October 31, 2023

The Future of Natural Gas in New England

PIERCE ATWOOD LLP

New England's Focus on Renewables & Inter-Relationship with Natural Gas Usage

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New England Greenhouse Gas Reduction Policies

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

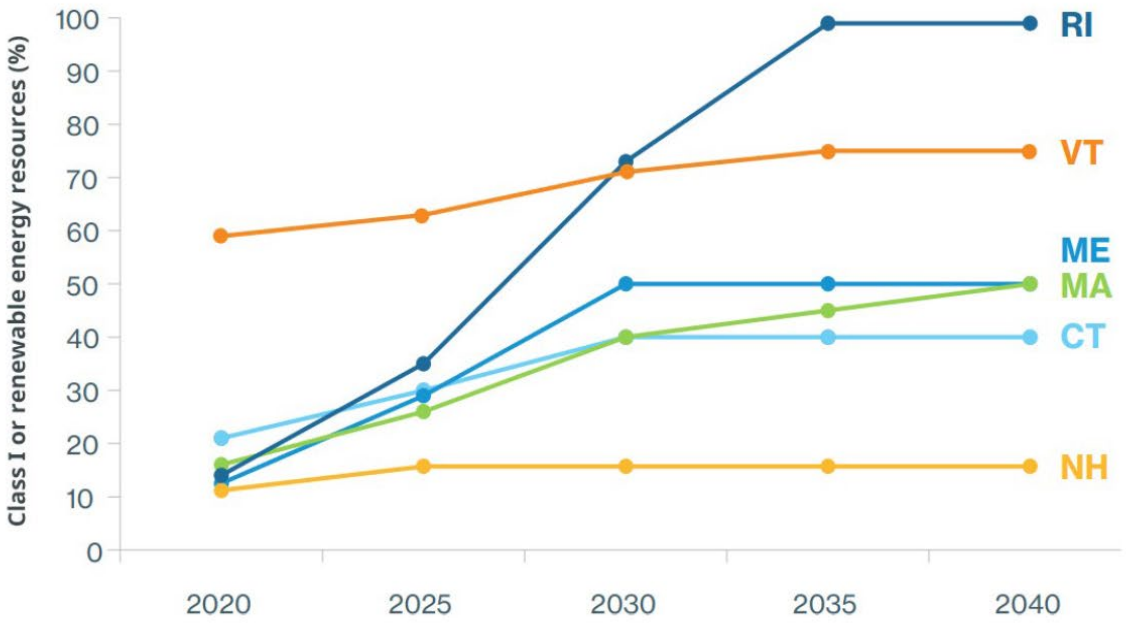
≥80% by 2050	Five states mandate greenhouse gas reductions economy wide: MA, CT, ME, RI, and VT (mostly below 1990 levels)
Net-Zero by 2050 80% by 2050	MA emissions requirement MA clean energy standard
90% by 2050	VT renewable energy requirement
100% by 2050 Carbon-Neutral by 2045	ME renewable energy goal ME emissions requirement
100% by 2040	CT zero-carbon electricity requirement
100% by 2030	RI renewable energy requirement

Source: ISO New England's Role in the Clean Energy Transition, Robert Ethier, March 30, 2023, Slide 5.

New England Renewable Portfolio Standards

Every state in New England has Renewable Portfolio Standard (RPS) requirements that promote renewable energy development.

2023:
Gov. Mills set a new goal of 100% clean energy by 2040



New England states' renewable portfolio standard (RPS) requirements for Class I (new) renewable energy resources.
Source: ISO New England

Source: Maine Climate Council, 9/29/2023, Energy Working Group Update.

New England Energy Generation Sources

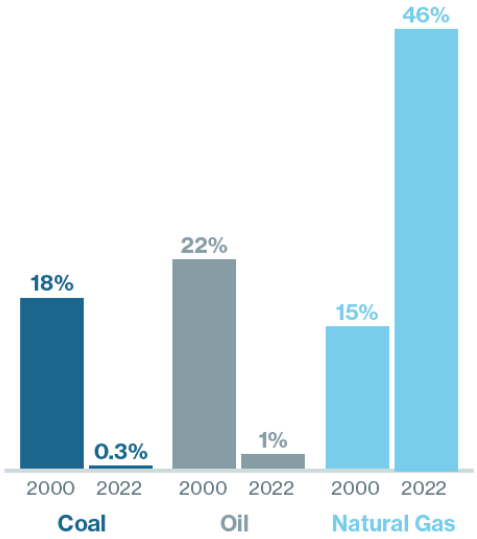
A Major Energy Transformation Is Underway

New England has shifted away from older coal- and oil-fired generation to cleaner burning natural gas.

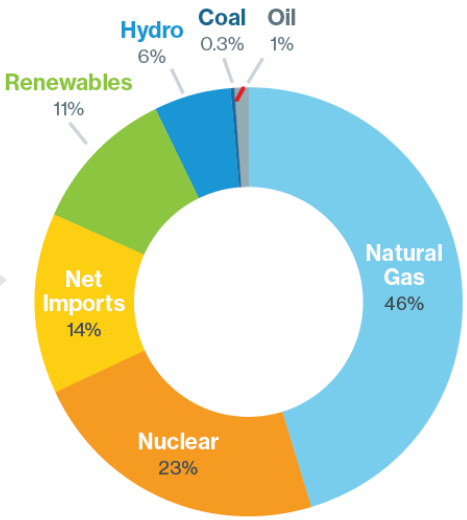
Most of today's electricity comes from lower-emitting energy resources.

The region is transitioning to large-scale clean and renewable energy.

YESTERDAY VS. TODAY



2022 ENERGY RESOURCES



The amount of electricity produced by generators in New England and imported from other regions to satisfy all residential, commercial, and industrial customer demand in New England. This is called Net Energy for Load (NEL).

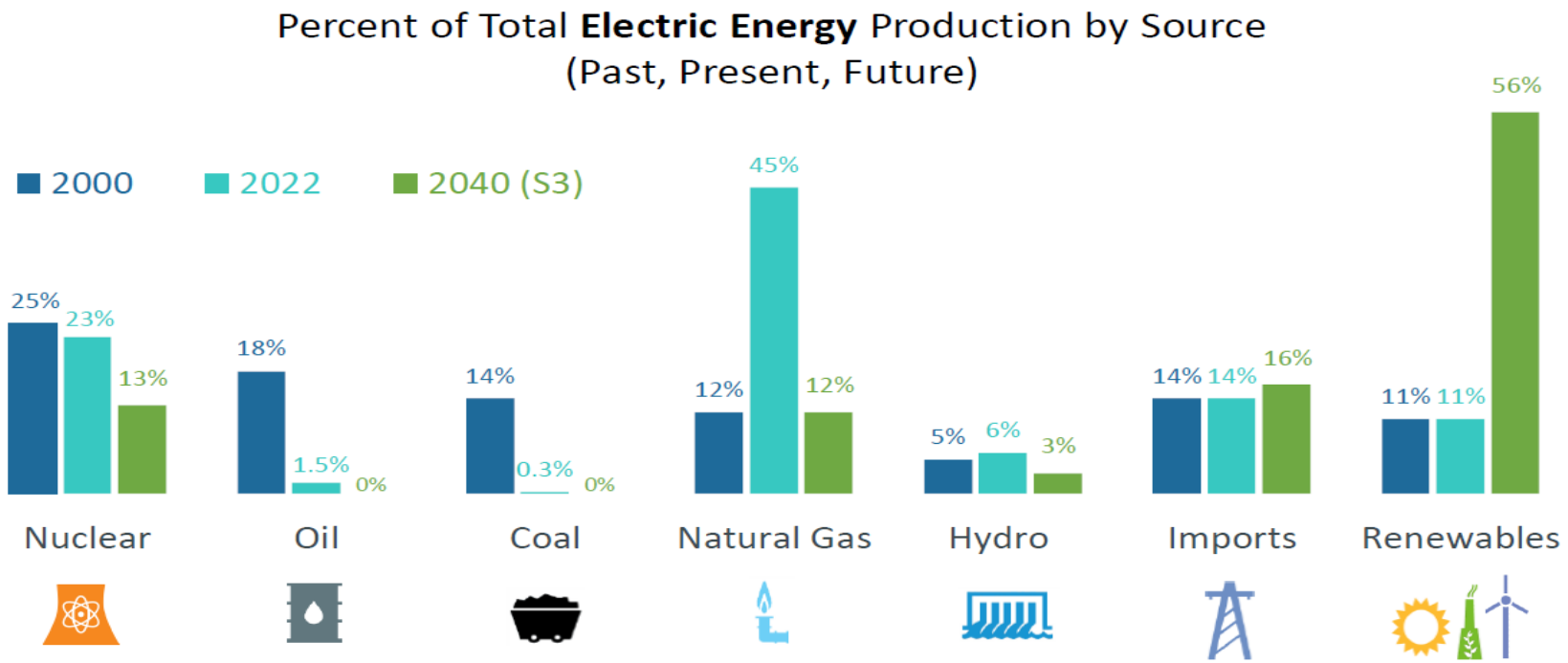
LOOKING TO THE FUTURE

- Wind power dominates new resource proposals: nearly 16,000 MW
- Solar power is growing rapidly: ISO-NE forecasts nearly 12,000 MW within a decade
- Battery storage technologies are emerging at the customer and grid level: more than 11,000 MW proposed
- New transmission proposals would provide access to additional clean or renewable energy in New England or Eastern Canada

Source: ISO-NEW New England Power Grid 2022-2023 Profile, February 2023.

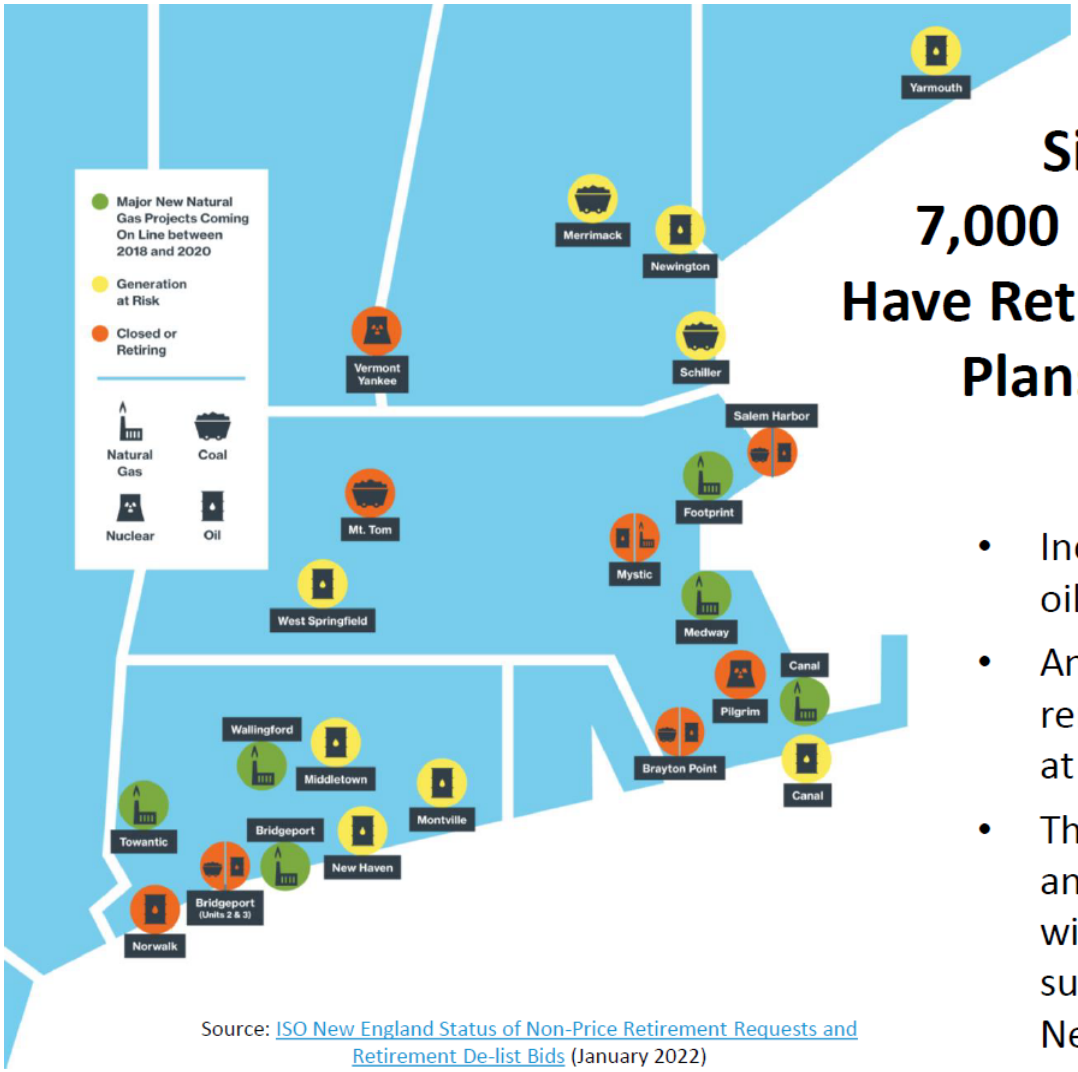
Dramatic Changes in the Energy Mix

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 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.

Source: ISO New England Presentation to Northeast Public Power Association 2023 Conference, New England's Changing Resource Mix and Planning for the Future Grid, Gordon van Welie, August 21, 2023, Slide 8.



Source: ISO New England Status of Non-Price Retirement Requests and Retirement De-list Bids (January 2022)

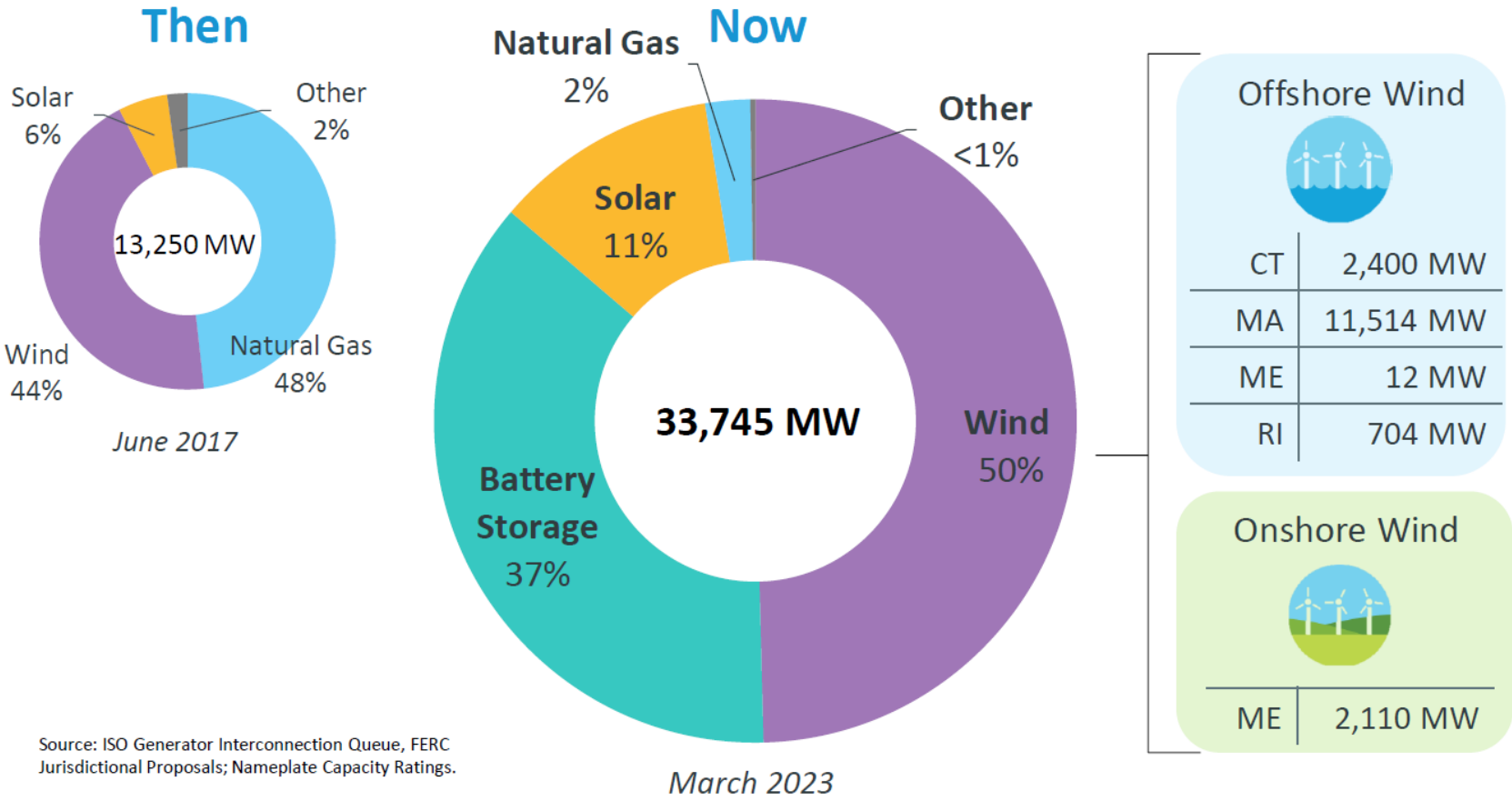
Since 2013, Roughly 7,000 MW of Generation Have Retired or Announced Plans for Retirement in the Coming Years

- 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

Source: ISO-NE Overview and Regional Update to the Maine Legislature EUT Committee, Eric Johnson and Melissa Winne, January 24, 2023.

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

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



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

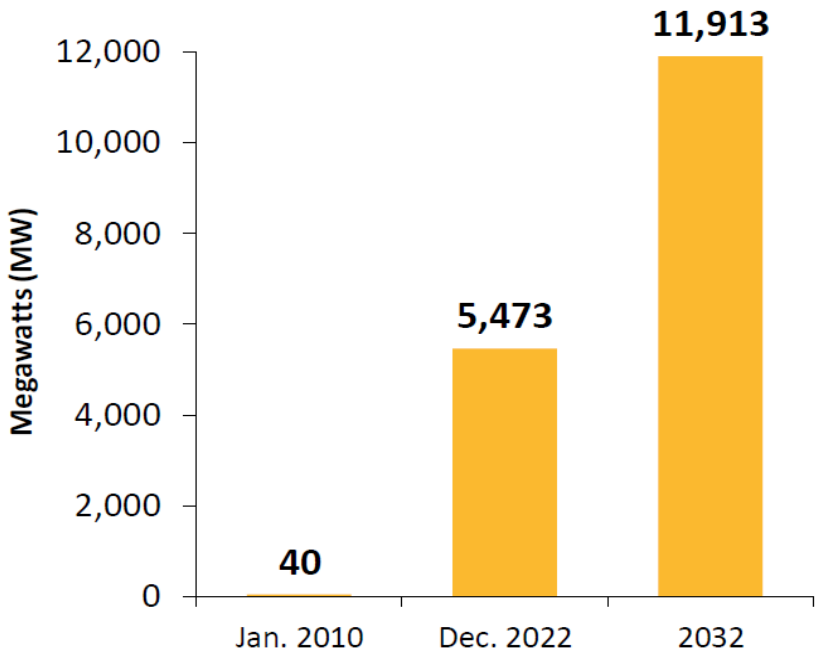
Source: ISO New England's Role in the Clean Energy Transition, Robert Ethier, March 30, 2023, Slide 6.

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})

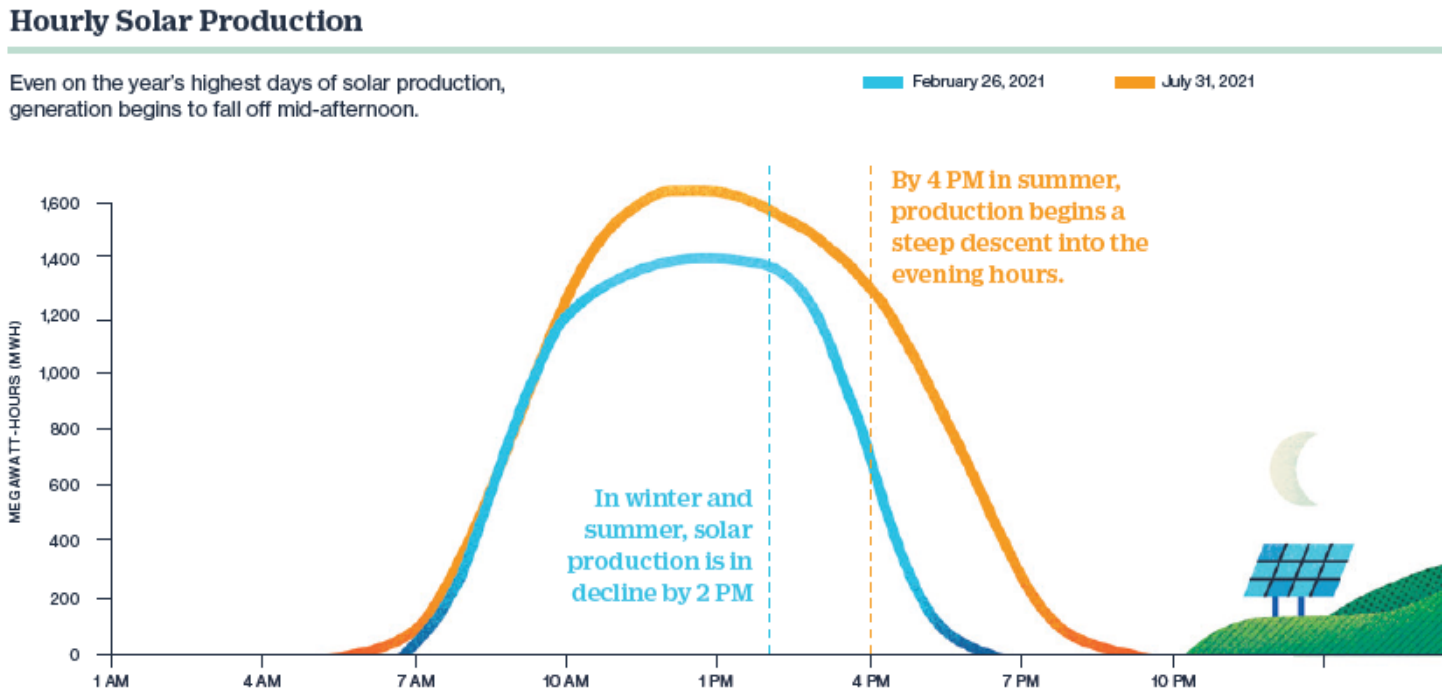


Note: The bar chart reflects the ISO's projections for nameplate capacity from PV resources participating in the region's wholesale electricity markets, as well as those connected "behind the meter." The forecast does not include forward-looking PV projects > 5 MW in nameplate capacity. Source: ISO New 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.

Source: ISO New England Presentation to Northeast Public Power Association 2023 Conference, New England's Changing Resource Mix and Planning for the Future Grid, Gordon van Welie, August 21, 2023, Slide 8.

Need for Balancing Resources

"A robust, secure supply chain for electricity is crucial for the safety and security of the region's 15 million residents. When the winds die down or solar production wanes—in variable, sometimes unpredictable cycles that could last moments or weeks—balancing resources that don't rely on the weather must fill the gaps to keep electricity flowing in New England." - ISO New England



Source: 2022 ISO-NE Regional Energy Outlook, p. 21.

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The 20-Year-Old Gas Capacity Dilemma and its Fundamentals

Rick Smead, RBN Energy LLC

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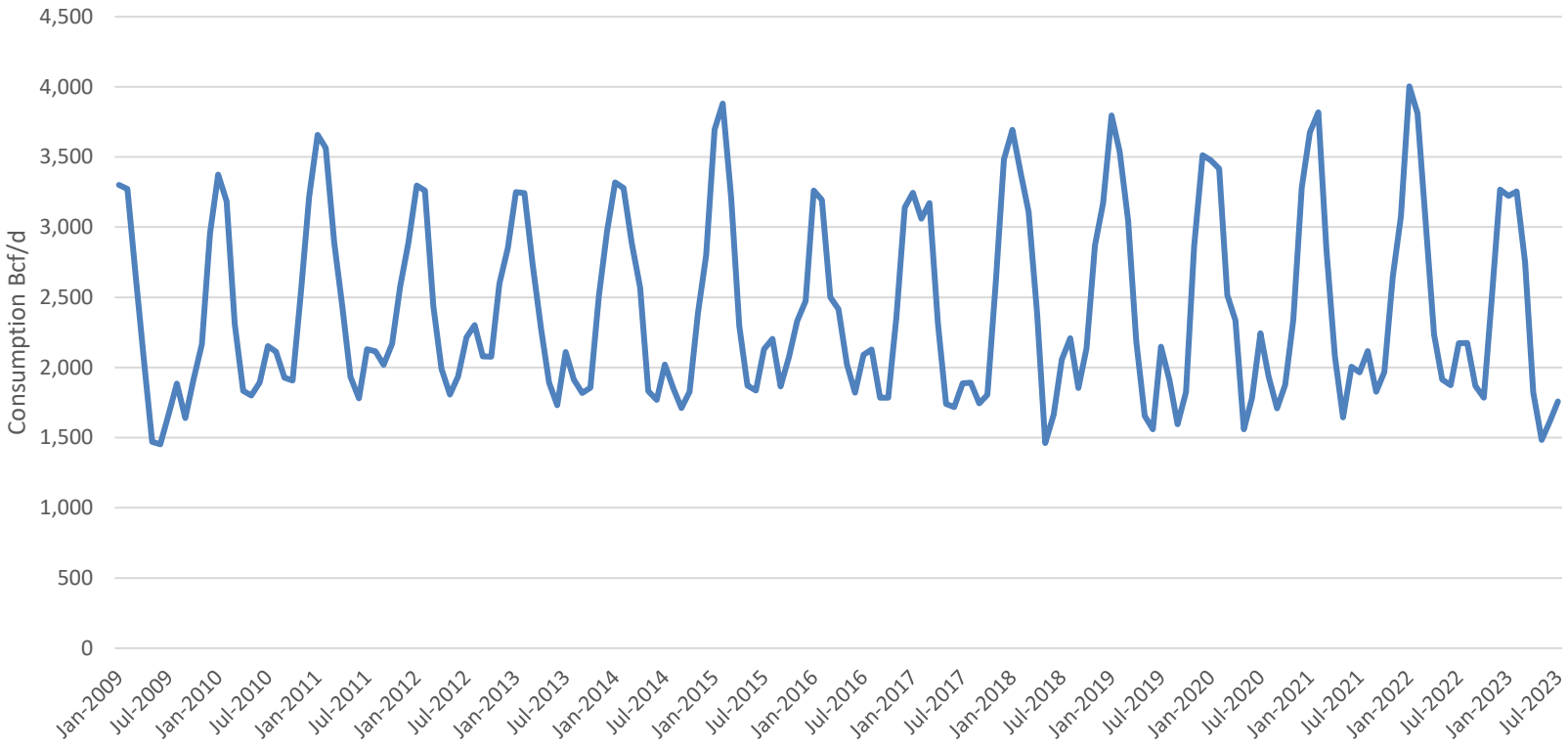
New England NatGas, Monthly Average Consumption



Source: EIA Natural Gas Historic Data

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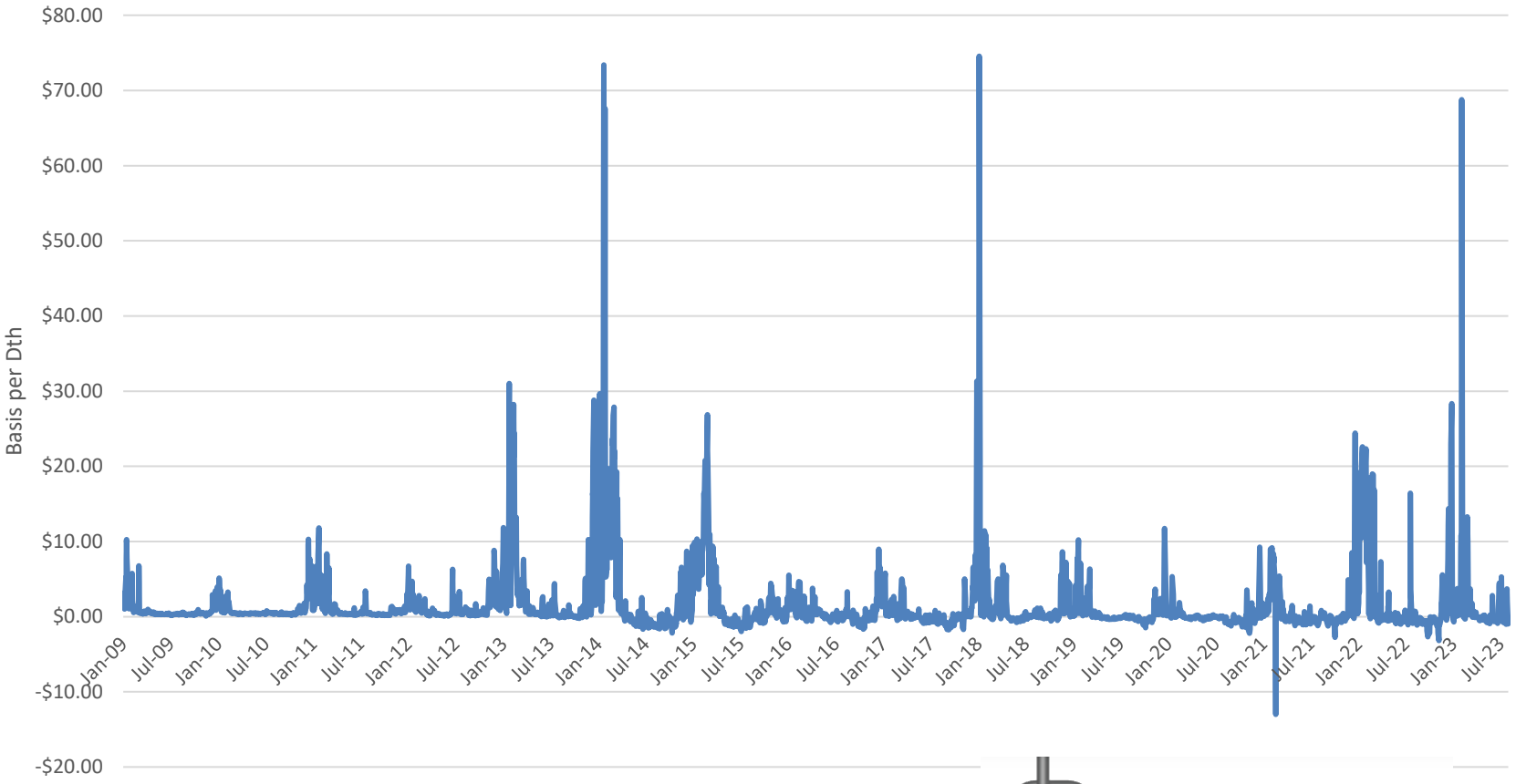
New England NatGas Basis from Henry Hub



Source: Natural Gas Intelligence

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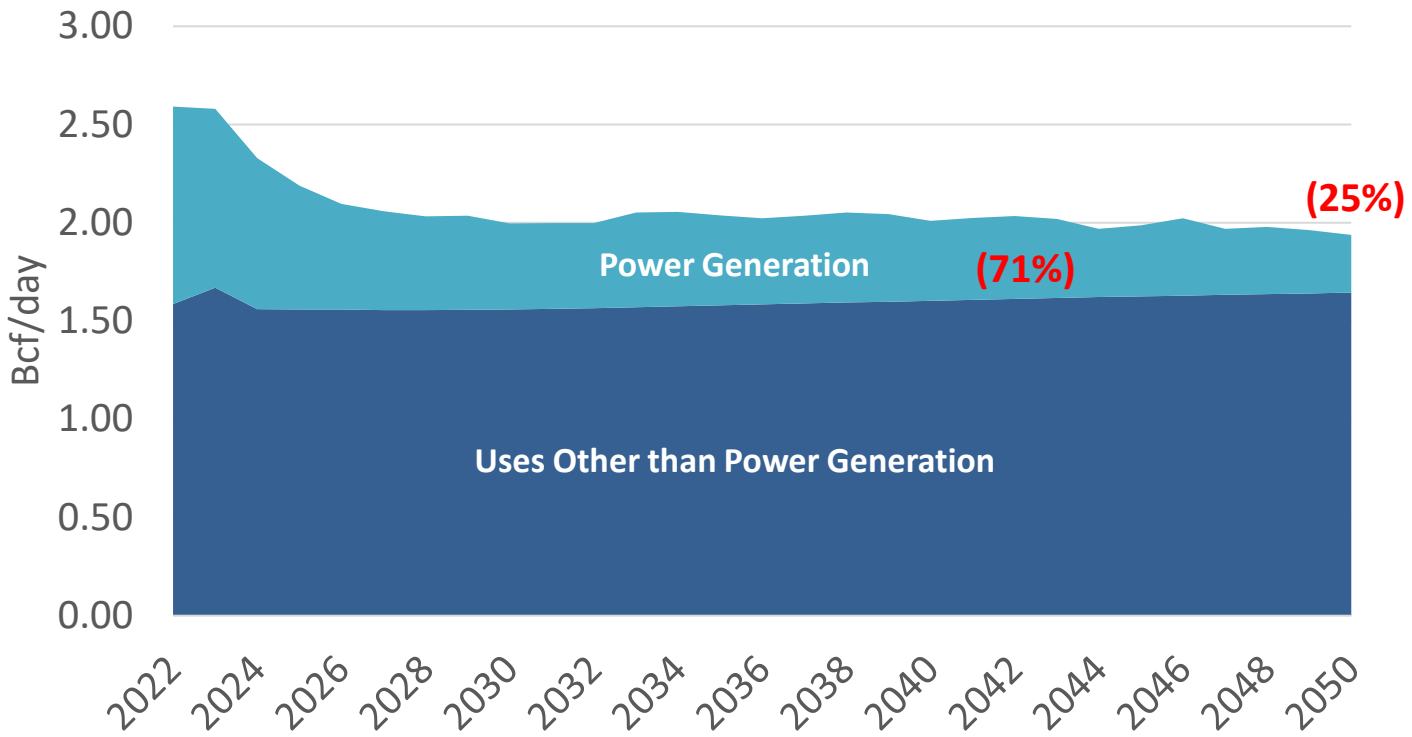
New England NatGas Use, EIA Low-Cost Renewable Case



Source: EIA Annual Energy Outlook, 2023

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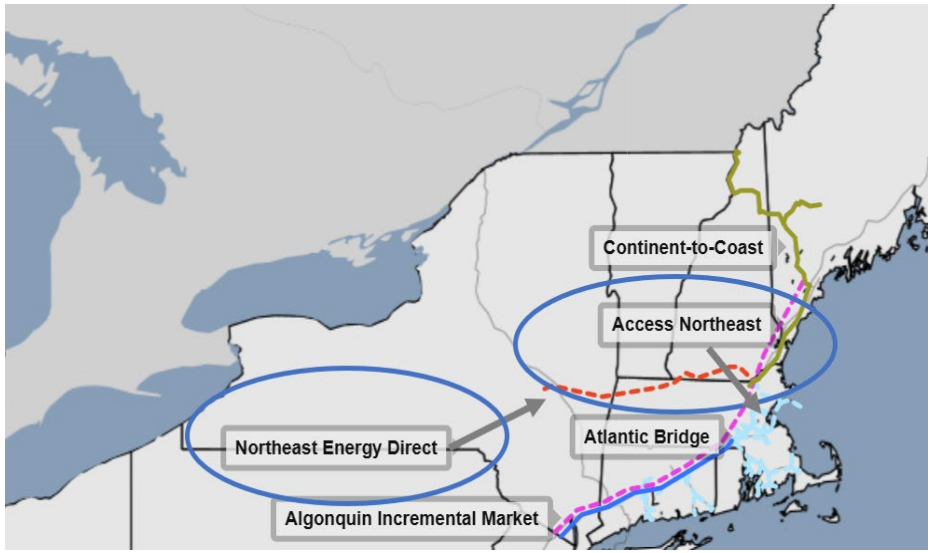
Implications of Renewable Displacement of Gas

- If gas-fired generation is just displaced on average, but not on peak, the economics of new capacity are terrible-year-round bills for capacity needed only for one-to-three days.
- If gas-fired generation is displaced ratably on peak, no new capacity might be needed—in other words, if the peaks are blunted, new pipe can be unnecessary.
- But the odds are that replacement by intermittent renewables will leave gas-fired generation as essential on peak, but not running a lot of the rest of the time.
- This means that the terrible economics of ensuring reliability of peak use only would make renewables really expensive.

Attempts at New Pipeline Capacity Show the Economic Issue

- Lots of proposals have been made.
- The two biggest were NE Energy Direct and Access Northeast.
- Both were opposed.
- But both failed because of lack of subscription, not because of challenges.
- The six states tried to work together to fund new capacity, but the proposal fell through when the MA Supreme Court ruled it unconstitutional.
- Generators won't/can't pay for new firm—LDCs don't need it.



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Pipe is Not a Good Answer for Low Load Factors

- The highest basis observed in 15 years per Slide 3 is $75.00.
- If a large-volume expansion could be done for $1.00 per Dth (it probably can't), the unit cost for a three-day needle peak would be over $120.00.
- In other words, pipe is simply not an economically valid answer to winter needle peaks that only occur infrequently.
- Some form of peak shaving or alternative fuel that can be stored (hydrogen?) would be far more economic.
- Keeping Everett LNG could be one partial solution, if it could be served with low-cost domestic LNG (Jones Act issue).
- Even then, it is questionable whether merchant generators would pay for it, unless ISO-NE makes them.

What is FERC's Role?

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