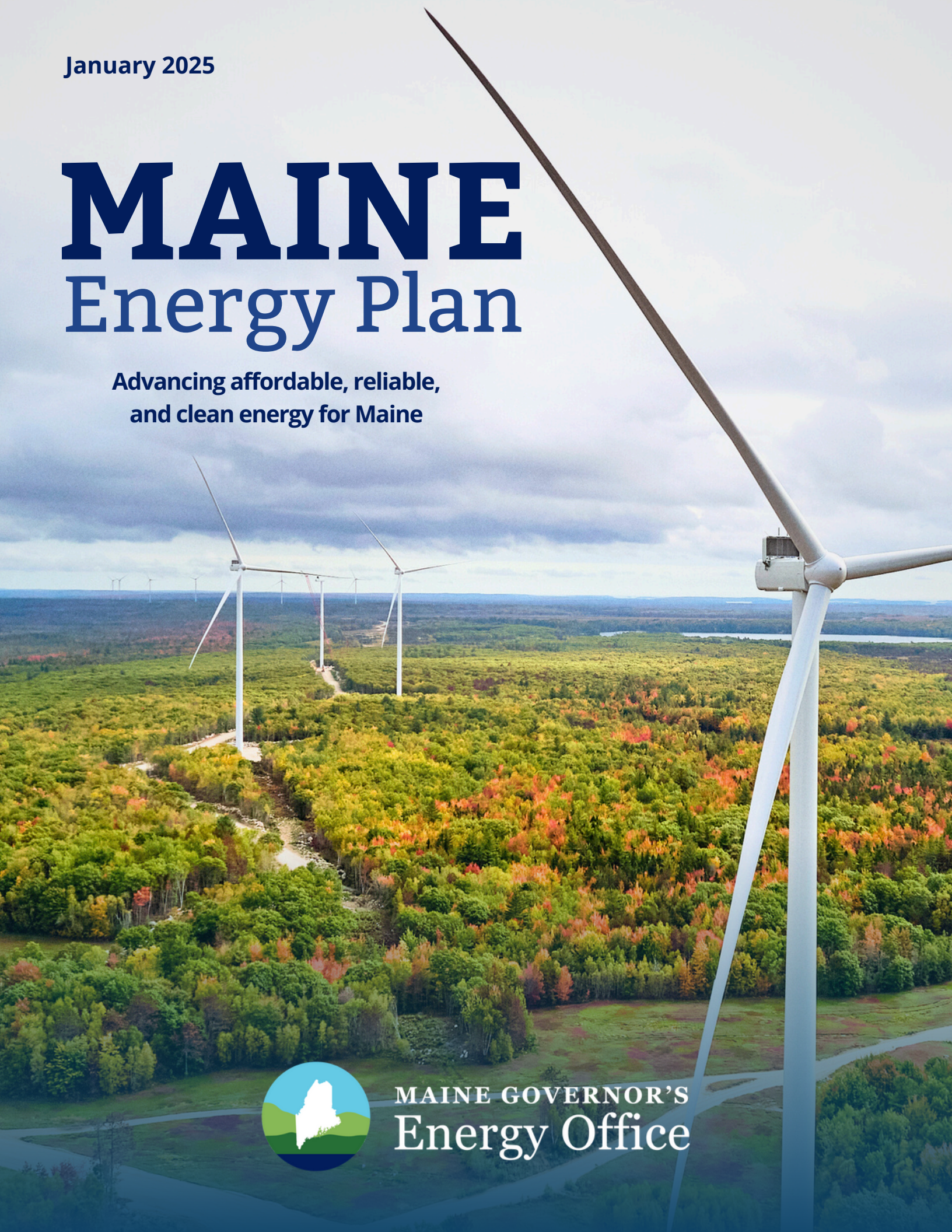
January 2025

MAINE Energy Plan

Advancing affordable, reliable, and clean energy for Maine



MAINE GOVERNOR'S
Energy Office

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Introduction

For decades, Maine people and businesses have experienced significant energy cost volatility due to overdependence on out-of-state fossil-fuels to heat homes and power the economy. From the oil embargo in the 1970s, to major disruptions in more recent years from the COVID-19 pandemic and the Russian invasion of Ukraine, Maine people have been and continue to be directly impacted by energy price swings driven by global fossil fuel markets.

Maine is the most home heating fuel-dependent state in the nation, and over 50 percent of the electricity produced in New England is generated with natural gas. Currently, Maine spends more than $4.5 billion on imported fossil fuels each year. Further, the combustion of those fuels is contributing to climate change, which continues to harm Maine communities by increasing the frequency and severity of extreme weather events and causing temperatures to rise, with 2024 being the warmest year on record.

As a heavily forested, rural state, Maine faces frequent and widespread electricity outages that impact residents and businesses directly. In 2023 and 2024, Maine experienced several winter storms which received federal disaster declarations. These storms devastated communities across the state and resulted in more than $90 million in damages to public infrastructure. Electric utilities have needed to request significant reimbursement funds to cover costs associated with storm recovery, which are ultimately passed onto ratepayers.

To mitigate the impacts of future extreme weather and provide greater energy security for people and businesses, Maine must build a modern electrical grid that is reliable and resilient.

In recent years, Maine has made unprecedented progress in deploying clean energy and energy efficiency technologies that are already saving Maine people and businesses money, reducing price volatility and emissions, and creating good jobs. Lower, stable energy prices are not just important for consumers – they can also improve the competitiveness of Maine businesses, attracting growth and further strengthening Maine's economy.

Maine's nation-leading adoption of high efficiency heat pumps and heat pump water heaters has unlocked long sought-after progress to reduce the state's dependence on heating oil – a bipartisan priority of lawmakers for several decades that was set in law in 2011.[1] More electric and hybrid vehicles than ever before are traveling Maine roads, and the state's network of charging stations has rapidly expanded to offer over 1,000 ports to the public. Electrifying end-uses through efficient technologies such as heat pumps reduces total energy costs for Maine households and businesses. While the electrification shift will increase Maine's overall electricity use over time, total energy costs will decrease as Maine people spend significantly less on costly fossil fuels and swap traditional combustion technologies for more efficient electric options.

Continued adoption of heat pumps and electric vehicles, along with additional forecasted growth, will increase net electricity demand in Maine.[2] To meet this demand, existing clean energy resources such as hydroelectricity, wind, and biomass are being upgraded or expanded and new renewable energy technologies such as solar and energy storage are growing across the state, expanding and diversifying Maine's electricity supply in conjunction with other New England neighbors. Maine is also conducting proactive grid planning and making strategic investments in grid resilience and innovation to ensure the necessary infrastructure is in place to meet growing demand and unlock abundant renewable energy resources in the state and region.

While Maine has made significant progress on each of these fronts, there is still work to do. The Maine Energy Plan offers objectives, strategies, and key actions needed to ensure an affordable, reliable, and clean energy future for Maine.

Maine Energy Plan

Maine law requires the Governor's Energy Office (GEO), in consultation with other state agencies and the public, to develop the State Energy Plan. This Energy Plan, developed through an unprecedented rigorous technical analysis and built upon a wide range of engagement activities, outlines a comprehensive plan with a focus on near-term actions to build upon existing statutory requirements.

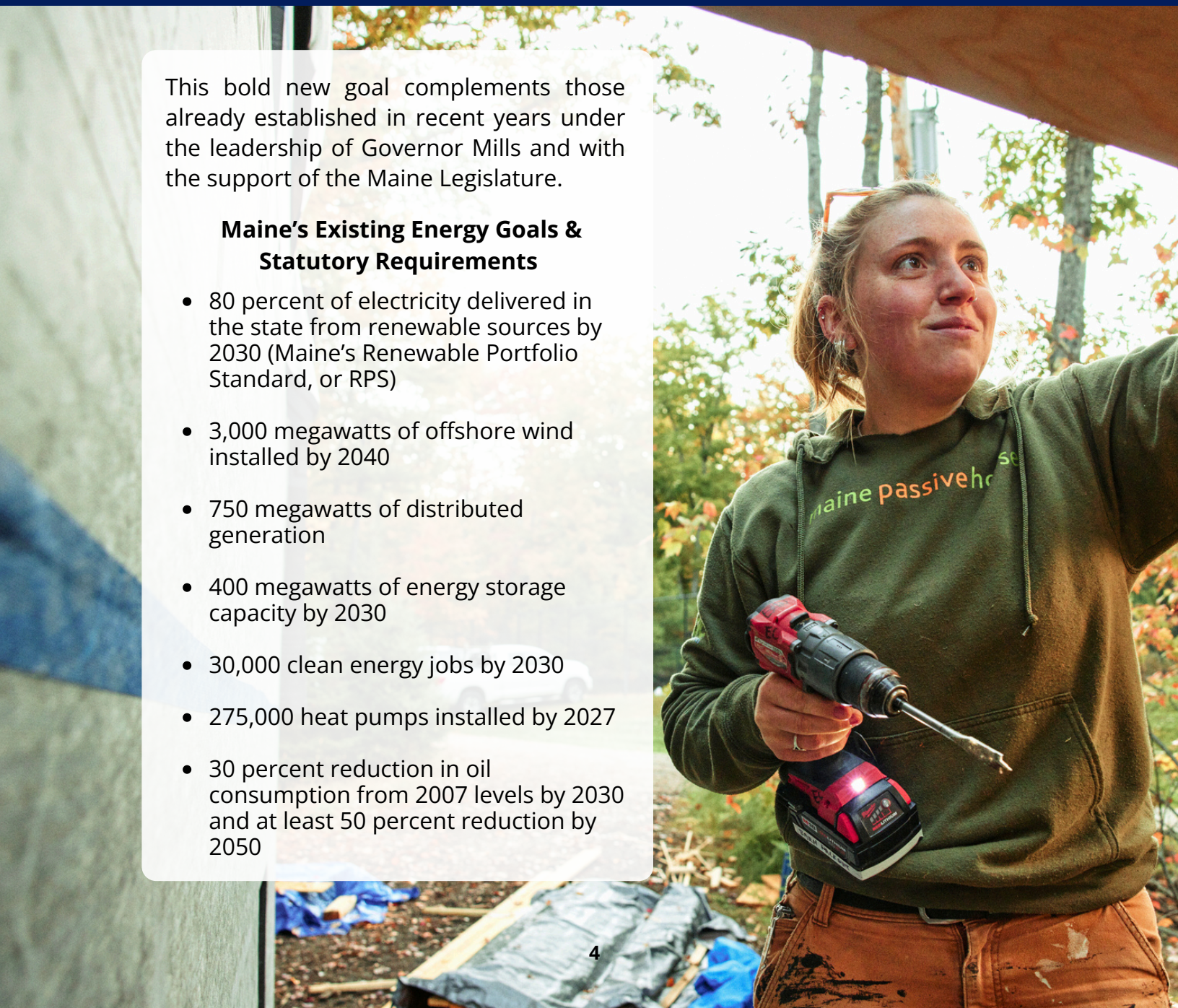
The Maine Energy Plan is underpinned by two foundational elements: a Technical Report outlining achievable pathways to 100 percent clean electricity by 2040, and a robust 18-month stakeholder engagement process. For the Technical Report, GEO invested one-time funding to support the creation of *Maine Pathways to 2040: Analysis and Insights* [3], which for the first time considers Maine's hourly energy needs out to 2050. To gather stakeholder input on the plan, GEO hosted several webinars in 2023 and 2024 with virtual presentations intended to broaden opportunities for public participation. In addition, GEO met in focused sessions with numerous business groups, consumer representatives, environmental and other advocates, workforce development and educational institutions, and state and local leaders to obtain feedback and understand priorities to inform this plan. In October 2024, GEO released a draft of the Technical Report for written public feedback, which strengthened the final version of the Technical Report and this Energy Plan.

Broadly, the Technical Report identifies multiple energy pathways for Maine by simulating future energy systems that meet identified reliability, emissions reduction, and other parameters while minimizing costs. The report demonstrates that Maine's goal of 100 percent clean electricity by 2040 is achievable, beneficial, and results in reduced energy costs across the economy. The report also identifies important considerations related to innovation, emerging technologies, and load flexibility, which are addressed in this Energy Plan.

In February 2023, recognizing the key role clean energy resources already play in advancing Maine toward a cleaner, more affordable, and more resilient energy future, Governor Janet Mills set a bold new goal: 100 percent of Maine's electricity sourced from clean resources by the year 2040.

"The time has come to be bolder…I am directing my Energy Office to draft legislation requiring that 100 percent of our electricity come from clean energy by 2040. By accelerating our pace toward 100 percent clean energy, we will reduce costs for Maine people, create new jobs and career opportunities that strengthen our economy, and protect us from the ravages of climate change."

Governor Janet T. Mills, February 2023



This bold new goal complements those already established in recent years under the leadership of Governor Mills and with the support of the Maine Legislature.

Maine's Existing Energy Goals & Statutory Requirements

- 80 percent of electricity delivered in the state from renewable sources by 2030 (Maine's Renewable Portfolio Standard, or RPS)
- 3,000 megawatts of offshore wind installed by 2040
- 750 megawatts of distributed generation
- 400 megawatts of energy storage capacity by 2030
- 30,000 clean energy jobs by 2030
- 275,000 heat pumps installed by 2027
- 30 percent reduction in oil consumption from 2007 levels by 2030 and at least 50 percent reduction by 2050

The Plan includes an overview of Maine's energy landscape today and offers objectives, strategies, and actions needed to responsibly advance Maine's energy system and meet the state's climate and clean energy requirements.

Maine Energy Plan Objectives

- **A:** Deliver Affordable Energy for Maine People and Businesses
- **B:** Ensure Maine's Energy Systems are Reliable and Resilient in the Face of Growing Challenges
- **C:** Responsibly Advance Clean Energy
- **D:** Deploy Efficient Technologies to Reduce Energy Costs
- **E:** Expand Clean Energy Career Opportunities for Maine people and Advance Innovation

The Maine Energy Plan is aligned with the goals, strategies, and analyses from the state's recently released climate action plan, *Maine Won't Wait*, the Maine Infrastructure Rebuilding and Resilience Commission Interim Report, and Maine's 10-Year Economic Development Strategy. The Plan is built upon recent regional efforts and state analyses on distributed generation, energy storage, offshore wind, renewable energy markets, and Maine's clean energy economy. Implementation of the Maine Energy Plan, like other state-wide plans, will require coordination across state agencies, entities, and communities to ensure success. The Plan will be updated every two years.

Maine's Energy Landscape Today

Energy Consumption

Across all sectors of the economy, Maine is highly dependent on fossil fuels for energy. Maine's total direct fuel consumption is primarily made up of petroleum, wood, and natural gas, according to the latest data from 2021 (Figure 1). Maine also consumes a significant amount of electricity to power the state's commercial, industrial, and residential sectors. The electricity used to power Maine is also derived in large part from fossil fuels. Over half of the electricity generated to power New England's electrical grid, which Maine shares with the region, is derived from natural gas. The following figures utilize data from the U.S. Energy Information Agency (EIA) State Energy Data System (SEDS).[4] Most of Maine's petroleum consumption comes from the transportation and residential sectors (Figure 2). The primary petroleum products consumed in Maine are gasoline, diesel, and heating oil.

Figure 1. Energy Consumed by Fuel Type in Maine (2021)

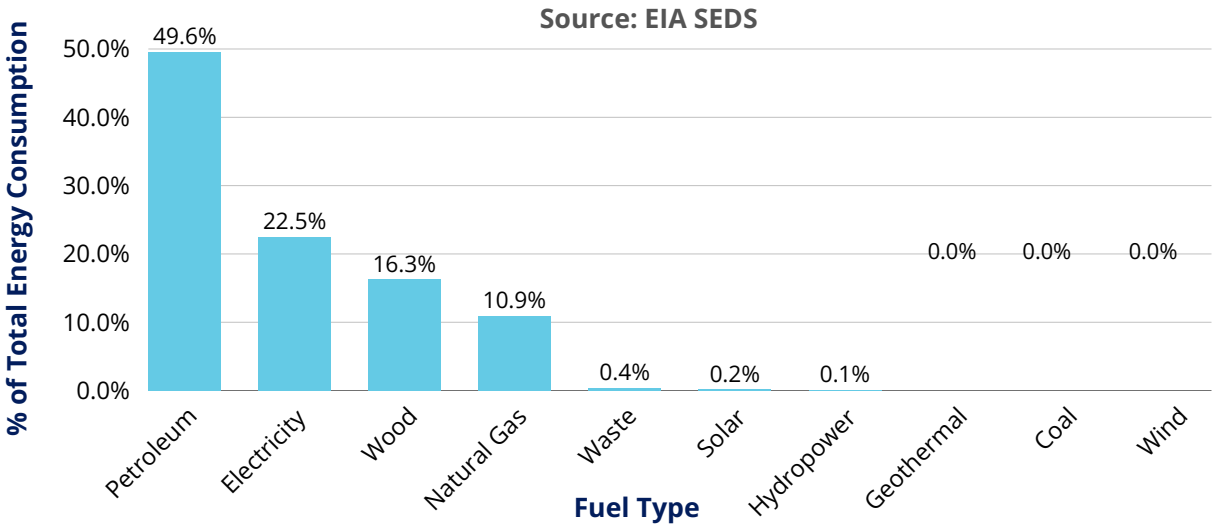
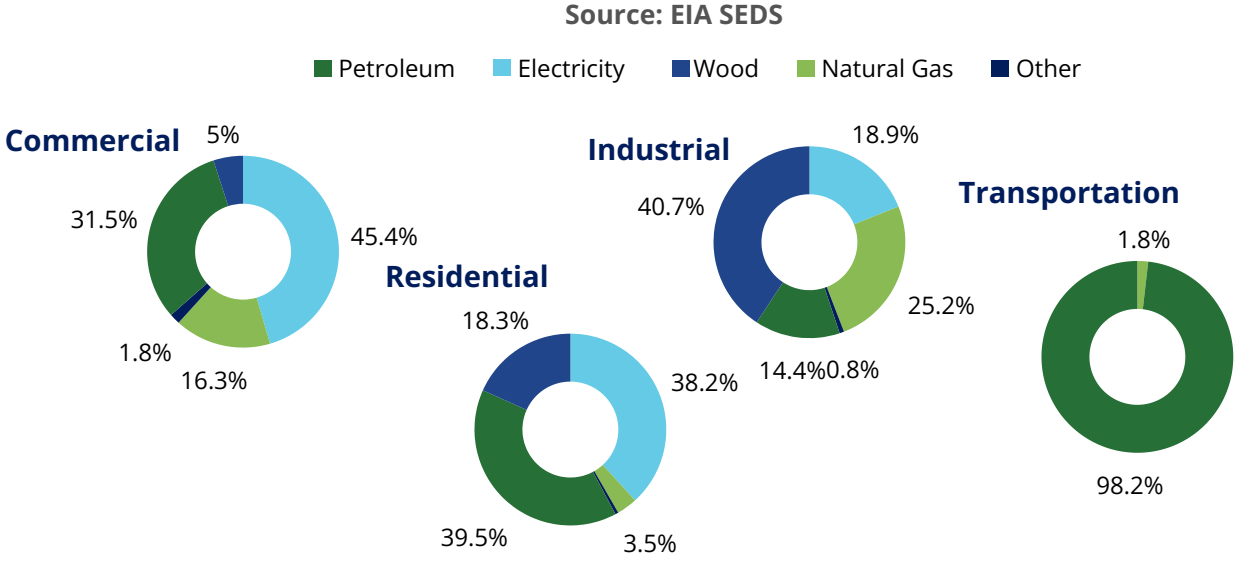


Figure 2. Energy Consumed by Sector and Fuel Type in Maine (2021)



As a large, rural state, Maine residents rely on personal vehicles as a primary mode of transportation. Roughly half of Maine's carbon emissions from fossil fuel combustion come from the transportation sector, and gasoline-powered vehicles are the most common vehicles on Maine roads. Maine consumes more residential heating oil per capita than any other U.S. state (Figure 3). Maine's dependence on petroleum for home heating and transportation costs the state billions annually. In 2021, Maine spent over $4.7 billion on imported fossil fuels, including gasoline and heating oil (Figure 4).

Figure 3. Distillate Heating Oil Consumed by the Residential Sector (2022)

Source: EIA SEDS

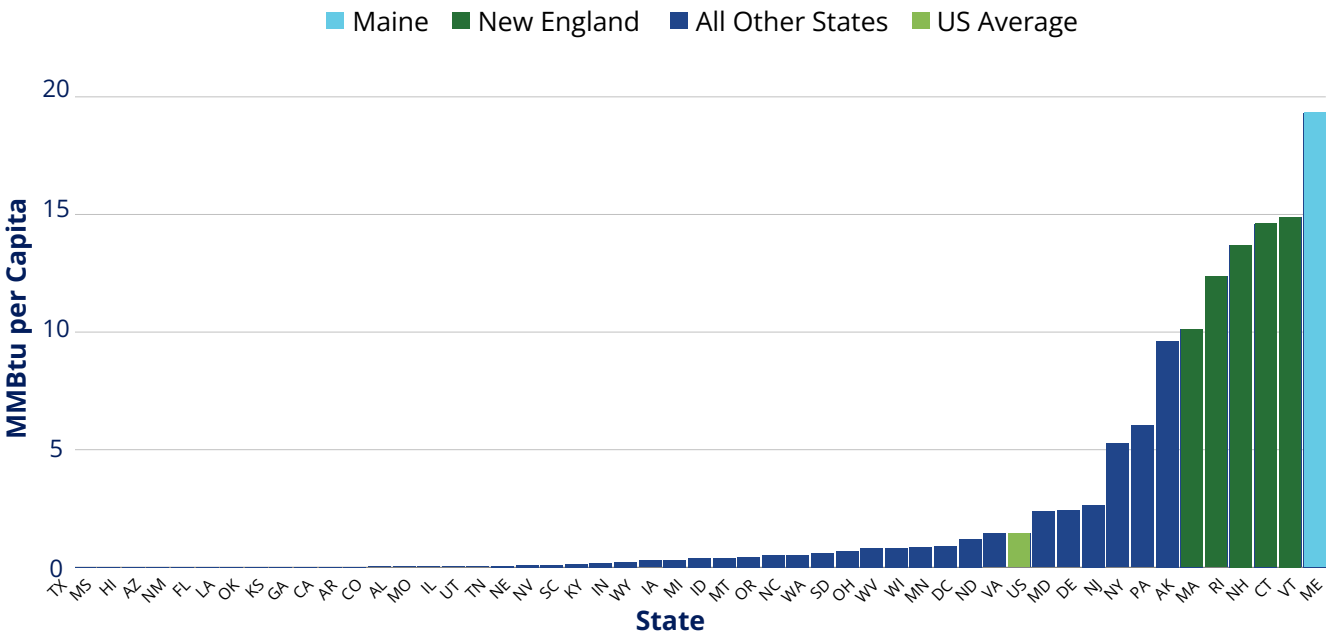
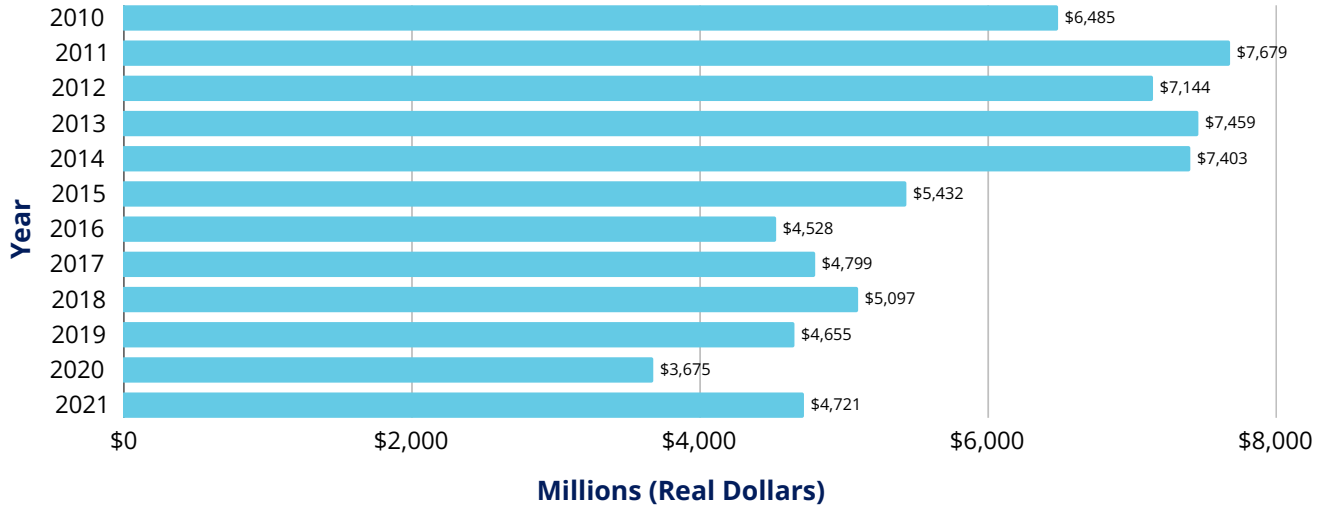


Figure 4. Fossil Fuel Expenditures, Maine

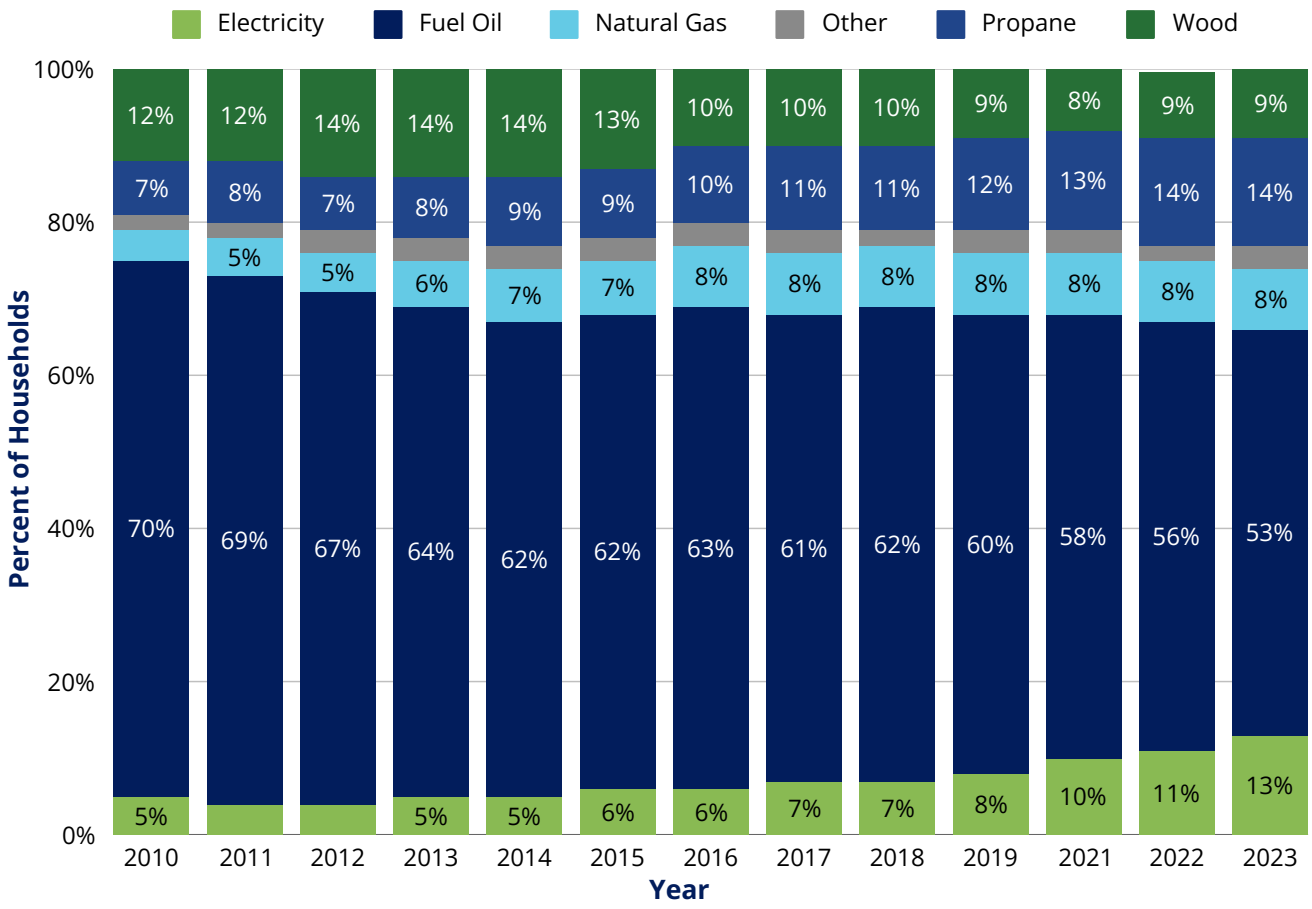
Source: EIA SEDS



While Maine has made significant progress in reducing the share of households reliant on fuel oil for home heating in recent years [5] (Figure 5), the state is still the most heating oil reliant in the nation and also continues to rely heavily on gasoline for transportation. From an energy security standpoint, this over-reliance on imported petroleum makes Maine particularly vulnerable to price shocks that occur in the global fossil fuel market. In 2022, heating oil reached nearly $6.00 per gallon in Maine and kerosene jumped to over $7.00 per gallon following Russia's invasion of Ukraine. Such volatility in global energy markets have implications for Maine's electricity rates as well, which will be covered in the following section.

Figure 5. Share of Energy Sources Consumed for Residential Heating, Maine

Source: U.S. Census Bureau, American Community Survey



Energy Supply and Production

Maine does not have indigenous petroleum, natural gas, or other fossil fuel reserves, nor does it produce or refine these products.[6] Refined petroleum products are imported to Maine through the Ports of Portland, Searsport, and Bucksport, as well as from Canadian border crossings via rail (Appendix Figure A). Propane is also imported to the Northeast through Newington, New Hampshire. This product is then distributed regionally, including by distributors and retailers in Maine. Canada is the dominant supplier of petroleum products that arrive in Maine ports and border crossings.

Natural gas enters Maine via pipelines from New Hampshire and Canada (Appendix Figure B). Saint John LNG, a liquified natural gas (LNG) terminal at St. John, New Brunswick, receives LNG from overseas and delivers it by pipeline to markets that include Maine, New Hampshire, and Massachusetts. Another interstate pipeline, the Portland Natural Gas Transmission System, delivers natural gas from Canada and the United States to southern Maine. The pipelines service approximately 50,000 residential and commercial customers statewide and a limited number of large institutional and industrial customers and power generators. Maine does produce some limited quantities of methane biogas through anaerobic digestion which turns agricultural or organic waste into usable gas for heating and other purposes, rather than extracting gas from underground fossil deposits. Maine has four natural gas distribution companies that service portions of the state as is shown in Appendix Figure C.

In 2022, Maine produced approximately 95 trillion British thermal units (Btus) of energy, some of which was consumed within the state and some of which was exported in the form of wood, wood byproducts, and electricity.[7] More than three quarters of that energy originated from wood and wood byproducts, which accounted for a total output of more than 73 trillion Btus. Maine's noncombustible renewable energy sources including hydro, wind, and solar generated over 22 trillion Btus in 2022. As covered in the following section, Maine generates a significant amount of electricity that flows into regional electricity grids and contributes to supplies consumed across New England and exchanged with adjacent regions.

Electricity

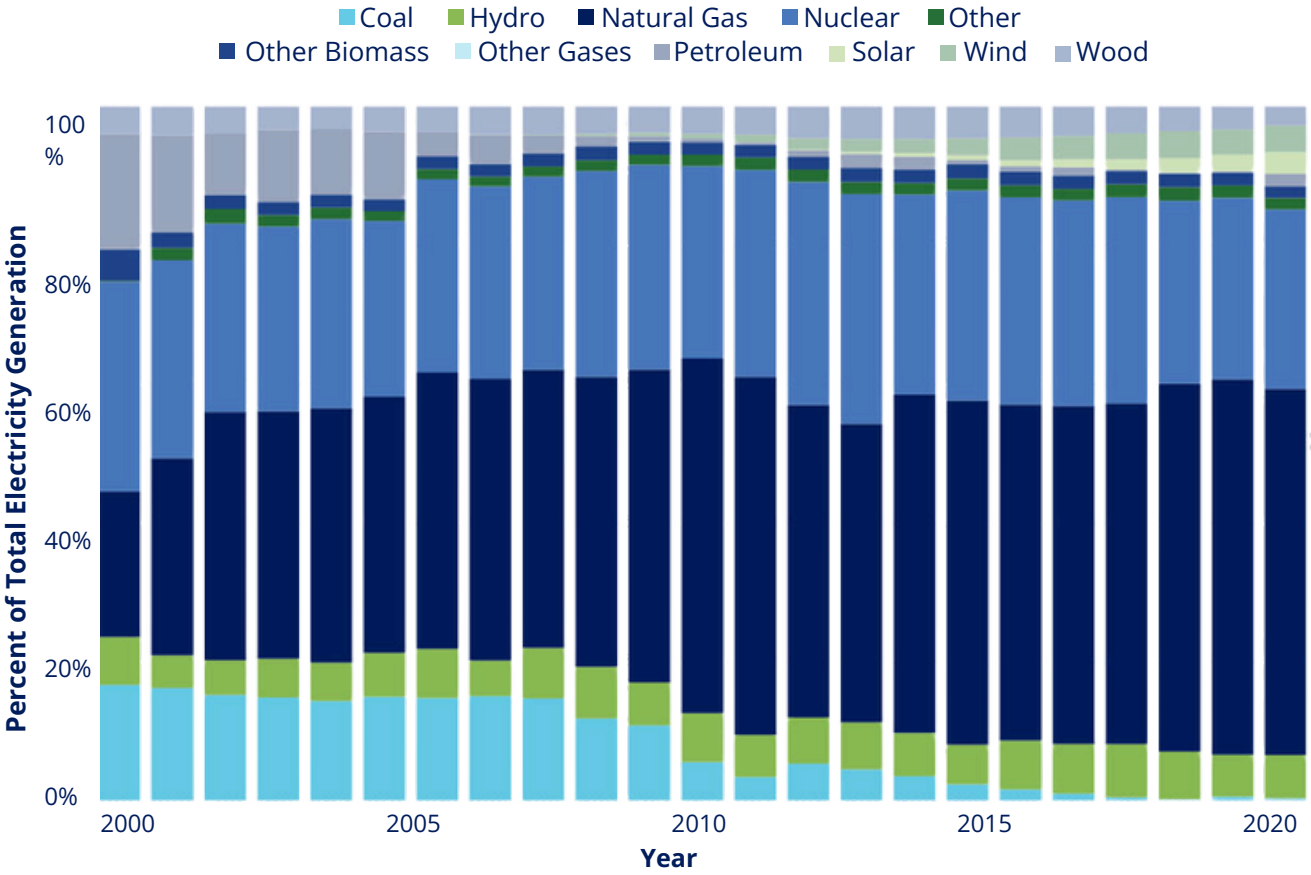
Maine is part of the regional electric grid, managed by ISO New England (ISO-NE), as well as another grid managed by the Northern Maine Independent System Administrator (NMISA). Northern Maine is unique in that it is the only region in the country that is not directly connected to the U.S. regional grid system. Instead, it is directly connected to New Brunswick and is managed by NMISA. NMISA is a non-profit entity responsible for the administration of the Northern Maine transmission system and electric power markets in Aroostook and Washington counties. A map of New England's transmission system can be seen in Figure D in the Appendix. The ISO-NE system has 13 interconnections to neighboring power systems.

Maine has two investor-owned utilities that serve the majority of the state's customers. Central Maine Power Company (CMP) has a service territory in Southern and Central Maine, servicing approximately 650,000 customers. Versant Power's territory covers almost as much land but is much more rural and services approximately 159,000 customers in Northern and Downeast Maine. Versant Power's customer base is split into two territories: the Bangor Hydro District and the Northern Maine District. The Bangor Hydro District is part of the ISO-NE grid and covers Hancock, Piscataquis, and Washington counties along with most of Penobscot County. The Northern Maine District is connected directly to the grid in New Brunswick and covers Aroostook County and a small part of Penobscot County. The state also has several municipal and cooperative utilities that serve a smaller numbers of customers. A map of electric utilities in Maine is included in the Appendix (Figure E).

New England's electrical grid is undergoing a transformation. Over the last two decades, the New England region has seen a decline in electricity produced by oil and coal coupled with a substantial increase in natural gas-powered generation as depicted in Figure 11. The ISO-New England states that, "since 2013, roughly 7,000 megawatts (MW) of mostly coal, oil, and nuclear generation have retired or have announced plans for retirement in the coming years" and that "another 5,000 MW of oil and coal, which now run only during peak demand or periods of gas pipeline constraints, are likely to retire soon."[8] Recent EIA analysis indicates that this follows a national trend when it comes to power plant retirements, with 85 percent of upcoming electric generation capacity retirements in the U.S. expected to be coal plants.[9]

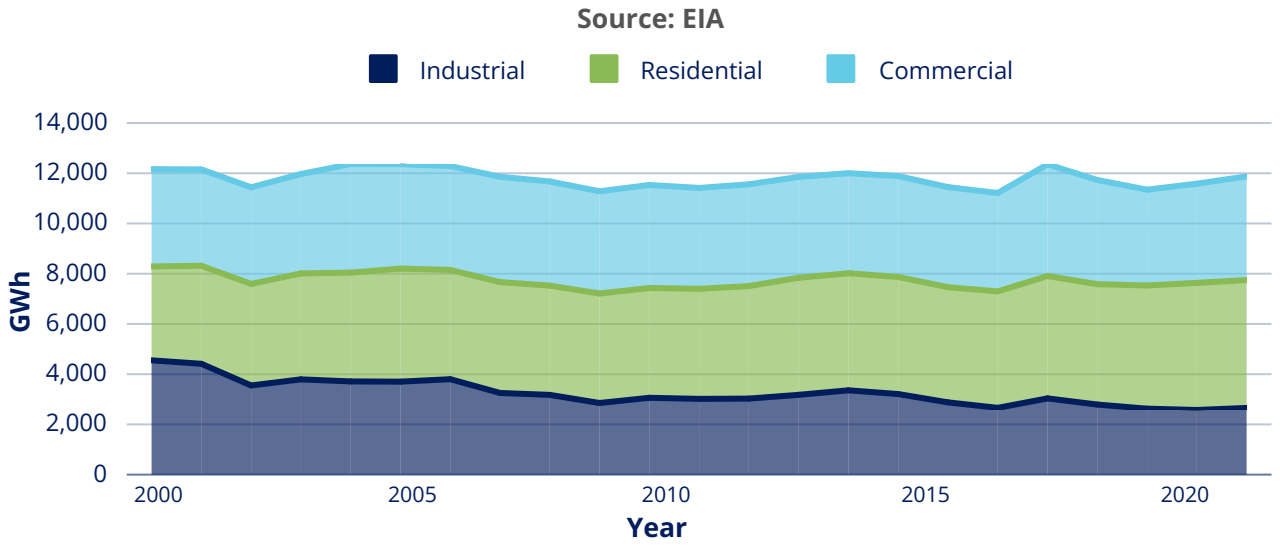
Figure 11. Electricity Generation by Energy Source, New England

Source: EIA



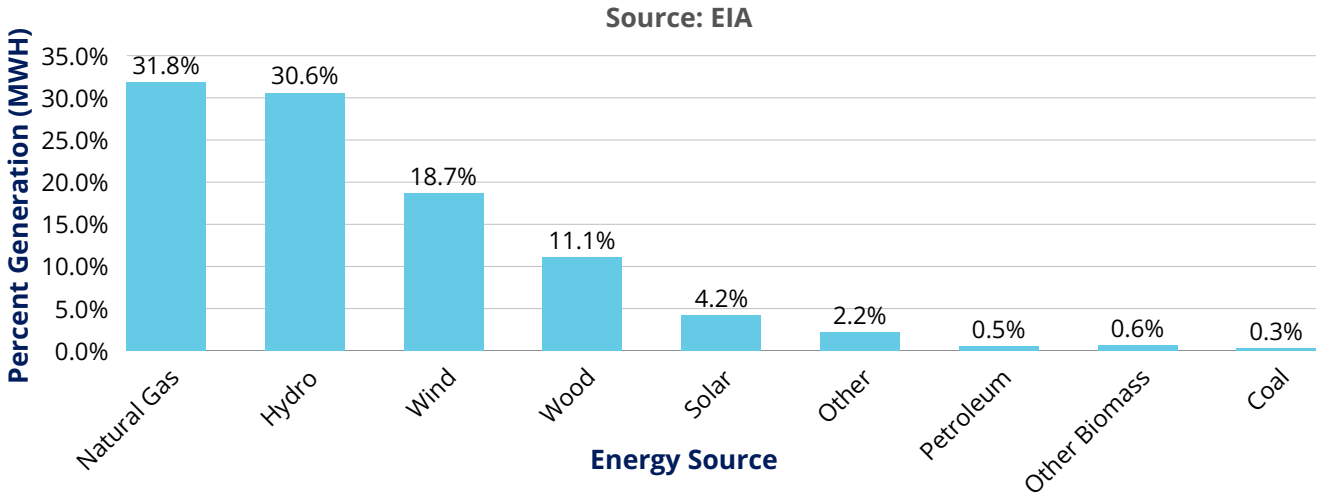
In 2022, Maine consumed over 11,800 GWh of electricity based on retail sales (Figure 12), which represents roughly 10 percent of New England's total electricity consumption (114,490 GWh). Maine's residential sector consumed the most electricity overall, followed by the commercial and industrial sectors, respectively.

Figure 12. Electricity Consumed in Maine in Retail Sales by Sector



Of the total electricity generated in Maine in 2023, about 65 percent was derived from renewable sources while 35 percent was derived from non-renewable sources. In 2023, natural gas was the largest source of electricity generated in Maine, representing approximately 32 percent of total electricity generation (Figure 13). This is closely followed by hydropower at 31 percent, wind at 19 percent, wood and wood-derived fuels at 11 percent, solar at 4 percent, and additional sources including other biomass, petroleum, and coal. A map of Maine's electric generating units is included in the Appendix (Figure F).

Figure 13. Electricity Generation by Energy Source, Maine (2023)

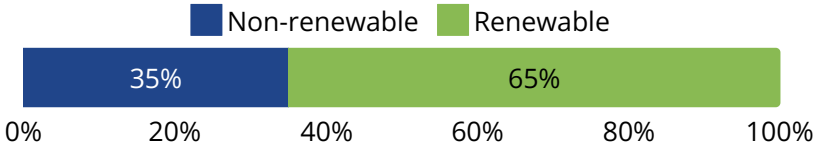


Total Electricity Generation in Maine (2023)

12,512,181

MWh

Total Electricity Generated in Maine by Non-Renewable and Renewable Sources (2023)



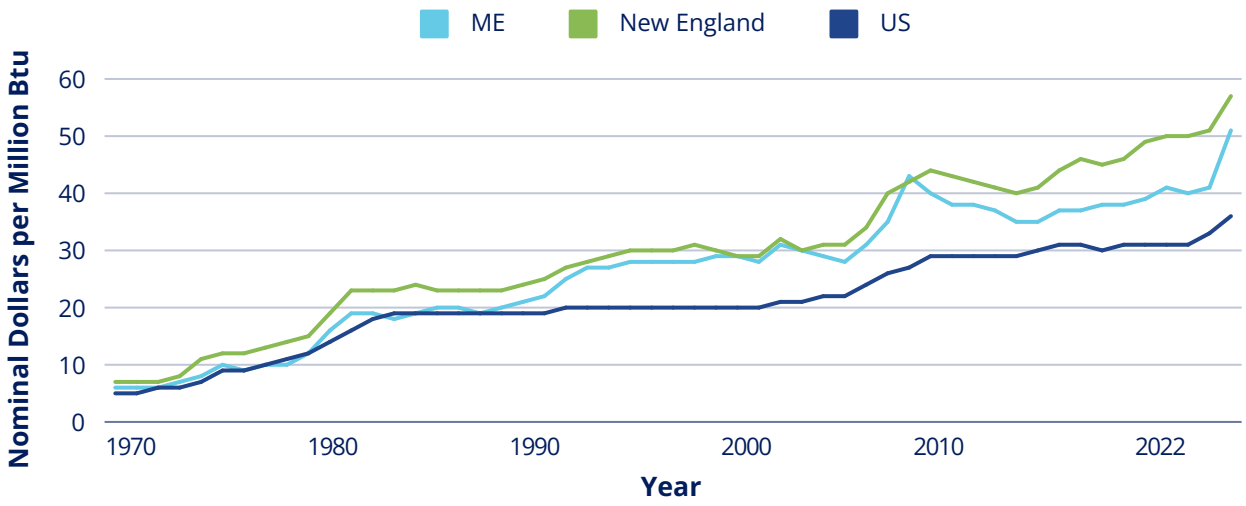
Energy Prices

Maine's energy prices are driven by three primary factors: the cost of energy generation throughout New England; the cost to maintain the regional transmission system of which Maine is responsible for roughly 9 percent; and the cost to run, maintain, and improve the state's electricity distribution system, which is generally comprised of smaller poles and wires that carry electricity throughout the state. While Maine has historically had low electricity prices compared to other New England states, the region itself has experienced high electricity prices when compared to other parts of the country. The high cost of electricity in New England is driven by several factors, including limited energy generation resources in the region, reliance on imported fossil fuels from other states and countries, and aging infrastructure.

The COVID-19 pandemic had unprecedented impacts on energy prices in Maine and the region. In 2020, energy demand decreased significantly around the world, resulting in an "historic energy demand shock that led to lower greenhouse gas emissions, decreases in energy production, and sometimes volatile commodity prices," according to EIA.[10] New England and the U.S. experienced these impacts as shown in Figure 14.

Figure 14. Electricity Prices in Maine, New England, and the U.S.

Source: EIA



One approach to analyzing electricity prices is to look at standard offer price trends. Electricity customers have the option of choosing a competitive electricity supplier or using the default supplier, commonly referred to as the standard offer service. The standard offer suppliers are chosen in a competitive bidding process conducted by the Maine Public Utilities Commission (PUC) that sets the purchase price for electricity for the following year. Following two years of historically low standard offer rates in 2020 and 2021, standard offer rates for 2022 were approximately 66-89 percent higher than previous years, depending on utility and customer class. This increase was primarily due to elevated global market prices of natural gas and other fossil fuels as the economy recovered from the pandemic.

Residential electricity bills in Maine have two main components:

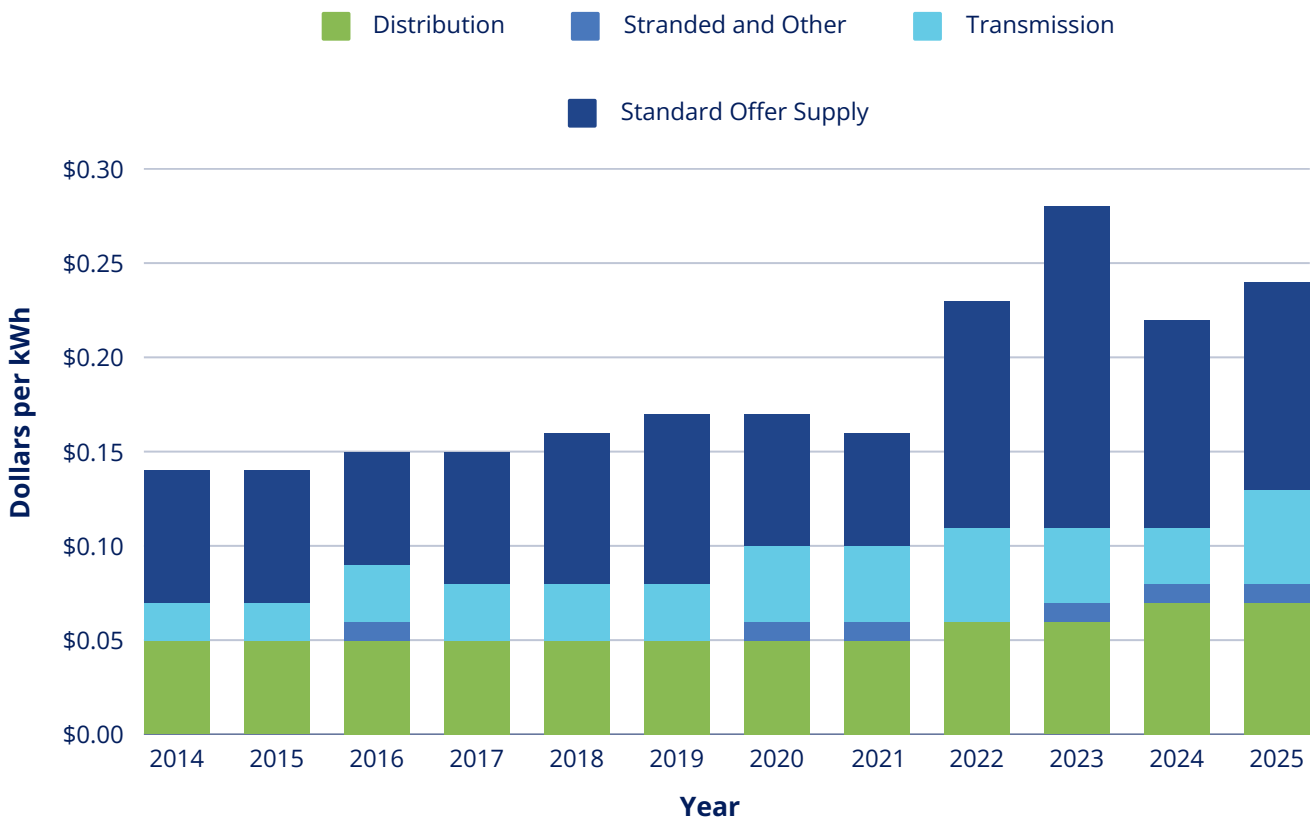
- Supply, which is the cost to generate the electricity used; and
- Delivery (distribution and transmission), which is the cost of wires, poles, equipment, and operations for delivering the electricity to consumers.

A third, smaller component of a typical bill is referred to as stranded costs, which include the costs associated with storm recovery as well as certain renewable energy and assistance programs. Annual adjustments to stranded costs and other program charges are typically made in the summer and include costs and revenues from programs such as net energy billing as well as significant costs that have been incurred to respond to major storms, for example the storms that impacted Maine during the winter of 2023-2024. How some of these costs are collected is currently under examination at the Maine PUC.

Transmission rates, which are regulated by the Federal Energy Regulatory Commission (FERC), typically change each year around January 1 and have increased in recent years. Figure 15 provides an example of the cost components included in a typical residential energy bill for customers of Central Maine Power, effective January 1, 2025.[11]

Figure 15. Residential Electricity Prices by Component, CMP

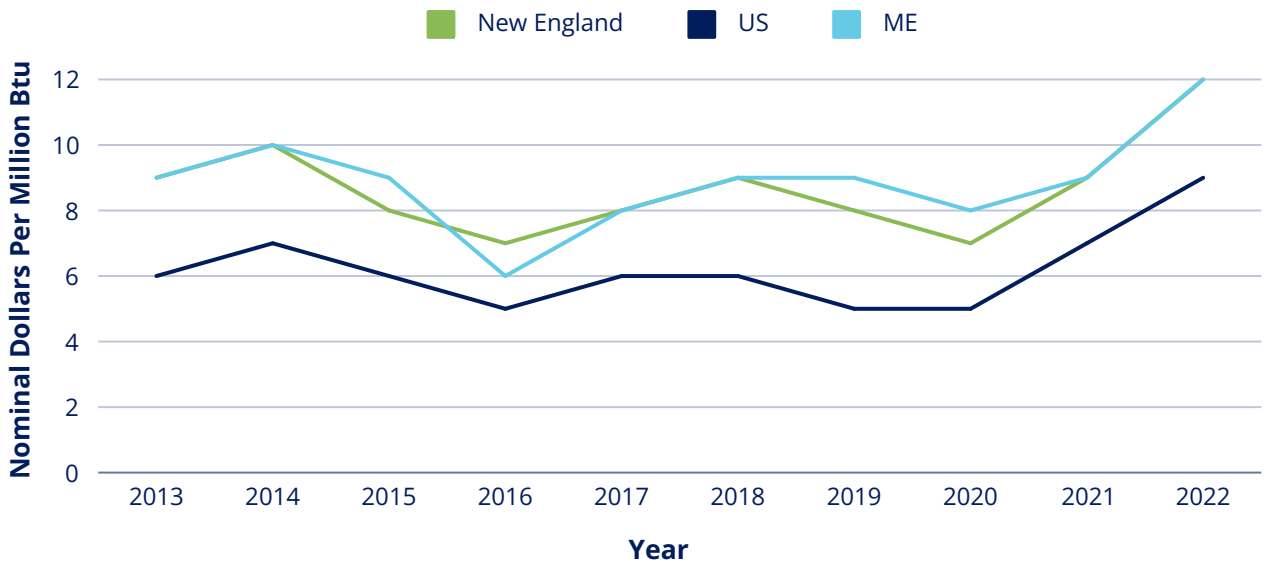
Source: GEO "Electricity Prices" webpage



Natural gas prices in Maine continue to follow the regional average trends at the New England hub, as shown in Figure 16. This further demonstrates that as long as the regional energy system continues to rely heavily on natural gas, energy prices will continue to be subject to the price volatility of these global markets.

Figure 16. Natural Gas Prices in Maine, New England, and the U.S.

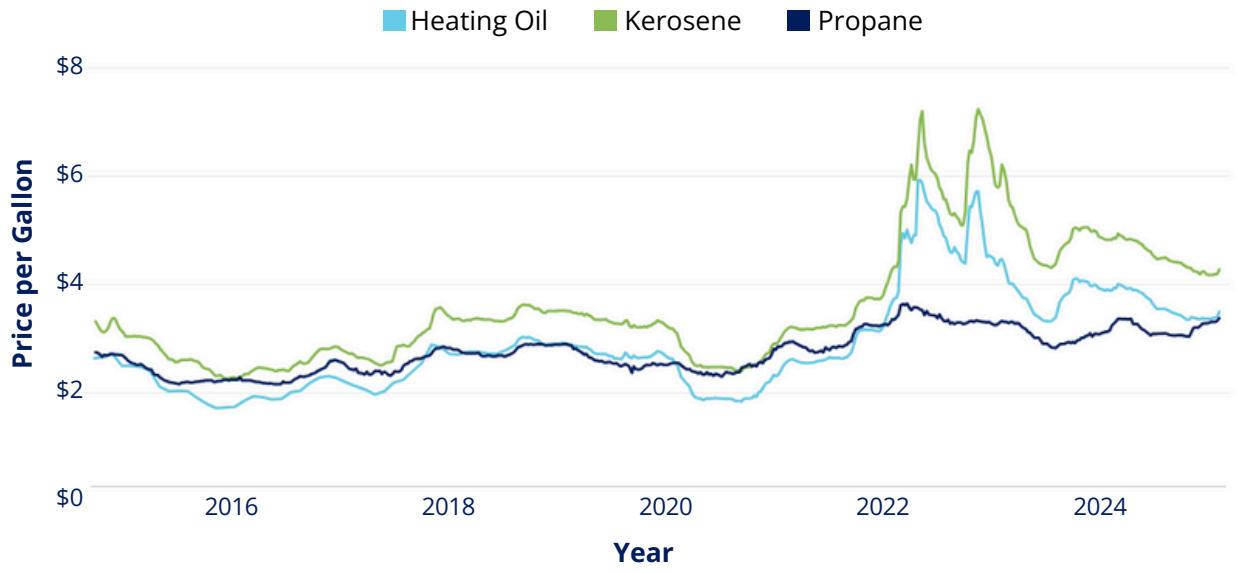
Source: EIA



Similar trends of pandemic impacts can be seen in heating fuel prices in Maine that are tracked weekly by GEO,[12] particularly for home heating oil prices which jumped in 2022 and 2023 as shown in Figure 17.

Figure 17. Maine Residential Delivered Fuels Prices

Source: GEO Heating Fuel Prices Webpage

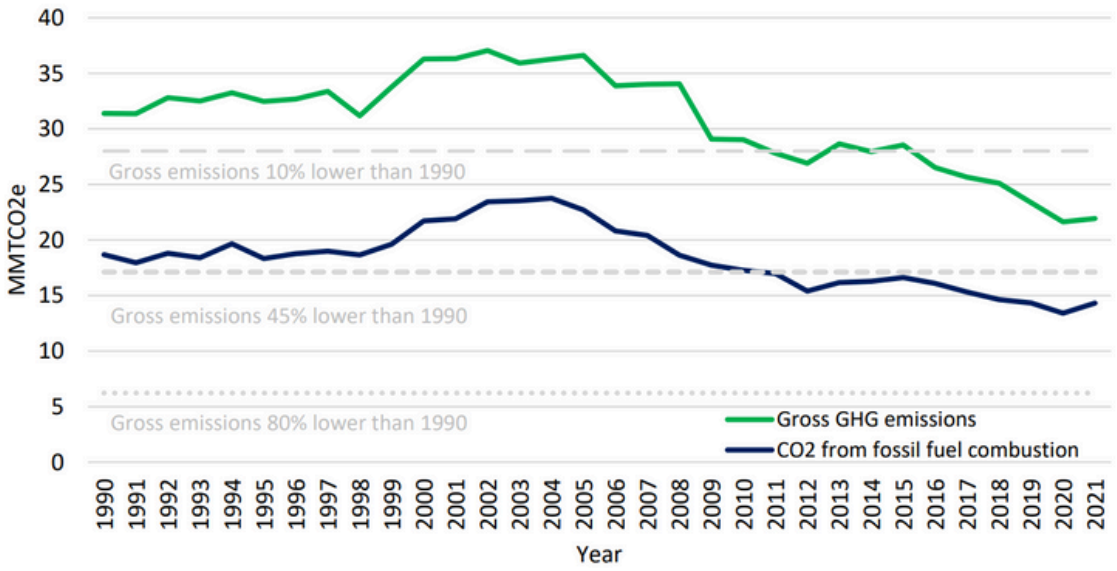


Greenhouse Gas Emissions

The consensus of climate scientists worldwide is that the world is facing unprecedented challenges associated with climate change as a result of human activities — primarily due to the combustion of fossil fuels that emits carbon dioxide and other greenhouse gases. The increase in extreme weather activity and rising temperatures highlight that these changes are already here. To meet the challenge of climate change, Maine has established statutory greenhouse gas emissions reduction requirements of 45 percent below 1990 levels by 2030 and 80 percent by 2050. In addition, state law requires Maine to achieve carbon neutrality – or net-zero emissions, under which the amount of greenhouse gas emissions sequestered in the state's environment is at least equal to the amount of greenhouse gas emissions produced in the state – no later than 2045. According to the Maine Department of Environmental Protection's 10th Report on Progress toward GHG Reduction Goals, Maine is on track to meet greenhouse reduction targets.[13] Figure 18 from this Report shows Maine's gross greenhouse gas emissions from 1990-2021 (including biogenic emissions).

Figure 18. Maine's Gross Greenhouse Gas Emissions

Source: Maine Department of Environmental Protection,
10th Report on Progress Toward GHG Reduction Goal



According to the analysis, this has not resulted in reduced economic value as the state's emissions have fallen while Maine's state gross domestic product (GDP) has generally increased. This is shown in Figure 19 from the report which shows gross greenhouse gas emissions and state GDP. This Report also outlines that "energy, which includes the combustion and distribution of fuels, is the largest source of emissions, accounting for 94 percent of Maine's gross GHG emissions in 2021." These CO2 emissions from fossil fuel combustion in 2021 are broken out by sector in the report and are shown in Figure 20.

Figure 19. Gross Greenhouse Gas Emissions and State Gross Domestic Product

Source: Maine Department of Environmental Protection,
10th Report on Progress toward GHG Reduction Goal

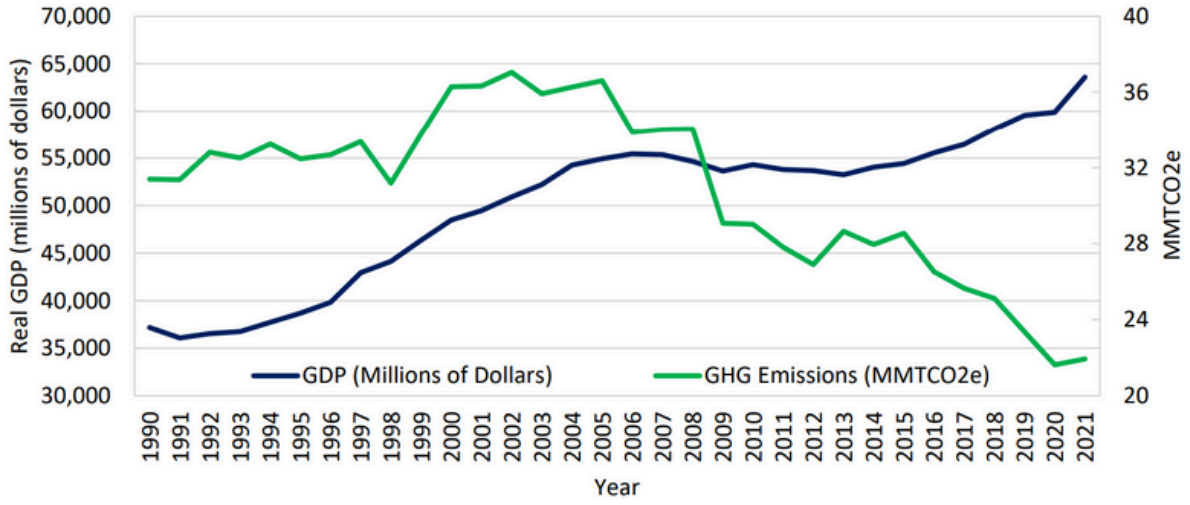
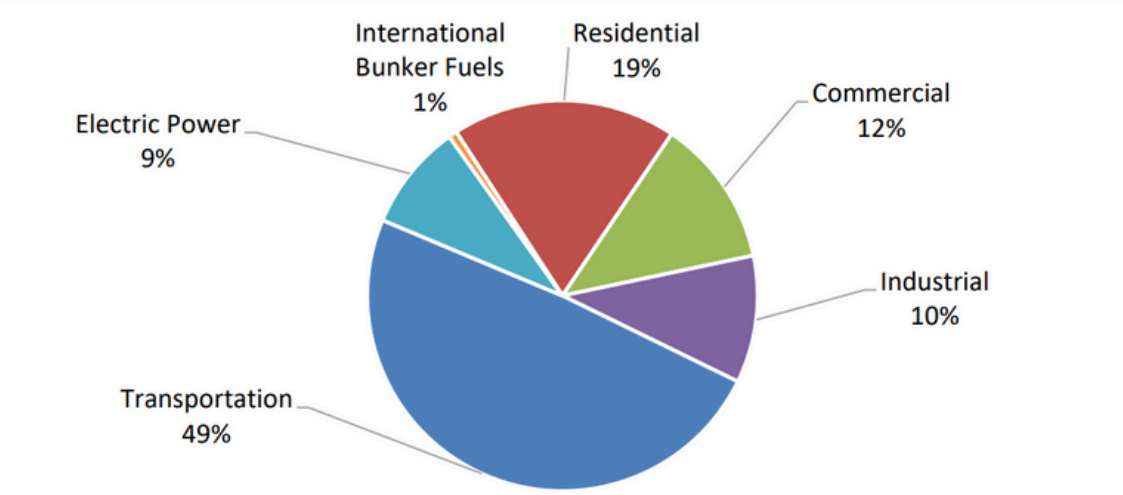


Figure 20. CO2 Emissions from Fossil Fuel Combustion by Sector (2021)

Source: Maine Department of Environmental Protection



Maine is also a member of the first cap-and-invest regional initiative in the United States, called the Regional Greenhouse Gas Initiative (RGGI). RGGI is a cooperative, market-based effort among participating states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont) to cap and reduce CO2 emissions from the power sector. According to analysis of this initiative, "the RGGI states have reduced annual power sector emissions by 50 percent" since 2005 and have "raised over $7 billion to invest into local communities."[14] In Maine, proceeds from RGGI are directed by statute to be invested in energy efficiency projects by Efficiency Maine. At the time of this report, the RGGI states are conducting a program review to consider successes, impacts, and design elements of the trading programs.

Maine Energy Plan Objectives

In recent years, Maine has taken important steps to reduce greenhouse gas emissions while growing the economy, achieve nation-leading heat pump adoption, and deploy more than a gigawatt of new clean energy across the state with significantly more in development. At the same time, the state continues to face challenges related to overreliance on imported fossil fuels, which contributes to volatile energy prices in the region, as well as separate issues resulting from the state's aging electrical grid. The following Maine Energy Plan objectives and strategies, many of which are interrelated, seek to outline the critical future steps that GEO, as well as other entities should take to achieve a more affordable, reliable, and clean energy system while meeting Maine's statutory requirements.

The following key themes are present throughout each of of the Plan's objectives:

- Working collaboratively with regional partners and local communities to maximize opportunities for cost-effective, responsible development of energy infrastructure.
- Planning grid improvements to address long-standing reliability challenges with the goal of building a more resilient grid for the future.
- Utilizing modern and innovative technology and planning to ensure Maine's electrical infrastructure is ready to meet the long-term needs of the state.
- Ensuring a more equitable energy system that reduces the burden on Maine people.

This Energy Plan outlines a series of specific actions Maine will take to reduce energy price volatility, stabilize costs in the long-run, and ensure that today's energy investments are made with an eye toward the future. The development and implementation of the Plan will require proactive and thoughtful engagement with communities across Maine and an increased commitment to finding new and better ways to engage Maine people in this work. The Plan will guide Maine's work over the coming years to design and implement programs and policies to achieve these objectives, all of which will require significant engagement and input from state government, local communities, the private sector and Maine people.

Objective A. Deliver Affordable Energy for Maine People and Businesses

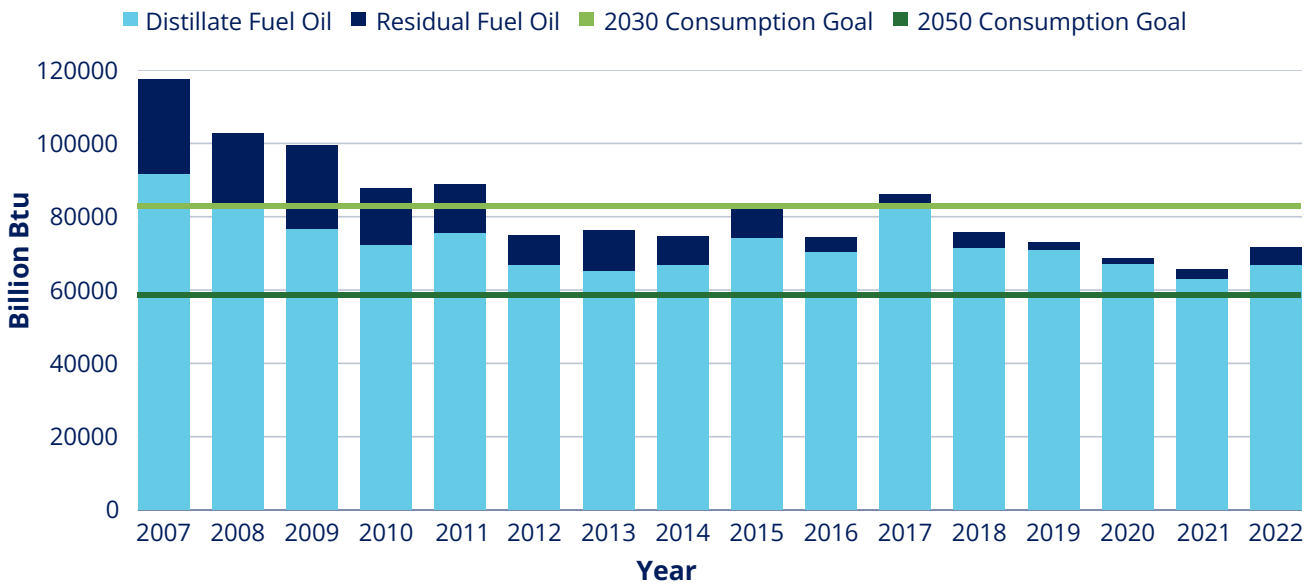
Access to affordable, reliable, and increasingly clean energy is critical to the well-being of Maine's people, communities, and economy. Energy prices across all sectors of the state's economy, including heating, transportation, manufacturing and industrial processes, have experienced recent volatility driven by price swings in global markets. Most recently, energy price increases were driven by global supply chain disruptions in the wake of the COVID-19 pandemic and Russia's invasion of Ukraine.

However, the primary factor that sets the price Maine people pay for energy has remained consistent for decades: a significant overreliance on imported fossil fuels. Since at least the 1970s, Maine people and policymakers have recognized the need to reduce this reliance to increase energy independence and shield Maine's economy from global markets beyond its control. Moreover, since 2011, Maine has had a statutory goal in place to reduce oil consumption from 2007 levels by at least 30 percent by 2030, and at least 50 percent by 2050. As shown in Figure 21, Maine has already surpassed its 2030 target and is on track to achieve the 2050 target through actions and goals discussed in Objective D.

In the past few years, Maine has demonstrated significant progress toward reducing heating oil dependence. From 2022 to 2023, Maine experienced the largest year-over-year decrease in the share of Maine households reliant on oil as their primary heat source.[5] However, there is much work ahead with over half of households still reliant on heating oil, including many that still utilize kerosene which has experienced supply chain constraints in recent years.

Figure 21. Maine Fuel Oil Total Consumption in Relation to State Oil Dependence Reduction Targets

Source: EIA



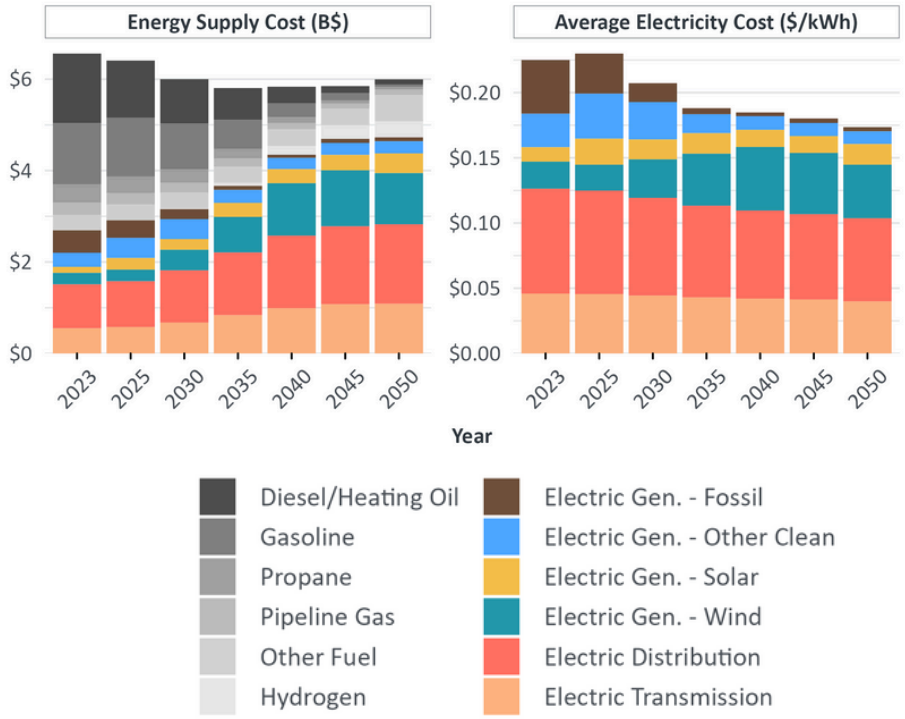
Fossil fuel dependence in Maine impacts sectors of the economy beyond home heating and transportation. Today, nearly 50 percent of New England's electricity is generated with natural gas. During periods of high electricity demand, particularly in the winter when natural gas is utilized for heat, it is common for power plants in the region to turn to oil-fired units, leading to increased costs and harmful emissions. Alternatively, increasing the amount of locally produced electricity from renewable generators and pairing that energy with advanced energy storage can diversify the region's electricity supply and reduce emissions that contribute to climate change. Progress on this effort as well as further actions needed are discussed in Objective C.

Transitioning from an energy system that is heavily reliant on fossil fuels to one that uses a diverse mix of local, renewable energy sources also offers long-term energy cost suppression benefits. As highlighted in the Technical Report's analysis on this transition and illustrated in Figure 22:

> *Overall energy supply costs are unlikely to increase significantly and may decrease somewhat over time. While overall expenditures on electric generation, transmission, and distribution will increase to serve higher demand from electrified end uses, these higher electricity costs are largely offset by savings from decreased reliance on costly fossil fuels. The average [real, i.e. adjusted for inflation] cost of delivered electricity will likely fall over time, since sales volumes will increase slightly faster than cost.*

Figure 22. Energy Supply Costs and Average Total Electricity Cost for Maine (inflation-adjusted 2022$)

Source: Maine Pathways to 2040: Analysis and Insights



To ensure energy affordability for Maine, continued efforts will be made to reduce fossil fuel dependence across the economy. Increased beneficial electrification, or utilizing electricity in place of direct fossil fuel uses in homes, businesses, and transportation, results in lower total energy costs and greenhouse gas emissions when thoughtfully integrated into energy infrastructure planning and efficiency investments (discussed in more detail in Objective D). Beneficial electrification can also result in lower electricity rates over time as fixed costs are spread out among a greater number of customers and end uses. To ensure this transition is successful, the state must address the issue of high energy burden for low- and moderate-income families and continue to review approaches and programs (i.e. weatherization, heat pumps) to deliver the lowest cost energy to Maine people.

Strategies

Strategy A: *Reduce Maine's dependence on imported fossil fuels for heating and electricity generation*

Reducing Maine's reliance on oil has been a statutory goal since 2011 and Maine has made significant progress in this effort and in the advancement of clean energy generation. This strategy is underway through policies that enable and support energy efficiency, clean energy deployment, and related policies which are detailed throughout this Energy Plan.

Strategy A Key Actions

- Deploy available funds already awarded to Maine to support clean energy development, energy efficiency, and grid modernization projects through programs and initiatives to reduce energy costs and strengthen the energy system. Continue to monitor and pursue additional funding opportunities that can be leveraged to advance the state's goals.
- Advance regional collaboration through implementation of the New England States' Vision for a Clean, Affordable, and Reliable 21st Century Regional Electric Grid to enable proactive, cost-effective, and efficient transmission planning to meet policy goals and enable joint procurements to address long-standing grid constraints in Maine.
- Plan for and implement responsible grid infrastructure investments in Maine to achieve policy goals, drive economic development, and prepare for electric load growth while maximizing benefits and protecting ratepayers. This work includes proactive planning while recognizing impacts from federally-required transmission upgrades, storm recovery, and other related costs.
- Consider updates to statutory oil dependence reduction goals, monitor oil dependence over time, and report annually on Maine's progress.
- Monitor and report on heating fuel and electricity prices on a regular basis, providing transparent, up to date information to support informed decision making for Maine consumers.
- Diversify Maine's energy resources and support cost-effective energy efficiency and beneficial electrification investments to reduce costs for ratepayers.

Strategy B: *Reduce energy burden for low- and moderate-income households*

As the frequency and severity of winter storms increase and more high heat days are experienced in Maine, access to affordable heating and cooling remains critical. A home energy burden is defined as the percentage of a household's income that is spent on energy costs. For low-income households in Maine, the average energy burden, including the cost of electricity and household fuels, is 14 percent based on 2018-2022 data.[15] This is nearly three times higher than the statewide average energy burden across all household income levels. More than 100,000 Central Maine Power and Versant Power customers across the state, predominantly low- to moderate-income, carry past-due balances each month. There are a variety of existing programs which work to reduce household energy burden, however there remains a gap between the assistance needed and the available assistance.

Increasing access to energy efficiency and weatherization programs, expanding financing options, and improving education and outreach designed to benefit low- to moderate-income households is essential to decreasing energy burden and providing reliable and affordable energy to all Maine people.

Strategy B Key Actions

- Regularly conduct comprehensive analyses and target-setting of household energy burden that evaluates all household energy costs, including heating fuels, secondary heating sources, electricity, water heating, and transportation.
- Work with the Maine Office of the Public Advocate (OPA) to implement components of the Electric Ratepayer Advisory Council's 2024 recommendations to streamline administration and increase consumer awareness of new and existing assistance and efficiency programs, among other recommendations.
- Expand education, outreach, and technical assistance activities to increase access to and utilization of existing energy efficiency, weatherization, and clean energy programs through navigator-type programs and partnerships with other state agencies and community-based organizations.
- Develop and support expanded financing options and ownership models to reduce barriers to clean energy and energy efficiency investments for low- and moderate-income households, renters, rural or underserved communities, and small businesses.

Strategy C: *Review existing approaches to identify additional electricity cost control opportunities*

Electricity cost drivers and rate structures are complex, with multiple entities at the federal and state levels influencing costs and market behavior of a wide range of private sector actors, including utilities, generators, and competitive electricity suppliers, among others. Policy decisions, including environmental permitting and land use, are often understood as tangential to electricity systems, but can also drive cost implications.

At the same time, continued advances in technology can create new opportunities for electricity consumers to control their electricity usage and household bills. Objective D highlights the opportunity of beneficial electrification to advance efficiency and lower overall rates. In addition, load flexibility strategies enabled by advanced rate design or other market mechanisms make the use of electric appliances more attractive relative to burning fuel by reducing the price of electricity.

Strategy C Key Actions

- Support the implementation of innovative mechanisms to enable customers to save money through advanced rate design, such as time-of-use rates, demand response programs, and other means.
- Work with the Maine PUC to continue to review standard offer procurement strategies to lower supply costs and increase stability for ratepayers.
- Continue to work with the PUC, OPA, and others to analyze and develop strategies to ensure customers benefit if utilizing competitive electricity providers.
- Review cost factors of new renewable energy projects in Maine, including risk premiums, to inform strategies to achieve multiple policy objectives while cost-effectively advancing clean energy infrastructure.

Objective B. Ensure Maine's Energy Systems are Reliable and Resilient in the Face of Growing Challenges

As the most heavily forested state in the country, Maine is susceptible to frequent and long duration power outages caused by severe storms, floods, and natural disasters. Between March 2022 and May 2024, the state experienced nine natural disasters, each of which necessitated a Presidential disaster or emergency declaration. In the wake of these storms, Governor Mills signed an executive order to establish a new commission that will develop the State of Maine's first plan for long-term infrastructure resilience.[16] The 24-member commission has engaged with communities, industries, and organizations across Maine to understand challenges following storms; identify and bridge gaps in resources like funding, financing, and insurance; find ways to improve the resilience of energy systems; propose new approaches to improve disaster recovery and response; and strengthen resilience supports at the state, regional, and local levels.

To ensure Maine is prepared to address future energy emergencies, GEO is responsible for developing Maine's State Energy Security Plan. This plan, required by the federal government, provides the state with a communications and coordination blueprint to address potential or actual energy emergencies caused by supply disruptions, rapid and unsustainable increases in energy prices, or other energy emergencies. It is a guide for state government leaders charged with the responsibility of ensuring the health, welfare, and safety of Maine citizens during emergency events.

As global energy markets remain volatile, and climate change continues to increase the severity and frequency of disaster events, it is imperative that Maine's energy systems are resilient and reliable. Prioritizing renewable energy sources, leveraging innovative resilience technologies, and coordinating with local emergency management, transmission and utility operators, and state agencies are critical to ensuring Maine's energy systems are resilient and reliable in the face of growing challenges.

Strategies

Strategy A. *Establish ambitious, data-driven targets for energy resilience*

Collecting quality data and establishing data-driven targets is a central component of both understanding and addressing disaster risks, energy security, and resiliency measures. Grid performance metrics, including Customer Average Interruption Duration Index (CAIDI), System Average Interruption Frequency Index (SAIFI), and Customer Average Interruption Frequency Index (CAIFI), are quality indicators of reliability and resiliency when assessed locationally and over time. Equipping communities with these tools and collaborative opportunities to understand their energy vulnerabilities is an important step to develop targets for resiliency.

Strategy A Key Actions

- Collect trend data on local electricity outages and grid vulnerabilities, and engage residents, community leaders, and critical facility operators to understand system weaknesses.
- Collaborate with the Infrastructure Rebuilding and Resilience Commission and other state entities to launch an online disaster data service that centralizes existing regional and community-level hazard, risk, and vulnerability information.
- Identify, monitor, and plan for delivered fuel resilience risks, including vulnerabilities related to fuel supply, access, and delivery.
- Connect vulnerable communities with state and federal resources and technical assistance opportunities, including through the Resilience Office in the newly created Maine Office of Community Affairs, the U.S. Department of Energy, and national laboratories to increase energy resiliency.

Strategy B. *Increase coordination and information sharing across energy-related emergency management and resilience entities*

Energy resilience and security encompasses both preventing and responding to disruptions. As climate change continues to increase the severity and frequency of disaster events, energy-related emergency management and resilience functions provide critical support to vulnerable communities across the state. Increasing coordination and communication across these functions is integral to reducing the negative social and economic impacts of disaster events as well as helping communities recover post-disaster.

Strategy B Key Actions

- Identify, develop, and share strategies to streamline and improve information sharing and coordination between municipal leaders, emergency managers and officials, and residents during extreme weather and other disruptive events.
- Coordinate the use of renewable energy sources (i.e. solar and battery storage) to supply and power emergency response entities and relief organizations during extreme weather and other disruptive events.

Strategy C. *Deploy targeted resources to advance innovative and modern resilience solutions including microgrids*

Maine's unique energy and geographic landscape provides an opportunity to explore and advance innovative resilience solutions, including microgrids, redundant energy systems, and bio-based resources. Innovative resilience solutions can be tailored to communities' distinct energy needs while providing critical energy supply during disruptive power events and reducing greenhouse gas emissions.

A modern grid connected to multiple energy generation sources requires modern infrastructure, including digital devices that enable new paths for electricity to meet demands. Maine is advancing grid modernization through multiple partnerships and efforts. These efforts include engagement with the Federal-State Modern Grid Deployment Initiative as well as work to secure federal funding for grid-enhancing technologies like sensors, power flow control devices, and analytical tools to maximize existing transmission infrastructure.

Strategy C Key Actions

- Leverage microgrids powered by renewable energy to supply power to communities during extreme weather and other disruptive events.
- Explore deployment of innovative resilience solutions and the expansion of redundant energy systems.
- Strengthen resilience options, solutions, and support for impacted communities including remote, island, and Tribal communities, as well as disadvantaged and low-income communities and those households heating with coal and kerosene.
- Implement the Federal Grid Innovation Program and other grid modernization efforts through projects that improve grid reliability and resilience using advanced technologies and innovative partnerships and approaches.

Strategy D. *Leverage innovative technologies including energy storage to increase resilience and reduce greenhouse gas emissions*

Innovative energy technologies provide a unique opportunity to increase community resiliency and help Maine achieve its clean energy goals. Energy storage systems, distributed energy resources, and energy efficiency upgrades can decrease costs and address vulnerabilities during disruptions while reducing dependence on fossil fuels.

Strategy D Key Actions

- Deploy energy storage systems to supply power during energy disruptions, decrease costs by supplying power when grid electricity is most expensive, and store energy to be utilized when intermittent clean energy resources may not be as abundantly available.
- Decrease community dependency on centralized power sources through the continued deployment of distributed generation resources and energy storage systems.
- Target critical infrastructure for energy upgrades, including heating and cooling shelters, emergency and healthcare facilities, and utilities, as well as vulnerable populations to bolster structural and community resilience.

Strategy E. *Strengthen planning and engagement by utilities to identify and address climate and resilience threats cost-effectively*

In 2022, the state legislature enacted "An Act Regarding Utility Accountability and Grid Planning for Maine's Clean Energy Future" (Public Law 2021, ch. 702). Among other items, this legislation requires investor-owned transmission and distribution utilities to file integrated grid plans and climate change protection plans to ensure utility infrastructure is resilient to extreme storms and other climate-related impacts. Since then, the Maine PUC has identified three priorities including reliability and resilience improvements to be included in the integrated grid plans.

Strategy E Key Actions

- Coordinate with, and assess the plans of, the state's transmission and distribution utilities as they prepare and submit 10-year Climate Change Protection Plans to the Maine PUC, pursuant to Public Law 2021, chapter 702.
- Encourage stakeholder engagement and community input to ensure solutions are affordable and in the public interest.

Strategy F. *Advance partnerships and coordination to enhance Maine's energy security and maximize relevant federal and other funding opportunities*

All states and territories participating in the U.S. State Energy Program must develop plans to enhance energy security, emergency response, and resilience. GEO is responsible for developing Maine's State Energy Security Plan. This plan provides a coordination blueprint designed to address a potential or actual energy emergency caused by supply disruptions, a rapid and unsustainable increase in energy prices, or other energy emergencies. It is a guide for state government leaders charged with the responsibility of ensuring the health, welfare, and safety of Maine citizens during emergency events. In creating this plan, GEO will continue to engage with local emergency responders to enhance the plan's usefulness to local emergency management agencies. The plan aligns with other emergency response, mitigation, and resilience plans and activities, including the Maine State Emergency Operations Plan; the state Hazard Mitigation Plan; the Maine Climate Council; the Infrastructure Rebuilding and Resilience Commission; and federal resiliency programs such as Grid Resiliency and Grid Innovation Partnership programs.

Strategy F Key Actions

- Update and refine Maine's State Energy Security Plan in accordance with federal requirements.
- Implement the Maine Grid Resilience Grant Program and coordinate funding pathways to further support energy resiliency for Maine communities, including rural and island communities and Tribal governments.
- Provide technical and project management assistance to support communities in navigating state and federal grant program applications and execution processes.
- Launch project Flexible Interconnections and Resilience for Maine (FIRM) and collaborate with Maine utilities to increase the flexibility, efficiency, and reliability of the grid; expand transmission capacity; and drive the deployment of distributed energy resources (DERs) and other grid-edge devices.

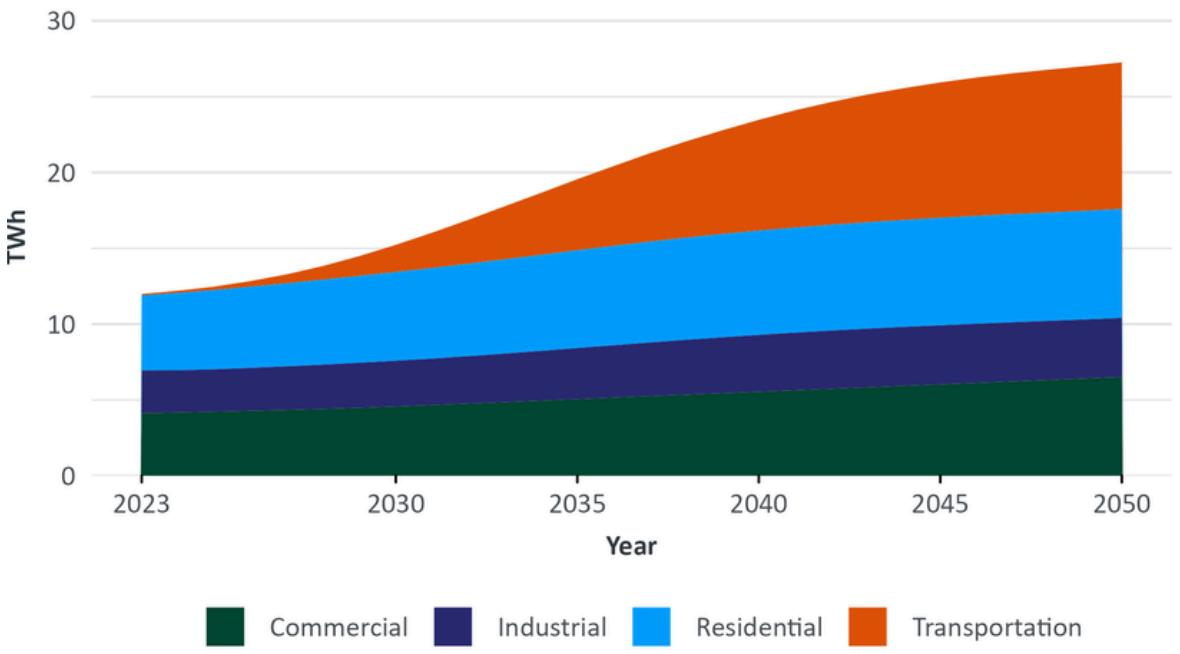
Objective C. Responsibly Advance Clean Energy

Maine has a long history of producing energy from clean resources including hydropower, biomass, and wind, and is working to advance those and other clean energy sources to meet energy needs, climate goals, and economic development targets. In recent years, hundreds of millions in capital expenditures from the clean energy sector have been invested across the state in the form of new projects and efficiency upgrades, generating significant economic activity in the state and creating new clean energy jobs. In recent years, GEO has secured over $215 million in federal funding, which is in addition to more than $600 million in energy funds secured by others that will benefit Maine. While government support for renewable energy development has grown in recent years, these investments follow more than half a century of subsidies in the form of tax breaks to support the oil and gas industry in the United States.[17]

As Maine continues to electrify the heating and transportation sectors and demand for energy grows, it is critical that the state's electricity is increasingly generated by affordable, reliable, homegrown clean energy resources. As identified in the Technical Report, electrification is the primary driver of increases in electric load growth, which is forecasted to more than double by 2050 as demonstrated in the Report's core pathway scenario and illustrated in Figure 23.

Figure 23. Electricity Consumption in Maine by Sector, Core Pathway

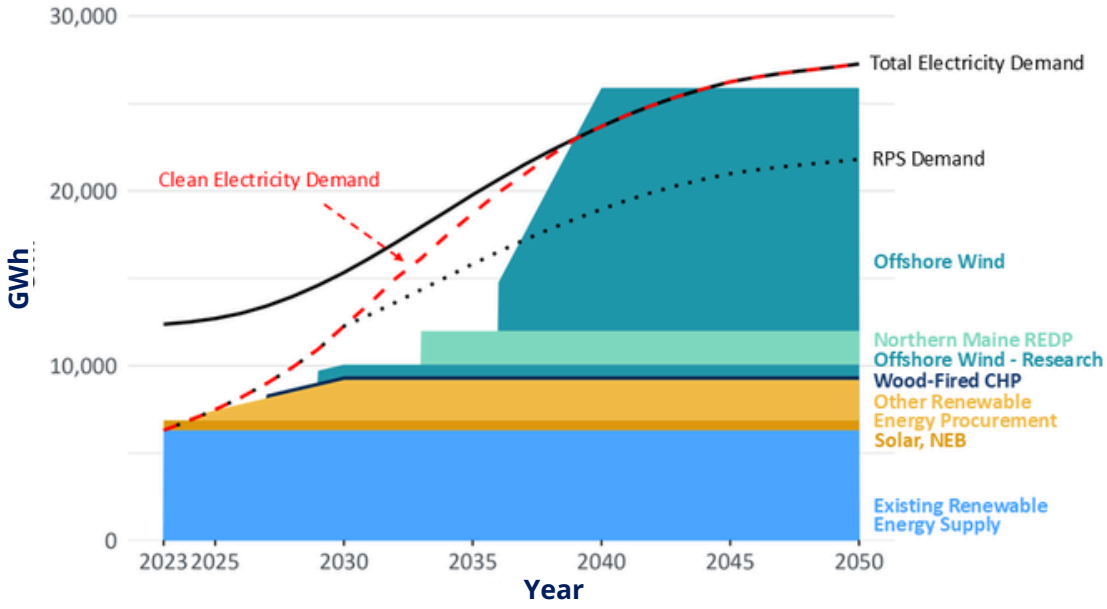
Source: Maine Pathways to 2040: Analysis and Insights



To date, Maine has statutory requirements to consume 80 percent renewable energy by 2030 and has planned or contracted for the diverse mix of resources needed to meet a significant portion of that requirement as illustrated in Figure 24. Maine is already taking steps to add clean electricity resources through commitments to offshore wind, the Northern Maine Renewable Energy Development Program, and other renewable energy procurements. As increased electrification drives greater demand for electricity, new policy mechanisms paired with timely and predictable procurements will be needed to ensure long-term certainty, resource adequacy, and cost-effectiveness.

Figure 24. Maine's Clean Electricity Demand and Planned/Contracted Resources

Source: Maine Pathways to 2040: Analysis and Insights



Further, the Technical Report includes several observations regarding energy supply, including a recommendation to maintain a portion of existing thermal electric generators while the state transitions to carbon-neutral fuels. The report shows that in a future with significant intermittent resources, a small number of thermal generators, dispatched at times of low renewable generation and powered by clean fuels, can support greater resource adequacy and reduced total infrastructure costs when compared to a 100 percent renewable-only pathway. To maximize these benefits, clean fuels will be needed for use on an intermittent basis. While the state does not have significant control over the development of clean fuels, it can take steps to ensure fuels in the state become cleaner over time. Maine will continue to monitor developing clean fuel markets and best practices regarding clean fuel policy and regulatory mechanisms.

The Technical Report also underscores the need to follow through with timely clean energy procurements; increase adoption of targeted DERs to reduce costs; conduct modern transmission and distribution planning; add short- and long-duration energy storage capacity to meet changing peak demands; and to define and establish a new mechanism to add clean energy resources that do not otherwise qualify for Maine's Renewable Portfolio Standard (RPS) to meet the 100 percent clean energy goal.

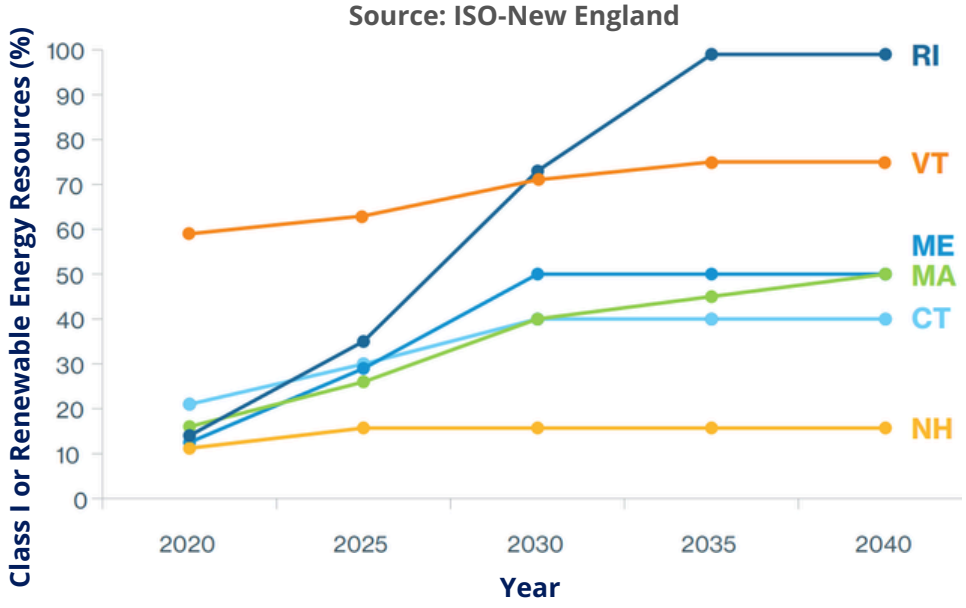
Strategies

Strategy A. *Establish a new Clean Energy Standard (CES) to ensure all Maine people have access to cost-effective, reliable, 100 percent clean energy by 2040*

Achieving 100 percent clean energy will lead to more stable energy costs, a reduced reliance on fossil fuels, and more energy dollars staying here in Maine. Maine's RPS, which requires that 80 percent of electricity sold in Maine is generated from renewable sources by 2030,[18] is already benefiting Maine. A 2024 report found that the state's RPS has saved Maine ratepayers more than $21 million annually in net electricity costs by suppressing prices in the regional electricity market while supporting more than $100 million in direct investment and approximately $900 million in operations and maintenance spending.[19]

Maine's RPS is in line with other New England state policies to require increasing amounts of renewable energy to be sold within the state each year. These policies are illustrated in Figure 25 which shows each state's RPS Class I requirements over time. An analysis commissioned by the GEO in 2021 demonstrated Maine is on track to achieve its RPS, although doing so will require continued additions of new renewable energy through the end of this decade.[20]

Figure 25. RPS Requirements for Class I or Renewable Energy Resources
Source: ISO-New England



The Technical Report demonstrated that Maine's RPS could be augmented by a new complementary Clean Energy Standard (CES) to allow other zero or very low carbon energy resources, such as nuclear, large-scale hydro, and/or clean fuels for thermal electricity generation, to contribute to Maine's goal of reaching 100 percent clean electricity by 2040. Like the RPS, this CES would not control or dictate operations of electric generation, but would provide an accounting mechanism for the electricity consumed in Maine using clean energy certificates. Maine's existing renewable resources plus those it has planned and contracted for can affordably meet most of the state's clean electricity demand by 2040. The addition of a CES can enable the resources needed to meet the remaining demand.

Strategy A Key Actions

- Design and establish a CES that is compatible with similar policies in other New England states and complementary to Maine's existing RPS by creating a new class that allows for energy generated by clean electricity resources (such as nuclear, clean fuels, large-scale hydropower, or other innovative technologies) defined by an emissions-based threshold to compete in Maine. This CES would phase in over time to ensure compliance with Maine's goal of 100 percent clean energy by 2040.

- Pursue state policies and regional market structures to enable deployment and unlock value from emerging resources such as long-duration energy storage, which has the potential to cost-effectively address capacity and resource adequacy needs in the coming decades.

- Continue to monitor and report on the progress of the state's RPS and future CES policies through statutorily required reports, the biannual State Energy Plan, and a new online dashboard that provides data on installed generation resources.

- Monitor and evaluate market trends to inform Maine's approach to clean fuels (such as green hydrogen, or other renewable or bio-based fuels), geothermal, and other emerging technologies, and plan for them in the future through the development of roadmaps, pilots, or targeted opportunities analyses.

Strategy B. *Establish a regular schedule of competitive energy purchases*

Maine's existing renewable energy procurements are supporting the development and maintenance of clean energy while driving significant economic growth across the state. Additional procurements are needed to support both the development of new resources and the long-term maintenance or repowering of existing renewables. As emphasized in Maine's climate action plan, *Maine Won't Wait*, establishing a regular schedule of competitive clean energy purchases is necessary to meet the long-term energy needs of the state. These new procurements should be adaptable to short-term opportunities and challenges while establishing long-term certainty to ensure cost-effective deployment. Greater predictability of procurements, in addition to greater predictability in siting, permitting, and interconnection processes for clean energy, can help reduce delays and cost increases. These new procurements should also be considered within the regional context.

Strategy B Key Actions

- Utilize Maine's biannual State Energy Plan in tandem with the state's Climate Action Plan, ISO New England planning, and distribution level grid planning activities to determine the need for new resource procurements to achieve state policy objectives and meet projected demand and reliability needs.
- Deliver on legislative directives and authorities to advance procurement of new energy storage; efficient combined heat and power, which supports modern clean wood heat and electrical generation; distributed and customer-sited solar; offshore wind; renewable resources and transmission in Northern Maine; and additional clean energy resources as needed to meet energy needs and satisfy Maine's beneficial electrification policy.
- Before 2026, assess the status and results of current procurements and adopt new procurement priorities as needed in line with statutory objectives.
- Identify and leverage opportunities to improve the long-term viability of existing renewables through repowering, reinvestment, and pairing with energy storage, as appropriate.
- Continue to consider recommendations and lessons identified in the 2024 Assessment of Maine's Renewable Portfolio Standard report as well as future assessments to deploy large-scale renewable procurements.

Strategy C. *Advance responsible development of offshore wind energy*

The Technical Report identified offshore wind as a key energy generation source to help meet Maine's long-term energy and reliability needs. Responsible and sustainable development of offshore wind is essential to meet Maine's growing electricity demand as well as the state's clean energy, climate, and economic development goals. In 2019, the state launched the Maine Offshore Wind Initiative,[21] which is engaged in offshore wind planning, research, infrastructure development, and policy.

In 2021, Maine initiated the development of a comprehensive plan for responsible offshore wind development. Following an 18-month stakeholder-driven process led by GEO, the Maine Offshore Wind Roadmap was published in 2023 with key actions to realize the economic and climate benefits of an offshore wind industry while supporting coastal communities and industries and protecting the unique Gulf of Maine ecosystem.[22]

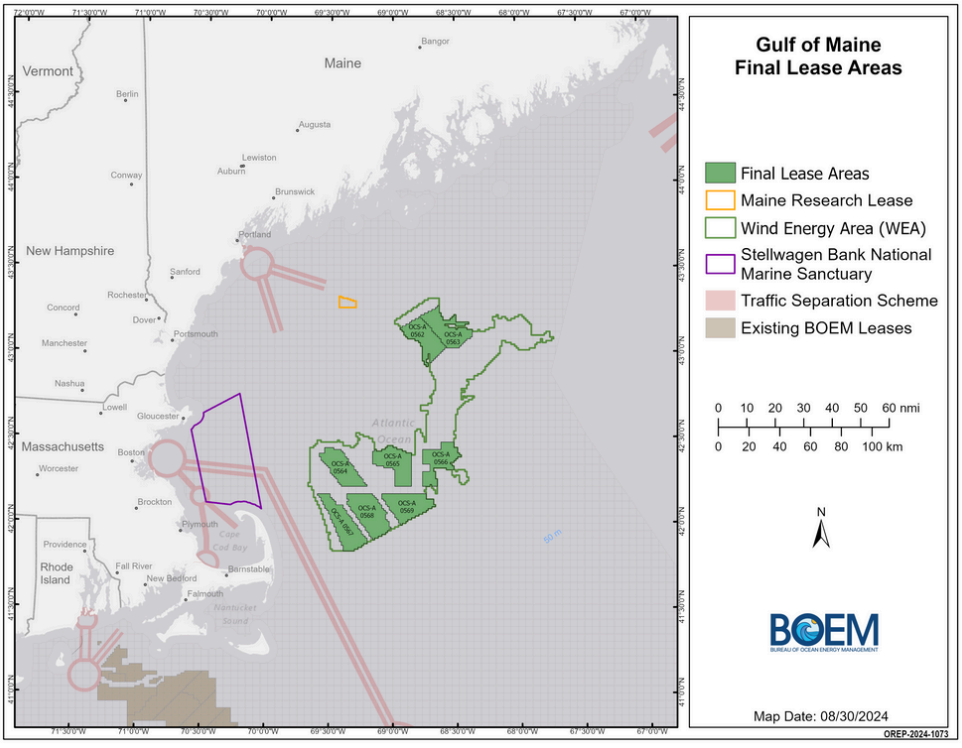
Continuing to implement the Roadmap objectives through the Maine Offshore Wind Initiative is crucial to meeting the state's energy needs and positioning Maine as a competitor and beneficiary in the emerging global offshore wind industry. These objectives include conducting offshore wind energy procurements, building critical port infrastructure, proactively engaging in the federal offshore wind leasing and development processes (map included in Figure 26), supporting the Maine Offshore Wind Research Array and Research Consortium, advancing Maine-based innovation, and engaging in regional transmission and interconnection planning, among other priorities.

Strategy C Key Actions

- Responsibly procure 3,000 MW of offshore wind energy in the Gulf of Maine by 2040 to meet Maine's clean energy goals and drive economic growth across the state through investment and workforce development.
- Advance Maine-based offshore wind port infrastructure to strengthen the state's position in the growing industry by attracting investments, expanding coalitions, and ensuring timely development to support offshore wind projects in the Gulf of Maine and beyond.
- Continue to advocate for responsible offshore wind development in the Gulf of Maine and facilitate meaningful dialogue between stakeholders, developers, and state and federal agencies.
- Advance the objectives of the Maine Offshore Wind Research Array and make findings publicly available to inform future commercial offshore wind development.
- Ensure timely and impactful research efforts through the Maine Offshore Wind Research Consortium.
- Support Maine-based innovation to enhance Maine's competitiveness in the blue economy and develop a skilled local workforce and supply chain.
- Continue regional, national, and international coordination and other partnership activities across multiple priorities, including transmission, procurement, ports, and supply chain development.

Figure 26. Gulf of Maine Offshore Wind Lease Areas

Source: Federal Bureau of Ocean Energy Management (BOEM)

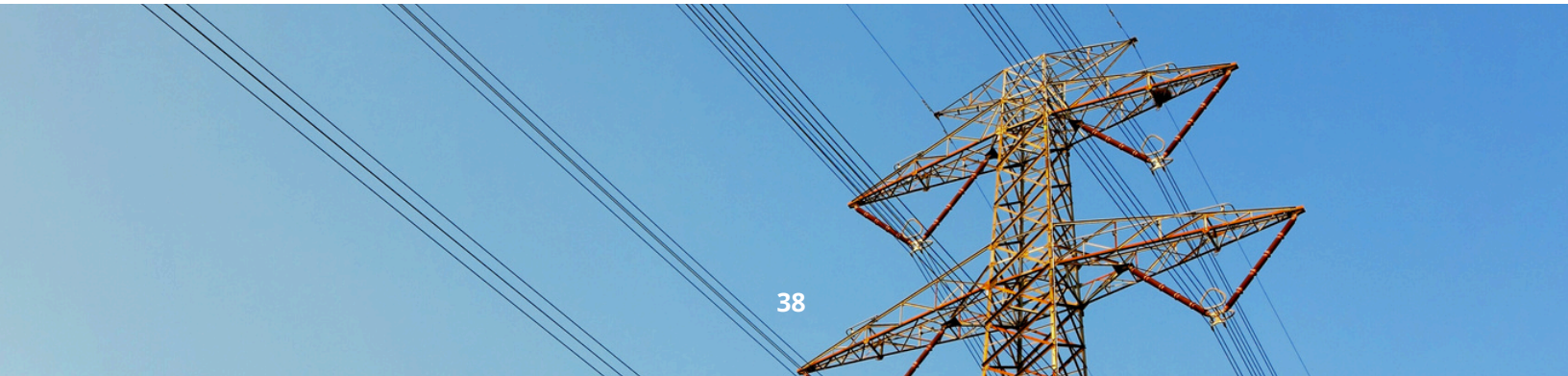


Strategy D: *Advance efficient, necessary infrastructure to modernize Maine's energy systems*

Maine's electrical infrastructure is aging and will require significant upgrades to ensure energy is delivered to homes and businesses in a cost-effective and reliable manner. The following activities will support the modernization of Maine's electrical system to prepare it to meet Maine's energy needs today and into the future. Grid modernization projects are critical investments in public infrastructure that will facilitate the efficient flow of power across the grid, enable deployment of local, clean energy resources, and reduce energy costs over the long run for consumers. These investments include upgrades to support more efficient use of existing infrastructure as well as the expansion of new transmission and distribution infrastructure across the state, both of which will deliver significant economic benefits while helping Maine build the grid of the future. Policy makers and grid planners in Maine must collaborate with each other and others across the region to advance proactive planning processes that ensure timely, cost-effective upgrades and successful navigation of complex local, state, and federal permitting policies. Delays in this planning can limit access to low-cost generation, slow adoption of electrified technologies, and cause reliability issues.

Strategy D Key Actions

- Reduce barriers to successful deployment of large-scale renewable energy and supporting infrastructure as well as DERs to lower clean energy deployment costs and increase certainty while balancing other state natural resource, wildlife, and planning priorities. Engage with stakeholders and communities to evaluate and implement best practices with respect to clean energy siting.
- Provide municipal assistance and support to enhance benefits of and build support for clean energy deployment by working with relevant state agencies, including the Maine Office of Community Affairs (MOCA). Share key information about energy infrastructure and needs with municipal planners, provide tools for communities such as model zoning ordinances, best practices, and community benefit agreements and plans, and work with community organizations to support informed decision making.
- Maximize existing transmission infrastructure by supporting studies and appropriate utilization of advanced transmission technologies, grid-enhancing technologies, and non-wires alternatives to increase reliability and resiliency while reducing costs.
- Advance recommendations from the RPS Report and Technical Report to reduce project attrition.



Strategy E: *Coordinate and collaborate regionally to maximize benefits and achieve shared goals*

Because Maine's energy system is connected to several neighboring jurisdictions, including New England and Eastern Canada, regional coordination is critical to each objective of this Energy Plan. Maine has prioritized coordination with neighboring entities to maximize benefits and minimize costs. To date, Maine has worked with others in the region to establish energy procurements, secure federal funding for energy efficiency, grid innovation, and resilience, and engage in regional planning activities.

In 2020, Maine joined the other five New England states in releasing the New England States Energy Vision Statement.[23] In 2024, Maine joined a total of 10 states to form the Northeast States Collaborative for Interregional Transmission and signed a memorandum of understanding for improved regional planning of electricity transmission.[24] In 2024, Maine was a member of both the New England Heat Pump Accelerator Coalition and Power Up New England, federal funding proposals which secured a cumulative $839 million for the region and almost $200 million for Maine. Efforts to collaborate with regional partners will continue as Maine works to implement the objectives the Energy Plan, as outlined in the key actions below.

Strategy E Key Actions

- Coordinate with neighboring jurisdictions to implement cost-effective energy procurements that benefit Maine ratepayers, including the Northern Maine Renewable Energy Development Program.
- Utilize lessons learned from other states in the region regarding cost-effective procurements and related policies best practices.
- Maximize opportunities to advance Maine's interests through the New England States Committee on Electricity (NESCOE), including the advancement of ISO-NE's Long-Term Transmission Planning and associated Requests for Proposals which seek to maximize existing transmission resources.
- Deploy federal funds awarded through regional applications, totaling hundreds of millions of dollars to strengthen transmission, clean energy, and energy efficiency.

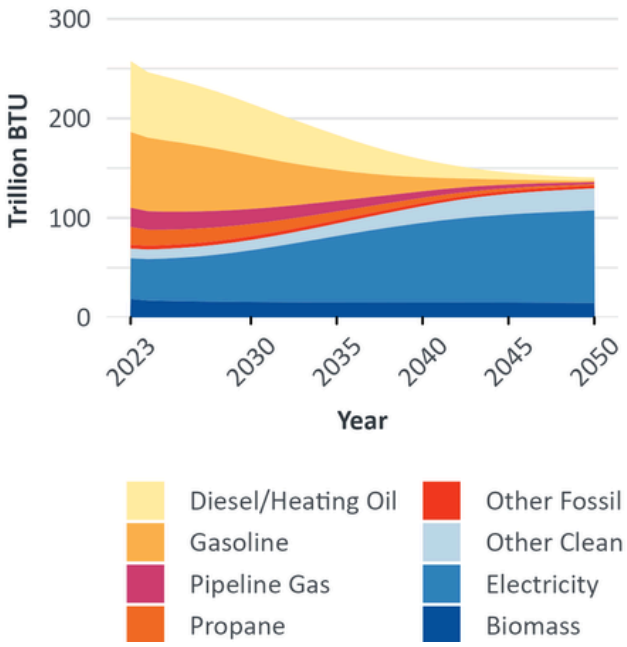
Objective D. Deploy Efficient Technologies to Reduce Energy Costs

Maine's Climate Action Plan, *Maine Won't Wait*, underscores the urgent need to reduce emissions from the state's building and transportation sectors, which are responsible for more than two-thirds of Maine's greenhouse gas emissions, and sets ambitious targets to do so. Energy efficiency investments are saving consumers money, ensuring buildings are comfortable year-round, helping to reduce total energy demand, and cutting Maine's reliance on fossil fuels. For applications where electricity is a viable energy source, it can be the most efficient source as well. As a result, increasing electrification is a core strategy to increasing efficiency. This is demonstrated by the Technical Report and in Figure 27 which shows overall energy use in Maine reduced by almost half in 2040 relative to today, in large part due to the electrification of end uses which today rely on less efficient combustion technologies.

Expanding electrification with modern technologies also increases the availability of an important resource: load flexibility. Because the electricity grid is built to accommodate the times of greatest demand, there is potential for significant cost savings for all electricity customers when peaks can be moderated. As more renewable energy flows into the grid, creating periods of abundant, low-cost electricity (e.g. during periods of high wind or intense sunshine), it will be critical to use or store that power to ensure consumers can benefit from these low-cost periods. Conversely, additional benefits can be reaped by shifting loads away from periods of high demand to avoid taxing the system and incurring higher operating costs. This underlying dynamic is referred to as load flexibility. The Technical Report highlights potentially significant cost savings for customers through load flexibility. For example, this can be done by adjusting overnight charging times for electric vehicles, ensuring the driver wakes up to a fully charged vehicle while paying the lowest possible amount for that electricity.

Figure 27. Total Energy Use in Maine Over Time

Source: Maine Pathways to 2040: Analysis and Insights



The Efficiency Maine Trust (EMT or Efficiency Maine) develops and manages energy efficiency and alternative energy programs statewide. As the administrator of several funding streams, EMT develops a plan every three years detailing spending and program activities. In 2024, cost-effective electrification measures, such as heat pumps, heat pump water heaters, and EVs that are paired with smart charging, were eligible for funding through electric ratepayer revenue which will advance the deployment of energy efficient technologies.

Efficiency Maine also offers other energy efficiency programming, such as the Thermal Energy Investment Program (TEIP) which provides incentives for projects that 1) convert fossil fuel boilers to wood-fueled boilers or boilers using wood-derived biofuels, and 2) installation of new wood-fueled boilers or boilers using wood-derived biofuels. There is a significant opportunity to leverage additional federal funding on its way to the state through the Bipartisan Infrastructure Law and the Inflation Reduction Act. In 2024, Maine was awarded $72 million in federal funding to support home energy efficiency and electrification rebate programs, with full availability of funds expected by 2025. Additionally, over the course of fiscal years 2022-2026, Maine will receive nearly $18 million to expand its network of public high speed EV chargers through the National Electric Vehicle Infrastructure Formula Program (NEVI).

Maine has made significant progress in becoming more energy efficient. Funding from state government, the federal government, local leadership, and private investments have positioned Maine as a national leader in energy efficiency and beneficial electrification. The latest rankings from the American Council for an Energy-Efficient Economy (ACEEE) ranked Maine at 5th in the country for state energy efficiency policies and programs.[25]

Building Efficiency

GEO works closely with EMT, the Maine State Housing Authority (MaineHousing), and others to ensure deployment of energy efficient technologies in an equitable, economical, and efficient manner. In July 2023, Maine surpassed Governor Mills' goal of installing 100,000 new heat pumps two years ahead of schedule and the Governor announced a new target to install an additional 175,000 new heat pumps by 2027.

This, in combination with the previous goal, would bring the number of heat pumps installed in Maine homes, businesses, and public buildings to 275,000 during the Mills Administration. If this target is achieved, Maine would have more than 320,000 heat pumps installed across the state by 2027. In 2024, nearly 28,000 heat pumps were installed in Maine through the combined efforts of Efficiency Maine and MaineHousing for a total of nearly 144,000 since 2019,[26] as shown in Figure 28.

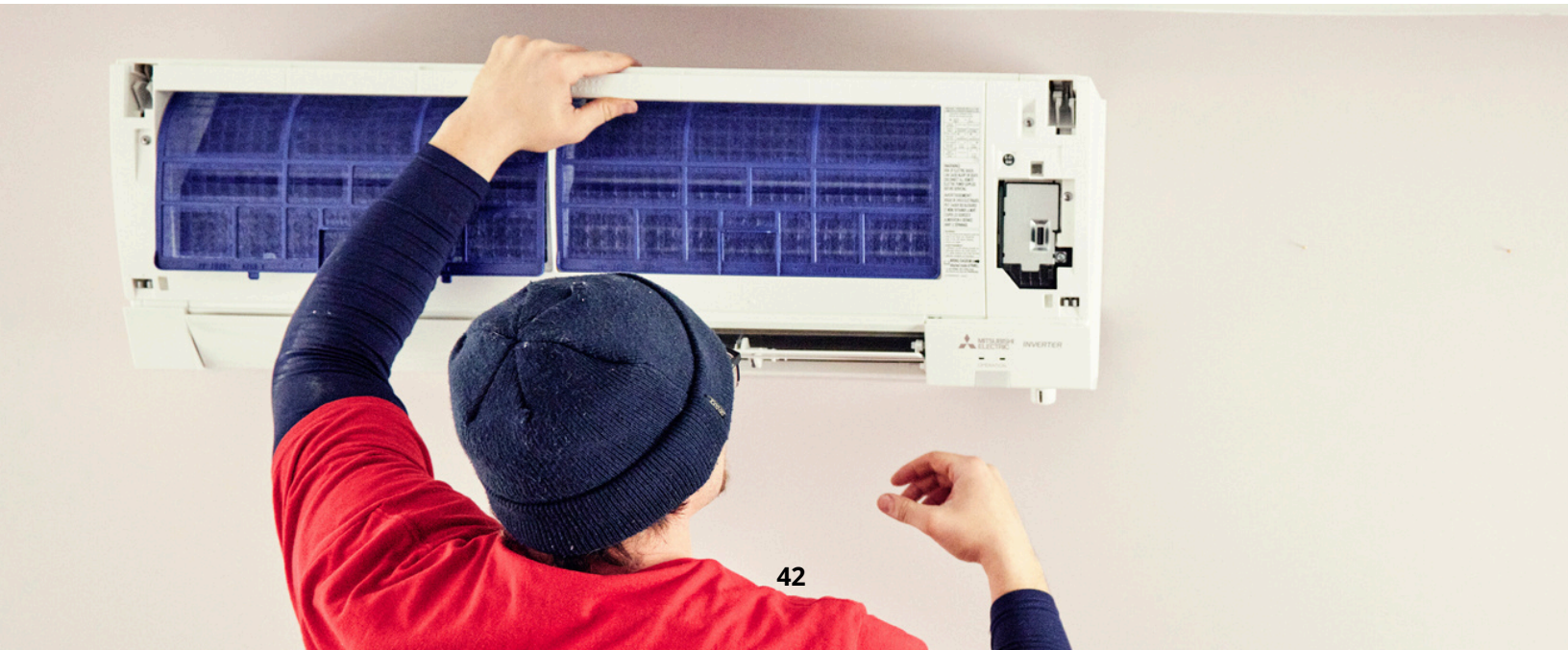
Figure 28. Energy Efficient Appliance Installation and Dwelling Weatherization in Maine

Source: Efficiency Maine Trust, *FY 2024 Annual Report*

Year	Heat Pumps Installed
2019	11,420
2020	12,765
2021	28,247
2022	30,258
2023	33,170
2024	27,996
Total	**143,857**

Year	Heat Pump Water Heaters Installed
2019	5,988
2020	8,542
2021	10,427
2022	9,368
2023	9,504
2024	10,576
Total	**54,405**

Year	Dwellings Weatherized
2019	2,691
2020	1,561
2021	1,740
2022	2,131
2023	3,331
2024	3,174
Total	**14,628**



Maine continues to be a national leader in the adoption of heat pump water heaters. Efficiency Maine reports that over 10,500 heat pump water heaters were installed in fiscal year 2024 for a total of over 54,000 heat pump water heaters installed since 2019. In addition, Maine has established a goal to double the pace of home weatherization, achieving the weatherization of 17,500 additional homes and businesses by 2025 and 35,000 by 2030, including 1,000 low-income residential units per year.

In 2024, nearly 3,200 homes were weatherized through the combined efforts of Efficiency Maine and MaineHousing for a total of nearly 15,000 since 2019. As Maine continues this work, it's crucial to continue to monitor and ensure sufficient fuel supplies for industries and households still reliant on traditional fuels, like heating oil, particularly for low-income families most impacted by volatile prices, while also seeking opportunities to make it easier for them to transition to more efficient heating sources.

Efficiency Maine's Triennial Plan VI,[27] submitted to the Maine PUC in 2024, is forecasted to accelerate this progress over the next three years by delivering:

- 38,000 homes heated entirely with heat pumps
- 6,500 low-income homes heated entirely with heat pumps
- 9,900 homes weatherized
- 1,700 new battery systems in homes and small businesses
- $43 million in small business investments
- $490 million in suppression of electricity rates

Clean Transportation

GEO is a key partner in the Recharge Maine Initiative,[28] a collaboration between GEO, the Governor's Office of Policy Innovation and the Future, Maine Departments of Transportation and Environmental Protection, and Efficiency Maine. Through this partnership, Maine is actively expanding its EV charging network, as shown in Figure 29. Since 2018, $52 million in state and federal funding has been allocated to install over 700 charging ports in Maine. In 2024, Maine added 13 new fast charging ports along key travel corridors and 40 new Level 2 charging ports across 12 communities.

Maine currently has more than 1.2 million registered light-duty vehicles on the road, with all-electric vehicles numbering 8,649 and plug-in hybrid electric vehicles totaling 8,864. Together, EVs make up nearly 1.5 percent of the state's light-duty vehicle fleet. As Maine's charging network continues to grow, EV adoption is steadily increasing and is expected to surpass previous years' registration counts, as illustrated in Figure 30.

Figure 29. Map of Maine's Public EV Charging Locations

Source: Recharge Maine (10/15/24)

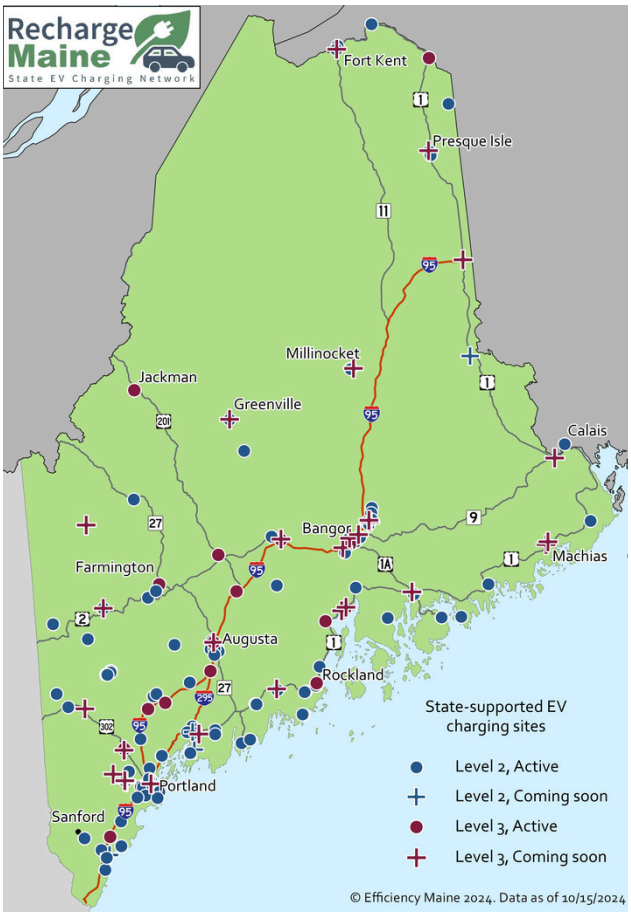
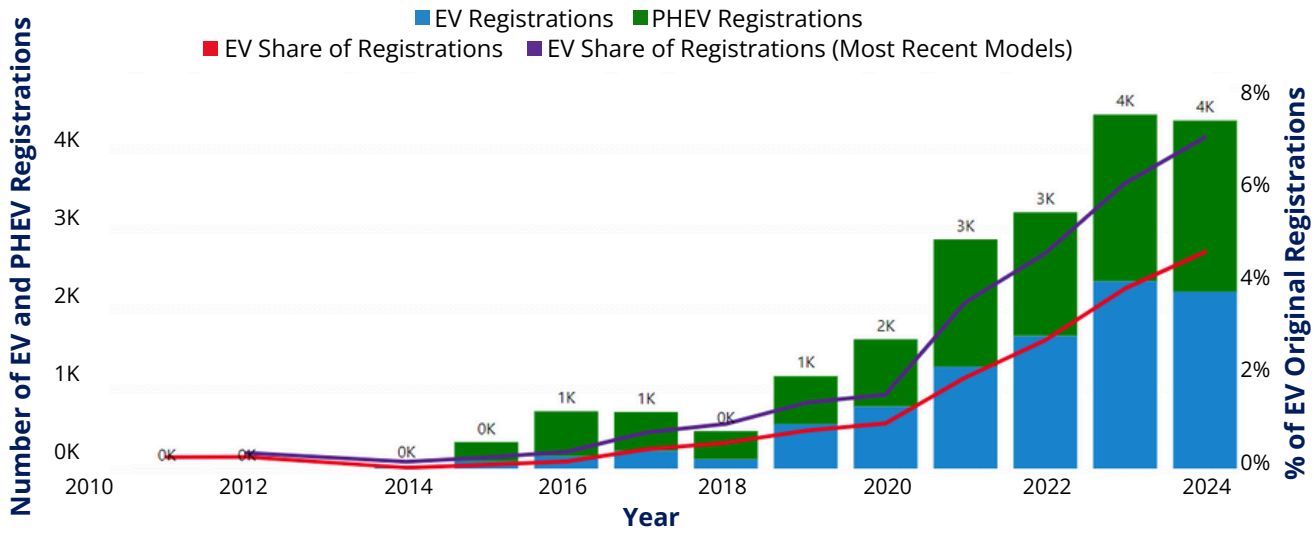


Figure 30. Original Registrations of EVs and Plug-in Hybrid EVs (PHEVs), Maine

Source: Recharge Maine (9/30/24)



Strategies

Strategy A. *Advance beneficial electrification and weatherization to reduce energy costs and increase overall grid efficiency*

Beneficial electrification will reduce electricity rates and enhance grid efficiency through deployment of heat pumps, electric vehicles, and smart charging solutions. These investments will drive energy savings, support grid reliability, and ensure wider adoption of energy-efficient solutions. Building weatherization measures like insulation and air sealing are essential for improving the overall performance of the state's building stock by lowering energy consumption, improving comfort for residents, and reducing long-term energy costs. Electrification and weatherization are not only critical for Maine's existing building stock, but also for new construction projects. Recent analysis [29] demonstrates Maine must accelerate new housing development to address historic underproduction and meet future needs. Doing so with a focus on energy efficiency will ensure lower energy costs for residents and lower emissions associated with these projects over the long-term.

Strategy A Key Actions

- Utilize the Beneficial Electrification Policy Act (35-A MRSA chapter 38) and other mechanisms to continue to advance fuel switching and deployment of heat pumps, heat pump water heaters, EVs, and other electrification measures that meet Maximum Achievable Cost Effectiveness (MACE) criteria and reliably reduce rates.
- Work with the Legislature, PUC and EMT to responsibly consider and adjust the 4 percent cap on procurement that could limit the ability of EMT to deploy beneficial electrification technologies that would reliably reduce rates over the life of those measures.
- Leverage federal funds (e.g., Home Energy Rebates, Climate Pollution Reduction Grants, Energy Improvements in Rural and Remote Areas) to support adoption of heat pumps and heat pump water heaters among hard-to-reach customer segments (e.g., low-income, multi-family, mobile/manufactured homes) and in line with state affordable housing goals.
- Leverage federal funds to support weatherization and building performance improvements in the residential and commercial sectors in partnership with Efficiency Maine, MaineHousing, state and local governments and the private sector.
- Advance the implementation and adoption of building energy codes and standards required in statute and outlined in *Maine Won't Wait.*
- Continue efforts to lead by example in state and government buildings in line with Executive Order 5 signed by Governor Mills in 2024. [30]
- Support business development among energy efficiency contractors and encourage new business creation in rural areas.

Strategy B. *Leverage electrified technologies to unlock grid benefits for consumers*

Traditional electric loads require electricity when the application is in use, while EV battery charging must occur when the vehicle is not in use. This is one example of an electrified technology which offers a significant opportunity for flexible load management which, as demonstrated by the Technical Report, is a cost-effective approach to reducing peak loads. While flexible loads can't balance the electric grid alone, tapping into the inherent flexibility of EVs, heat pump water heaters, batteries, and even heat pumps could help meet short-term balancing needs, bolstering system reliability while reducing the need for new electric supply, transmission, and distribution infrastructure. Load flexibility can provide cost-effective reliability while reducing peak loads and infrastructure needs.

Strategy B Key Actions

- Support ongoing innovation activity with Efficiency Maine including those that further enable smart technology such as managed charging or demand response.
- Expand programs and markets that help customers participate in demand-management initiatives and track participation in these programs by income.
- Further consider software, technologies, and integrated controls that can provide transparent price signals to enable markets to balance electricity demand with supply.
- Identify policies that facilitate the integration of EV charging stations with Vehicle-to-Grid technology, preparing for its crucial role in balancing supply and demand, particularly for medium- and heavy-duty fleets, as discussed in the Maine Clean Transportation Roadmap for Medium- and Heavy-Duty Vehicles.[31]
- Consider battery storage integration where appropriate with public EV fast charging stations to help manage peak demand and enhance grid stability.

Strategy C. *Expand Maine's EV charging network*

Expanding Maine's EV charging network will build driver confidence and accelerate the adoption of electric vehicles statewide. By leveraging federal funds and, Maine can provide residents with the opportunity to transition to EVs through the expansion of convenient and reliable EV charging infrastructure in key locations.

Strategy C Key Actions

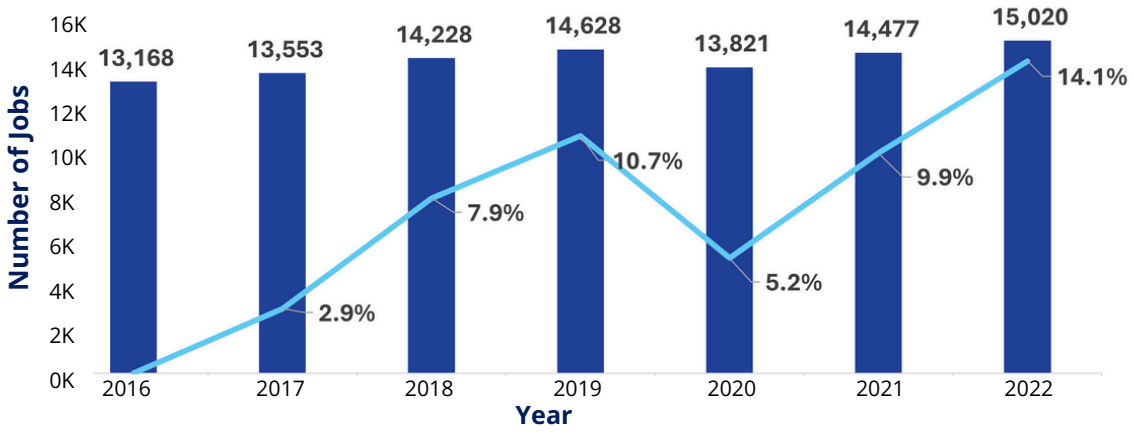
- Leverage federal funding through the National Electric Vehicle Infrastructure Formula Program and Charging and Fueling Infrastructure Grants to strategically expand the EV charging network across the state, including high-speed charging stations for medium- and heavy-duty vehicles.
- Engage businesses on the benefits of installing EV charging stations and expand level 2 charging in community locations.
- Promote workplace charging as a key solution for individuals without access to home charging while enabling them to charge during the day when electricity demand is lower.

Objective E. Expand Clean Energy Career Opportunities for Maine People and Advance Innovation

As the clean energy sector grows in Maine, so does the demand for workers to fill the growing number of jobs in the industry. The 2023 Maine Clean Energy Industry Report found that over 15,000 people are currently employed in Maine's clean energy sector, surpassing pre-pandemic levels.[32] The sector is on track to continue this growth in the coming years (Figure 31), bolstered by state programs and initiatives. Maine's clean energy sector continues to expand, contributing more than $2.31 billion to the state's economy in 2022.

Figure 31. Clean Energy Job Growth in Maine

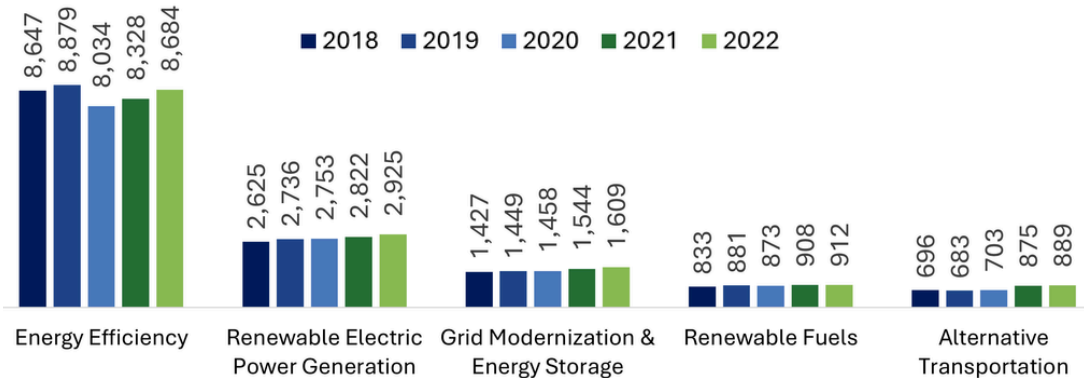
Source: 2023 Maine Clean Energy Industry Report



The industry report shows that the largest clean energy technology sector in Maine is energy efficiency, accounting for over 8,600 jobs, or 58 percent of the clean energy workforce. This is followed by renewable electric power generation which employs approximately 20 percent of the state's clean energy workers. There are approximately 900 workers in alternative transportation, constituting 6 percent of Maine's clean energy workforce (Figure 32).

Figure 32. Clean Energy Jobs in Maine by Sector

Source: 2023 Maine Clean Energy Industry Report



There are also growth opportunities in clean energy entrepreneurship and innovation, as many innovators are committed to utilizing local resources and benefiting Maine communities. As highlighted in Maine's 10-year Economic Development Plan, innovation is a leading contributor to GDP growth, and businesses of all sizes and sectors contribute to the State's entrepreneurship and innovation ecosystem.

In the U.S. and around the world, government policies and private sector innovation have driven down the cost and accelerated the deployment of clean energy. Emerging public-private partnerships between governments, industry, and academic institutions focused on energy-related challenges are nurturing innovation, advancing the deployment of clean energy products and services, and growing a skilled workforce. These investments in research and development will continue to support innovation, turning research into marketable products.

The energy sector can harness powerful new technologies like artificial intelligence (AI) to help solve complex grid management challenges while preparing and planning for increased electric load. Maine has an opportunity to advance innovation leadership in ocean energy, including floating offshore wind technology and tidal energy generation; advanced building materials, and biotech products derived from forests, oceans, and farms; and should consider future opportunities associated with green hydrogen and other renewable fuels. Maine has existing strengths within its research institutions, particularly the collaborations between industry, academia and state agencies in growing markets such as bioproducts, composites manufacturing, and offshore wind. The Clean Energy Partnership [33] (CEP) is an initiative led by GEO focused on advancing energy innovation and preparing Maine people for good-paying, family-sustaining jobs in the growing clean energy and energy efficiency fields, providing avenues for business support, and achieving Governor Mills' goal of reaching 30,000 clean energy jobs in Maine by 2030. The CEP is led by the GEO in partnership with the Governor's Office of Policy Innovation and the Future (GOPIF) and the Maine Departments of Labor (DOL) and Economic and Community Development (DECD).

Through the CEP, GEO has worked to expand career and entrepreneurship opportunities for Maine people in clean energy through partnerships with other state agencies, Maine's Community College and University Systems, local workforce development groups, private sector companies, and other organizations. This work will continue and expand, as outlined by this objective.

Strategies

Strategy A. *Raise awareness of clean energy careers and connect employers to the local workforce through the Clean Energy Partnership*

Maine's clean energy sector is poised for economic growth and will continue to create new high-quality jobs for Maine people. Clean energy jobs are well-paid and offer valuable career opportunities and other benefits to people with diverse backgrounds, skillsets, and expertise. Maine has a significant opportunity to grow the clean energy economy and bridge the workforce gap by expanding outreach and raising awareness of clean energy careers among key populations.

Strategy A Key Actions

- Partner across state agencies to raise awareness of career pathways and workforce training opportunities across five clean energy technology sectors: Energy Efficiency, Renewable Electric Power Generation, Grid Modernization & Energy Storage, Alternative Transportation, and Alternative Fuels.
- Launch targeted career awareness initiatives in weatherization, solar, and energy efficiency with federal funds through the Maine Energy Auditor Pathways program, the Maine Solar for All program, the Maine Training for Residential Energy Contractors program, and others.
- Grow the reach of the Maine Clean Energy Jobs Network (www.mainecleanenergyjobs.com), a new online training directory and job board, to reach employers and jobseekers while providing career navigation support for aspiring clean energy workers in partnership with the Maine Department of Labor's Career Centers and other partners.

Strategy B. *Advance clean energy curricula development, technical training, and experiential learning*

Many clean energy jobs have relatively low barriers to entry and offer significant opportunities for growth. The CEP provides funding for programs in Maine that attract new workers to the clean energy workforce, provide career training and upskilling opportunities to existing workers, increase diversity and representation, and facilitate entry into rewarding and high-paying jobs through new and expanded internship, Registered Apprenticeship, and pre-apprenticeship programs.

Strategy B Key Actions

- Advance clean energy curricula development, technical training, and experiential learning through new programs and the 15 clean energy workforce training programs already awarded nearly $5 million in federal funds by the CEP in Maine since 2022.

With an estimated more than $13 million in additional federal funds for workforce development made available through the Bipartisan Infrastructure Law and Inflation Reduction Act, GEO will implement the following:

- Advance workforce development in the solar industry and related occupations by piloting innovative K-12 programming, investing in pre-apprenticeship, apprenticeship, and training programs, expanding instructional capacity, and providing technical assistance and outreach to industry.
- Assess the workforce skills, occupations, training infrastructure, and capacity needs associated with grid modernization and provide training, pre-apprenticeships, apprenticeships, and internships leading to employment in the sector.
- Train a qualified contractor workforce for new federal energy efficiency rebates programs in addition to existing rebates and incentives offered by Efficiency Maine and weatherization programs offered by MaineHousing.
- Raise awareness of energy auditing career pathways, provide training and certification in energy auditing competencies, fund an energy auditing Workforce Navigator position, and offer upskilling and technical assistance workshops for existing energy auditors and contractors.
- Address workforce training, development and capacity building needs for building code compliance and enforcement and allocate funding for trainings to support industries and occupations impacted by the adoption of new code requirements.

Strategy C. *Coordinate with educational institutions, technical and vocational training centers, labor unions, and employers to expand and promote clean energy career pathways*

Through the CEP, GEO convenes an Advisory Group which consists of members representing State government, industry, training and educational institutions, and labor organizations. Coordinated engagement between these partners guides program development and implementation by defining needs, monitoring progress, informing adjustments, and designing future programs.

Strategy C Key Actions

- Through increased engagement with the CEP Advisory Group, continue to guide clean energy workforce development program development and implementation.
- Using federal funds, establish Energy Efficiency and Grid Modernization workforce subcommittees within the CEP Advisory Group to offer feedback to workforce development projects and programs.
- Identify pathways to clean energy and climate-friendly careers for workers and industries most impacted by climate change, including stackable workforce credentials in K-12 and higher education.

Strategy D. *Expand pilot programs, technical assistance, and funding for clean energy innovation and foster partnerships with research, education, and innovation institutions and the private sector to advance clean energy innovation*

Maine has a long history of entrepreneurship and innovation, and clean energy is well positioned for growth and innovation in the state. Establishing pilot programs, providing technical assistance, and fostering partnerships in clean energy innovation will help bring new technologies and services to market while advancing Maine's energy and economic development goals.

Strategy D Key Actions

- In partnership with the Maine Department of Economic and Community Development, continue to advance the Maine Community Energy Redevelopment Program (MECERP), which provides technical assistance to communities to help them revitalize current and former industrial sites with excess electrical capacity to create jobs, grow local economies, and accelerate the clean energy transition.
- Continue to pursue alignment among key partners to enable clean energy economic development, and the attraction of private sector capital through the Maine Technology Institute, Finance Authority of Maine, Maine Venture Fund, and Maine International Trade Center, among others.
- Advance the Maine offshore wind research array and other renewable ocean energy research projects in the Gulf of Maine to accelerate innovation in the growing blue economy.
- Review opportunities to establish a floating offshore wind innovation hub in Maine, capitalizing on existing strengths in research and development, deepwater ports, supply chain, and workforce.
- Support innovations through Maine's Forest Bioproducts Advanced Manufacturing Tech Hub to develop wood fiber bioproducts that help advance climate solutions and grow the economy.
- Execute the Clean Energy Research, Demonstration, and Financing Analysis and Feasibility Study to identify potential financing vehicles and incentive programs.
- In partnership with other state agencies, support the review and procurement of Maine-made clean technology products for use by state government, municipal governments, and other public institutions in Maine.

Conclusion

Maine has made significant progress and is well on the path to achieving the state's statutory energy requirements. The years ahead will offer opportunities to work together on additional planning and analysis to ensure policies and programs are effectively contributing to growth in Maine's economy, workforce, and clean energy sector, and are delivering clean, affordable and reliable energy to all Maine people. This plan positions Maine well to prioritize actions to achieve state energy goals while remaining flexible enough to meet inevitable challenges and leverage new innovations in the years ahead.

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Appendix

Figure A. New England Petroleum Infrastructure

Source: U.S. Energy Information Administration

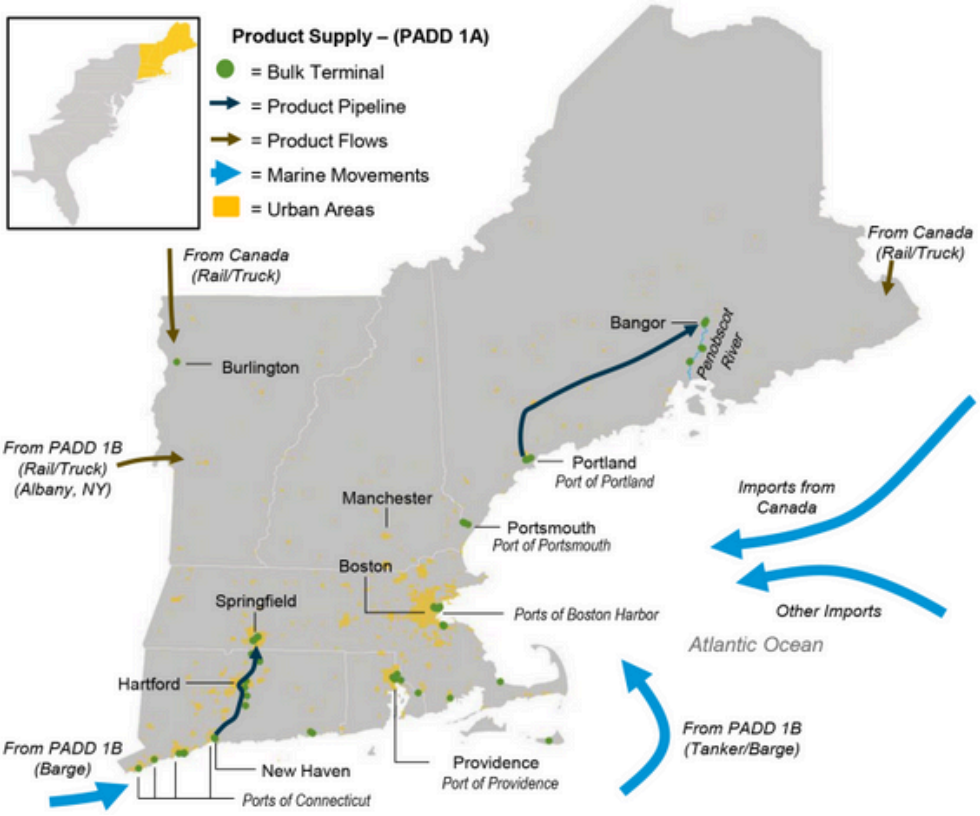


Figure B. Natural Gas Infrastructure in New England

Source: U.S. Energy Information Administration

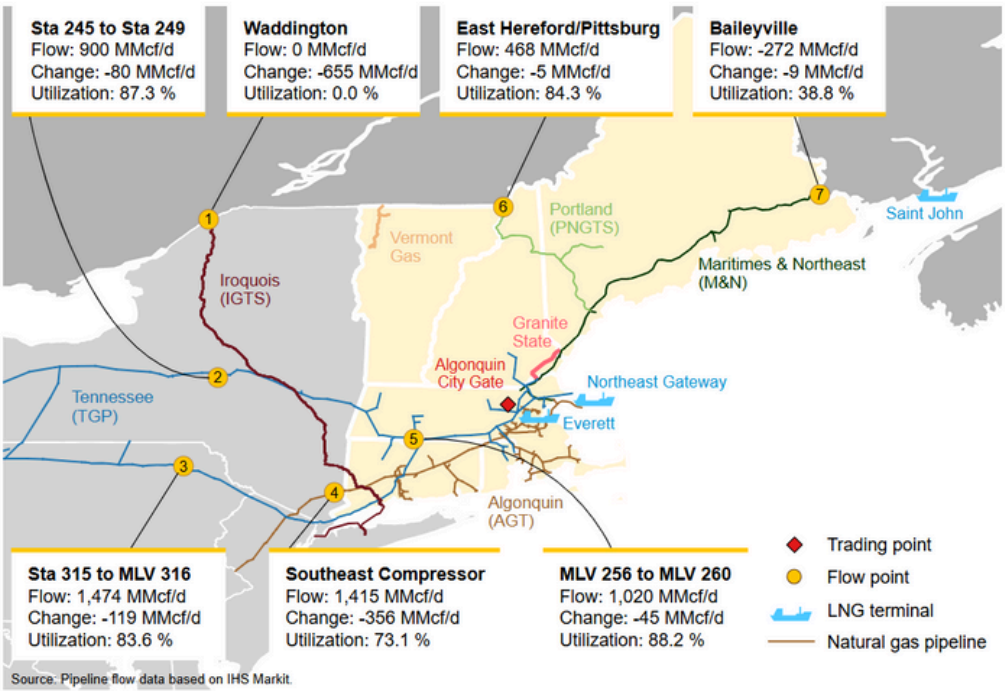


Figure C. Map of Maine Natural Gas Service Territories

Source: Maine Office of the Public Advocate

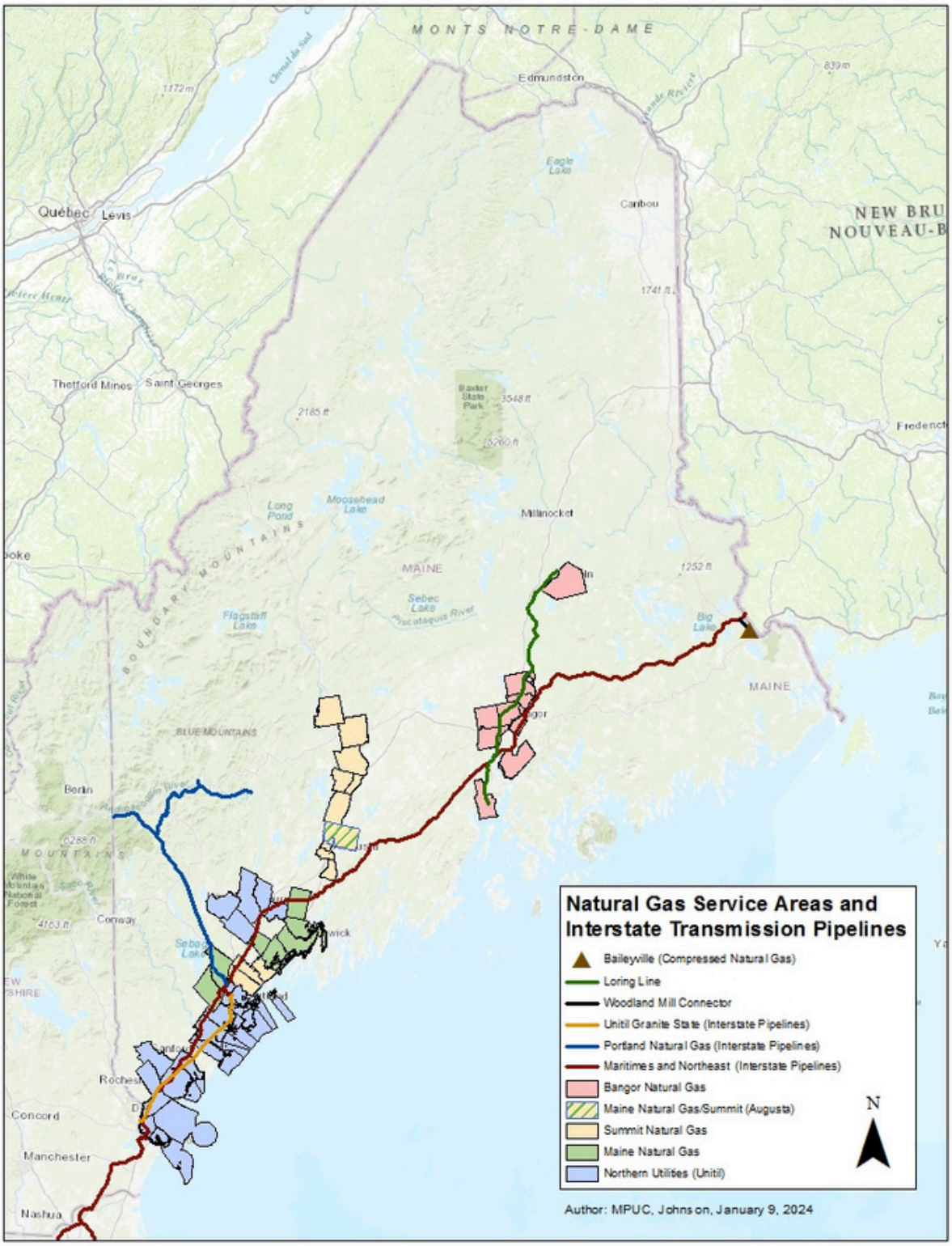


Figure D. New England Geographical Transmission System Map

Source: ISO-NE

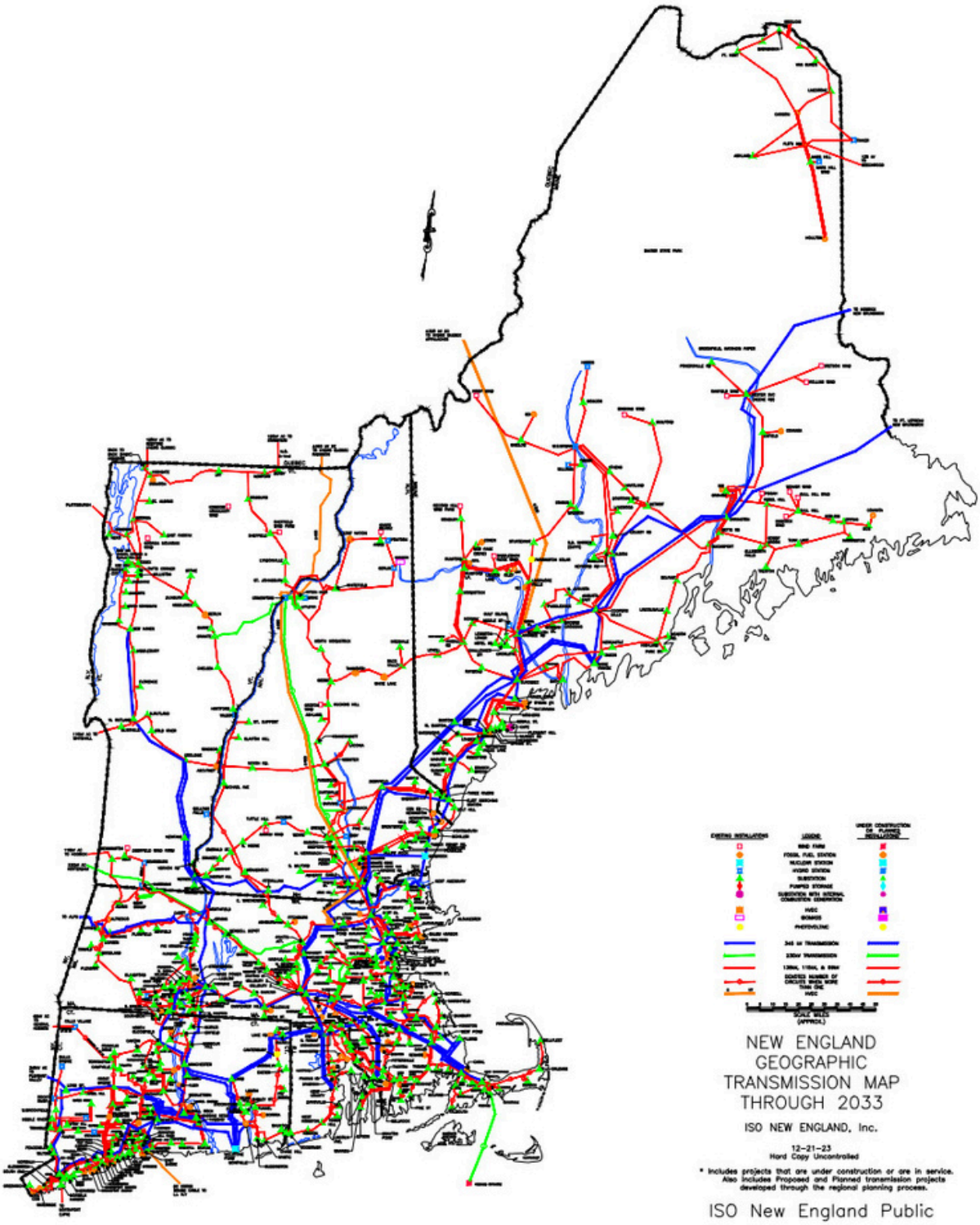


Figure E. Map of Maine Electric Utilities

Source: Maine Office of the Public Advocate

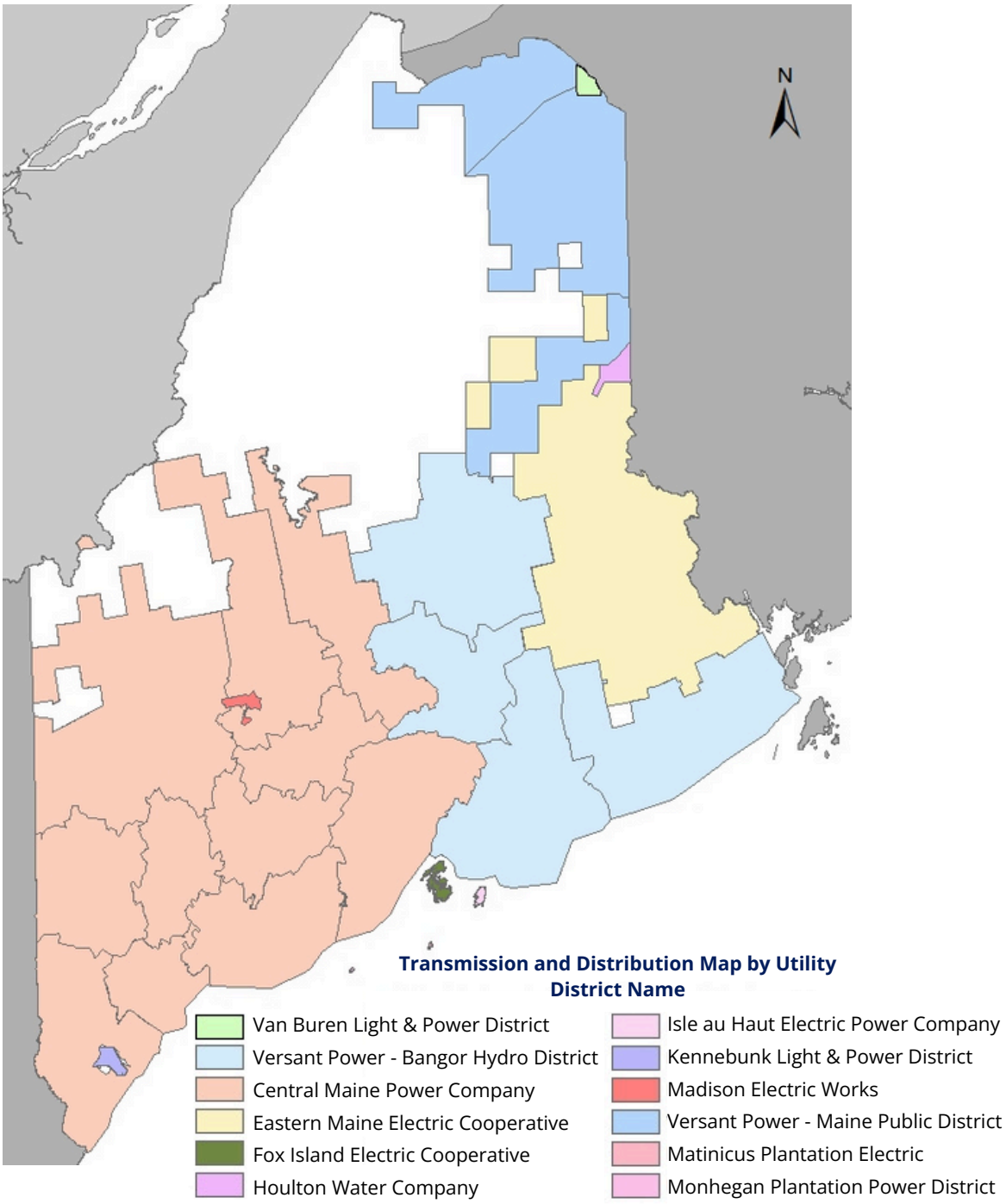
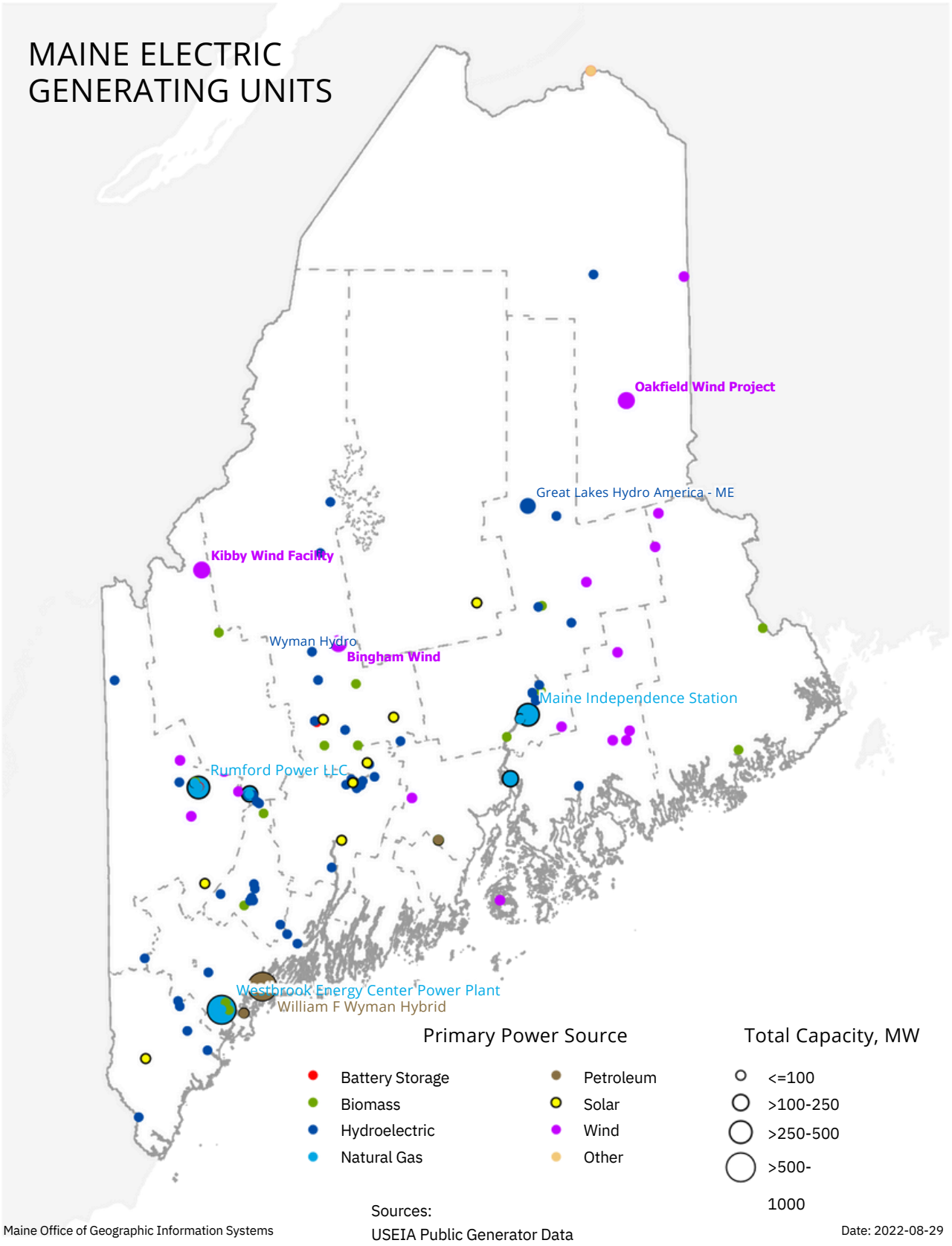


Figure F. Map of Maine's Electric Generating Units (2022)

Source: Maine Office of Geographic Information Systems



Appendix References

Figure A. U.S. Energy Information Agency. *New England Dashboard.* https://www.eia.gov/dashboard/newengland/petroleum

Figure B. U.S. Energy Information Agency. *New England Dashboard*. https://www.eia.gov/dashboard/newengland/naturalgas

Figure C. Maine Office of the Public Advocate. https://www.maine.gov/meopa/natural-gas

Figure D. ISO-New England. *Transmission Map*. https://www.iso-ne.com/about/key-stats/maps-and-diagrams#system-diagram

Figure E. Maine Office of the Public Advocate. https://www.maine.gov/meopa/electricity/utilities

Figure F. Produced by Bob Bistrais for the Maine Office of Geographic Information Systems (2022).

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