



# New England Power System Outlook

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*CBIA 2022 Energy & Environment Conference*

Eric Johnson

DIRECTOR, EXTERNAL AFFAIRS



# 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*



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

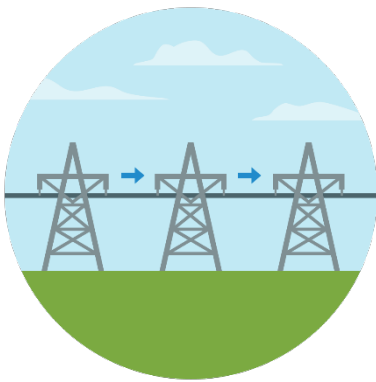
- **Regulated** by the Federal Energy Regulatory Commission
- **Reliability Coordinator** for New England under the North American Electric Reliability Corporation
- **Independent** of companies in the marketplace and **neutral** on technology



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

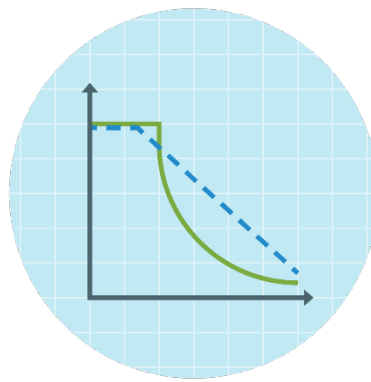
## Grid Operation

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



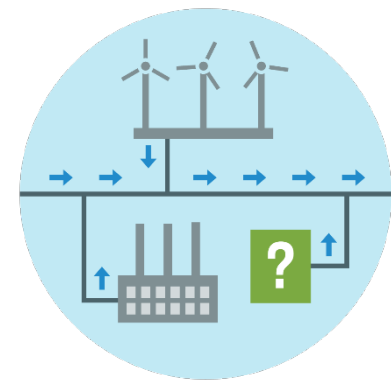
## Market Administration

Design, run, and oversee the markets where wholesale electricity is bought and sold



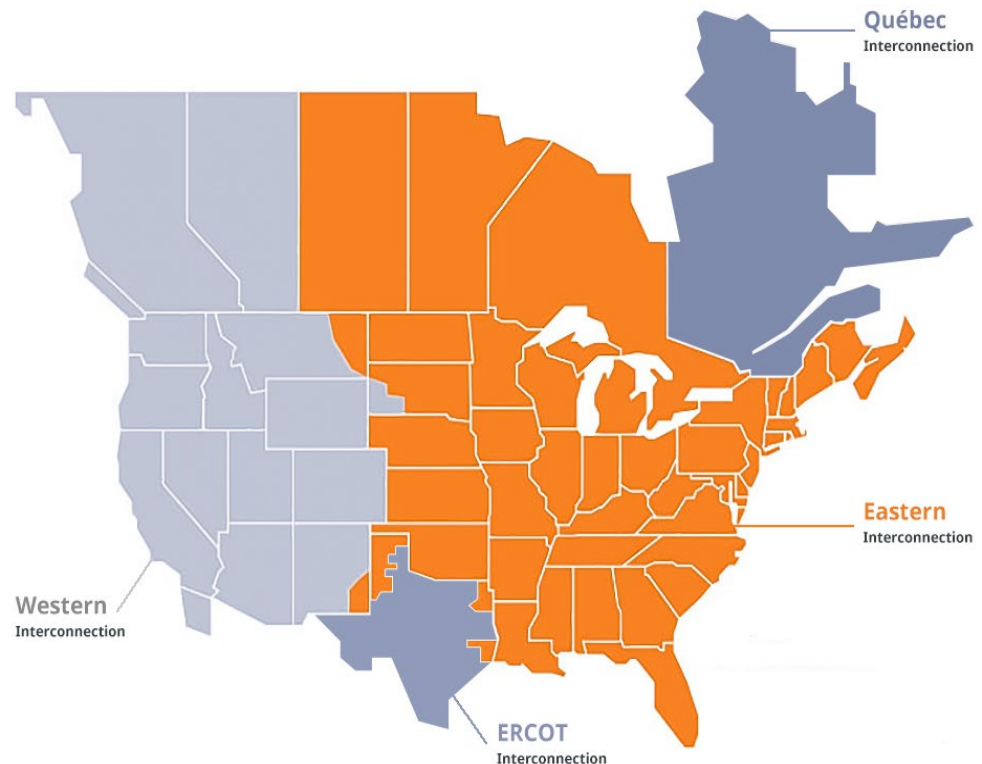
## Power System Planning

Study, analyze, and plan to make sure New England's electricity needs will be met over the next 10 years



# 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**\*

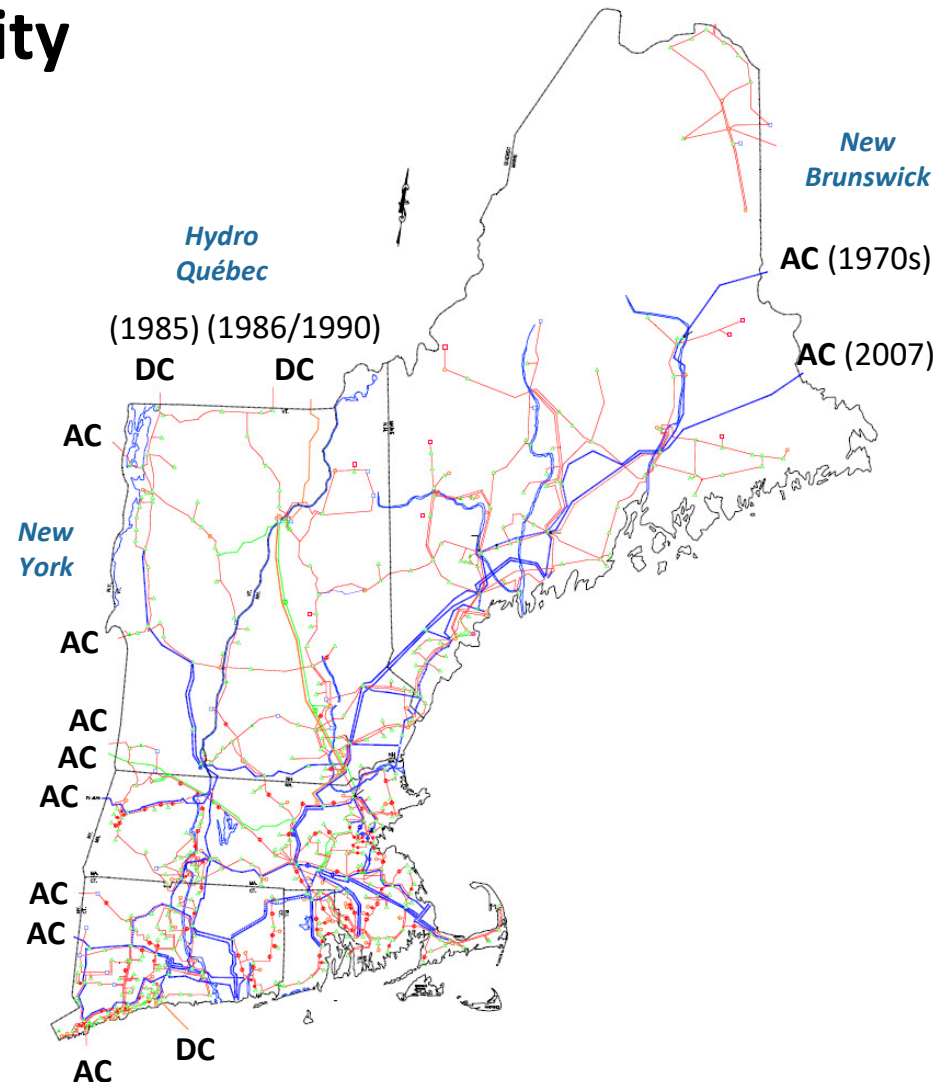


\* North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council (NPCC)



# 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
- **16%** of region's energy needs met by imports in 2021
- **\$11.7 billion** invested to strengthen transmission system reliability since 2002; **\$1.1 billion** planned
- Developers have proposed multiple transmission projects to access **non-carbon-emitting resources** inside and outside the region

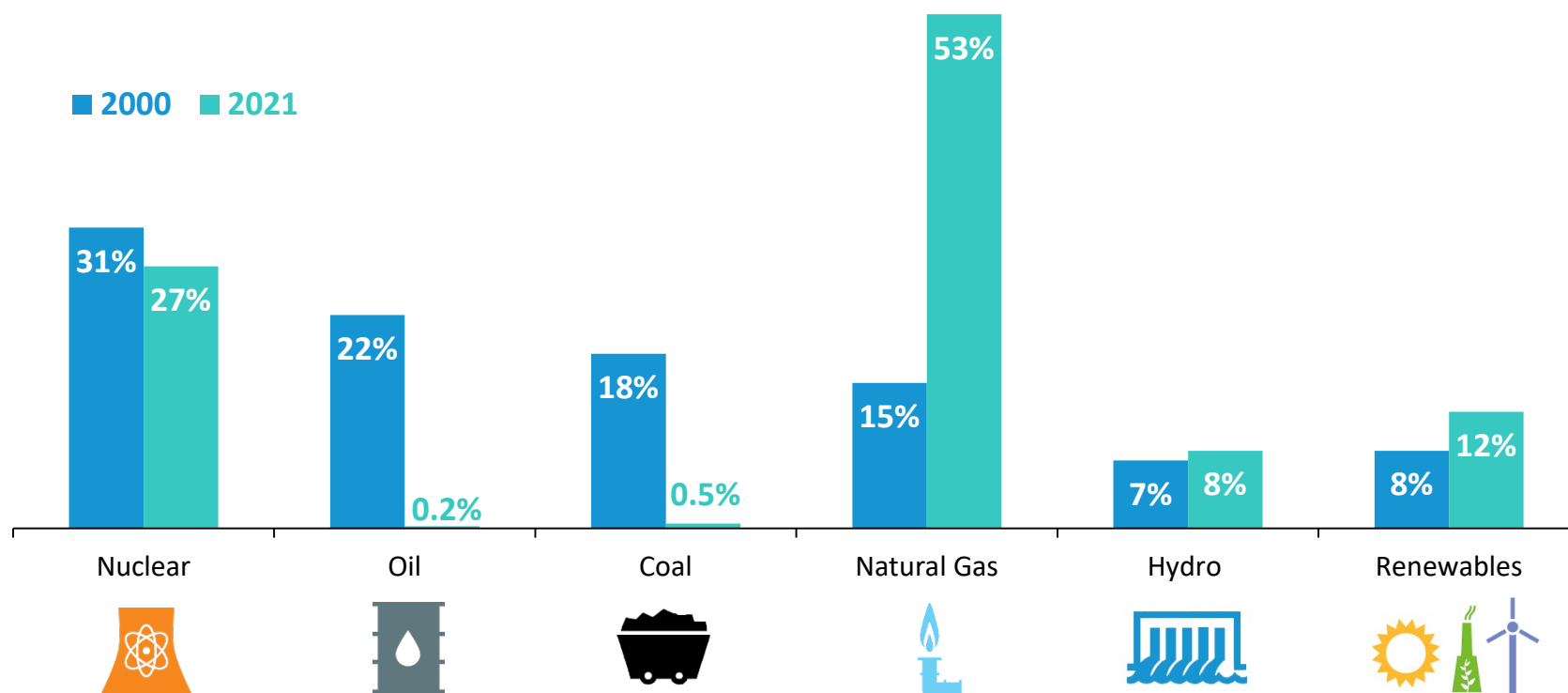


Note: AC stands for Alternating Current and DC stands for Direct Current

# Dramatic Changes in the Energy Mix

*The fuels used to produce the region's electric energy have shifted as a result of economic and environmental factors*

Percent of Total **Electric Energy** Production by Fuel Type  
(2000 vs. 2021)



Source: ISO New England [Net Energy and Peak Load by Source](#); data for 2021 is preliminary and subject to resettlement

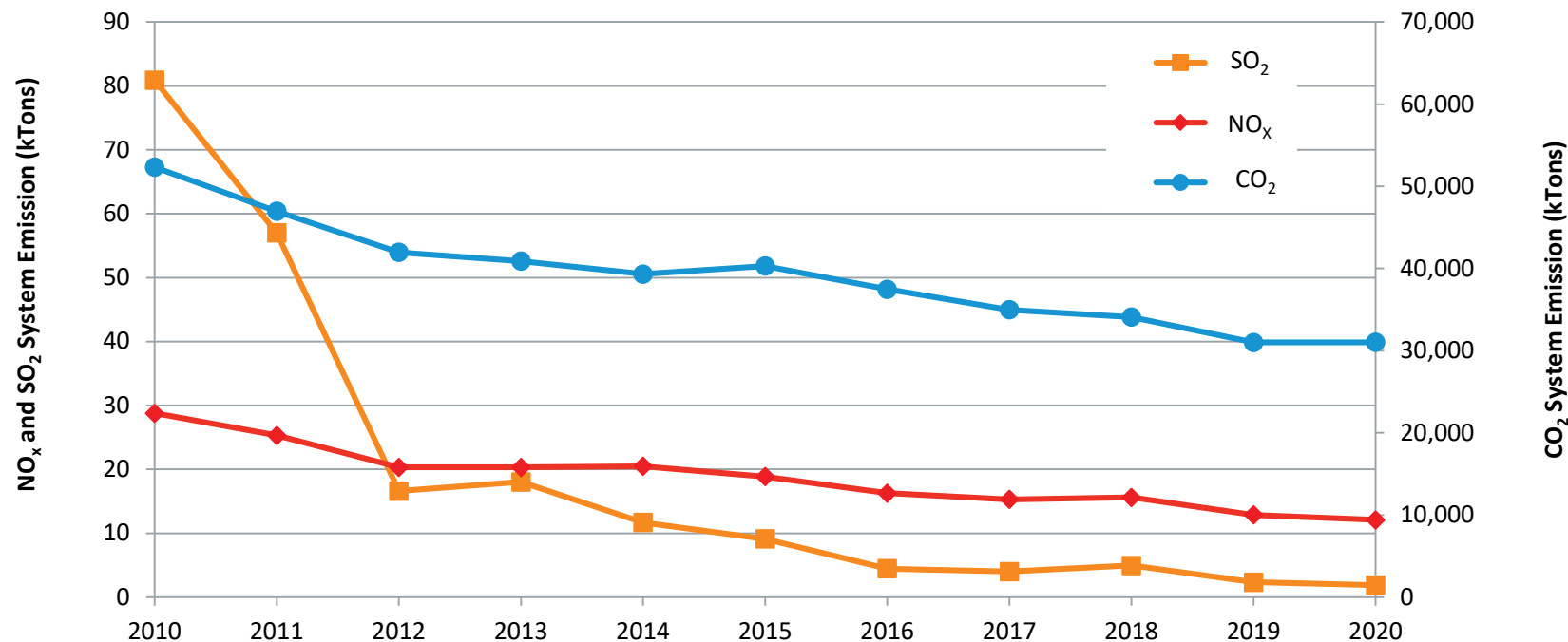
Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, municipal solid waste, and miscellaneous fuels.

This data represents electric generation within New England; it does not include imports or behind-the-meter (BTM) resources, such as BTM solar.

# Major Emissions Reductions

*Emissions from regional generators have fallen significantly since 2001*

## Annual New England System Generator Emissions, 2010-2020\* (Thousand Short Tons)



Carbon Dioxide (CO<sub>2</sub>) ↓41%

Nitrogen Oxide (NO<sub>x</sub>) ↓58%

Sulfur Dioxide (SO<sub>2</sub>) ↓98%

\*2020 data is preliminary and subject to change. Source: ISO New England, *New England Electric Generators Air Emissions Report*



# States Are Targeting Increases in Renewable and Clean Energy and Deep Reductions in CO<sub>2</sub> Emissions

≥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 statewide GHG emissions limit MA clean energy standard
90% by 2050	VT renewable energy requirement
100% by 2050 Carbon-Neutral by 2045	ME renewable energy requirement ME emissions goal
100% by 2040	CT zero-carbon electricity goal
100% by 2030	RI renewable energy goal

# States Accelerate Clean Energy Procurements (2017-2022)



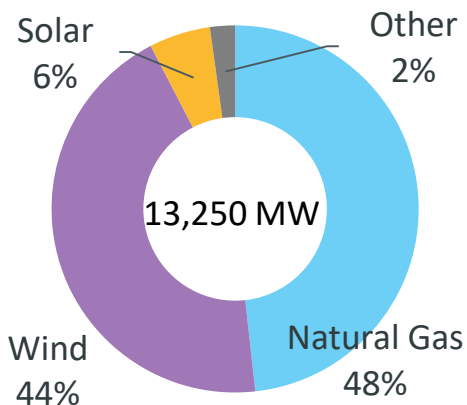
State	State Procurement Initiatives for Large-Scale Clean Energy Resources	Eligible Resources	RFP Target MW (nameplate)	Projected COD/ Selected MW
ME	2022 Northern Maine Transmission and Renewable RFP	Transmission and Newly Developed Renewables	700-1200 MW	TBD
MA	2021 Section 83C III Offshore Wind RFP	Offshore Wind	1632 MW	TBD
ME	2020-2021 RPS RFP	ME RPS Class IA renewables	2,360,000 MWh	2022-2024
CT	<b>2019 Offshore Wind RFP</b>	<b>Offshore Wind</b>	<b>400 – 2,000 MW</b>	<b>2026</b> 804 MW
MA	2019 Section 83C II Offshore Wind RFP	Offshore Wind	800 MW	2025 804 MW
RI	2018 Renewable Energy RFP	Solar, Wind, Biomass and Other Eligible Resources	400 MW	2023 50 MW
CT	<b>2018 Zero-Carbon Resources RFP</b>	<b>Nuclear, Hydro, Class I Renewables, Energy Storage</b>	<b>Approx. 1,400 MW</b> (12,000,000 MWh)	<b>2020-2026</b> 11,658,080 MWh
CT	<b>2018 Clean Energy RFP</b>	<b>Offshore Wind, Fuel Cells, Anaerobic Digestion</b>	<b>252 MW</b>	<b>2019-2025</b> 252 MW
MA RI	2017 Section 83C I Offshore Wind RFP	Offshore Wind	800 MW (MA) 400 MW (RI)	2023(800 MW) 2025 (400 MW)
MA	2017 Section 83D Clean Energy RFP	Hydro Imports	Approx. 1,200 MW (9,554,000 MWh)	2022 9,554,940 MWh/year



# The ISO Generator Interconnection Queue Provides Snapshots of the Future Resource Mix

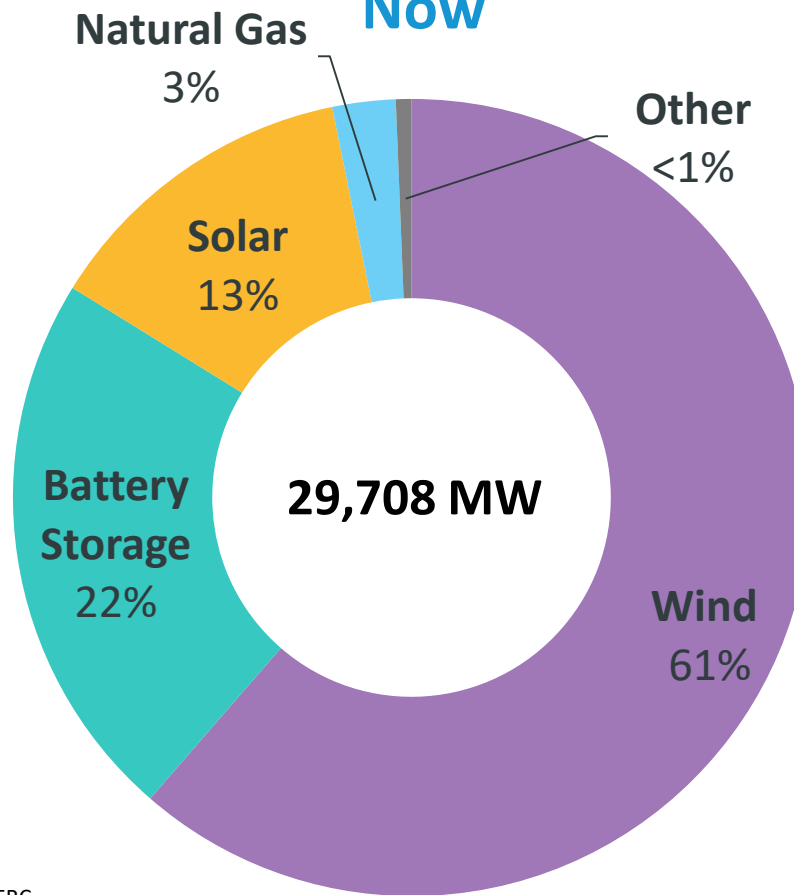
*Dramatic shift in types of proposed resources from natural gas to wind*

**Then**



June 2017

**Now**



May 2022

Offshore Wind



CT	2,400 MW
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MA	12,789 MW
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ME	12 MW
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RI	704 MW
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Onshore Wind



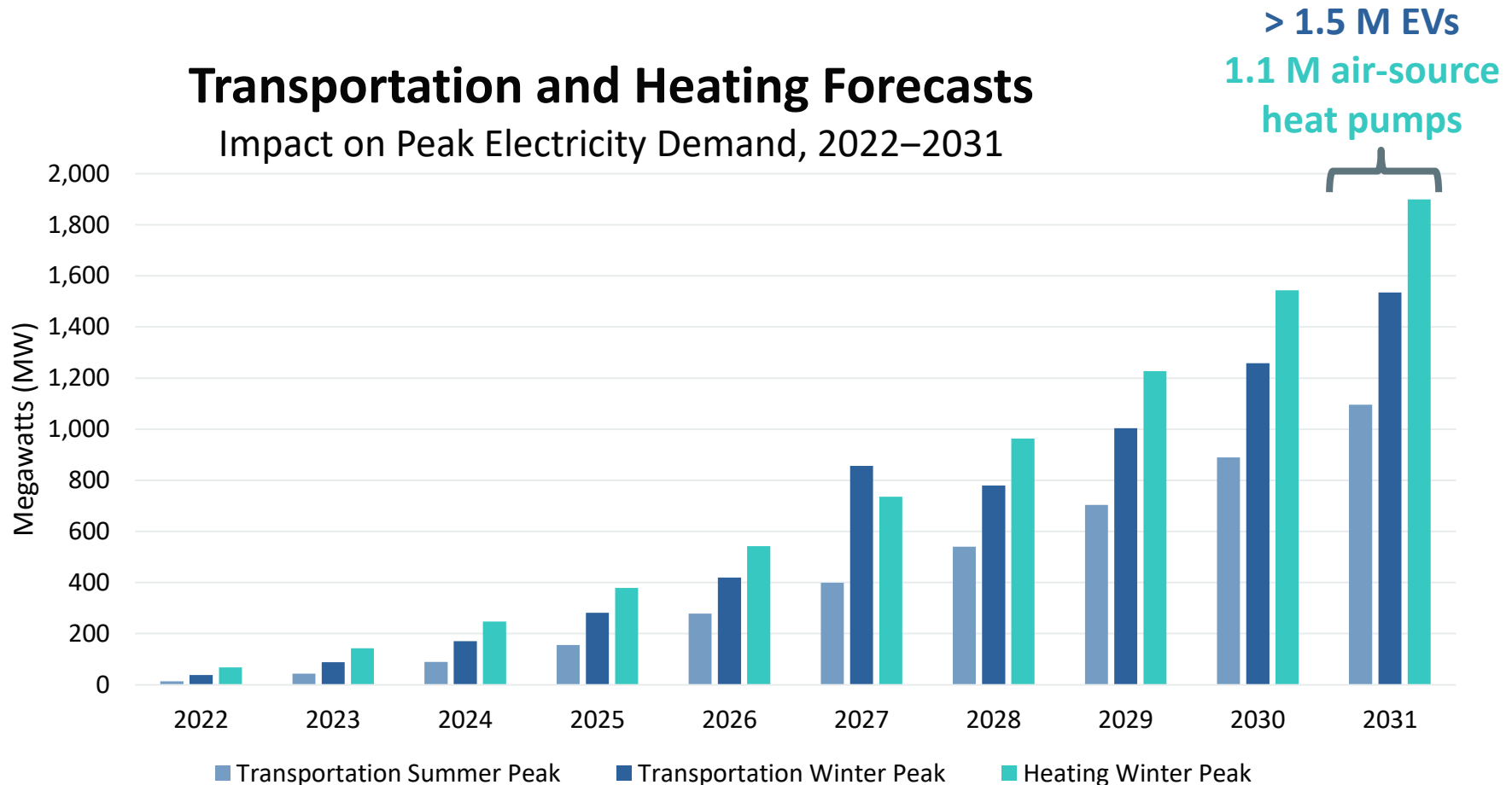
ME	2,330 MW
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Source: ISO Generator Interconnection Queue, FERC Jurisdictional Proposals; Nameplate Capacity Ratings.

# Electricity Demand from Electric Vehicles and Heating Sectors to Grow Over the Next Decade

## Transportation and Heating Forecasts

Impact on Peak Electricity Demand, 2022–2031



Percentage of Net System Peak in 2030: Transportation – summer: 4%; Transportation – winter: 7%; Heating – winter: 8%. Sources: [ISO New England 2022-2031 Forecast Report of Capacity, Energy, Loads, and Transmission](#) (2022 CELT Report) (May 2022), [2022 Forecast Data](#).

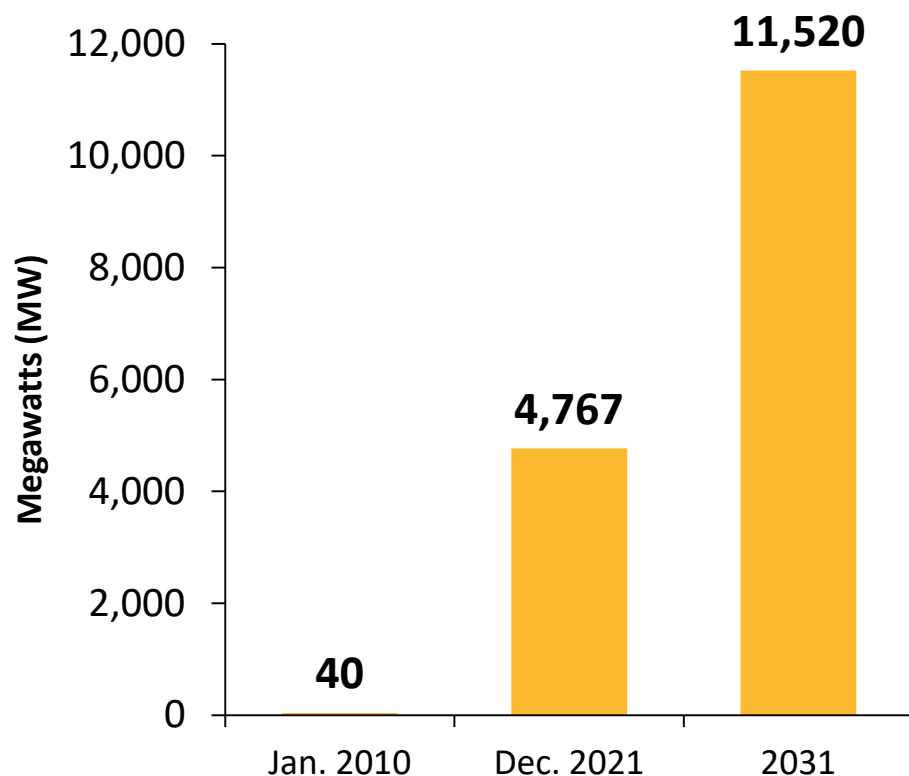


# ISO New England Forecasts Strong Growth in Solar Photovoltaic (PV) Resources

December 2021 Solar PV  
Installed Capacity (MW<sub>ac</sub>)

State	Installed Capacity (MW <sub>ac</sub> )	No. of Installations
Connecticut	809	63,735
Massachusetts	2,953	130,040
Maine	125	7,403
New Hampshire	157	12,186
Rhode Island	288	12,641
Vermont	434	17,296
<b>New England</b>	<b>4,767</b>	<b>243,301</b>

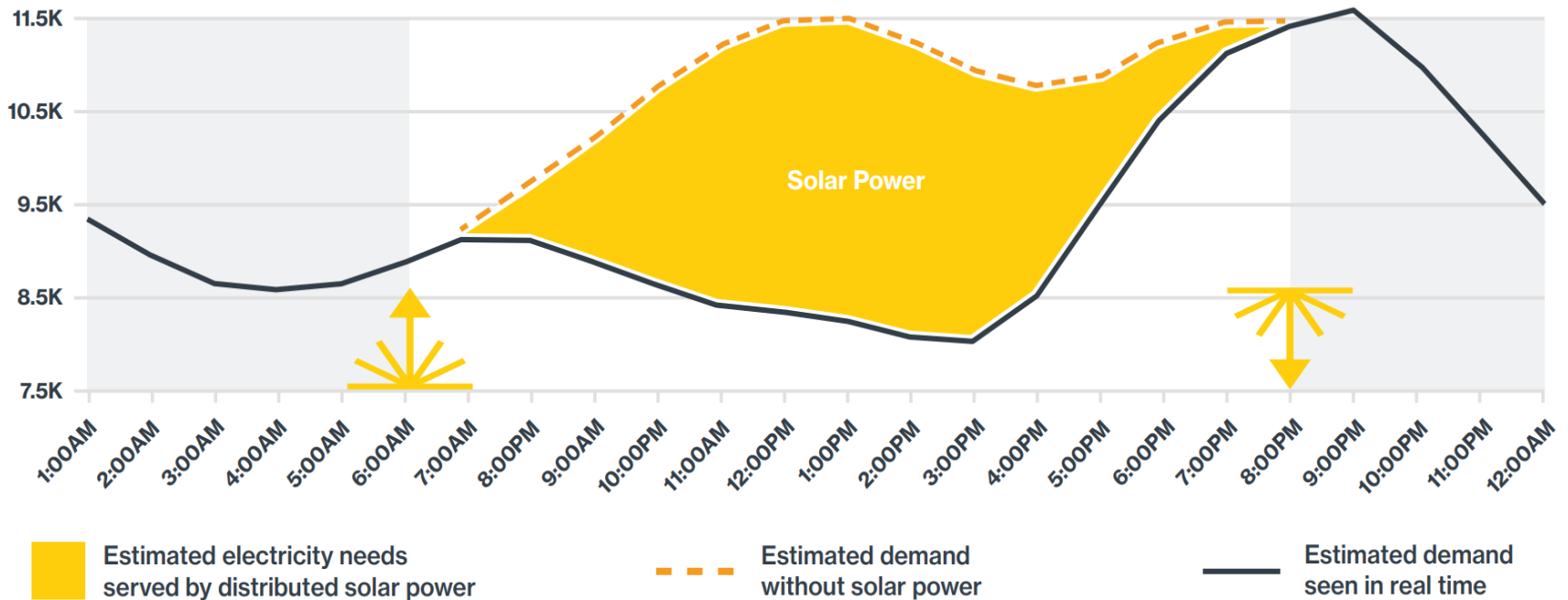
Cumulative Growth in Solar PV  
through 2031 (MW<sub>ac</sub>)



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 2022-2031 Forecast Report of Capacity, Energy, Loads, and Transmission](#) (2022 CELT Report) (May 2022), and [December 2021 Distributed Generation Survey Results](#); MW values are AC nameplate.

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

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

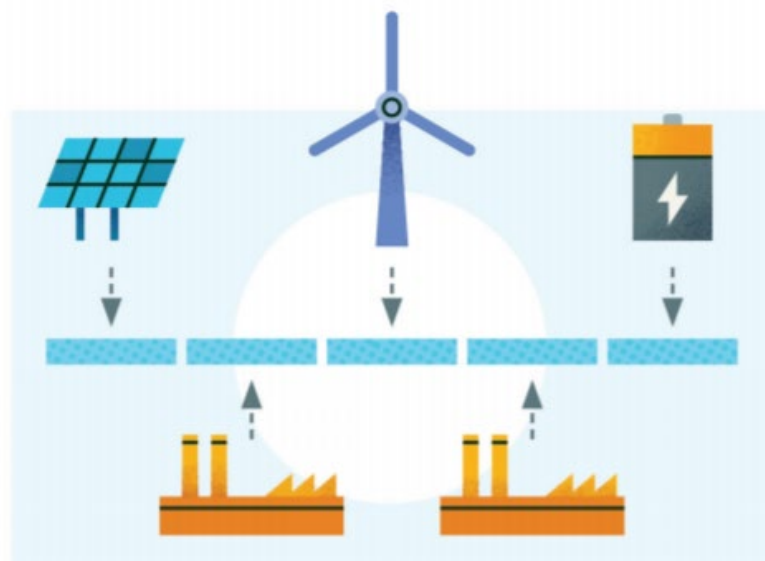


# New England Will Need Flexible Resources to Balance the Variability of Renewables

*ISO is working to adapt both its operations and markets so the grid stays reliable and prices competitive as our energy mix transitions*

Due to state policies driving change, **variable, renewable resources** will eventually become the new “baseload” resource and produce most of the electrical energy

**Balancing resources** will be necessary to “fill in” the energy gaps, which may last from seconds to weeks, and occur when renewable resources are not available or are not producing at full capacity



# PREPARING FOR THE FUTURE GRID

*Four Pillars and Studies Supporting the Future Grid*





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

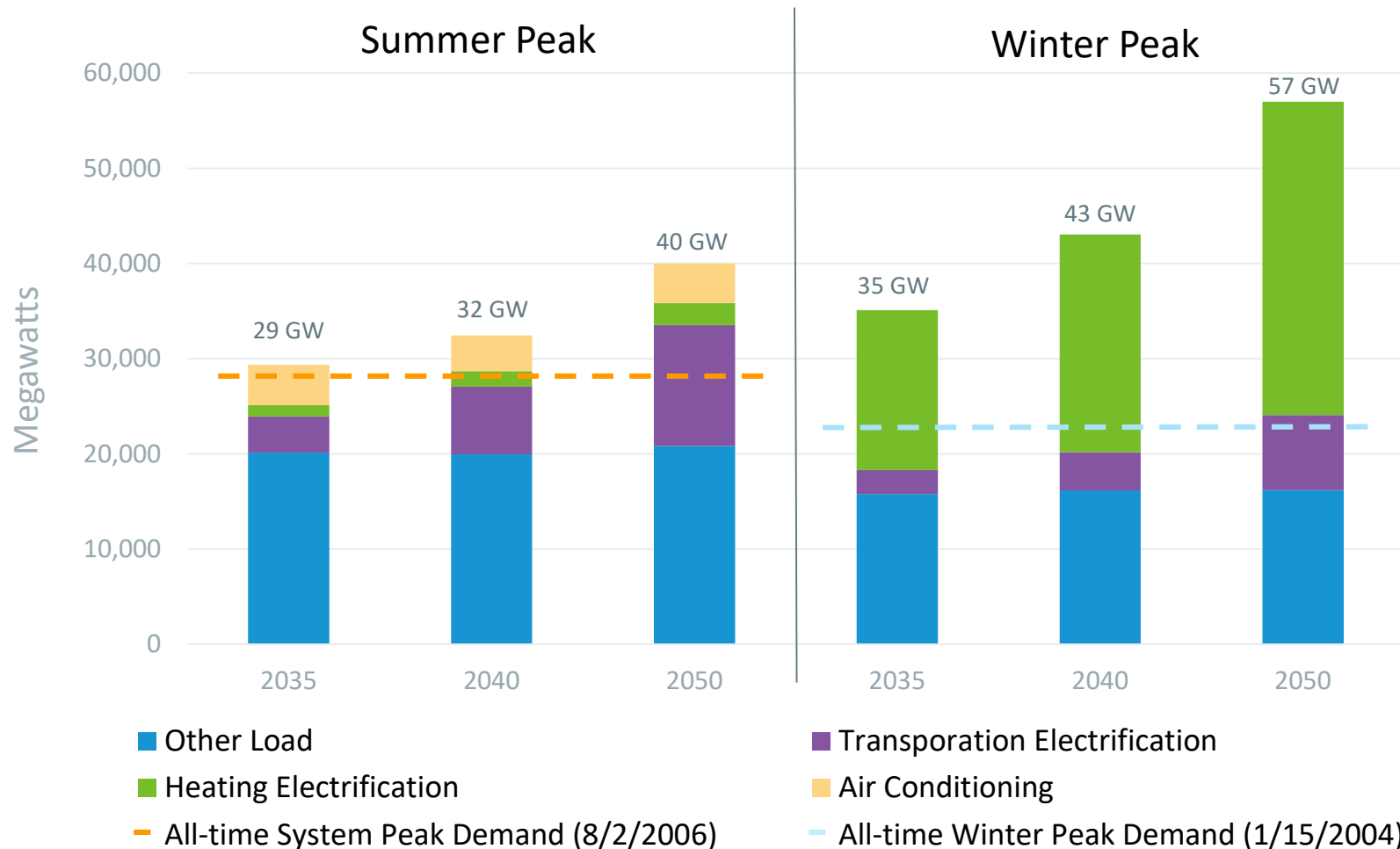
- Initial study scope and assumptions developed **in conjunction with the states**
- Aims to **inform the region** of the amount, type, and high-level cost estimates of transmission infrastructure that would be needed to cost-effectively:
  - Reliably serve peak loads, including electrified transportation and heating, in a clean-energy future
  - Meet state energy policy requirements and goals, including economy-wide decarbonization
- Looks **well beyond** the ISO's 10-year horizon for transmission planning
- It is ***not*** a plan to build specific projects



The most up-to-date information on the 2050 study is available at the [Planning Advisory Committee](#)

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

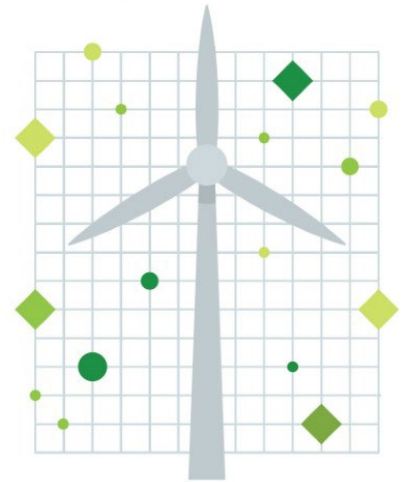
## 2050 Transmission Study



# Future Grid Reliability Study (Phase 1)

## *Stakeholder-led Assessment of the Region's Power System in 2040*

- Examines the implications of a **substantially-changed** New England grid, where clean, intermittent resources comprise a majority of the generation mix
  - Studies whether the ISO can operate the grid reliably under status-quo market mechanisms
  - Considers what products and attributes are missing
- NEPOOL requested this study; stakeholders, including the New England States Committee on Electricity (NESCOE), **developed the scenarios**



The most up-to-date information on the FGRS study is available at

<https://www.iso-ne.com/committees/key-projects/new-englands-future-grid-initiative-key-project>

# Pathways Study: Evaluation of Pathways to a Future Grid

- The ISO modeled four potential pathways to help the region **decarbonize** the New England electric system
  - Net Carbon Pricing
  - Forward Clean Energy Market (FCEM)
  - Hybrid (elements of FCEM and Net Carbon Pricing)
  - Status quo (state procurements of clean energy)
- Report focuses on the tradeoffs in economic and regulatory considerations between approaches
  - All of the studied pathways are capable of achieving substantial levels of decarbonization
- Additional discussion is underway with the states, stakeholders, and the ISO on the path forward for New England



Information on the Pathways study is available at: <https://www.iso-ne.com/committees/key-projects/new-englands-future-grid-initiative-key-project>

# Overview of Studies Supporting Future Grid

- **Weather:** Operational Impacts of Extreme Weather Events
  - Rigorously model likelihood and impact
  - Discussion of initial steps commenced in May, [study](#) is expected to take 15-18 months (continuing into 2023)
- **Transmission:** 2050 Transmission Study
  - What transmission is needed to support renewable/high load future
  - Initial results presented at the [Planning Advisory Committee](#) in March and April
- **Operations:** Future Grid Reliability Study (Phase 1)
  - Examine operational effects of renewable-heavy grid, [initial results available](#)
  - The most up-to-date information is [available here](#)
- **Markets:** Pathways to the Future Grid
  - Evaluate different market options to support a renewable-heavy grid
  - [Final report available](#)
- **Reliability:** Transmission Planning for the Clean Energy Transition
  - How should near-term needs assessments evolve with renewables?
  - [Final report available](#)





## Key Takeaways

- New England's power system has undergone a significant shift in the resource mix
- State policies are driving further investments in renewable and clean energy
- Electricity demand will increase significantly with the electrification of the heating and transportation sectors
- ISO New England is working with the states and stakeholders to support the region's clean energy transition

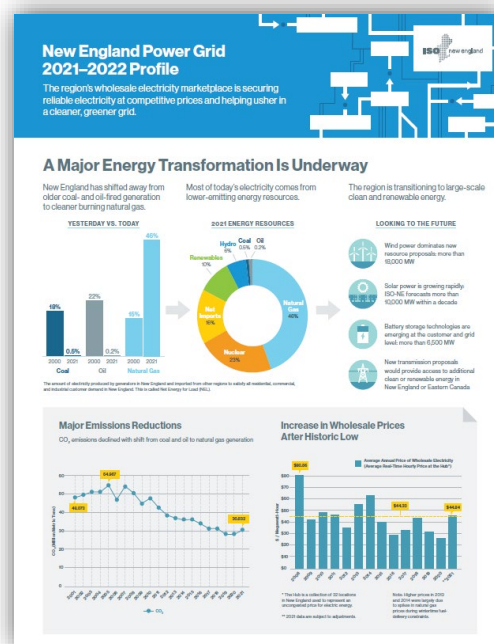


# ISO New England Releases Several Publications



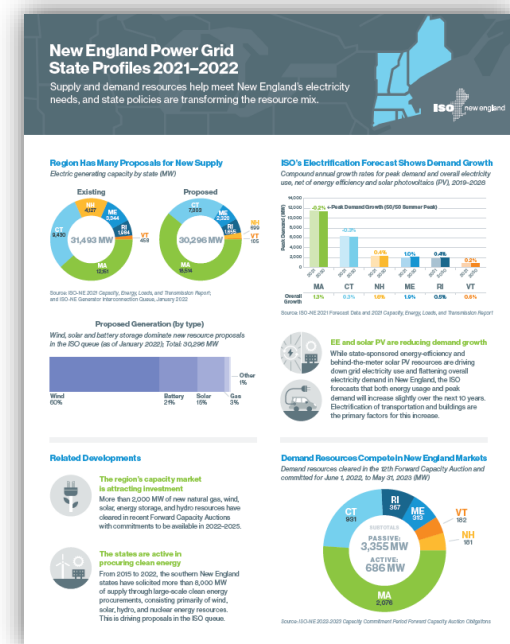
## 2021 Regional Electricity Outlook

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: 2021 Report, 2022 Meetings

- On March 9, the ISO and the CLG Coordinating Committee posted the **2021 annual report**
- **2022 meeting dates:**
  - June 9
  - September 15
  - November 30
- CLG meetings are:
  - A **forum** for sharing information between ISO New England and electricity consumers in the region
  - **Developed** by the CLG Coordinating Committee and **facilitated** by ISO New England
  - **Free** and **open** to the public



2021 CLG Annual Report is posted at: [https://www.iso-ne.com/static-assets/documents/2022/03/2021\\_report\\_of\\_the\\_consumer\\_liaison\\_group\\_final.pdf](https://www.iso-ne.com/static-assets/documents/2022/03/2021_report_of_the_consumer_liaison_group_final.pdf)

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



# 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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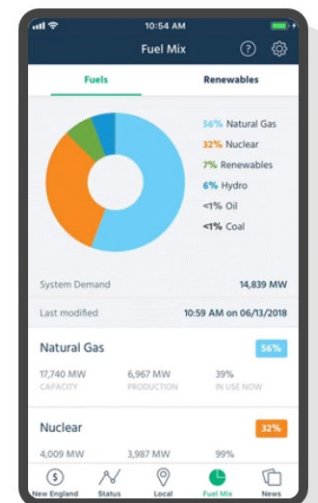
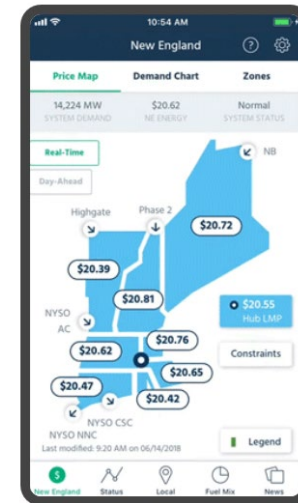


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## Download the ISO to Go App

[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



## A circular collage of icons representing various aspects of sustainable energy and environmental management. The icons include solar panels, wind turbines, factories with smokestacks, recycling bins, electric vehicles, and energy storage batteries. The entire graphic is rendered in a dark blue color.