ENERGY

Production

The Seabrook nuclear power plant accounted for approximately 60 percent of electricity generated in New Hampshire between 2018 and 2022. On average, electricity generated at Seabrook was more than the state consumed in a year.[1] Over the last five years, the state has increasingly relied on natural gas to make up the remaining 40 percent, while the share produced by coal, hydro and biomass declined slightly. In 2022, generation from petroleum products increased to a level not seen since 2006. Disruptions to the global energy market led to supply shortages and increased prices for natural gas in 2022. The two New Hampshire power plants with the capability to use either natural gas or fuel oil to generate electricity used more fuel oil in 2022 to compensate. Electricity generated by renewable sources, such as hydroelectric and wind, remained at a consistent rate (this does not include small-scale solar generation).

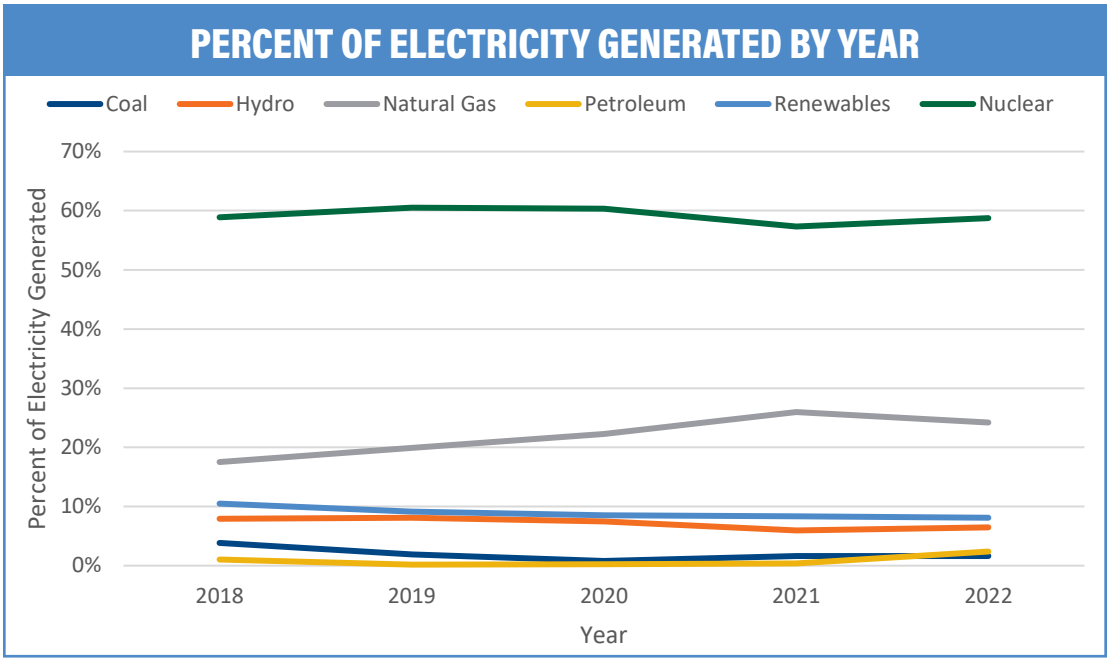
Along with the other New England states, New Hampshire is part of ISO-NE, the organization that operates and manages the New England electrical grid. The other ISO-NE states have climate goals that necessitate the closing and decommissioning most of the fossil fuel plants in the region by 2050[2] and the expansion of renewable energy.

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

Figure 2-3: New England State Emission Reduction and Energy Decarbonization Goals

Source: ISO-New England, "2021 Economic Study: Future Grid Reliability Study Phase 1."



Source: U.S. Energy Information Administration

1 U.S. Energy Information Administration, Electricity Data Browser. https://www.eia.gov/electricity/data/browser/.
2 ISO New England Inc, "2021 Economic Study: Future Grid Reliability Study Phase 1," July 2022. https://www.iso-ne.com/static-assets/documents/2022/07/2021_economic_study_future_grid_reliability_study_phase_1_report.pdf.

New England has historically produced approximately 50 percent of electricity through natural gas.[3] The climate goals of the other states in the region will require substantial development of renewable energy to replace decommissioned natural gas-powered generators. Between 2018 and 2022, New Hampshire accounted for an average of 17.1% of the electricity generated in New England. Although New Hampshire is a net electricity producer, it does not have the mandate to change the sources of electricity used within the state. As the rest of the states transition their own electrical grids, the interconnected nature of New England's electrical grid will result in systemic changes for all member states. New Hampshire will be affected by the restructuring of the region's energy grid.

	Percent of ISO-NE Generation				
	2018	2019	2020	2021	2022
Connecticut	37.4%	40.1%	42.5%	42.8%	40.8%
Massachusetts	25.7%	21.5%	18.8%	18.9%	19.9%
New Hampshire	16.2%	18.0%	16.9%	16.7%	17.8%
Maine	10.7%	10.5%	10.3%	10.6%	12.1%
Rhode Island	7.9%	7.6%	9.2%	9.0%	7.4%
Vermont	2.1%	2.3%	2.2%	2.0%	2.1%

Source: U.S. Energy Information Administration

All electrical grids rely on dispatchable resources, which respond to changes in demand. The current electrical grid depends on fossil fuels to provide baseline electricity generation and as dispatchable resources. Wind and solar electricity generation are considered variable resources, as production is dependent on environmental factors outside of human control. According to ISO-NE, "the variable energy resources in the future grid scenarios lack the controllability and predictability of the region's current dispatchable resources."[4] Ensuring that the renewable-based energy grid is sufficiently reliable is a large challenge for ISO-NE and its members.

Offshore Wind

As part of the development of the United States offshore wind industry, planning continued regarding the establishment of an offshore wind farm in the Gulf of Maine. The location selected for development would connect into the electrical grid in New Hampshire, Maine, or Massachusetts. A report detailing the economic impact for New Hampshire was prepared by Normandeau Associates, Veritas Economics Consulting, and Tetra Tech in September 2023 for the New Hampshire Department of Energy.[5]

This report performed extensive modeling of the ISO-NE electrical grid accounting for: clean energy targets, the closure of fossil fuel plants, offshore wind developments southeast of Rhode Island and Massachusetts and the planned operation of New England's two nuclear plants. The model was run with and without the development of offshore wind in the Gulf of Maine to analyze the impact.

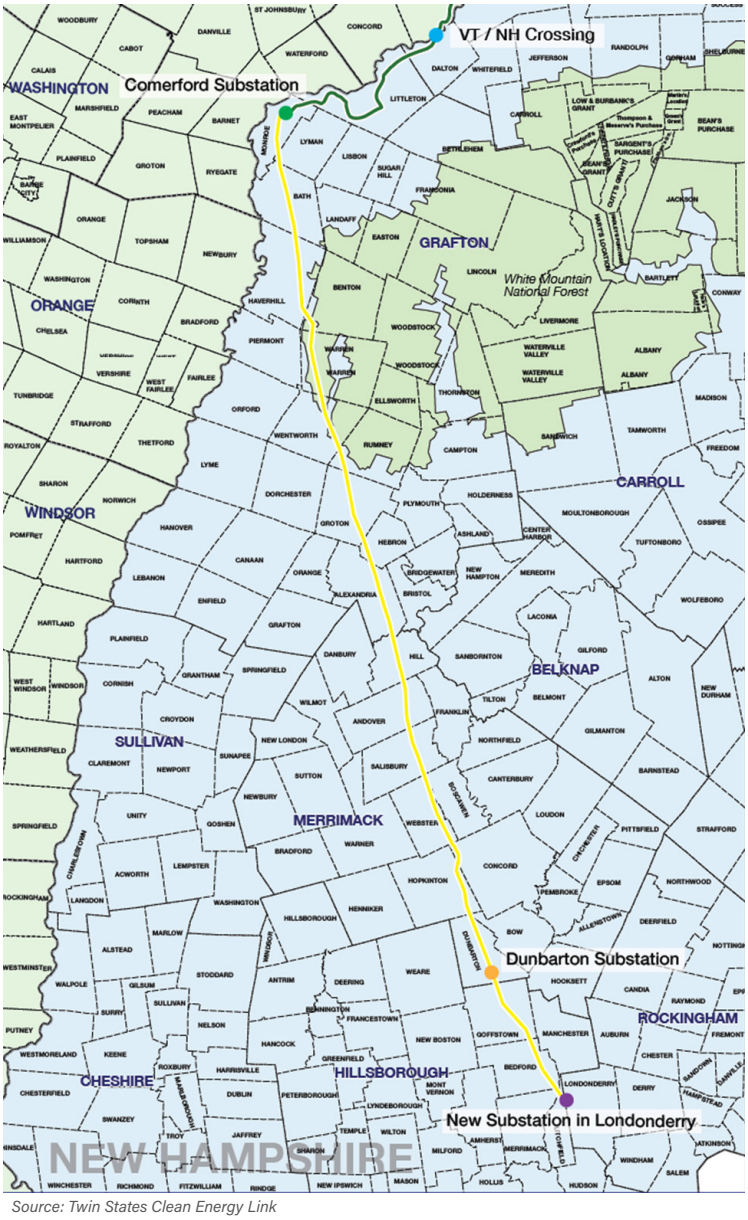
In both models, achieving grid reliability standards "required a significant amount of dispatchable, emission-free, electricity."[6] This requirement increased in 2035 with the planned closure of Millstone Nuclear Plant Unit 2 in Connecticut, which outputs an estimated 8 billion kWh annually.[7] The inclusion of the Gulf of Maine wind farm reduced the distance to the reliability threshold but did not alleviate the issue. Relying solely on offshore wind to compensate for clean energy goals would not be sufficient to ensure required capacity and reliability. Improvements in clean energy storage would also be required to meet the reliability threshold. The proposed approaches included improvements in battery storage, a complex hydrogen storage system, and Canadian hydro power, a dispatchable renewable resource.[8]

3 U.S. Energy Information Administration, op. cit.
4 ISO New England Inc, op. cit.
5 New Hampshire Department of Energy, "Energy Impacts in New Hampshire from Development of Offshore Wind in the Gulf of Maine," September 2023. https://www.energy.nh.gov/sites/g/files/ehbemt551/files/inline-documents/sonh/offshore-wind-potential-environmental-economic-energy-impacts-report.pdf.
6 Ibid.
7 U.S. Energy Information Administration, op. cit.
8 New Hampshire Department of Energy, op. cit.

Twin State Project

The closure of fossil fuel plants will impact the reliability of electrical supply in the region as these plants that typically react to increases in demand will be closed. While the development of offshore wind has the potential to provide a substantial portion of New England's electricity supply, it does not have the capacity to solely ensure grid reliability. One proposed solution is the Twin States Clean Energy Link.[9] This is a proposal for construction of a bidirectional high-voltage line through Vermont and New Hampshire to connect New England to Canadian hydropower producers, improving the reliability of an increasingly renewable energy system.

– Aaron Rockwood



Source: Twin States Clean Energy Link

9 Twin State Clean Energy Link, https://www.twinstatescleanenergylink.com/.

RETAIL SALES OF ELECTRICITY	2018	2019	2020	2021	2022
Sales to Ultimate Customers (million kWh)					
New Hampshire:					
Total	11,046	10,712	10,694	10,867	10,816
Percent change	2.4%	-3.0%	-0.2%	1.6%	-0.5%
Residential	4,641	4,507	4,790	4,832	4,807
Percent change	4.5%	-2.9%	6.3%	0.9%	-0.5%
Commercial	4,443	4,281	4,030	4,107	4,084
Percent change	1.2%	-3.6%	-5.9%	1.9%	-0.6%
Industrial	1,963	1,924	1,873	1,929	1,925
Percent change	0.4%	-2.0%	-2.7%	3.0%	-0.2%
New England:					
Total	118,634	114,458	111,846	113,799	113,998
Percent change	2.8%	-3.5%	-2.3%	1.7%	0.2%
Residential	48,099	46,173	48,328	48,598	48,411
Percent change	4.9%	-4.0%	4.7%	0.6%	-0.4%
Commercial	52,924	51,503	47,469	49,061	49,430
Percent change	1.4%	-2.7%	-7.8%	3.4%	0.8%
Industrial	17,054	16,234	15,583	15,662	15,664
Percent change	1.1%	-4.8%	-4.0%	0.5%	0.0%

Source: U.S. Energy Information Administration, ELMI Analysis. Last Update 9/15/2023

ELECTRICITY GENERATED	2018	2019	2020	2021	2022
Net Electrical Energy Generated, New Hampshire (million kWh)	17,087	18,027	16,351	17,193	18,596
As percentage of energy purchased	154.7%	168.3%	152.9%	158.2%	171.9%
Energy by type (million kWh)					
Coal	660	343	128	284	305
Hydro	1,355	1,462	1,228	1,025	861
Natural Gas	2,992	3,583	3,638	4,466	4,502
Nuclear	10,062	10,907	9,865	9,856	10,922
Petroleum	178	30	42	70	446
Renewables	1,793	1,647	1,393	1,437	1,510
As percentage of total generated by type:[a]					
Coal	3.9%	1.9%	0.8%	1.7%	1.6%
Hydro	7.9%	8.1%	7.5%	6.0%	4.6%
Natural Gas	17.5%	19.9%	22.2%	26.0%	24.2%
Nuclear	58.9%	60.5%	60.3%	57.3%	58.7%
Petroleum	1.0%	0.2%	0.3%	0.4%	2.4%
Renewables	10.5%	9.1%	8.5%	8.4%	8.1%

[a] *Other energy sources, accounting for less than one percent of generation, include municipal solid waste, purchased steam, and miscellaneous technologies.*

Source: U.S. Energy Information Administration, ELMI Analysis. Last Update 9/15/2023

ENERGY AND FUEL CONSUMPTION	2018	2019	2020	2021	2022
Energy Consumption					
Total consumption (trillion BTU)	325.8	319.7	295.7	301.6	
Annual percent change	2.5%	-1.9%	-7.5%	2.0%	
United States rank	46	46	46	46	
Types of energy consumption (percent of total)					
Residential	32.9%	32.9%	34.3%	32.1%	
Commercial	22.5%	22.2%	22.1%	22.2%	
Industrial	12.9%	12.6%	13.4%	13.0%	
Transportation	31.7%	32.2%	30.3%	32.7%	

Fuel Consumed to Generate Electricity (In equivalent barrels of oil)					
New Hampshire total (thousand barrels)	21,661,228	23,806,907	22,135,248	23,155,973	24,957,041
Oil	298	49	61	104	655
Coal	943	509	186	396	469
Gas	3,817,685	4,502,807	4,618,463	5,683,397	5,640,071
Nuclear	17,842,302	19,303,541	17,516,537	17,472,076	19,315,845
Source: U.S. Energy Information Administration, ELMI Analysis. Last Update 9/15/2023					
These data are made available every two years					

ENERGY EXPENDITURES AND PRICES	2018	2019	2020	2021	2022
Energy Expenditures Per Capita	4,310	4,075	3,354	4,080	
United States rank (including DC)	32	32	33	30	

Energy Prices ($ per million BTU)	$24.50	$23.52	$21.48	$25.65	
United States rank (including DC) (1 = lowest)	47	46	45	45	

Petroleum prices ($ per million BTU)	$21.96	$20.72	$17.59	$22.98	
United States rank (including DC) (1 = lowest)	36	34	33	29	

Electric prices ($ per million BTU)	$49.87	$50.28	$48.75	$50.92	
United States rank (including DC) (1 = lowest)	46	46	45	45	
Source: U.S. Energy Information Administration, ELMI Analysis. Last Update 9/15/2023					
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