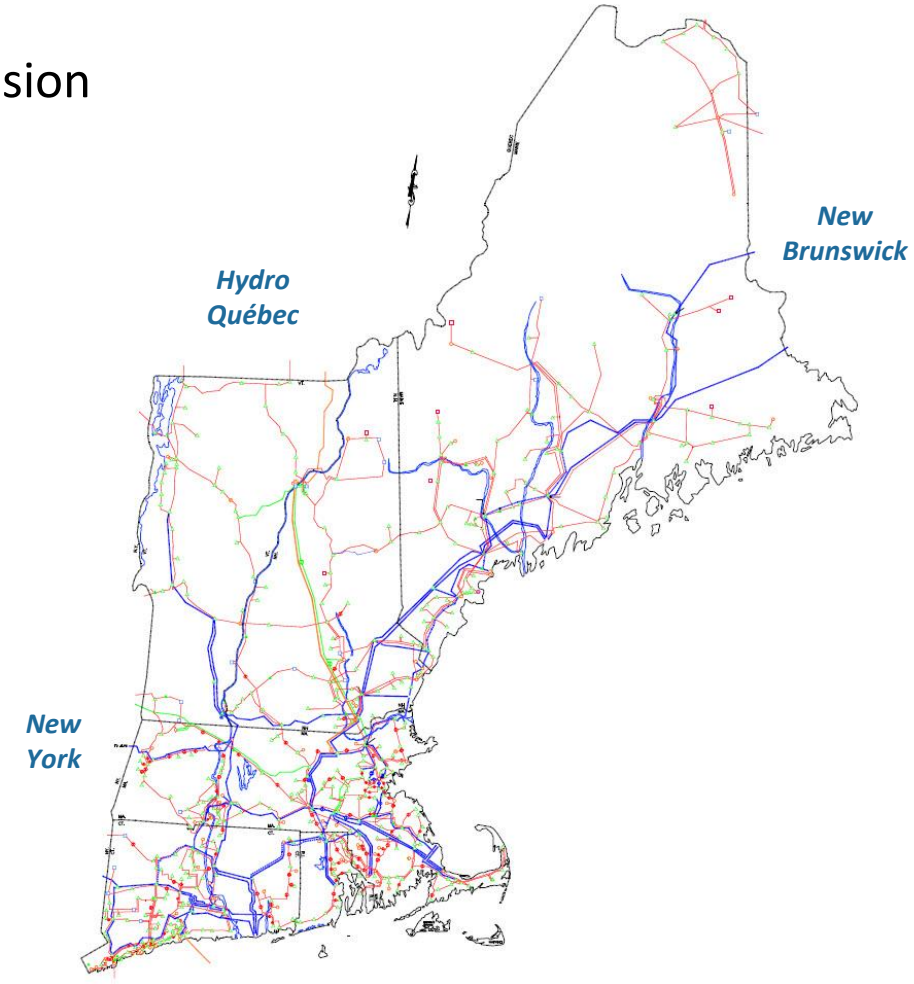
- Part of the **Eastern Interconnection**, one of four large power grids in North America
  - Interconnected through primarily alternating current (AC) transmission
- Tied to **Québec** only through direct current (DC) transmission
- 2003 blackout ushered in wide-area monitoring and **mandatory** reliability 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 (primarily 115 kV and 345 kV)
- **13 transmission interconnections** to power systems in New York and Eastern Canada
- **9%** of region's energy needs met by imports in 2024
- **$12.7 billion** invested to strengthen transmission system reliability since 2002; **$1.4 billion** planned
- Developers have proposed multiple transmission projects to access **non-carbon-emitting resources** inside and outside the region



ISO-NE Is a Summer-Peaking System

New England shifted from a winter-peaking system to a **summer-peaking** system in the early 1990s, largely because of the growth of air conditioning and a decline in electric heating

- Peak demand on a normal summer day has typically ranged from 17,500 MW to 22,000 MW
- Summer demand usually peaks on the hottest and **most humid** days and averaged roughly 25,600 MW since 2000

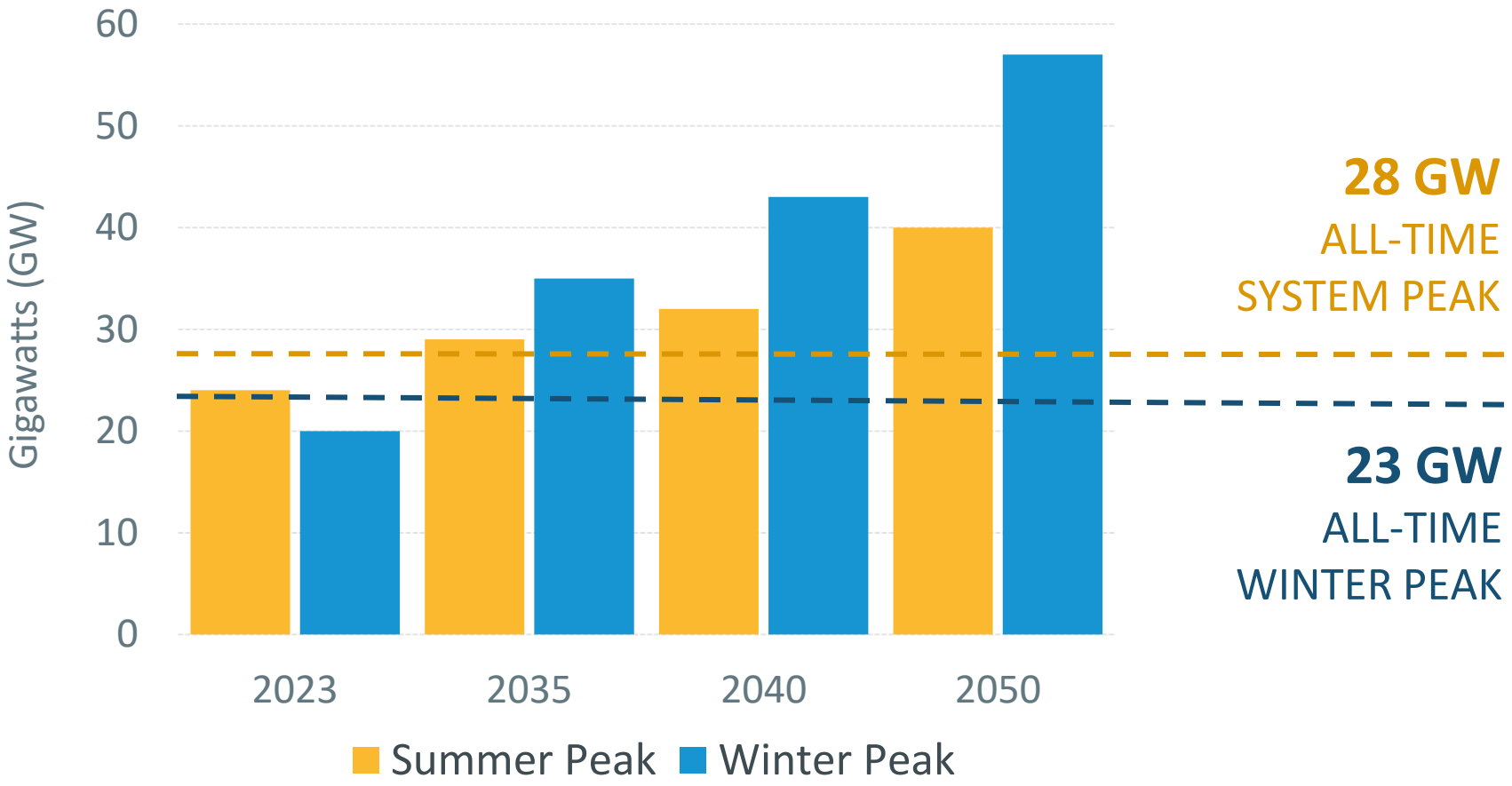
- Region's all-time summer peak demand was **28,130 MW** on **August 2, 2006**

The region is expected to shift back to a **winter-peaking system** with the electrification of heating demand

- Region's all-time **winter** peak demand was **22,818 MW** on **January 15, 2004**

Peak Demand Period Will Shift to Winter

Significant amounts of clean energy will be needed to meet state decarbonization goals while serving significantly increased demand



Source: 2050 Transmission Study (Final Report) (Feb 2024)

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

- Nearly **400** dispatchable generators in the region
- **29,700 MW** of generating capacity
- Approximately **38,000 MW** of proposed generation in the ISO Queue
  - Mostly wind, storage, and solar proposals
- Roughly **7,000 MW** of generation have retired or will retire in the next few years
- Nearly **3,600 MW** of demand resources with obligations in the Forward Capacity Market*, including energy efficiency, load management, and distributed generation resources
  - Demand resources have had further opportunities in the wholesale markets since 2018

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

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 Services

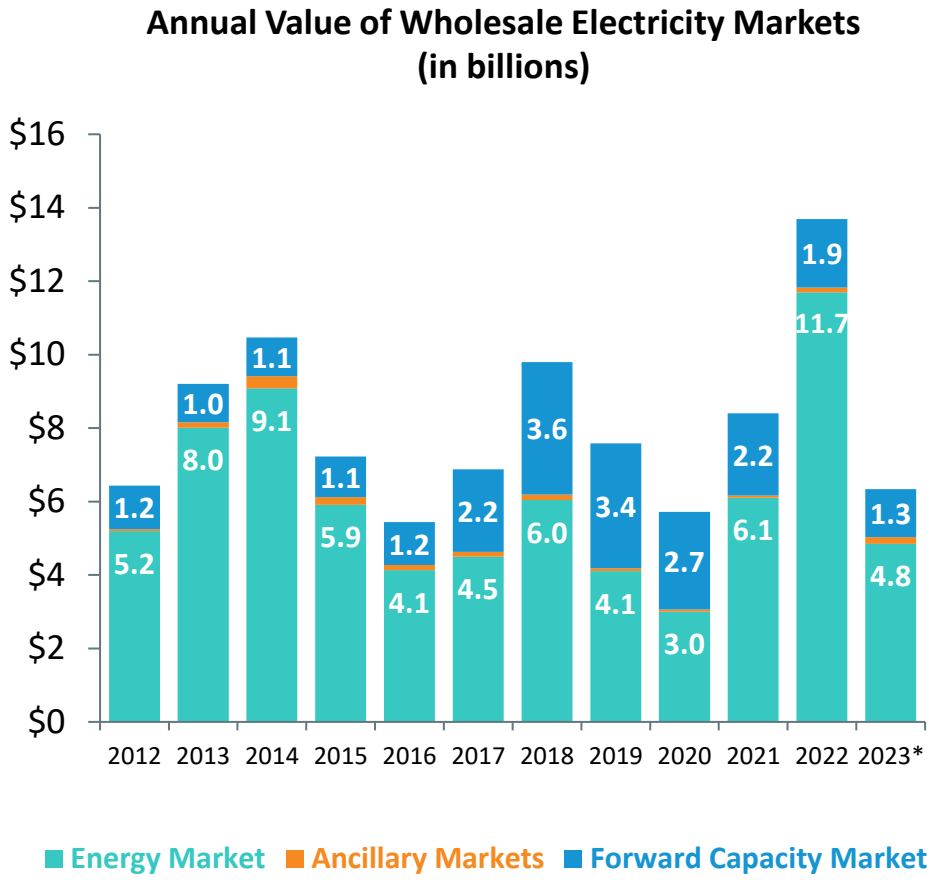
Short-Term Reliability Services: Resources compete in the ancillary markets to provide backup electricity as well as services needed to support the physical operation of the system, such as frequency regulation and voltage support. These services are **critical** during periods of heavy demand or system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

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

- Approximately 600 buyers and sellers in the markets
- **$6.3 billion** in wholesale electricity market transactions in 2023*
  - **$4.8 billion** in the energy market
  - **$182 million** in the ancillary services markets
  - **$1.3 billion** in the capacity market
- Extensive analysis and reporting of market results



Source: ISO-NE Markets and Settlements Data; (March 2024) *2023 data are subject to adjustment

Key Project Proposes Changes to the ISO's Forward Capacity Market

Capacity Auction Reform (CAR) Key Project*

- To ensure system reliability and affordability as the region's electricity demand and power resource mix transforms, CAR:
  - Transitions the capacity market from a three-year forward auction to a **prompt auction** that runs shortly before the capacity commitment period (CCP)
  - Restructures the CCP from **annual to seasonal** commitment periods
  - Reshapes capacity market accreditation to more accurately reflect **resource adequacy contributions** from an evolving resource mix, from season to season
- Design and implementation of the changes is expected to span from **2025-2027**

* Additional information related to the CAR Key Project is available on the ISO website: https://www.iso-ne.com/committees/key-projects/capacity-auction-reforms-key-project

State Laws Target Deep Reductions in CO_2 Emissions and Increases in Renewable and Clean Energy

≥80% by 2050	Five states mandate greenhouse gas reductions economy wide: MA, CT, ME, RI, and VT (mostly below 1990 levels)
Net-Zero by 2050 80% by 2050	MA emissions requirement MA clean energy standard
100% by 2035	VT renewable energy requirement
100% by 2050 Carbon-Neutral by 2045	ME renewable energy goal ME emissions requirement
100% by 2040	CT zero-carbon electricity requirement
100% by 2033	RI renewable energy requirement

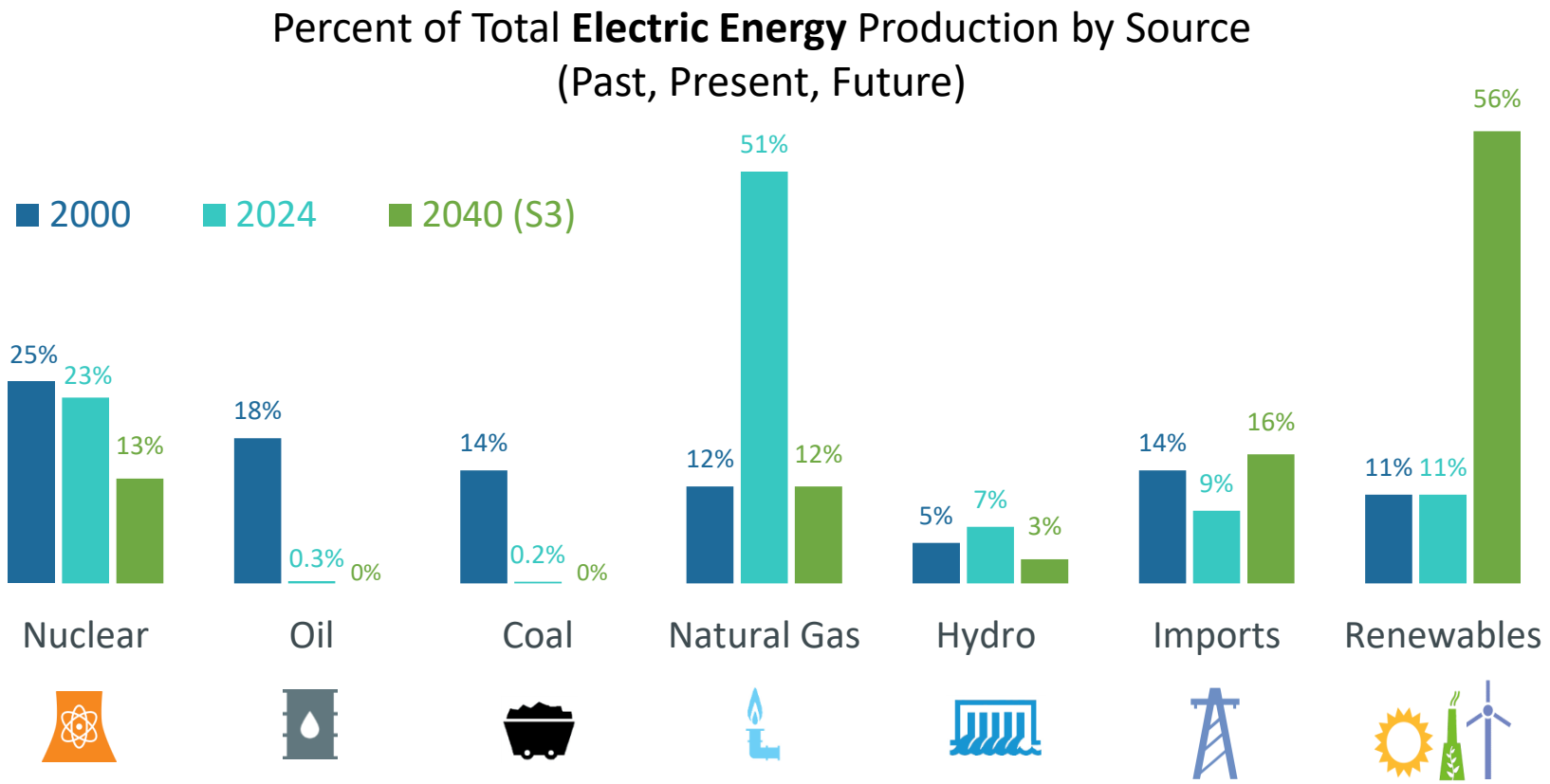
Source: ISO New England Status of Non-Price Retirement Requests and Retirement De-list Bids (February 2024)

From 2013 to 2024, Over 7,000 MW of Generation Have Retired

- Include predominantly coal, oil, and nuclear resources
- Another **750 MW** of generation have announced plans for retirement
- These resources have played an **important** role in recent winters when natural gas supplies are constrained in New England

Dramatic Changes in the Energy Mix

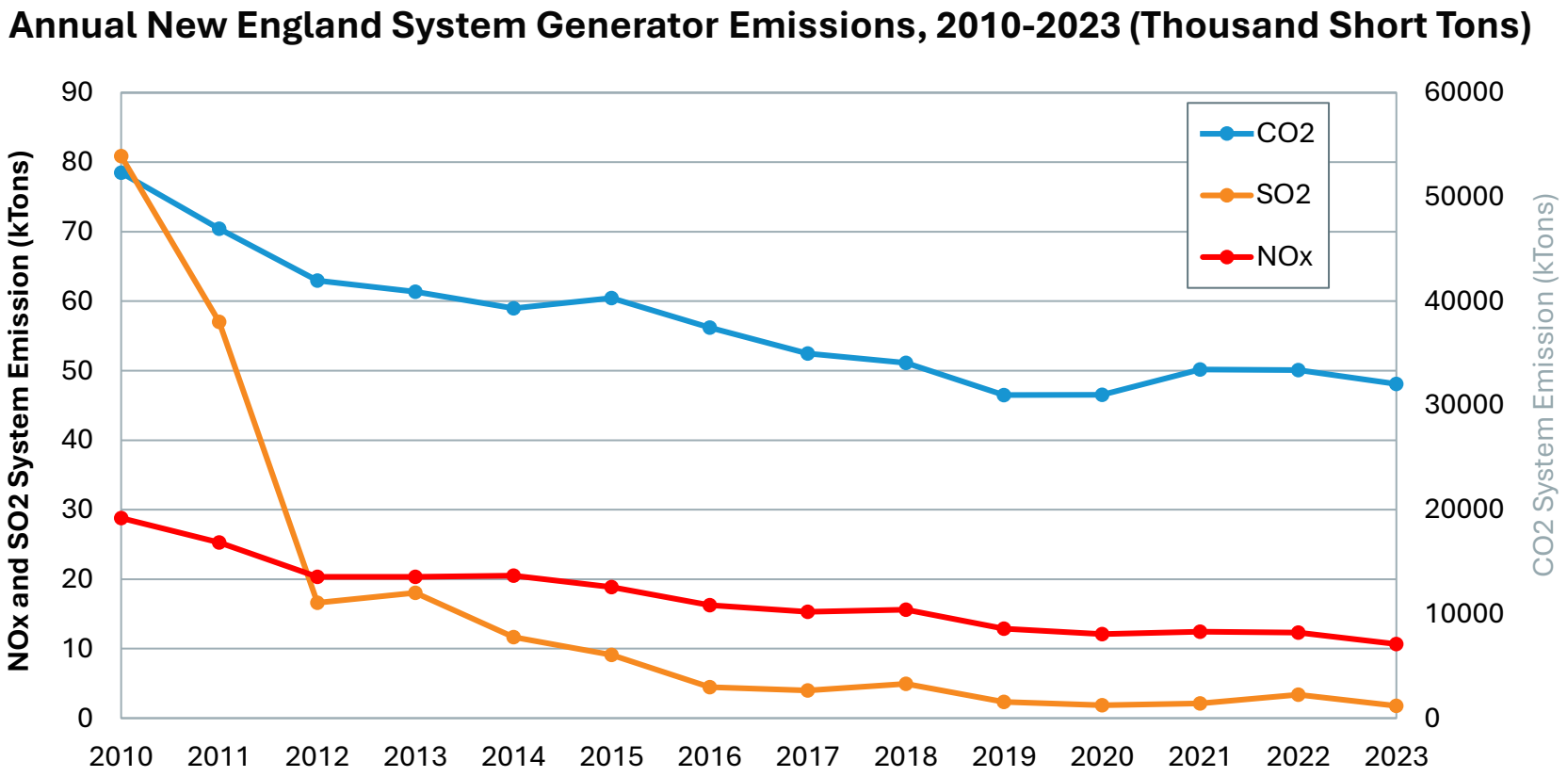
New England made a major shift from coal and oil to natural gas over the past two decades, and is shifting to renewable energy in the coming decades



Source: ISO New England Net Energy and Peak Load by Source; data for 2024 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.

Major Emissions Reductions

Emissions from regional generators have fallen significantly since 2001

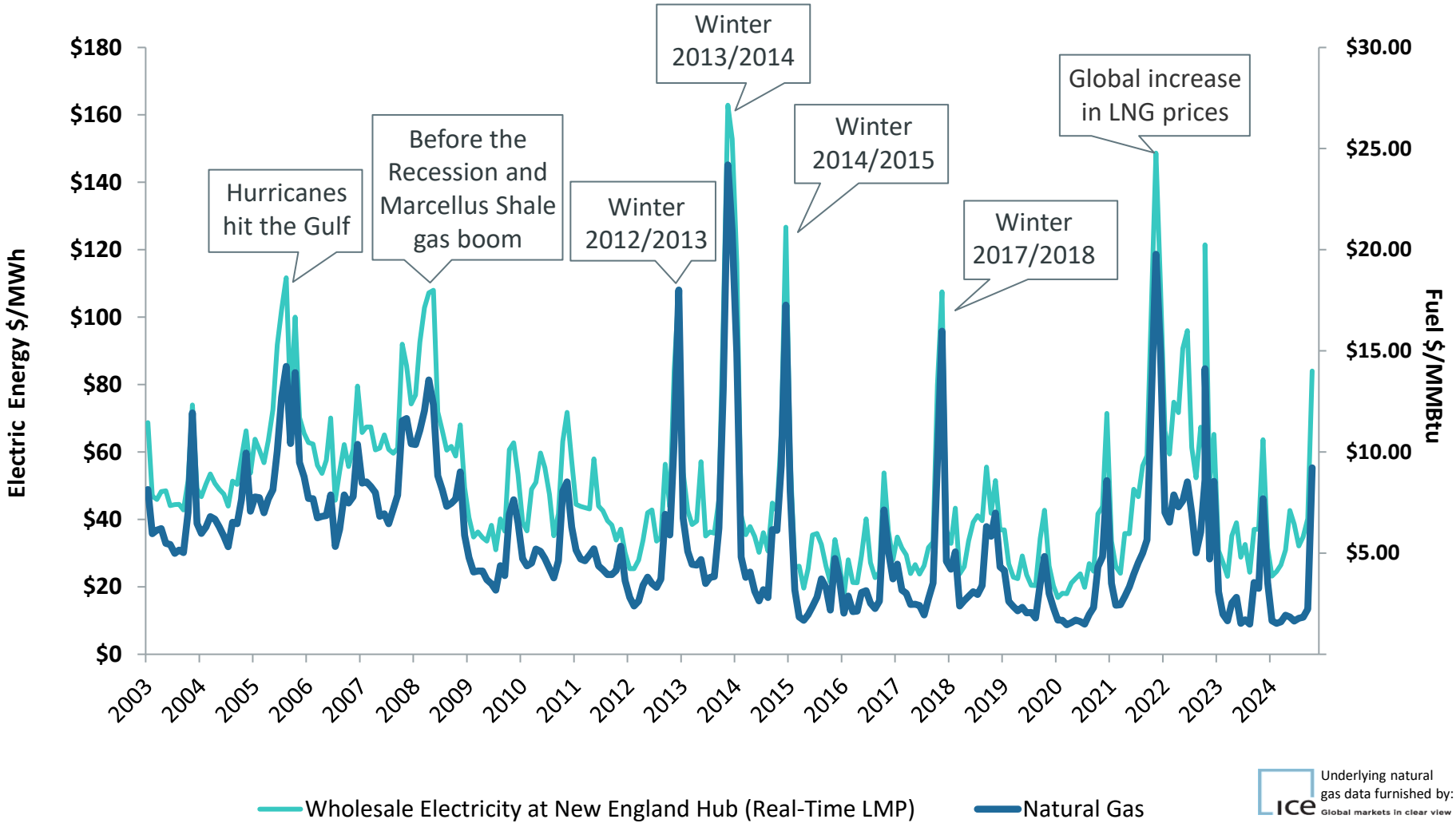


Carbon Dioxide (CO_2) ↓39% **Nitrogen Oxide (NOx) ↓63%** **Sulfur Dioxide (SO_2) ↓98%**

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

Natural Gas and Wholesale Electricity Prices Are Linked

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

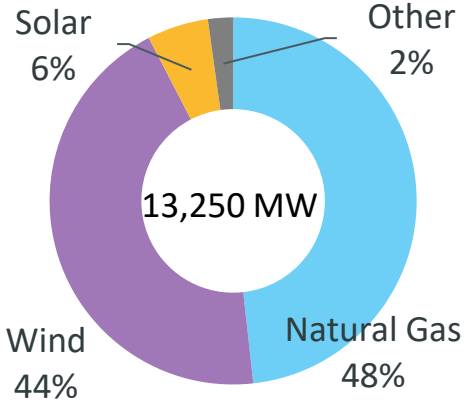


Underlying natural gas data furnished by: ICE Global markets in clear view

The ISO Generator Interconnection Queue Provides a Snapshot of Resource Proposals

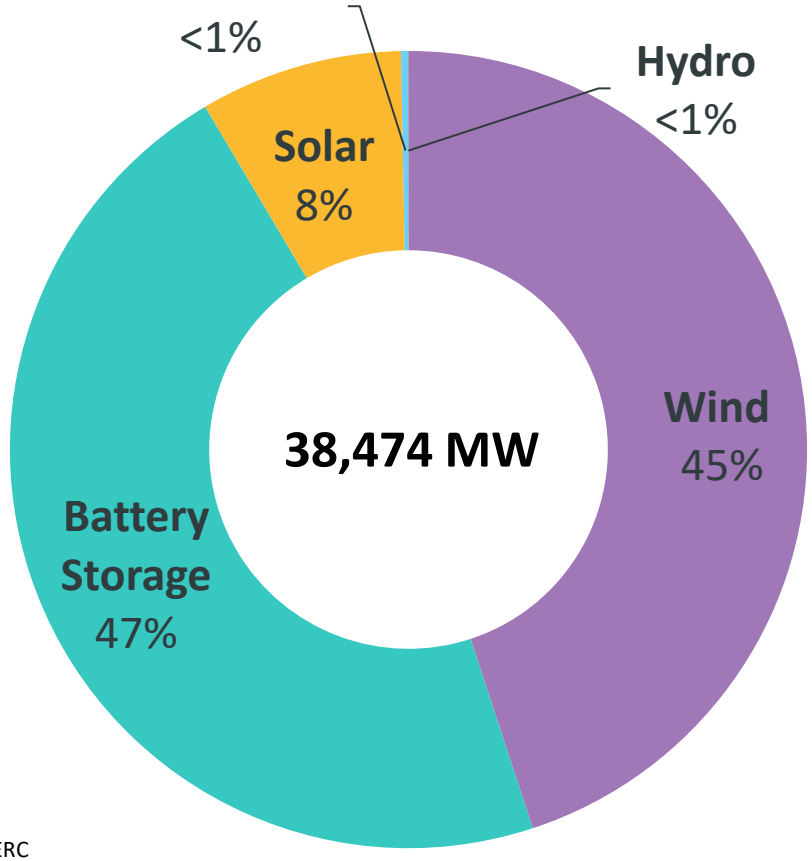
Dramatic shift in proposed resources from natural gas to battery storage and renewables

Then



June 2017

Now



January 2025

Offshore Wind

CT	3,750 MW
MA	8,923 MW
RI	1,904 MW

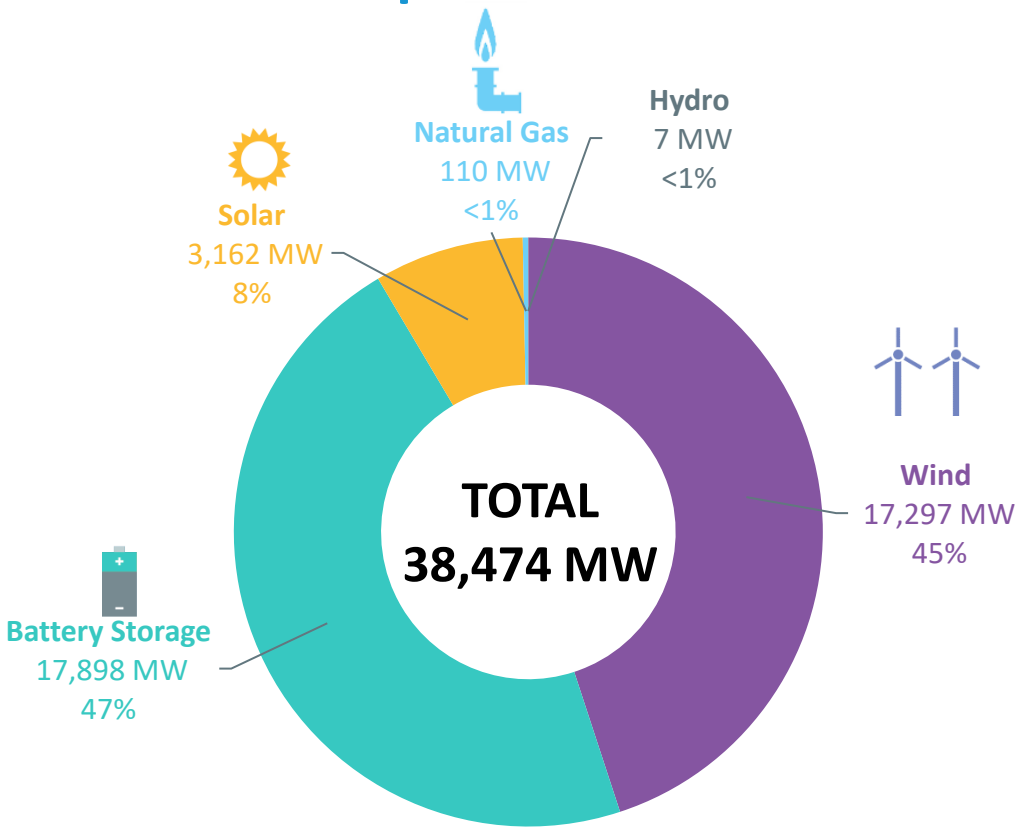
Onshore Wind

ME	2,720 MW

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

Wind Power & Battery Storage Comprise Most of the New Resource Proposals in the ISO Interconnection Queue

All Proposed Resources



Source: ISO Generator Interconnection Queue (January 2025)
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. Other includes hydro, biomass, fuel cells and nuclear uprate.

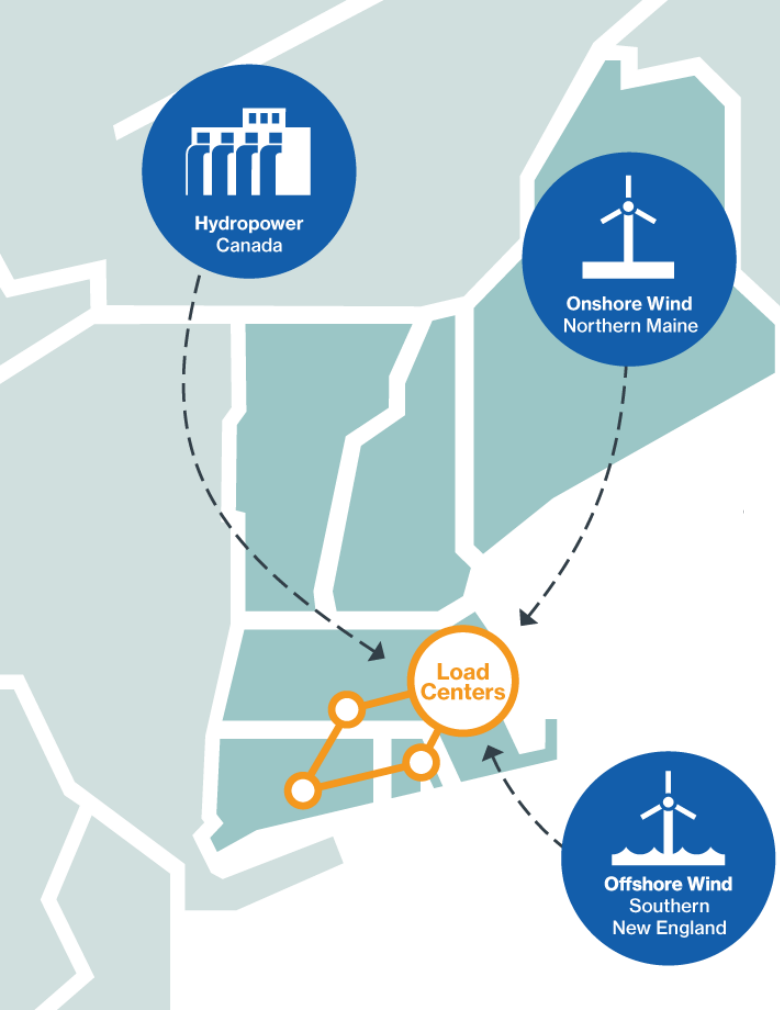
Proposals by State

(all proposed resources)

State	Megawatts (MW)
Connecticut	8,610
Massachusetts	20,903
Maine	5,120
New Hampshire	899
Rhode Island	2,597
Vermont	344
Total	**38,474**

Source: ISO Generator Interconnection Queue (January 2025)
FERC Jurisdictional Proposals

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



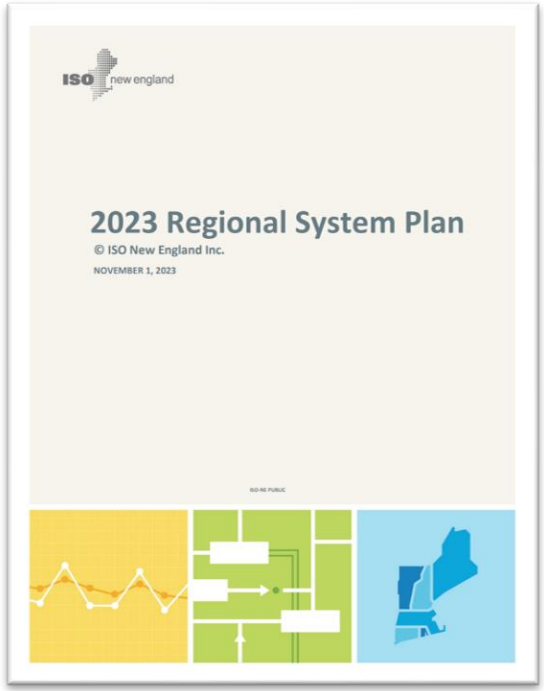
Lines represent types of ETUs private developers have proposed in recent years

Source: ISO Interconnection Queue (January 2025)

- Developers are proposing eight elective transmission upgrades (ETUs) to help deliver over **10,000 MW** of clean energy to New England load centers
- Wind projects make up about **40%** 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

ISO New England's Role in Transmission Planning

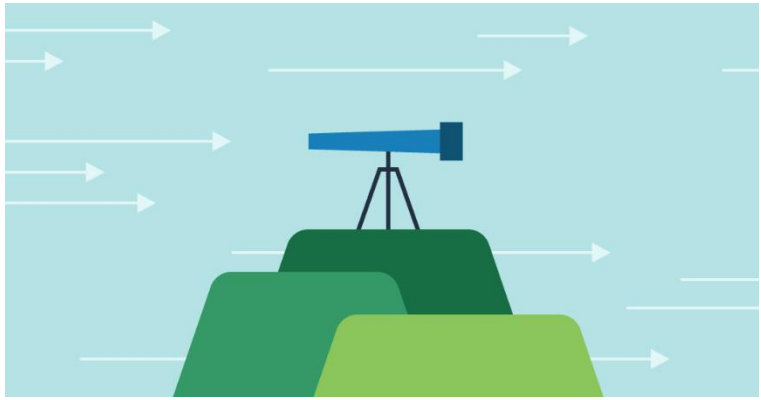
- As the **Regional Transmission Organization**, the ISO is required to identify transmission infrastructure solutions that are essential for maintaining power system reliability in New England
- Through an **open stakeholder process**, the ISO is responsible for the development of long-range plans to 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**
- ISO-NE continuously revises the transmission planning process to comply with applicable FERC orders



ISO New England 2023 Regional System Plan

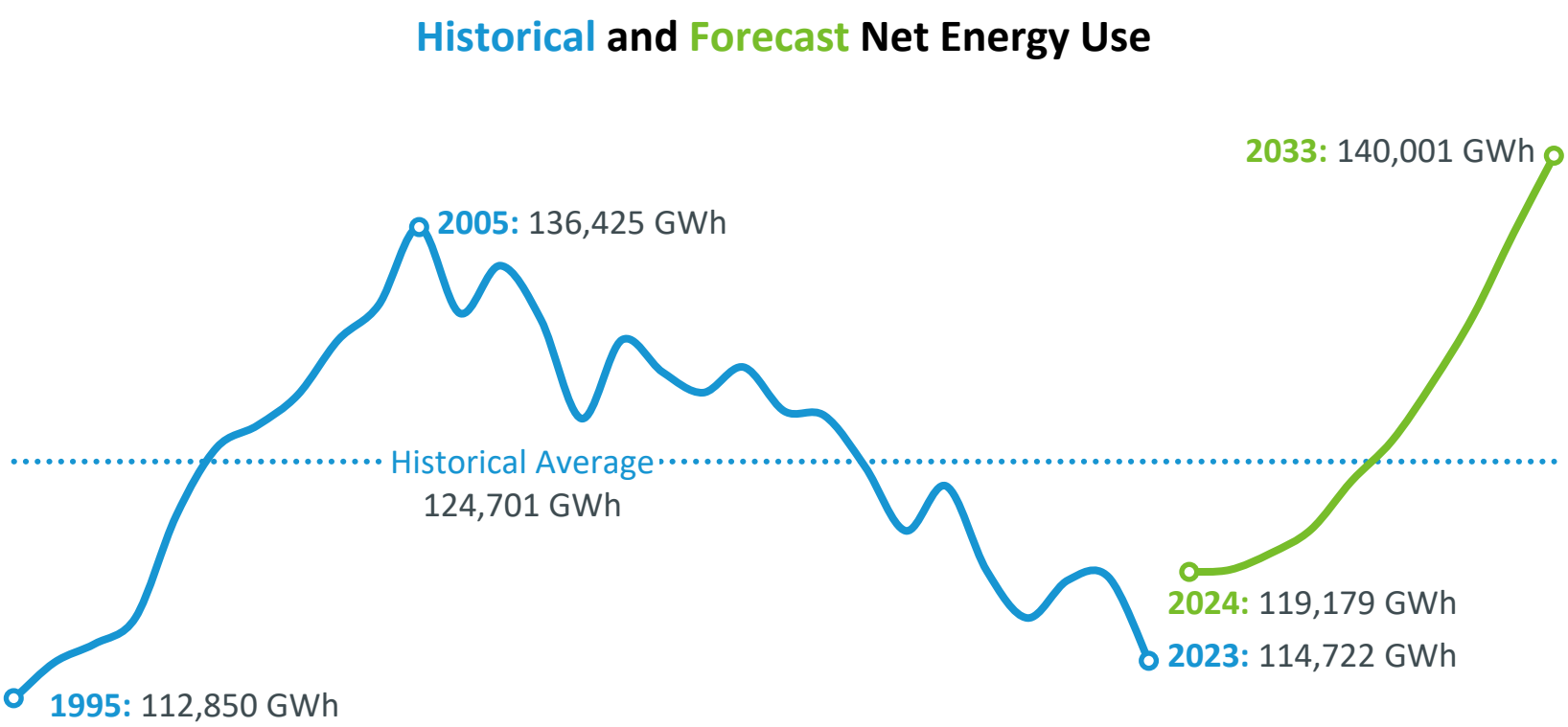
ISO Prepares Annual 10-Year Forecast Report

- Last issued on May 1, 2024, the annual Capacity, Energy, Loads, and Transmission (CELT) Report is the **primary source** for assumptions used in ISO system planning studies
- **Overall** electricity use is expected to **increase** 1.8% annually over the ten-year period (2024–2033)
- **Summer peak demand** is expected to **increase** 1% annually
- **Winter peak demand** is expected to **increase** 3.1% annually



Increased Electrification is Expected to Drive Steady Growth in Net Annual Energy Use

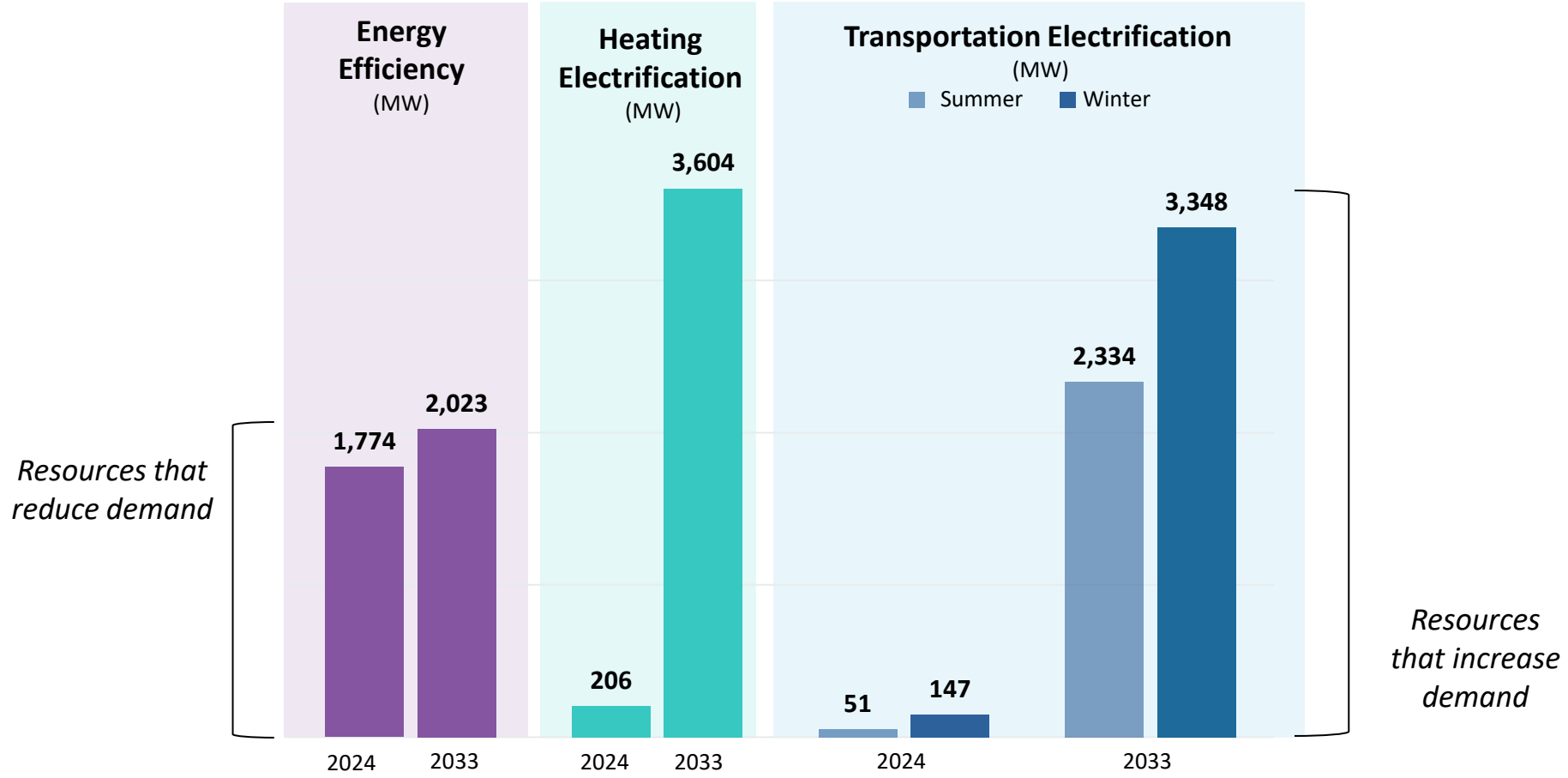
Following two decades of decreased net energy use as a result of state policies incentivizing solar PV and energy efficiency



Source: ISO New England 2024-2033 Forecast Report of Capacity, Energy, Loads, and Transmission (2024 CELT Report) (May 2024)

ISO's Ten-Year Forecasts Provide an Outlook for Electricity Use and Peak Demand

Deployment of these technologies create new challenges for grid operations and forecasting



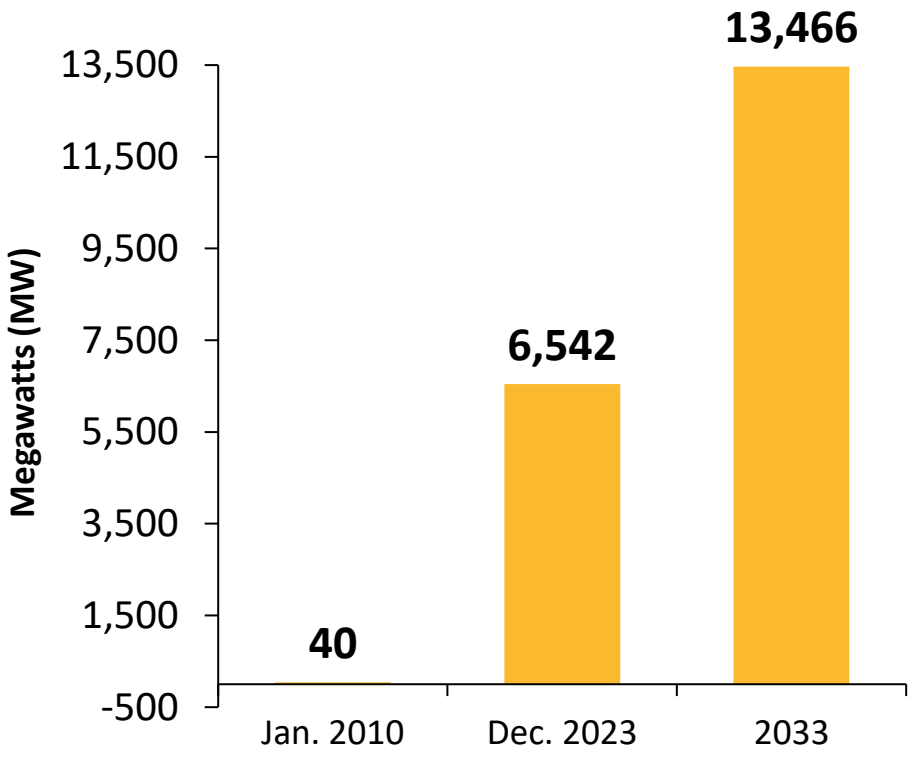
Source: ISO New England 2024-2033 Forecast Report of Capacity, Energy, Loads, and Transmission (2024 CELT Report) (May 2024)

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

December 2023 Solar PV Installed Capacity (MW_{ac})

State	Installed Capacity (MW_{ac})	No. of Installations
Connecticut	1,091	91,290
Massachusetts	3,712	179,362
Maine	588	11,506
New Hampshire	244	21,234
Rhode Island	400	22,769
Vermont	507	21,179
New England	**6,542**	**347,341**

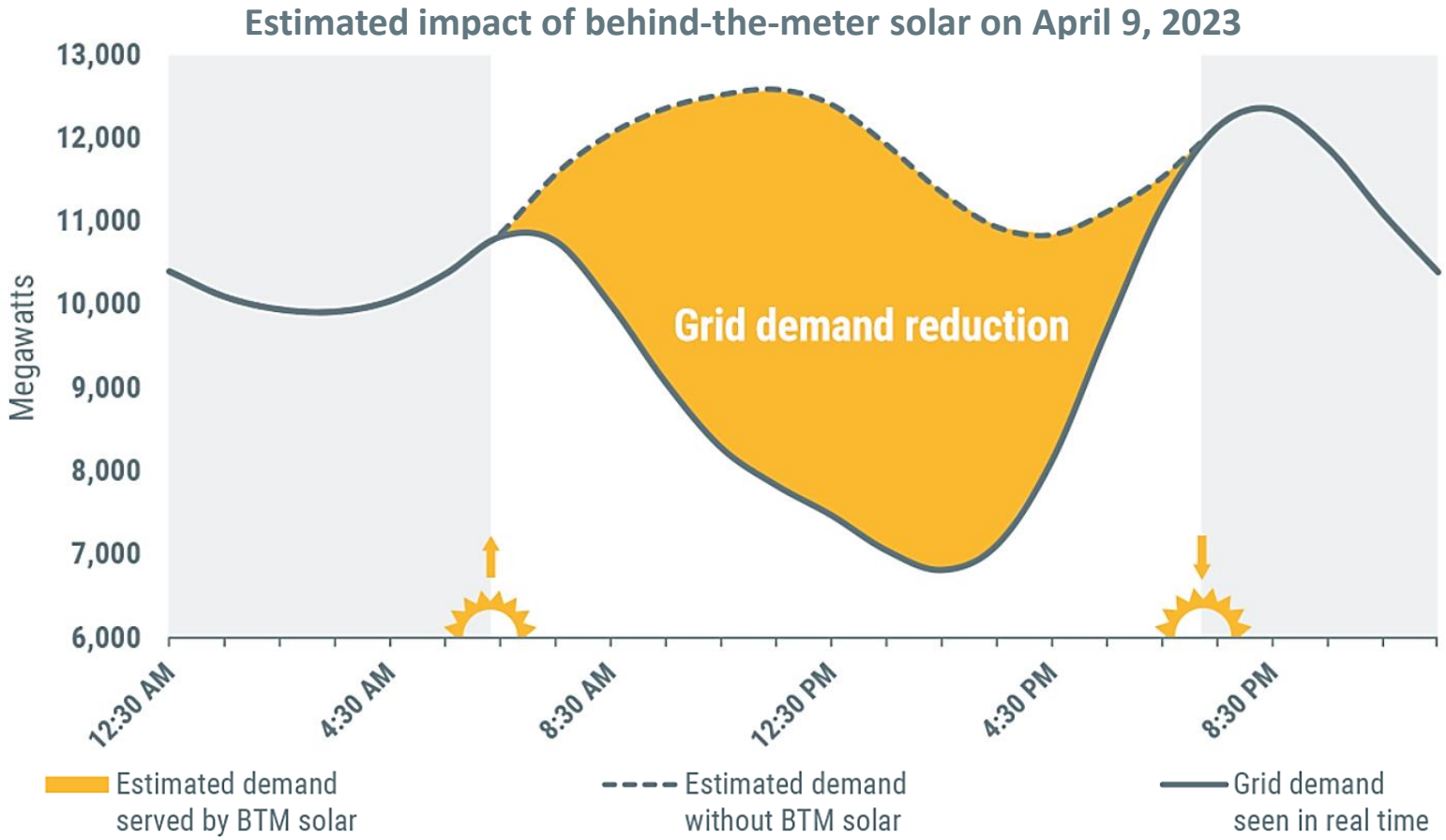
Cumulative Growth in Solar PV through 2033 (MW_{ac})



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: ISO New England 2024-2033 Forecast Report of Capacity, Energy, Loads, and Transmission (2024 CELT Report) (May 2024), and 2024 Photovoltaic (PV) Forecast; MW values are AC nameplate.

Nighttime Electricity Load on the Region's Electric Grid is Exceeding Daytime Consumption On Sunny Days

Continued development of solar deployment drives down afternoon load, especially in spring when demand is lower



Source: ISO Newswire Article from April 11, 2023, New England again sets record for low demand on regional power system - ISO Newswire

There Are Four Pillars Necessary to Support a Successful Clean Energy Transition

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 chain and/or a robust energy reserve to manage through extended periods of severe weather or energy supply constraints

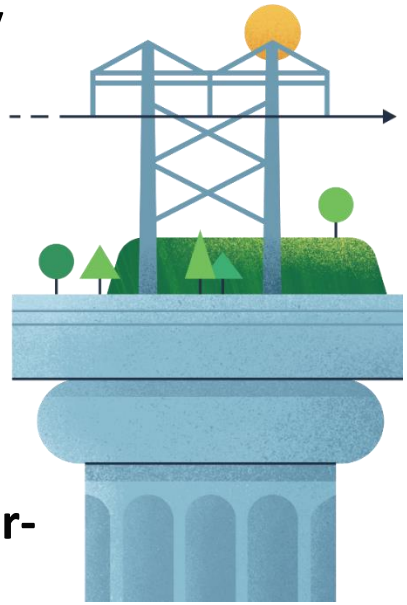
PILLAR FOUR

Robust Transmission

To integrate renewable resources and move clean energy to consumers across New England

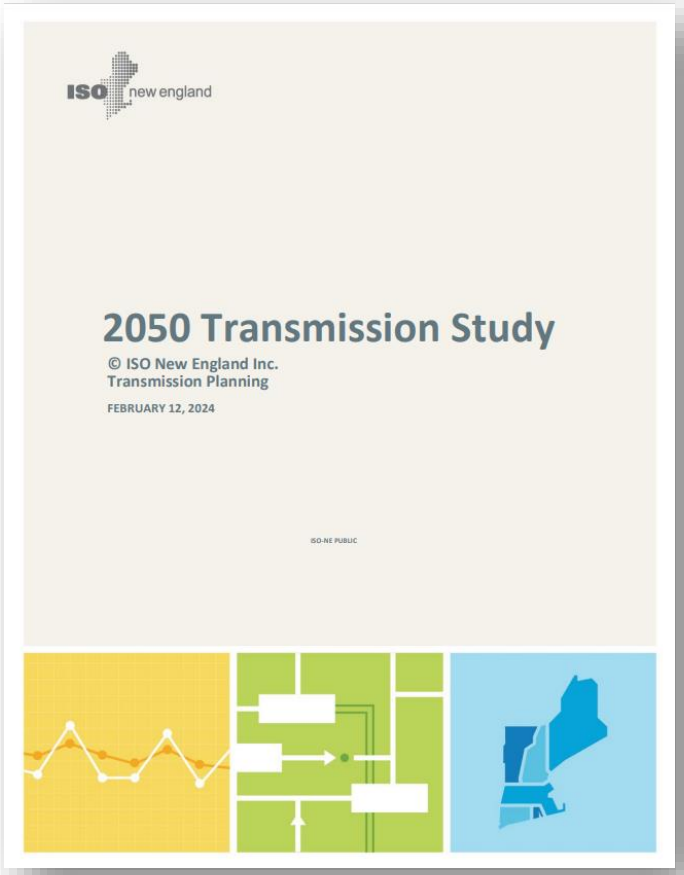
Longer-term Transmission Planning (LTTP)

- In 2020, the New England States Committee on Electricity (NESCOE) vision statement recommended that the ISO work with stakeholders to conduct a **comprehensive long-term regional transmission study**
- In response, the ISO began the study and received **FERC approval** to revise the ISO Tariff to establish a repeatable longer-term study process
- The resulting 2050 Transmission Study was the **first longer-term transmission study** conducted for New England

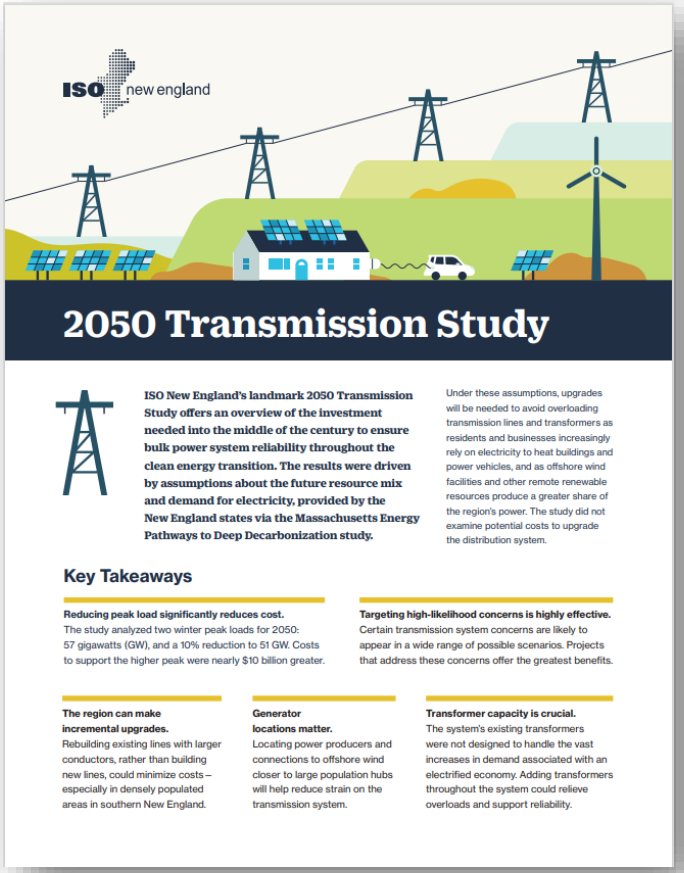


- The study informs stakeholders of the **amount and type** of **transmission infrastructure** necessary to provide reliable, cost-effective energy to the region through the **clean energy transition**, driven by state policy
- The **region's aging transmission system** has the potential to become **a significant bottleneck** to progress if it does not keep pace with changes to other elements of the power system

ISO Releases 2050 Transmission Study



[2050 Transmission Study Final Report]



[2050 Transmission Study Fact Sheet]

Next Steps: Solving Transmission Needs through an LTTP RFP

- Accepted by FERC in July 2024, Phase II creates a **new process to implement transmission system upgrades** based on LTTP studies
  - Provides an avenue for the **states** to evaluate and finance transmission upgrades needed to ensure a reliable grid throughout the clean energy transition
  - Upon request by the states, through NESCOE, ISO will issue and evaluate **requests for proposals (RFPs)** to address needs identified by the states and provide technical assistance to the states in support of their procurements

- On December 13, 2024, NESCOE issued a letter **requesting that ISO issue an RFP** to address the following needs by 2035:
  - Increase **Surowiec-South** interface limit to at least 3,200 MW
  - Increase **Maine-New Hampshire** interface limit to at least 3,000 MW
  - Accommodate the interconnection of at least 1,200 MW of **new onshore wind** at or near Pittsfield, ME

Additional information related to the LTTP and longer-term transmission studies is available on the ISO website:
https://www.iso-ne.com/system-planning/transmission-planning/longer-term-transmission-studies

Next Steps: Tentative LTTP RFP Schedule

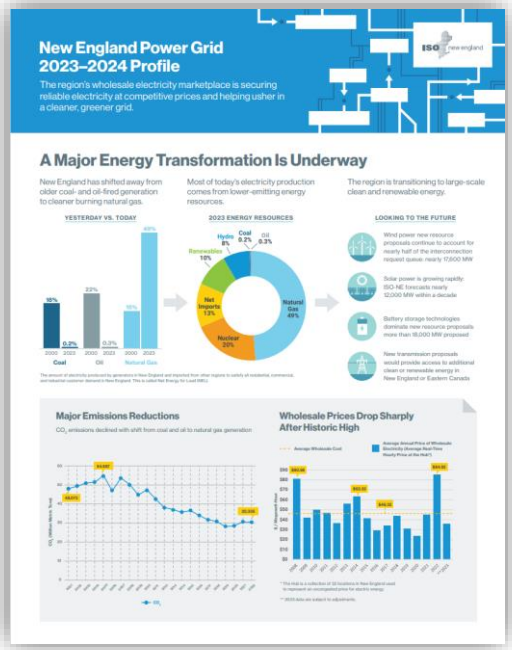
Schedule is subject to change

* May be either the Preferred Longer-Term Transmission Solution or Preferred Longer-Term Transmission Proposal, depending on whether Attachment K Section 16.4(i) or 16.4(j) applies.

ISO New England Releases Several Publications

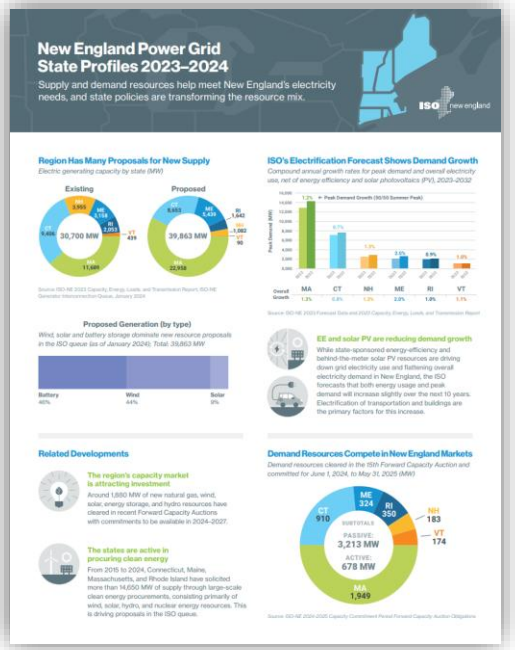
[2024 Regional Electricity Outlook]

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 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]

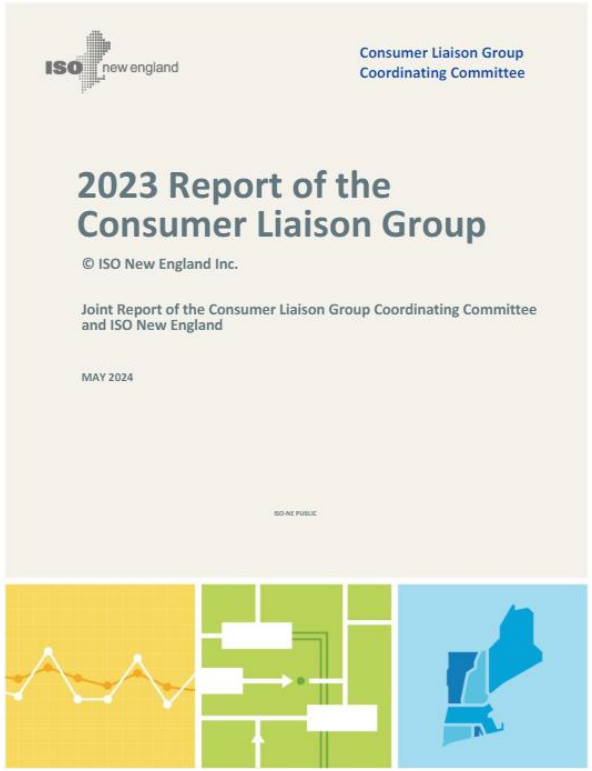
Provides state-specific facts and figures relating to supply and demand resources tied into the New England electric grid and state policies transforming the resource mix in the region

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 14 members who represent various stakeholder groups
- Quarterly meetings are free and open to the public, with in-person and virtual options to participate

Anticipated 2025 CLG Meeting Dates and Locations

- Thursday, March 27 – Rhode Island
- Wednesday, June 4 – Massachusetts
- Thursday, September 11 – New Hampshire
- Wednesday, December 3 – Boston, MA



2023 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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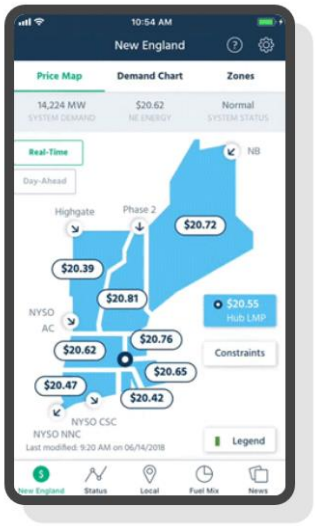

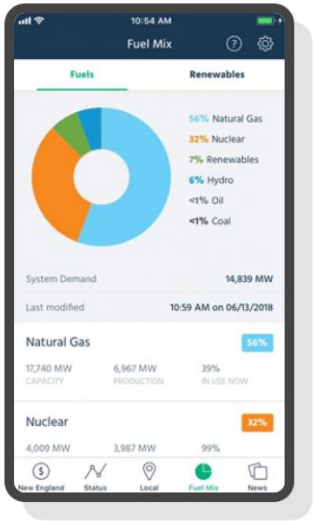

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