New England's Extreme Weather Challenges & 2021/2022 Winter Outlook

Business & Industry Association of New Hampshire Energy Symposium

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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*

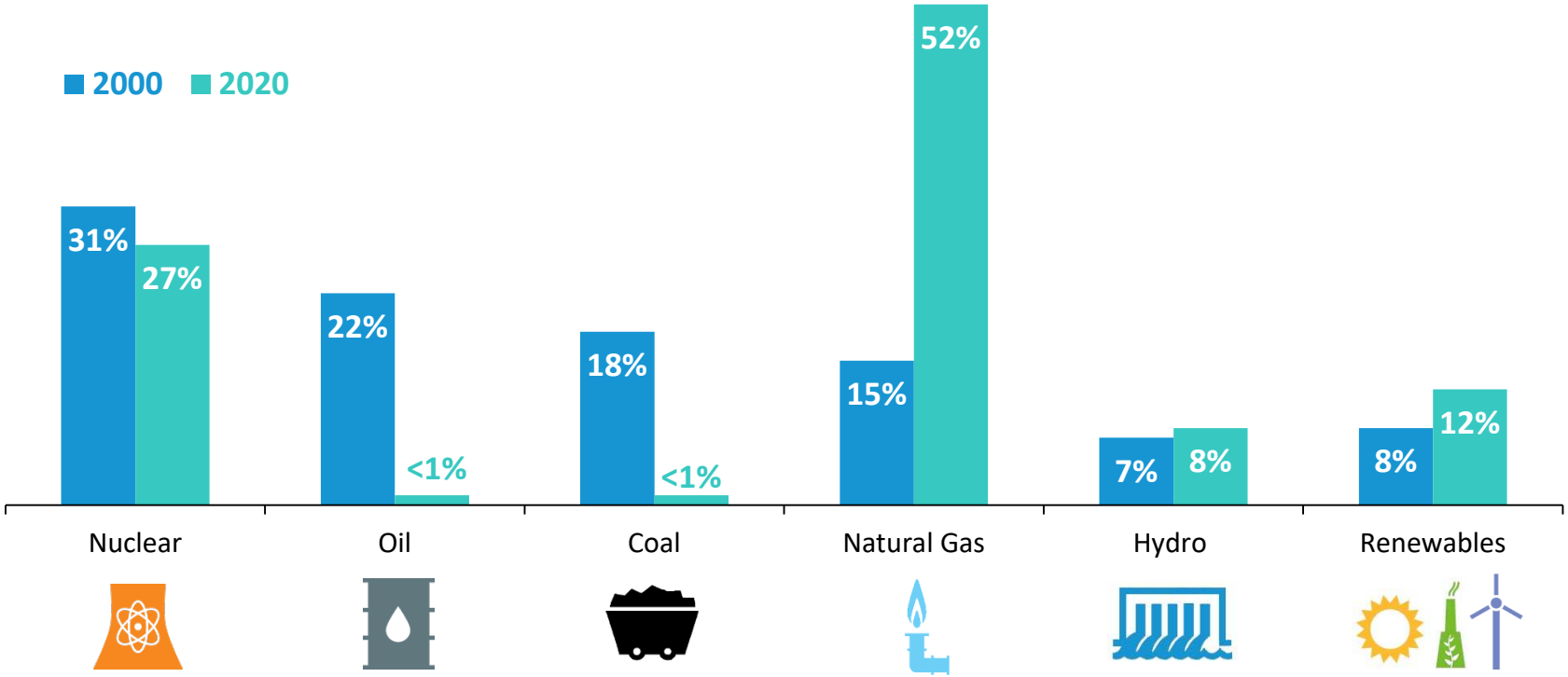
ACHIEVING STATE POLICY GOALS WILL FUNDAMENTALLY CHANGE THE RESOURCE MIX

This will ultimately affect the entire economy as states seek to use clean energy from the grid to electrify the heating and transportation sectors

New England's Power System Has Already Experienced Dramatic Changes in the Energy Mix

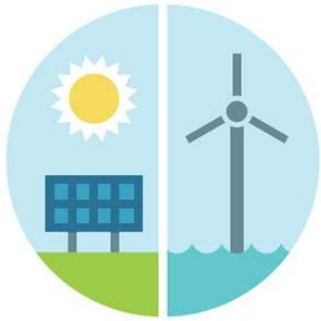
Economic and environmental factors have shifted the region's electricity production

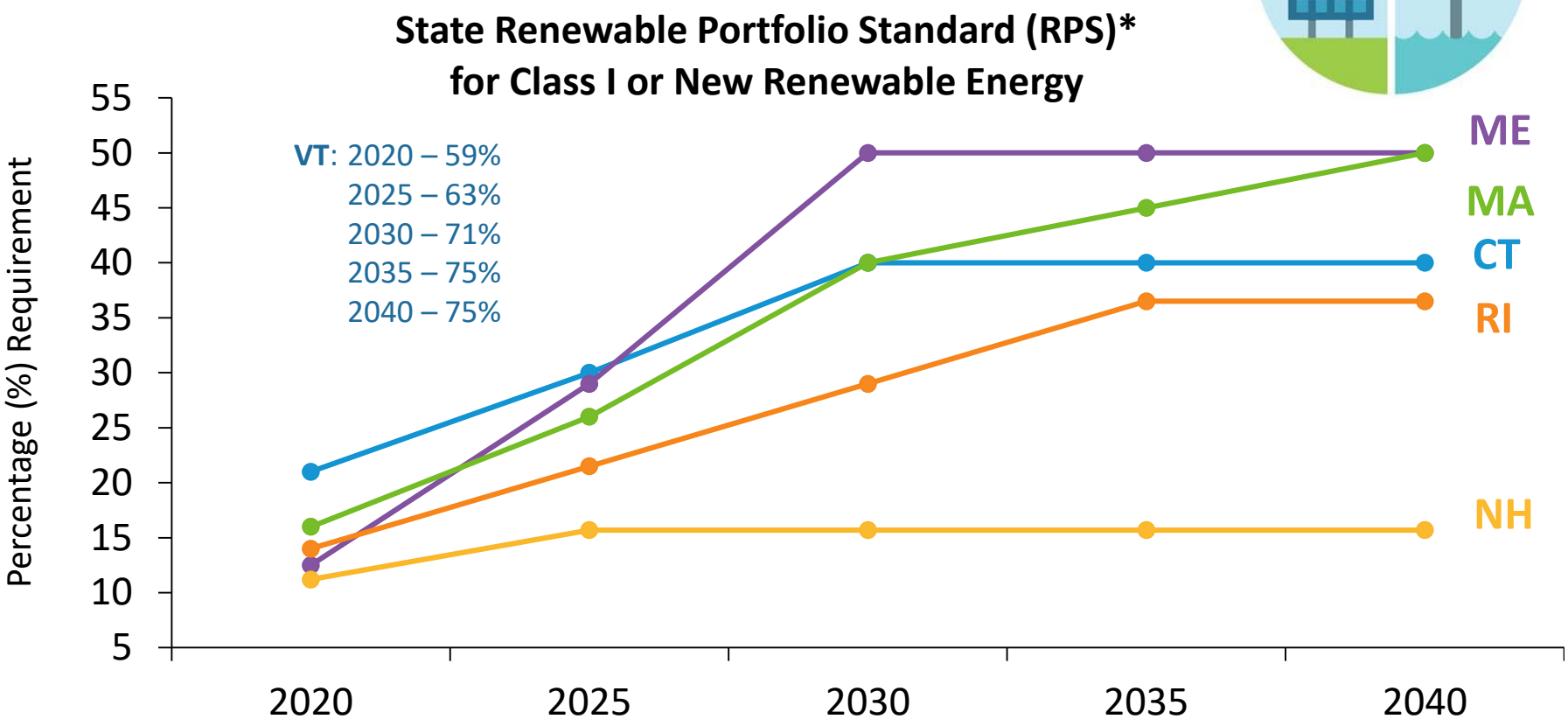
Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2020)



Source: ISO New England Net Energy and Peak Load by Source; data for 2020 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.

State Polices are Requiring Increasing Amounts of Renewable Energy

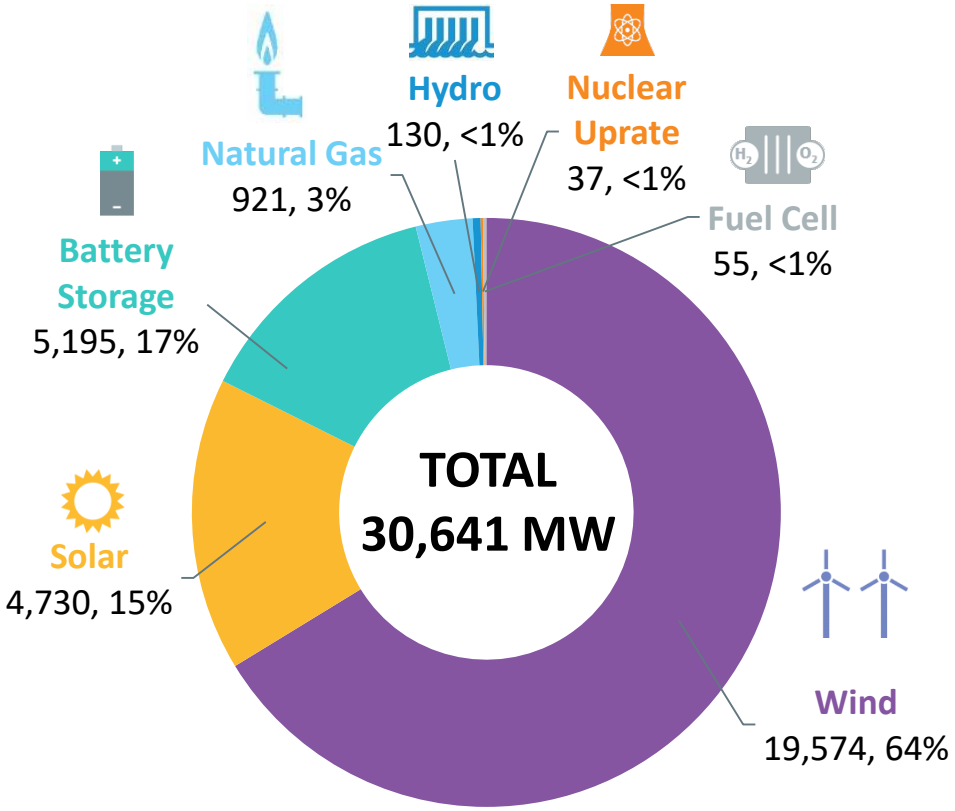




Notes: State RPS requirements promote the development of renewable energy resources by requiring electricity providers (electric distribution companies and competitive suppliers) to serve a minimum percentage of their retail load using renewable energy. Connecticut's Class I RPS requirement plateaus at 40% in 2030. Maine's Class I/IA RPS requirement increases to 50% in 2030 and remains at that level each year thereafter. Massachusetts' Class I RPS requirement increases by 2% each year between 2020 and 2024, 3% each year between 2025 and 2029, reverting back to 1% each year thereafter, with no stated expiration date. New Hampshire's percentages include the requirements for both Class I and Class II resources (Class II resources are new solar technologies beginning operation after January 1, 2006). New Hampshire's Class I and Class II RPS requirements plateau at 15.7% in 2025. Rhode Island's requirement for 'new' renewable energy plateaus at 36.5% in 2035. Vermont's 'total renewable energy' requirement plateaus at 75% in 2032; it recognizes all forms of new and existing renewable energy and is unique in classifying large-scale hydropower as renewable.

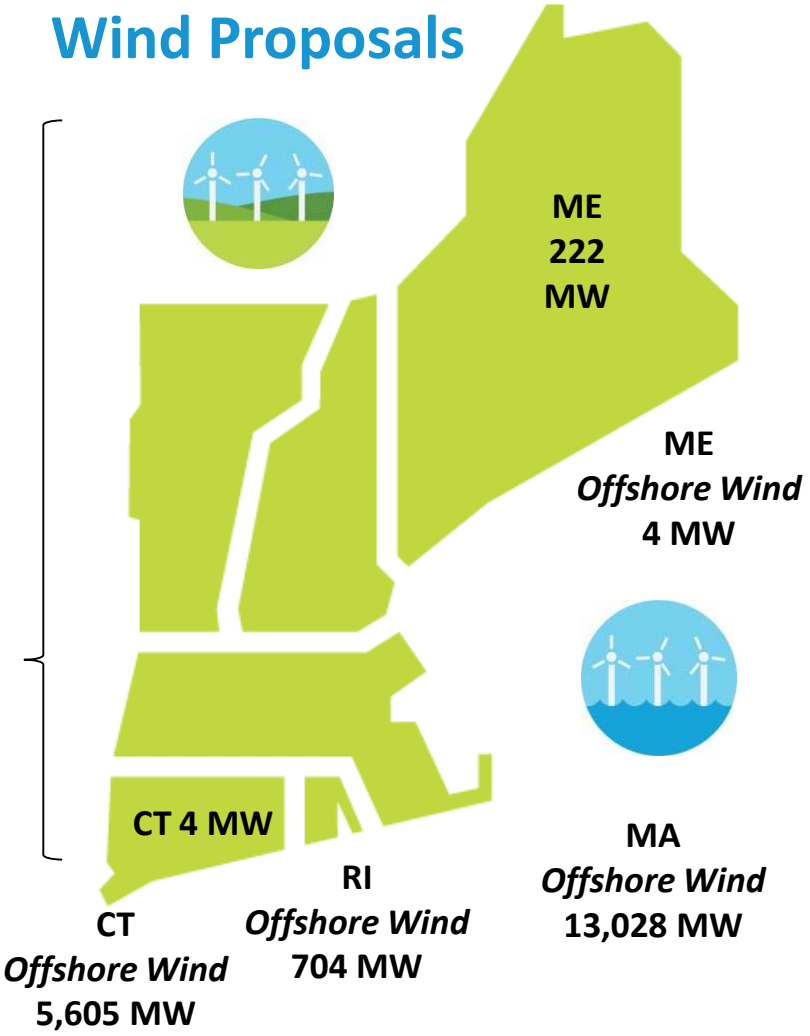
Wind Power Comprises Almost Two Thirds of New Resource Proposals in the ISO Interconnection Queue

All Proposed Resources



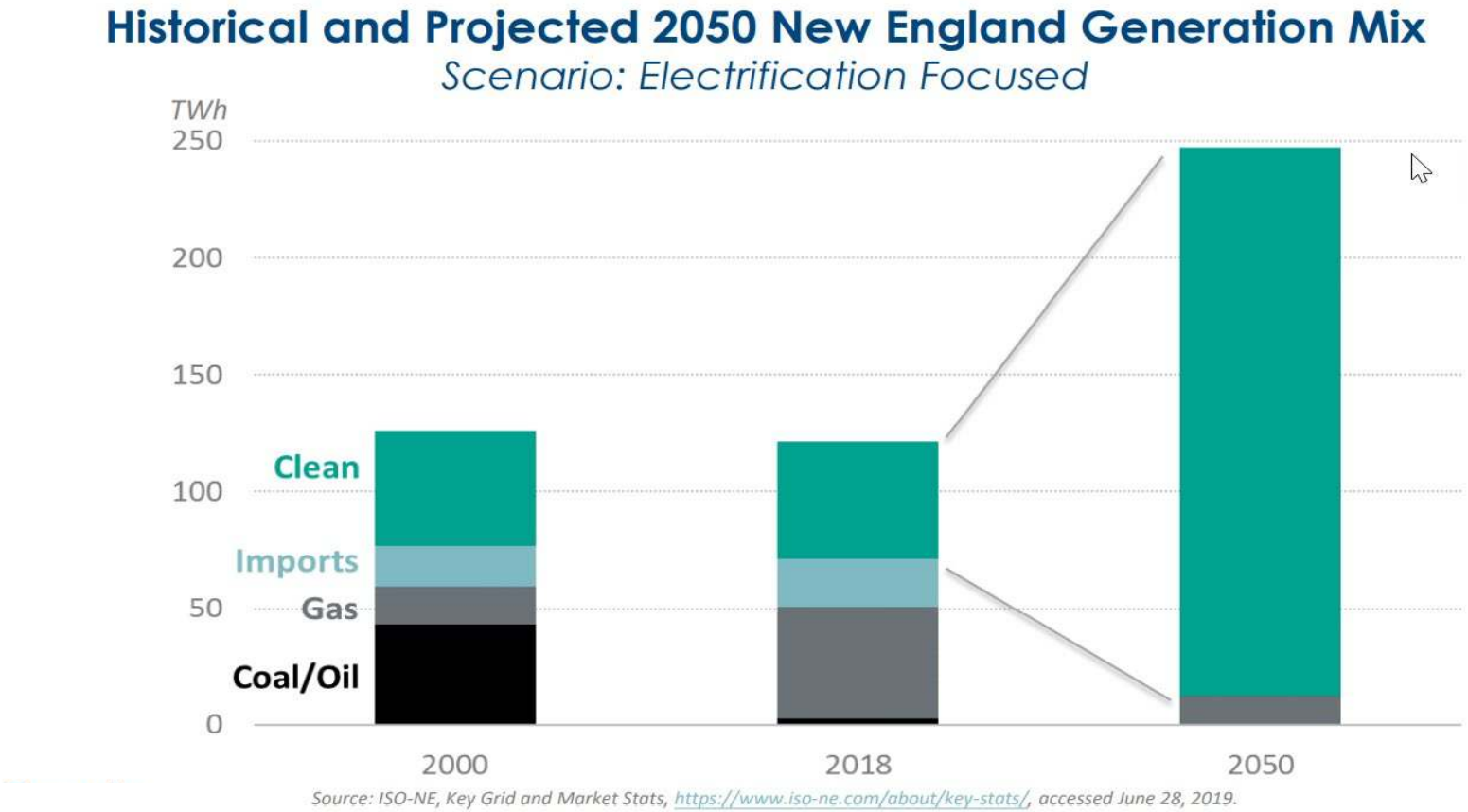
Source: ISO Generator Interconnection Queue (September 2021)
FERC and Non-FERC Jurisdictional Proposals; Nameplate Capacity Ratings
Note: Some natural gas proposals include dual-fuel units (with oil backup).
Some natural gas, wind, and solar proposals include battery storage.

Wind Proposals



Electrification Could Double Regional Electricity Demand by 2050: Brattle Group

This will need to be supplied by clean energy resources to meet state objectives



Source: *Achieving 80% GHG Reduction in New England by 2050*, September 2019, The Brattle Group

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

Source: ISO Interconnection Queue (June 2021)

Major Transmission Investment Will Be Required to Support the Region's Clean Energy Transition

- Developers are proposing 13 elective transmission upgrades (ETUs) to help deliver about **3,400 MW** of clean energy to New England load centers
- Wind projects make up roughly **66%** 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
- We are working with NESCOE to study the investment/cost implications of the states' 2050 Vision for the transmission system
- In July, FERC announced it is revisiting transmission planning and cost allocation nationwide to further enable clean energy
- Changes will be required to our transmission planning tariff, including a cost allocation methodology for this transmission

Source: ISO New England Status of Non-Price Retirement Requests and Retirement De-list Bids (January 2021)

Since 2013, Roughly 7,000 MW of Generation Have Retired or Announced Plans for Retirement in the Coming Years

- Include predominantly coal, oil, and nuclear resources
- Another **5,000 MW** of remaining coal and oil are at risk of retirement
- These resources have played an **important** role in recent winters when natural gas supplies are constrained in New England

Critical Inputs to a Reliable Power System with High Penetration of Renewables

Robust Transmission System

- $12B invested over two decades
- Active planning for the *Clean Energy Transition*, including a look-ahead to 2050 at the request of the New England States

Robust Fleet of Balancing Resources

- Market design improvements are needed to ensure *retention* and *entry* of resources that can balance renewable energy on a routine basis

Robust Energy Supply Chain

- Region needs "on call" **stored energy** to fill ***gaps*** when there is no sun or wind
- **Electrification** of heating and transportation will *increase* this gap until clean energy is available on a large scale

WINTER 2021/2022 OUTLOOK

Winter 2021/2022 Outlook

- New England's demand for electricity is expected to peak at **19,710 megawatts** (MW) during average winter conditions of 10°F, and **20,349 MW**, if temperatures reach below average conditions of 5°F
- The National Oceanic and Atmospheric Administration is predicting **a milder than average winter in New England**
- ISO New England **expects to have the resources needed** to meet consumer demand throughout the winter season, if this forecast holds

Pipeline Gas Availability

- Natural gas pipeline constraints occur when there is **simultaneous demand** for natural gas for heating homes and operating electric generating plants
- **Heating customers are served first** and the remaining gas is available for electric generators
- Region uses other fuels (**oil or LNG**) when pipeline gas is unavailable or prohibitively expensive

Availability of Other Fuels

- Current storage levels of oil and LNG are **lower** than in recent winters, while prices are high globally
- The region has **yet to find** a robust solution to bolster the supply chain for these fuels during inclement weather
- Pandemic-related supply chain issues and adverse weather could **limit deliveries** to the region this winter
- Emissions restrictions could limit the availability of dual-fuel and oil-fired plants

Weather

- NOAA is predicting **above-average temperatures**
- A mild season **does not eliminate risk** of prolonged cold snaps, as evidenced in recent winters
- Prolonged cold snaps **heighten risk** of the probability that the ISO would need to implement emergency procedures

High-Level Scenario Analysis: Winter 2021/2022

If this winter is similar to…

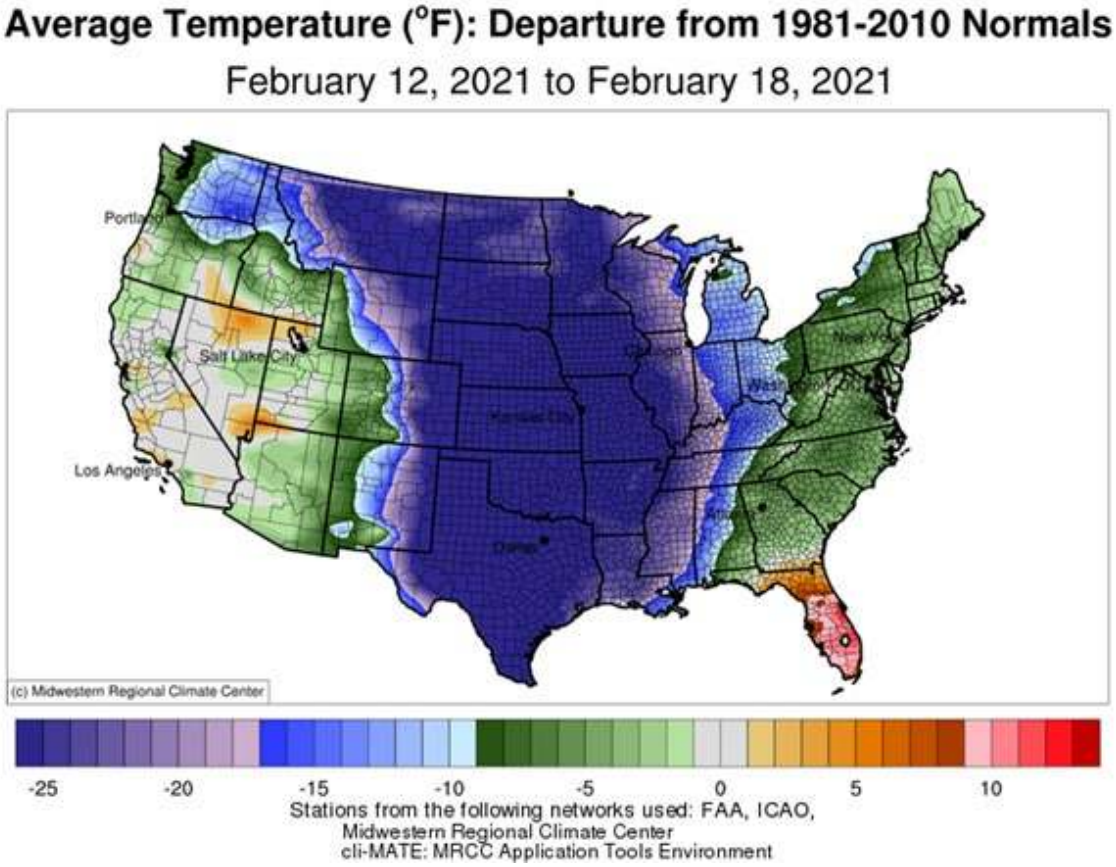
Winter 2020/21 *(Mild weather)*	**Winter 2017/18** *(Two-week cold snap)*	**Winter 2013/14** (below-normal temps and several cold stretches)
The ISO anticipates that the system can be operated reliably *without* the need for emergency procedures	The ISO anticipates that the system can be operated reliably, but *may require* **limited emergency procedures**	The ISO anticipates that it *may require* implementation of **all available emergency procedures**

All three scenarios for this winter:
Assume no significant generation or transmission outages and *limited fuel replenishment*

If the region has ***adequate fuel replenishment*** this winter the ISO anticipates that the system can be operated reliably without the need for emergency procedures

New England Is Not Texas, but Risks Remain

- New England generators and transmission lines are **better winterized**, but this region remains vulnerable during *extreme* and *extended* cold weather
- **Transmission** to neighboring power systems is beneficial; however, a *large-scale weather event* is likely to impact New York and Canada, limiting their ability to export power to New England.



Source: Midwest Regional Climate Center

Preparations and Actions during Winter

- Before and during the winter, ISO New England:
  - Evaluates region's winter supply outlook
  - Meets with generators, industry stakeholders, and governmental officials to review forecasts
  - Prepares short-term forecasts on a rolling 21-day basis to identify potential energy shortfalls
  - Can take emergency actions to prevent grid collapse
  - May request energy conservation over hours or days to minimize need for emergency actions

A CLEANER FUTURE, BUT CHALLENGES REMAIN

Energy Security Challenges

- Insufficient in-region energy storage, limited access to hydro storage in Quebec, and continued dependence on a fragile fuel supply chain for gas and oil will continue to inject uncertainty into the supply picture
- Offshore wind and increased imports from Canada will help, but remain years away and face development challenges
- Balancing resources will continue to be needed as we become more dependent on wind and solar resources

Future Grid Initiative

- A regional energy strategy is central to achieving the region's climate goals while maintaining a reliable supply of electricity
- ISO New England, the New England states, and industry stakeholders have launched the Future Grid Initiative
- This broad, collaborative effort will define and quantify the trajectory of the region's power system, including quantifying the nature of the services needed to ensure a reliable clean energy transition

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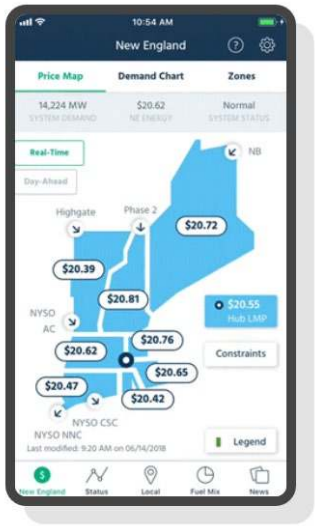

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