

ISO New England Regional Update

Senate Natural Resources and Energy Committee



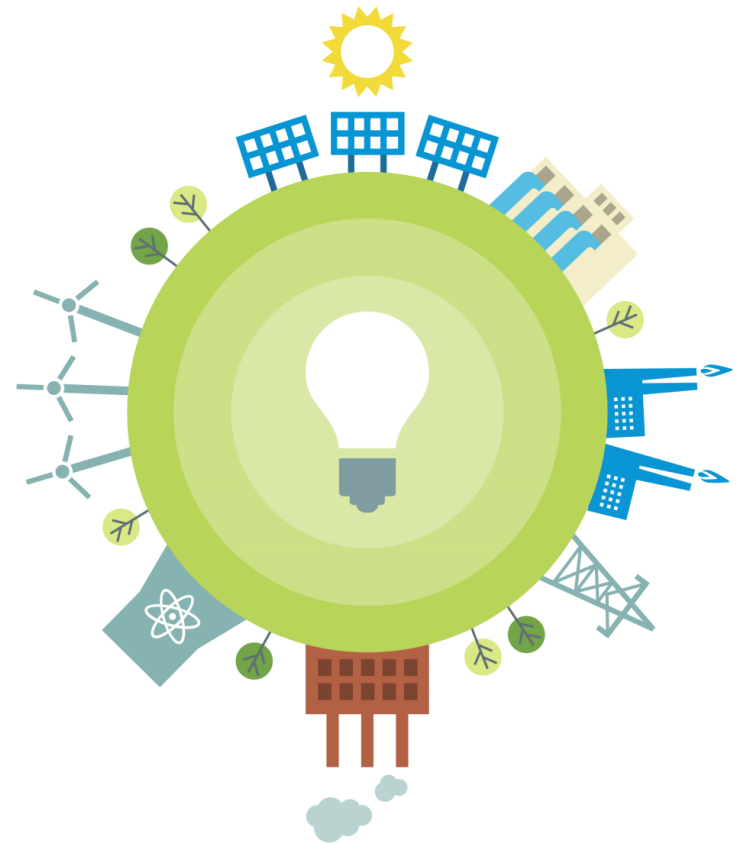
Sarah Adams

STATE POLICY ADVISOR



Overview of Presentation

- About ISO New England
- Grid Transformation
- Transmission Developments
- ISO New England Studies



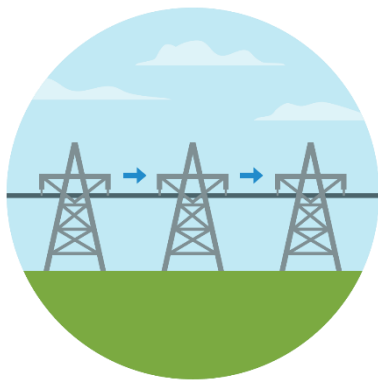
ABOUT ISO NEW ENGLAND



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

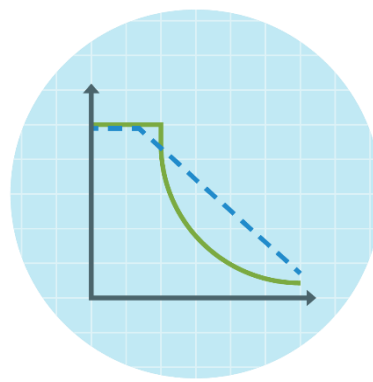
Grid Operation

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



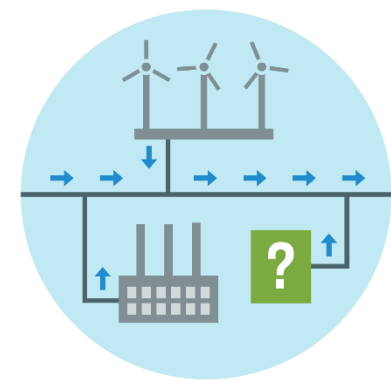
Market Administration

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



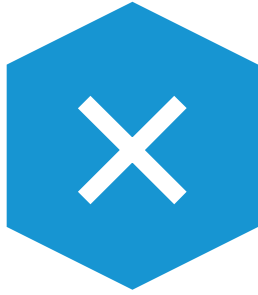
*The ISO's new **Vision** for the future represents our long-term intent and guides the formulation of our Strategic Goals*



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



GRID TRANSFORMATION

Achieving state policy goals will fundamentally change the resource mix



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



1

Significant amounts of clean energy to power the economy with a greener grid



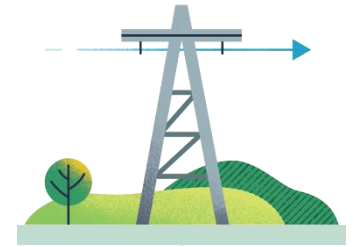
2

Balancing resources that keep electricity supply and demand in equilibrium



3

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



4

Robust transmission to integrate renewable resources and move clean electricity to consumers across New England



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 could 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**



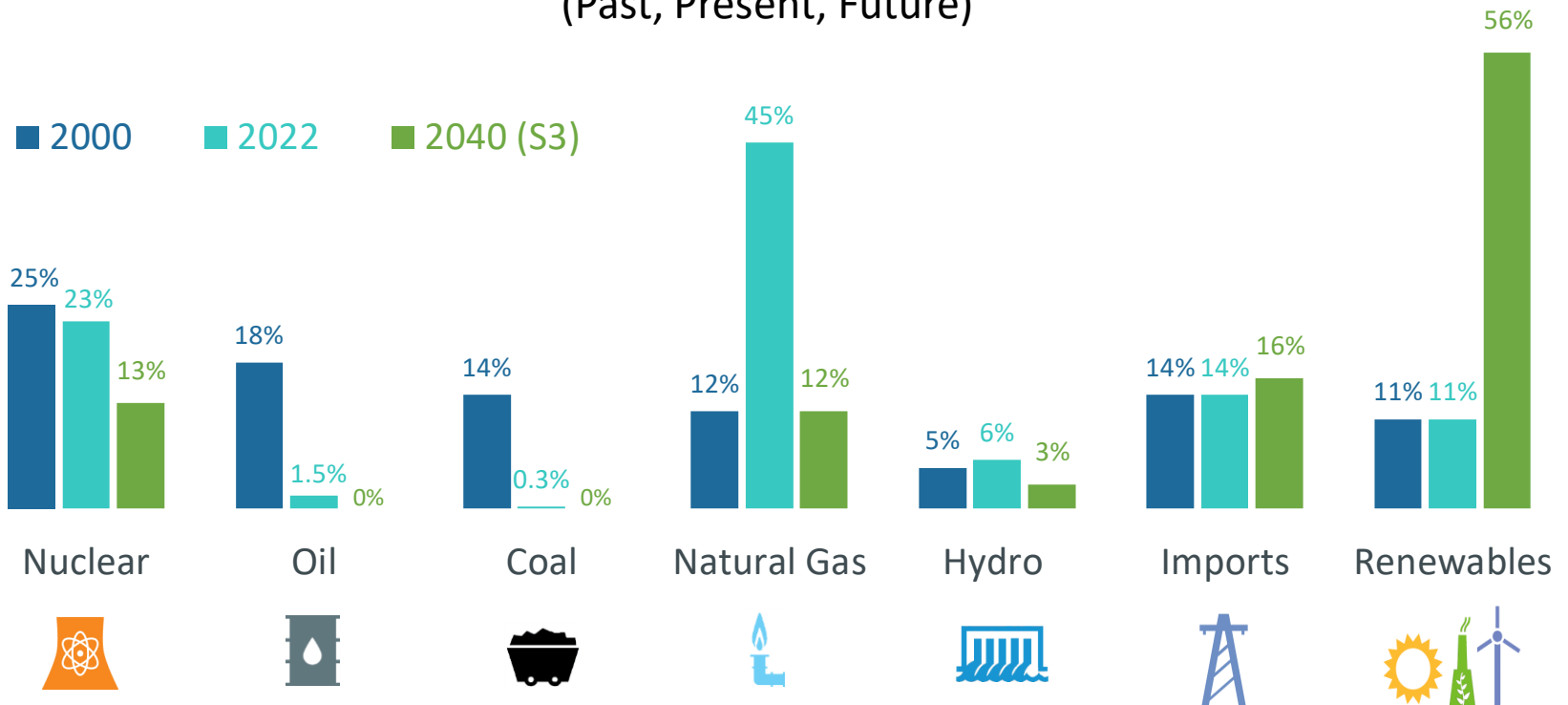
State Laws Target Deep Reductions in CO₂ Emissions and Increases in Renewable and Clean Energy

≥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
90% by 2050	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 2030	RI renewable energy requirement

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

Percent of Total **Electric Energy** Production by Source
(Past, Present, Future)

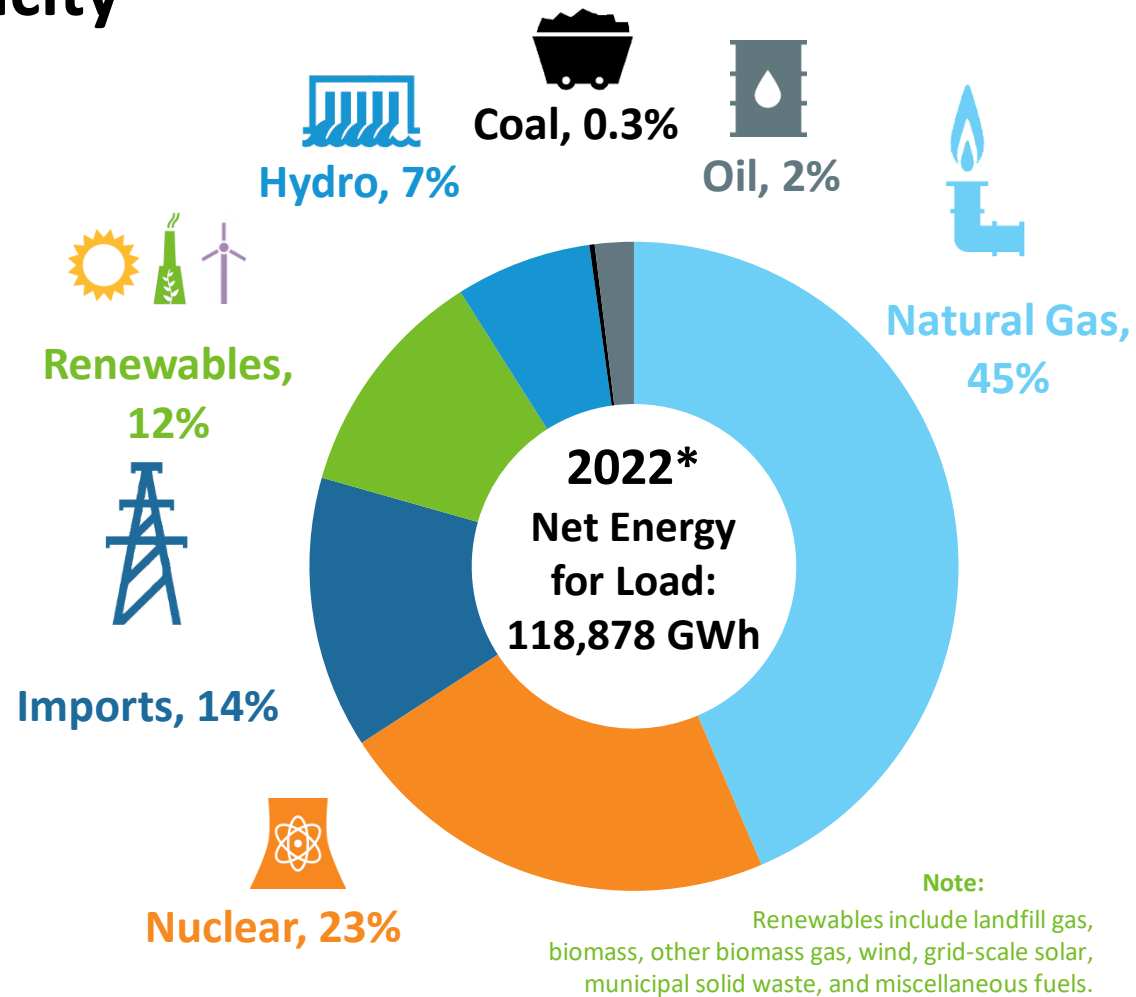


Source: ISO New England [Net Energy and Peak Load by Source](#); data for 2022 is preliminary and subject to resettlement; data for 2040 is based on Scenario 3 of the ISO New England [2021 Economic Study: Future Grid Reliability Study Phase 1](#).

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

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

- In 2022, 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

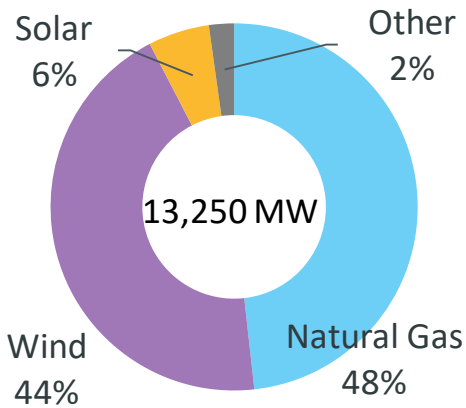


*Data is subject to adjustment. Source: 2022 Net Energy and Peak Load by Source
<https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load>

The ISO Generator Interconnection Queue Provides a Snapshot of Resource Proposals

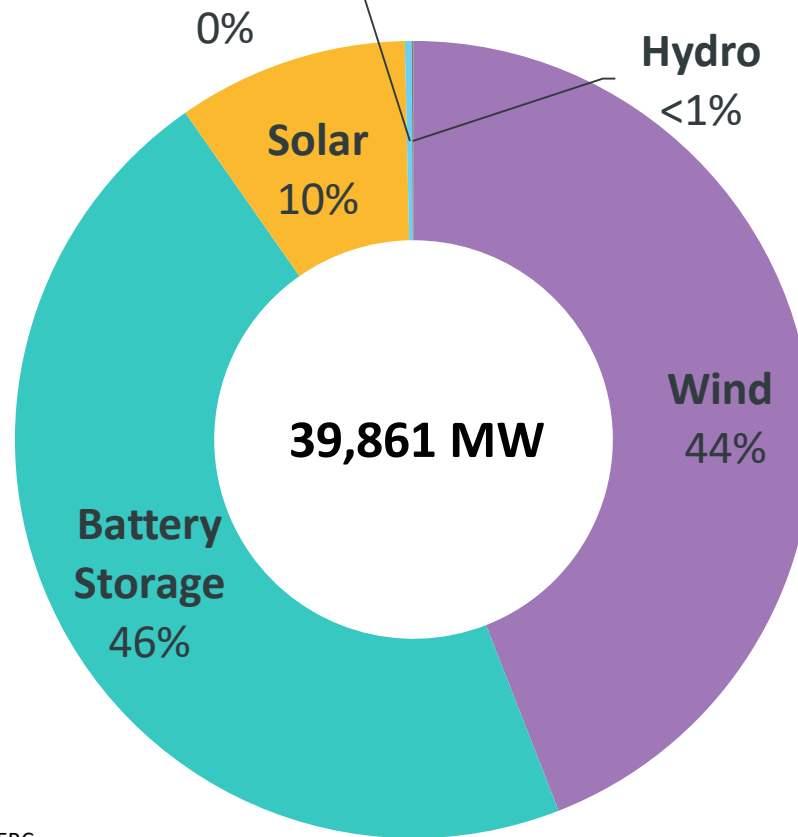
Dramatic shift in proposed resources from natural gas to battery storage and renewables

Then

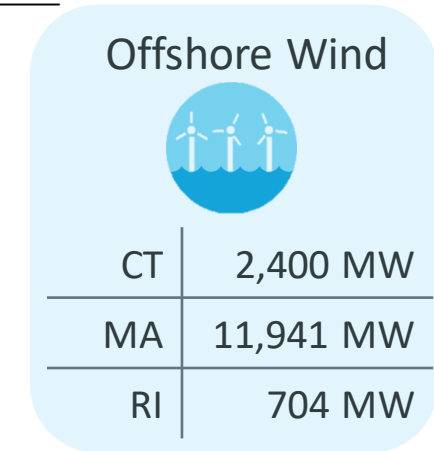


June 2017

Now



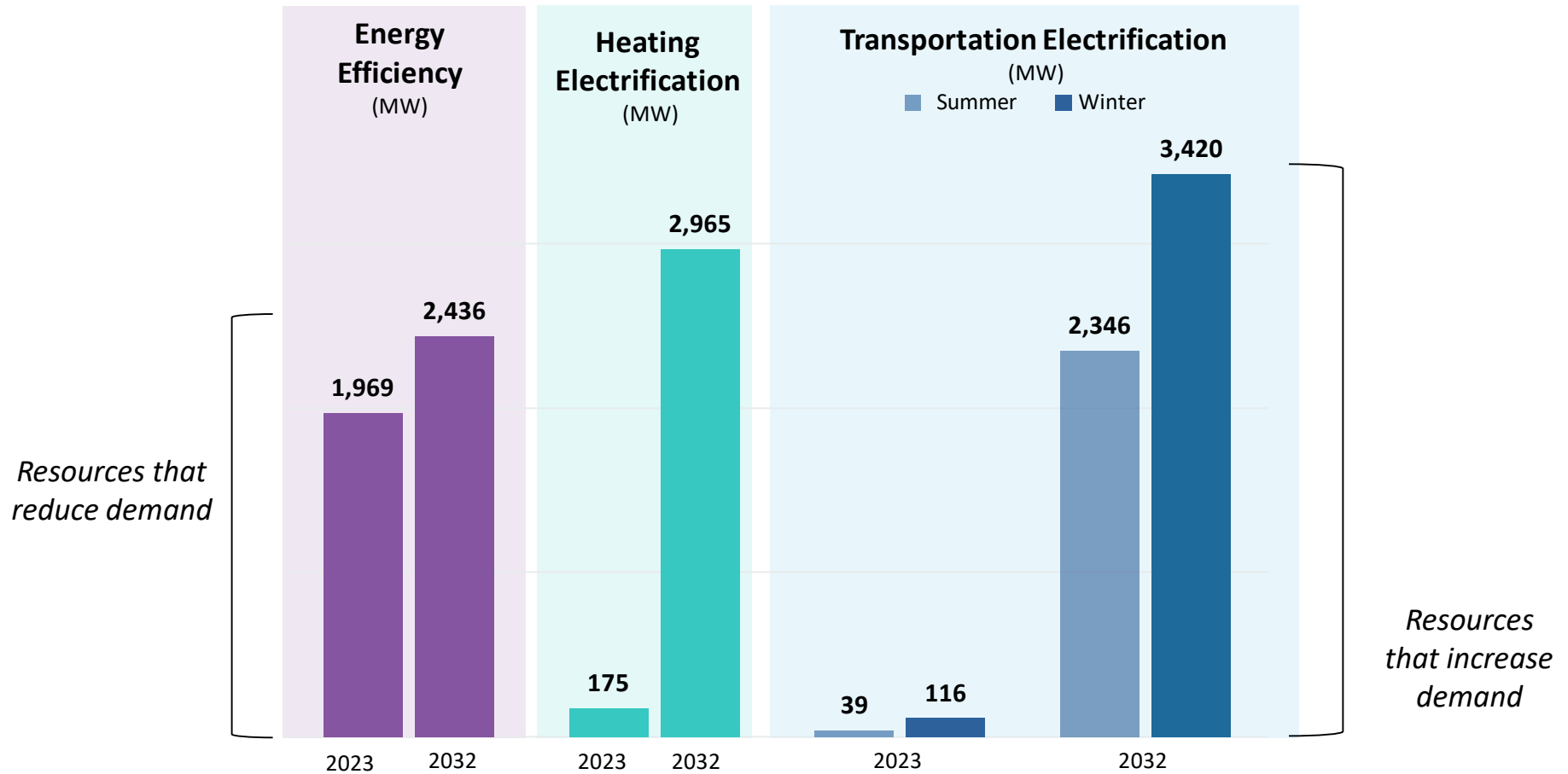
January 2024



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

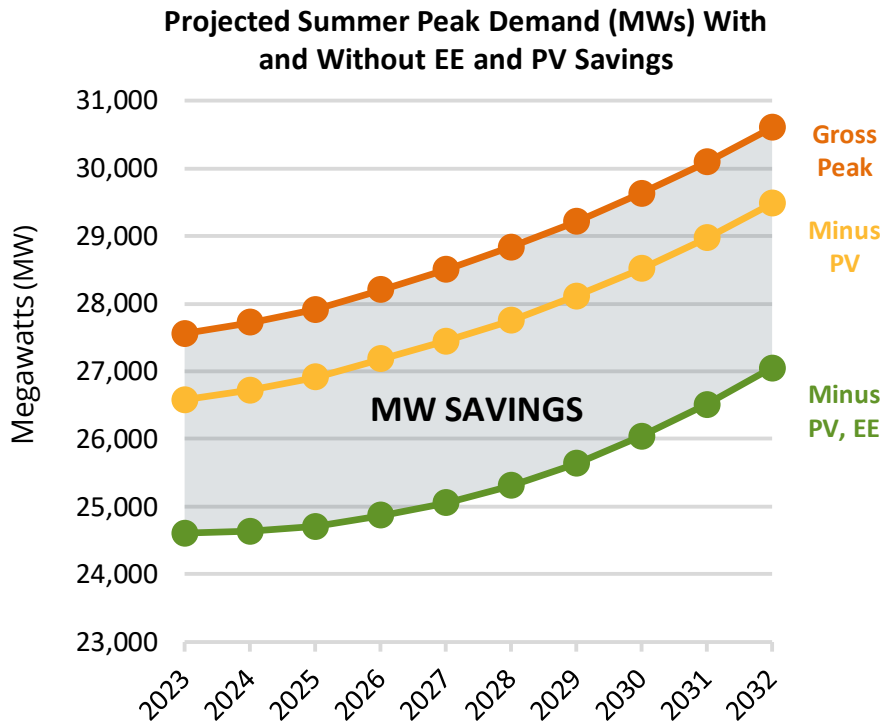
ISO's Ten-Year Forecasts Provide an Outlook for Electricity Use and Peak Demand

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



Source: [ISO New England 2023-2032 Forecast Report of Capacity, Energy, Loads, and Transmission](#) (2023 CELT Report) (May 2023)

Energy Efficiency and Behind-the-Meter Solar Resources Are Reducing Peak Demand



- The gross peak and load forecast
- The gross peak and load forecast minus existing and anticipated BTM solar PV and energy efficiency
- The gross peak and load forecast minus existing and anticipated “behind-the-meter” (BTM) solar PV resources

- **28,130 MW:** all-time summer peak demand, set on August 2, 2006
- Energy efficiency (EE) and behind-the-meter (BTM) solar are **reducing peak demand**
- Peak demand reductions:
 - 2023: EE and BTM solar **reduce peak demand by 10.7%**
 - 2032: EE and BTM solar **reduce peak demand by 11.6%**

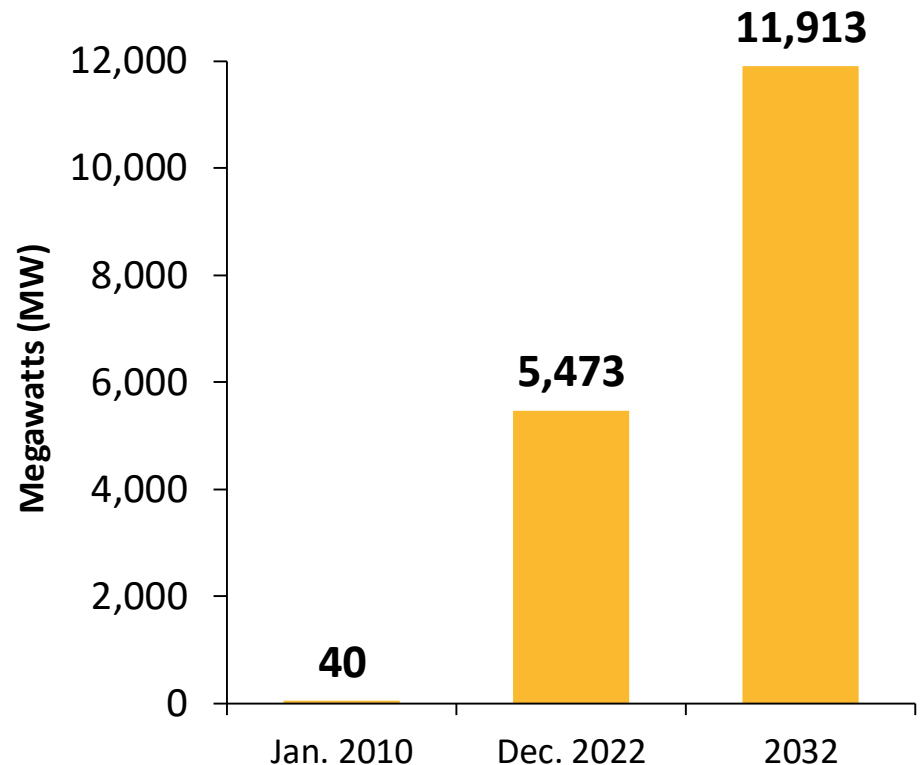
Source: [ISO New England 2023 Forecast Data](#). Summer peak demand is based on the “50/50” forecast.

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

December 2022 Solar PV Installed Capacity (MW_{ac})

State	Installed Capacity (MW _{ac})	No. of Installations
Connecticut	912	73,553
Massachusetts	3,289	150,020
Maine	295	8,583
New Hampshire	183	14,427
Rhode Island	326	17,034
Vermont	468	19,348
New England	5,473	282,965

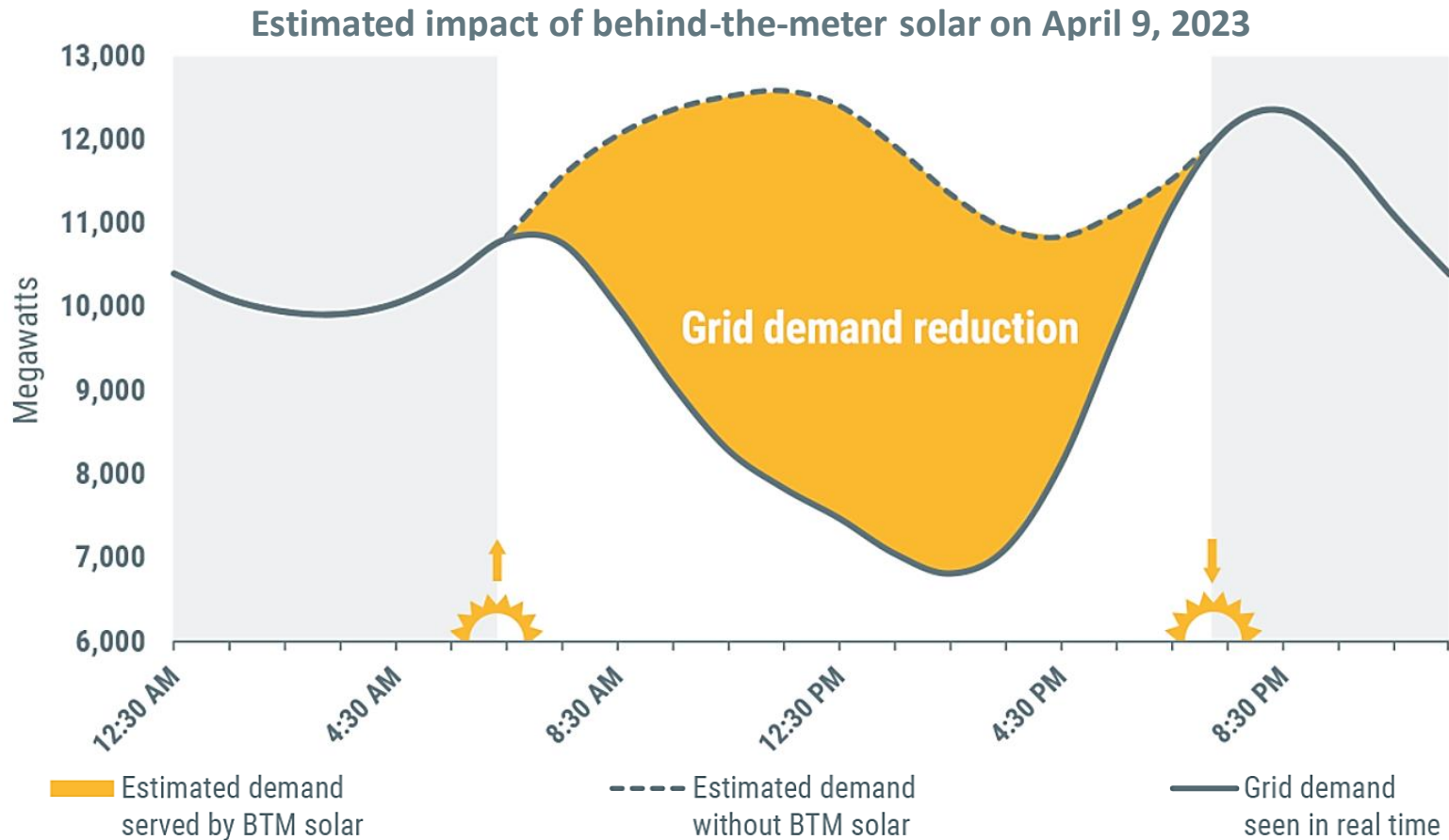
Cumulative Growth in Solar PV through 2032 (MW_{ac})



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 2023-2032 Forecast Report of Capacity, Energy, Loads, and Transmission](#) (2023 CELT Report) (May 2023), and [2023 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



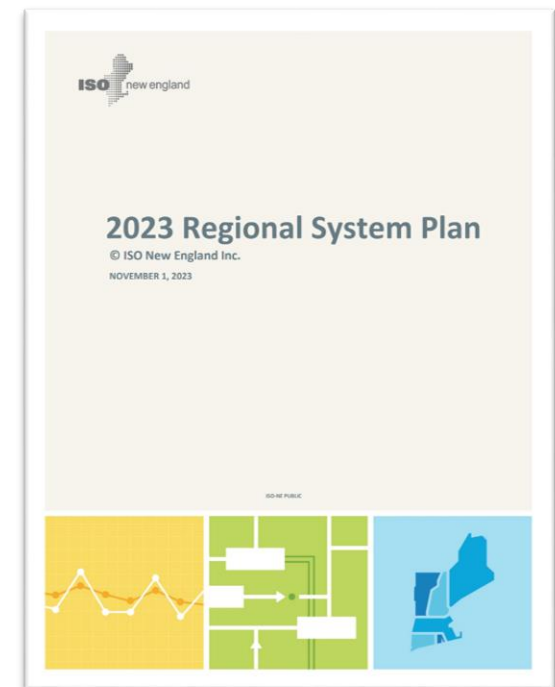
Source: ISO Newswire Article from April 11, 2023, [New England again sets record for low demand on regional power system - ISO Newswire](#)

TRANSMISSION DEVELOPMENTS



Overview of Transmission Planning

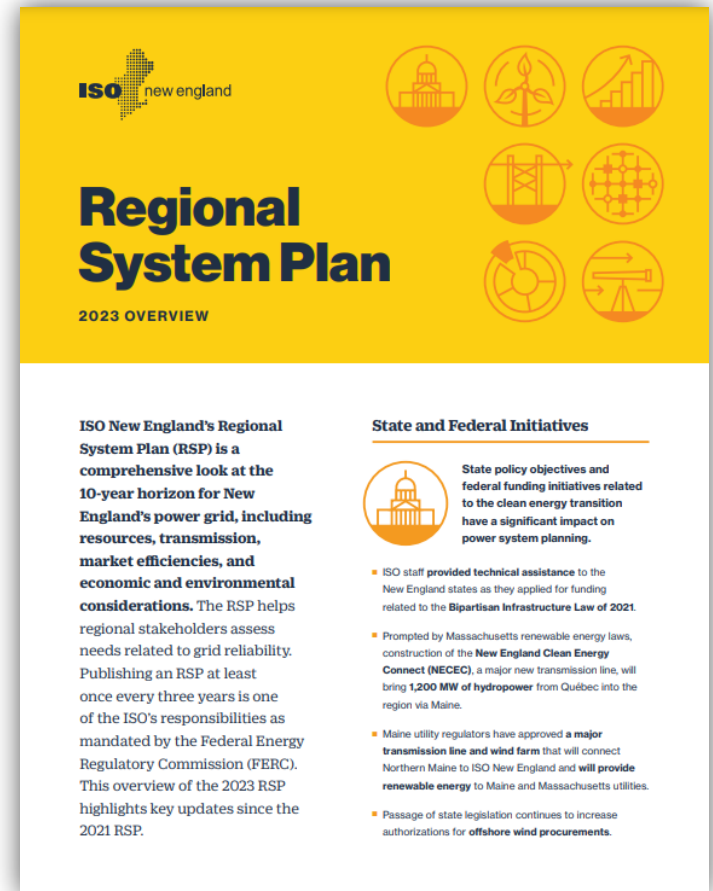
- As the **Regional Transmission Organization**, the ISO is required to identify transmission infrastructure solutions that are essential for maintaining power system reliability in New England
- Through an **open stakeholder process**, the ISO is responsible for the development of long-range plans to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



[ISO New England 2023 Regional System Plan](#)

2023 Regional System Plan

- To forecast system needs 10 years out, the RSP considers:
 - Forecasts of Electric Energy, EE, and PV Capacity and Energy
 - Existing and Future Resource Development in Areas of Need
 - Fuel-Related Risks to System Reliability
 - Existing and Pending Environmental Regulations
 - Projections of Capacity and Operating Reserves Needs
 - Federal, State, and Regional Initiatives
 - Transmission System Needs, Solutions, and Cost Considerations
 - Interregional Planning
- ISO New England hosted a public meeting to discuss the 2023 Regional System Plan on November 1
 - A [recording](#) of the meeting is available on our website

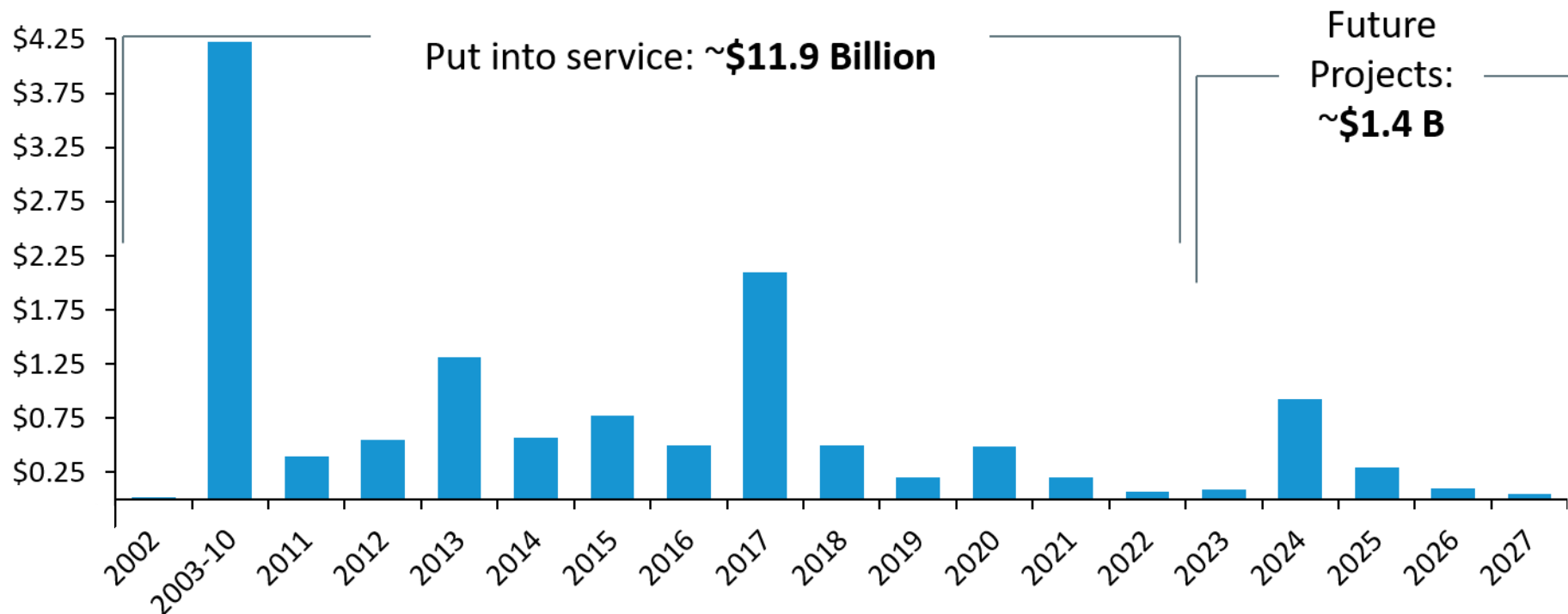


[Regional System Plan 2023 Summary](#)

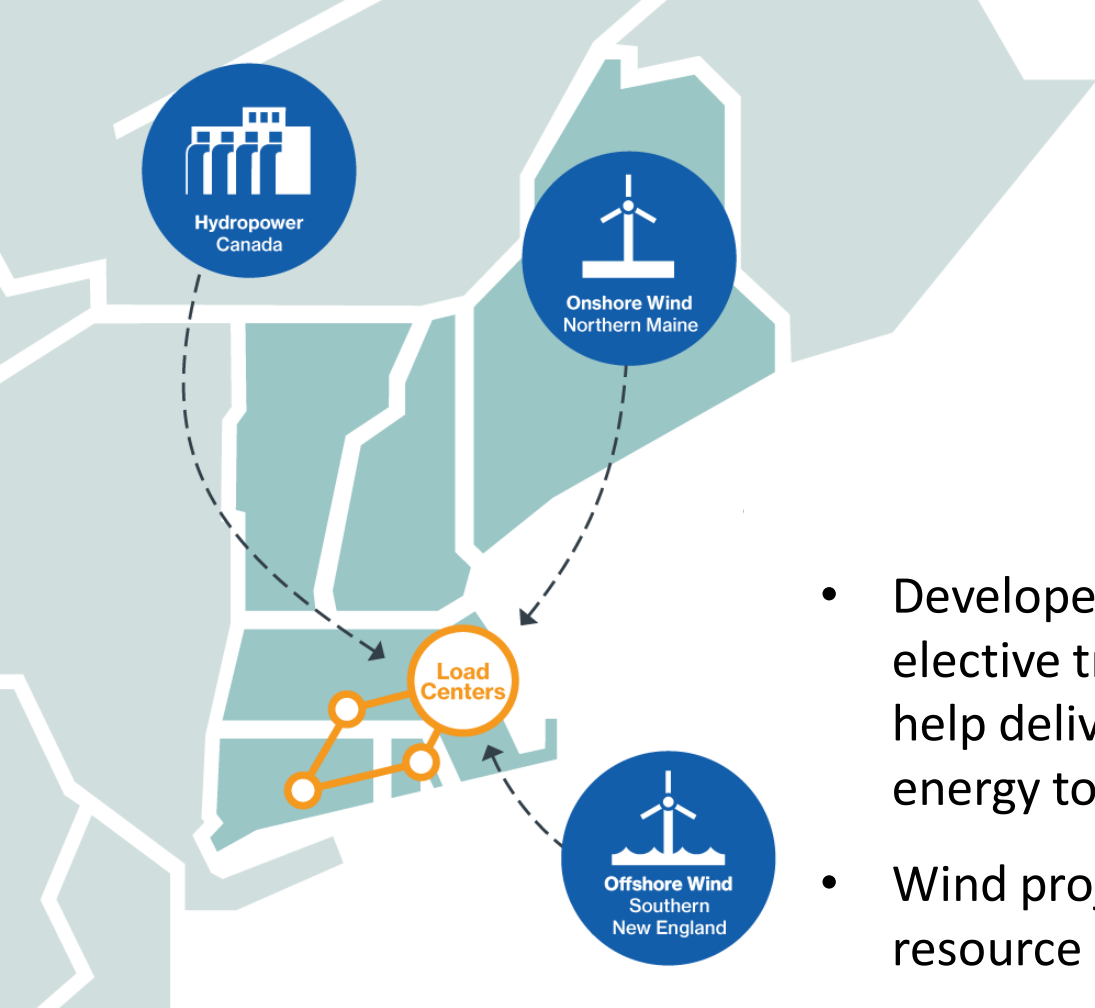
New England Has Made Major Investments in Transmission to Ensure a Reliable Electric Grid

Transmission investment by year that projects are put into service (capital costs)

Billions of Dollars



Source: ISO New England RSP Transmission Project Listing, October 2023
Estimated future investment includes projects under construction, planned and proposed



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

- Developers are proposing eight elective transmission upgrades (ETUs) to help deliver over **14,000 MW** of clean energy to New England load centers
- Wind projects make up over **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

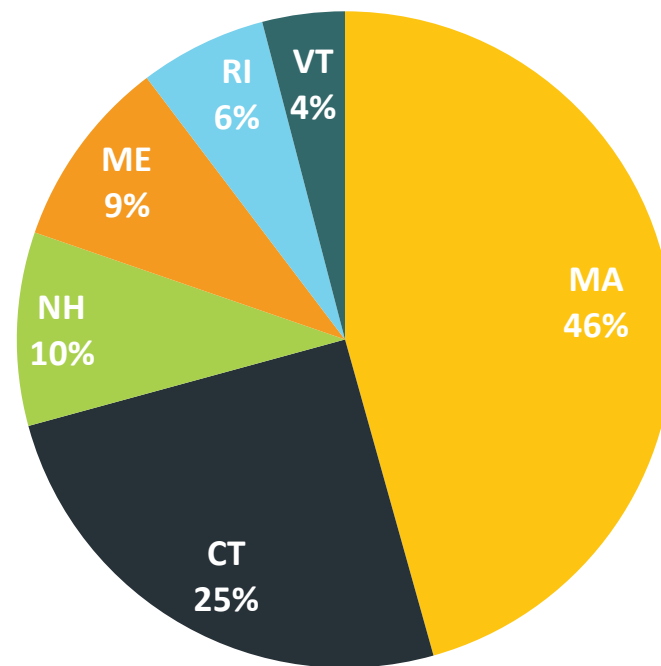
Lines represent types of ETUs private developers have proposed in recent years

Source: [ISO Interconnection Queue](#) (January 2024)

How Are Transmission Costs Allocated?



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



2022 Network Load by State



Changes to Transmission Planning Processes

- The ISO revised Attachment K to incorporate new transmission planning process designed to look beyond the current 10-year planning horizon
 - Changes filed in [December 2021](#); accepted by FERC in [February 2022](#)
- The 2050 Transmission Study is the first example of this longer-term transmission study
- New England states have many goals and mandates related to energy and environmental objectives
- Individual states and the New England States Committee on Electricity (NESCOE) provide input during the planning process



OTHER ISO NEW ENGLAND STUDIES



Overview of Studies Supporting Future Grid

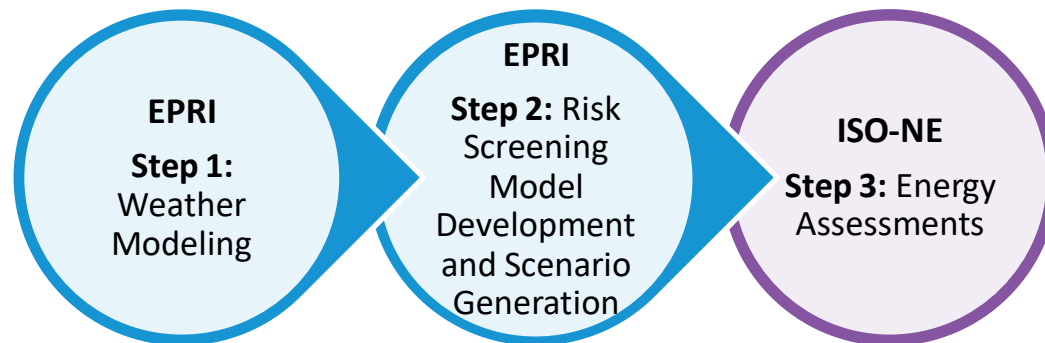
- **Weather:** [Operational Impacts of Extreme Weather Events](#)
 - Rigorously model likelihood and impact of extreme weather events
- **Transmission:** [2050 Transmission Study](#)
 - Determine transmission needs to support renewable/high load future
- **Operations:** [Future Grid Reliability Study \(Phase 1\)](#)
 - Examine operational effects of renewable-heavy grid
- **Markets:** [Pathways to the Future Grid](#)
 - Evaluate different market options to support a renewable-heavy grid
- **Reliability:** [Transmission Planning for the Clean Energy Transition](#)
 - Explore how near-term needs assessments should evolve with renewables



Operational Impact of Extreme Weather Events

– Energy Adequacy Study

- [Operational Impact of Extreme Weather Events](#) is a probabilistic energy-security study undertaken jointly by the ISO and the Electric Power Research Institute ([EPRI](#))
- The study seeks to inform the region about future energy adequacy risks and provide context for assessing solutions, is one of several [key projects](#) undertaken by the ISO to help New England prepare for tomorrow's greener grid
- The study is being undertaken in three major steps, with EPRI providing weather modeling and risk screening model development, and ISO completing the energy assessments, using the [21-day energy assessment tool](#)



- The energy adequacy risk profile is dynamic and will be a function of the evolution of both supply and demand profiles

Energy Adequacy Study Key Takeaways

- [Final Report](#) released in December 2023 includes results of Step 3 energy assessments completed for winter and summer 2027 and 2032 events, and reviews sensitivity analysis performed for the worst case 2032 winter event
- Results reveal a range of energy shortfall risks and associated probabilities and reveal similar energy adequacy risk with and without the Everett Marine Terminal in-service
- Sensitivity analysis of 2032 worst-case scenarios indicate an increasing energy shortfall risk profile between 2027 and 2032
- Timely additions of BTM and Utility Scale PV, offshore wind, and incremental imports from NECEC are critical to mitigate energy shortfall risks that result from significant peak winter load growth and retirements
- This energy adequacy study tool developed in partnership with EPRI provides a much needed foundation for the ISO to monitor risks and study the system as it continues to evolve



Introduction to the Regional Energy Shortfall Threshold (REST)

- The Probabilistic Energy Adequacy Tool (PEAT) framework for risk analysis under extreme weather events will be essential for evaluating regional energy shortfall risk as the resource mix evolves and as climate projections are refined
- ISO's initial 2027 and 2032 energy adequacy study results are expected to help inform the development of a Regional Energy Shortfall Threshold (REST)
 - ISO expects that the REST will be a reliability-based threshold that reflects the region's level of risk tolerance with respect to energy shortfalls during extreme weather
- The REST scope of work was [introduced](#) at the December NEPOOL Reliability Committee meeting; work will continue through 2024

More information on the Operational Impacts of Extreme Weather Events Key Project, including ongoing efforts related to development of a Regional Energy Shortfall Threshold, is available on the ISO website: [Operational Impacts of Extreme Weather Events Key Project \(iso-ne.com\)](https://www.iso-ne.com/operational-impacts-of-extreme-weather-events-key-project)

2050 Transmission Study

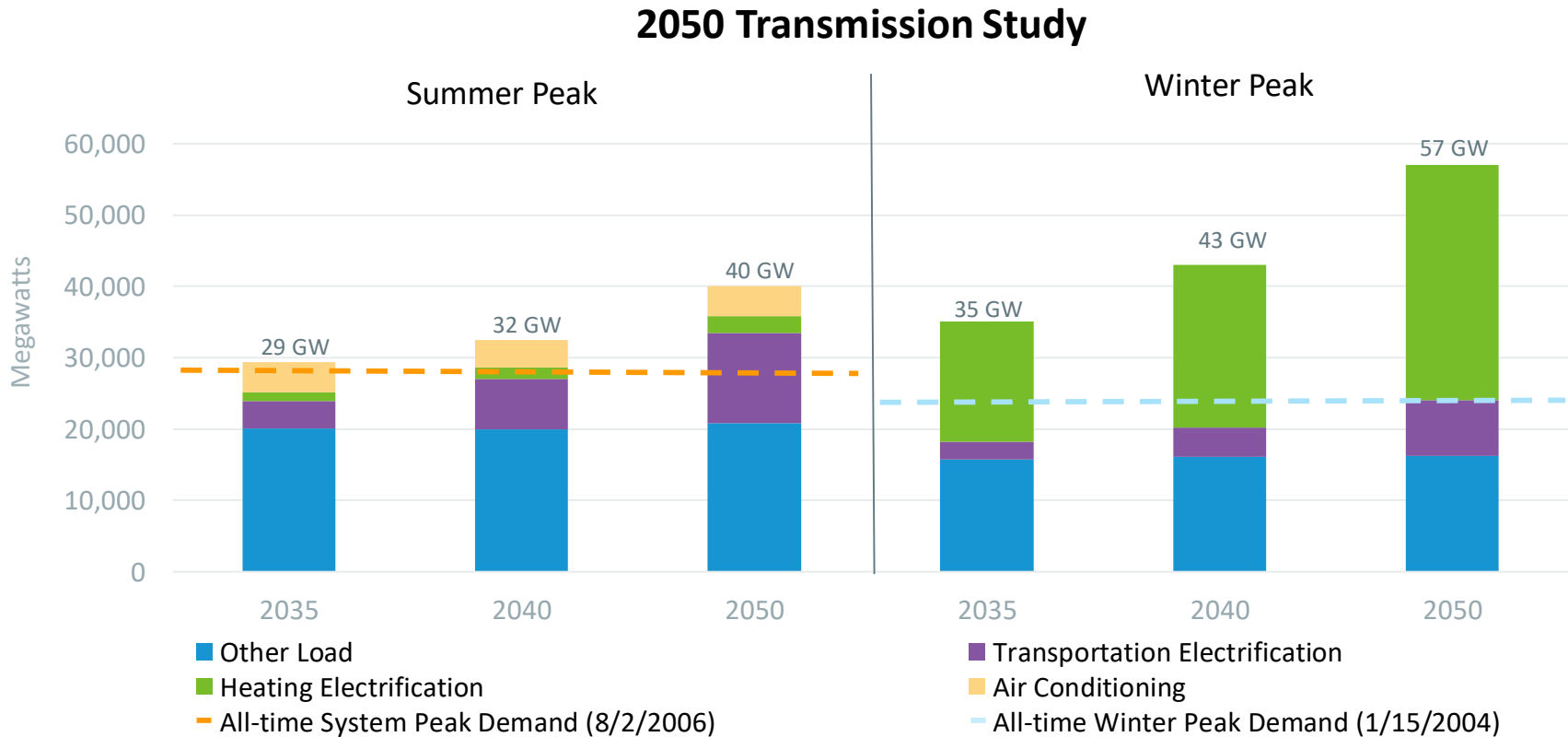
A High-Level Study for the Years 2035, 2040, and 2050

- Initial study scope and assumptions developed **in conjunction with the states** and in accordance with a recommendation from NESCOE's October 2022 [New England States Vision Statement](#)
- Aims to **inform the region** of the amount, type, and high-level cost estimates of transmission infrastructure that would be needed to cost-effectively:
 - Incorporate clean-energy and distributed-energy resources
 - Meet state energy policy requirements and goals, including economy-wide decarbonization
- Looks **well beyond** the ISO's 10-year horizon for transmission planning and is **not** a plan to build specific projects
- The [Draft 2050 Transmission Study](#) was published in November 2023 and the ISO anticipates finalizing the report in early 2024



The most up-to-date information on the 2050 study is available at the [Planning Advisory Committee](#) and [Longer-Term Transmission Studies](#) webpages.

New England System Peak Grows Substantially and Shifts to Winter-Peaking

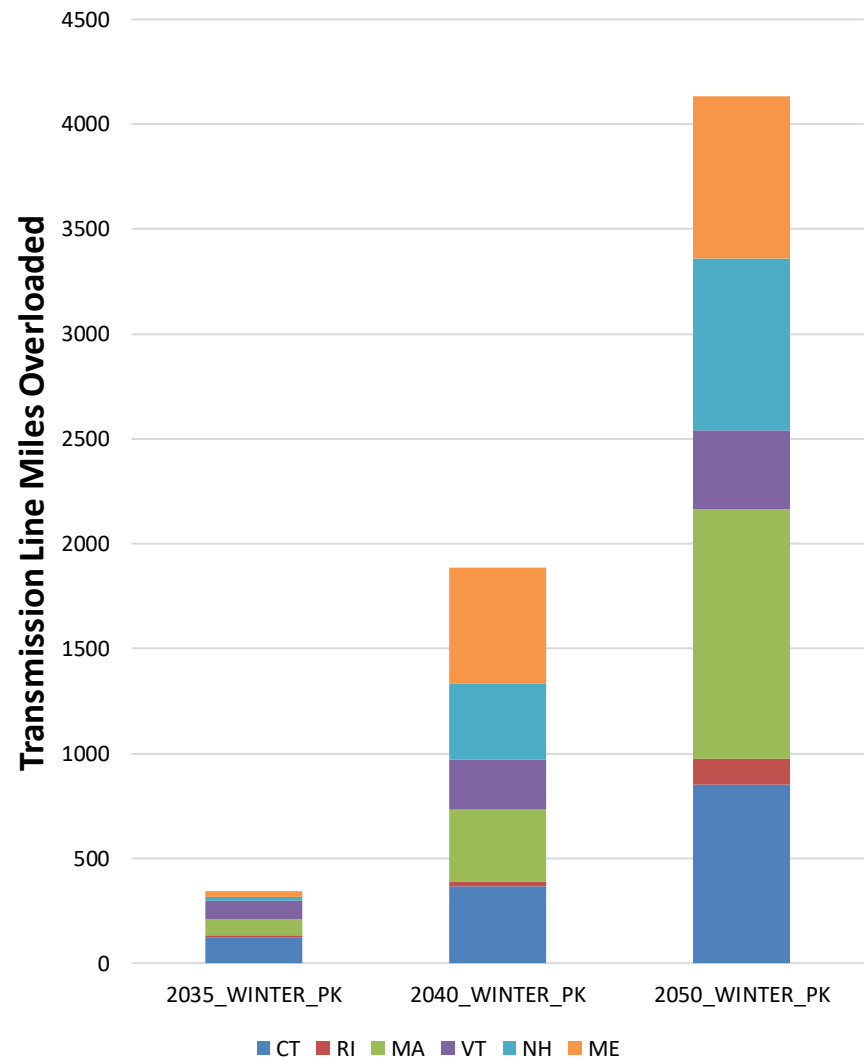


Source: ISO New England [2050 Study Draft Report](#). The future scenarios in the 2050 Study were based on the All Options Pathway in [Massachusetts' Deep Decarbonization Roadmap](#) report, published in December 2020.

2050 Transmission Study

- Preliminary results indicate approximately **4,000 miles, or 50%**, of New England's transmission line mileage could be overloaded by 2050
- Total mileage of transmission overloads can be **decreased by about 35%** by reducing the 2050 winter peak from 57 GW to 51 GW
- Significant **new transmission** will be needed to reliably serve load under the assumptions analyzed in this study
- The final report details **multiple roadmaps** and **cost estimates** for the evolution of certain portions of the transmission system

Total Transmission Line Miles Overloaded for Winter Evening Peak



ISO NEW ENGLAND PUBLICATIONS AND RESOURCES

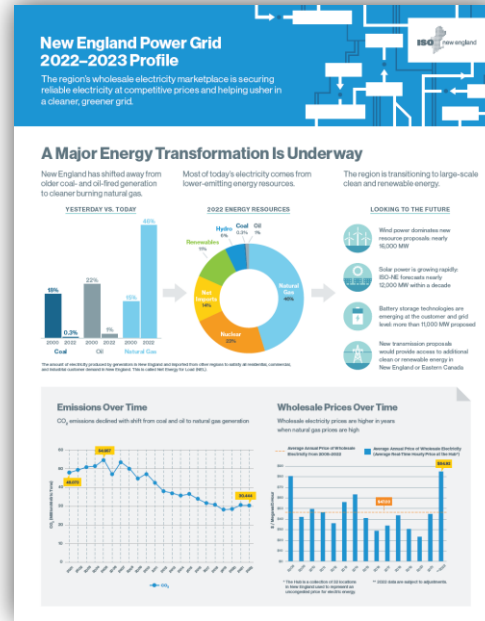


ISO New England Releases Several Publications



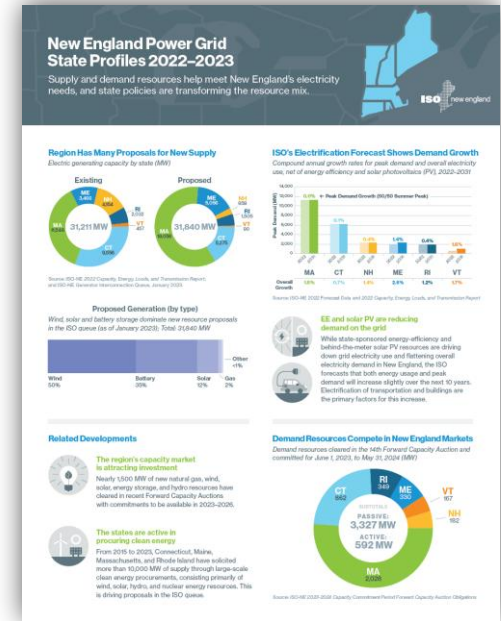
[2022 Regional Electricity Outlook](#)

Provides an in-depth look at New England's biggest challenges to power system reliability, the solutions the region is pursuing, and other ISO New England efforts to improve services and performance



[New England Power Grid Profile](#)

Provides key grid and market stats on how New England's wholesale electricity markets are securing reliable electricity at competitive prices and helping usher in a cleaner, greener grid



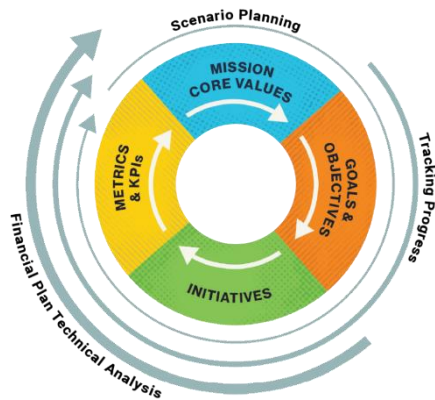
[New England State Profiles](#)

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

ISO New England's Strategic Plan



- In October 2022, the ISO released [Vision in Action: ISO New England's Strategic Plan](#)
- The plan provides insight into how the ISO intends to fulfill its three critical roles during the clean energy transition
- In addition to discussing the ISO's key goals and initiatives, the plan offers perspectives on trends shaping the power industry
- ISO CEO Gordon van Welie presented an overview of the plan at the [2022 Open Board Meeting](#)



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
- Tentative 2024 CLG Meeting Dates:
 - Wednesday, March 6
 - 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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FOR MORE INFORMATION...



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Log on to ISO Express

[ISO Express](#) provides real-time data on New England's wholesale electricity markets and power system operations



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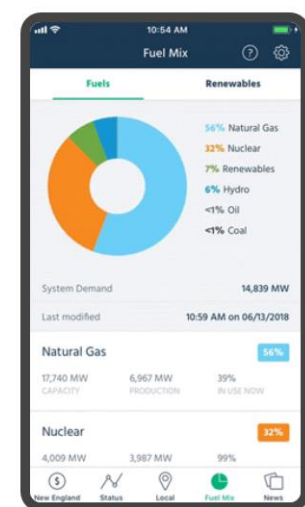
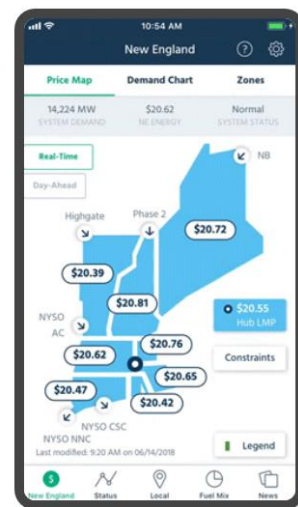


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[ISO to Go](#) is a free mobile application that puts real-time wholesale electricity pricing and power grid information in the palm of your hand



Questions

