MAINE GOVERNOR'S
Energy Office

DRAFT Maine Energy Plan

Advancing affordable, reliable and clean energy for Maine people and businesses

Draft for Public Comment

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Introduction

For decades, Maine people and businesses have experienced significant energy cost volatility due to over dependence on out-of-state energy resources. In recent years, major disruptions across the world including the COVID-19 pandemic and the Russian invasion of Ukraine have caused price swings in fossil fuel markets, directly impacting households and businesses in Maine. As the most home heating fuel-dependent state in the nation, and with over 50 percent of the electricity produced in New England generated with natural gas, Maine is highly dependent on imported fossil fuels to keep homes comfortable, enable transportation, and power the economy. Currently, Maine spends more than $4 billion on imported fossil fuels each year. This volatility continued in 2024, causing energy prices to remain higher than historic averages and putting a strain on many households and businesses across the state.

As a heavily forested, rural state, Maine has and continues to face frequent and widespread electricity outages, which impact residents and businesses directly. In the last year, Maine experienced several winter storms which received federal disaster declarations, that devastated communities across the state and resulted in more than $90 million in damages to public infrastructure. All of this is on top of significant funding requested in reimbursements from utilities for power restoration efforts over the last several years. These storms, exacerbated by climate change, are increasingly common in Maine and are impacting the everyday lives of communities and people, and driving up costs to consumers for infrastructure recovery. To mitigate the impacts of future extreme weather, and to provide greater energy security for people and businesses, Maine must build a modern electrical grid that is reliable and resilient. Investments in the grid will not only improve energy security, but they will also help Maine transition to a clean energy future, in turn reducing the state's dependence on imported fossil fuels and cutting harmful emissions that contribute to climate change.

Maine has made unprecedented progress in advancing clean energy and energy efficiency technologies that are saving Maine energy consumers money and reducing exposure to price volatility and emissions while creating good jobs and growing the state's economy.

The nation-leading proliferation of high efficiency heat pumps and heat pump water heaters in Maine homes and businesses has unlocked long sought-after progress to reduce the state's dependence on imported, costly heating oil – a bipartisan priority of policymakers for several decades. 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.

Existing clean energy resources such as hydroelectricity, wind and biomass are being upgraded and maintained, and new cost-effective 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's clean energy economy has grown more than three times faster than the state's overall economy in recent years, and now contributes over $2.3 billion in economic activity to the state annually. With over 15,500 people employed in the clean energy sector, more people than ever are staying in or moving to Maine to build family-sustaining careers in clean energy. New clean energy innovations are being fostered and investments in community planning, workforce development, and entrepreneurship are being made across the state's economic landscape.

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 Mills set a bold new goal: 100% 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. These include:

- Maine's Renewable Portfolio Standard (RPS), which requires 80% of electricity delivered in the state to come from renewable resources by 2030;
- 3,000 megawatts of offshore wind installed by 2040;
- 750 megawatts of distributed solar generation;
- 400 megawatts of energy storage capacity by 2030;
- 30,000 clean energy jobs by 2030; and
- 175,000 additional heat pumps by 2027.

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 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 Energy Plan is underpinned by two foundational elements: a technical analysis outlining achievable pathways to reaching 100 percent clean energy by 2040, and a robust 18-month stakeholder engagement process. For the technical analysis, GEO invested one-time funding to support the creation of *Maine Pathways to 2040: Analysis and Insights* (draft link here), which for the first time considers Maine's hourly energy needs out to 2040 and outlines achievable pathways for the state to reach 100 percent clean energy by 2040. To gather robust stakeholder input on the plan, GEO hosted multiple 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 that inform this plan. In October 2024, GEO released a draft of the technical analysis for written public feedback, which will strengthen the final version of the technical report and the State Energy Plan.

Broadly, the technical analysis identified multiple pathways simulating future energy systems that meet identified reliability, emissions reduction, and other parameters while minimizing energy costs. The analysis demonstrates that Maine's goal of 100% clean electricity by 2040 is achievable, beneficial, and results in reduced energy costs across the economy. It also identifies important considerations related to innovation, emerging technologies, and load flexibility.

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

This State Energy Plan includes an overview of Maine's energy landscape today, five key objectives, and associated strategies that are key to responsibly advancing Maine's energy system and meeting the state's climate and clean energy requirements. The five key objectives are:

Objective A: Deliver affordable energy to Maine people and businesses
Objective B: Ensure Maine's energy systems are reliable and resilient in the face of growing challenges
Objective C: Responsibly advance clean energy
Objective D: Deploy efficient technologies to reduce energy costs

Objective E: Expand clean energy career opportunities for Maine people and advance innovation

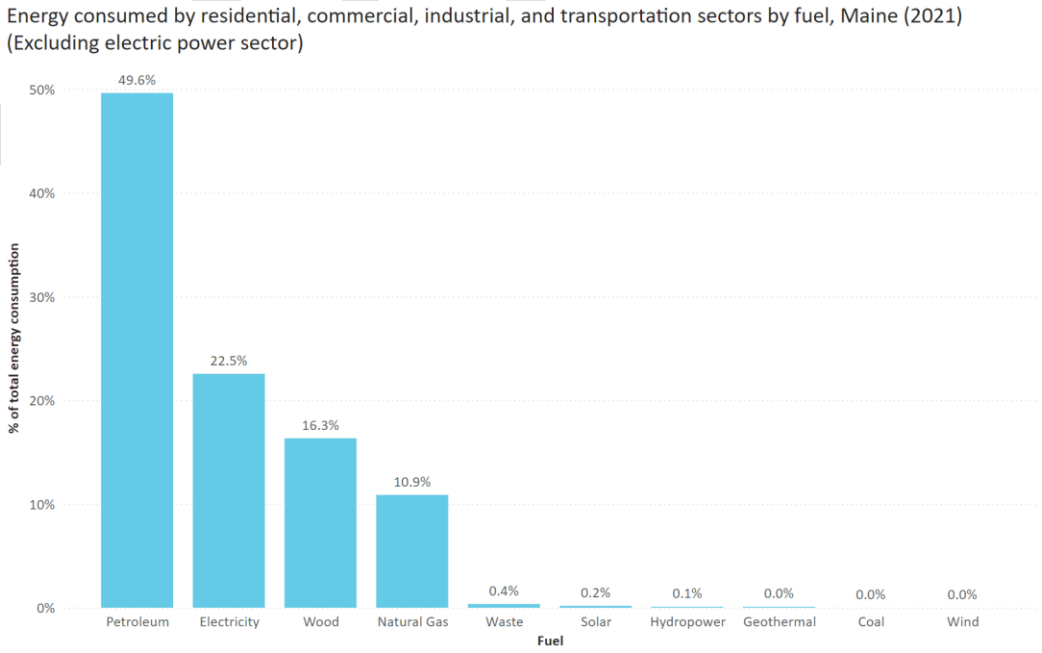
This comprehensive Energy Plan outlines a path to a more reliable, affordable, and cleaner energy future for Maine. Outlined below is an overview of Maine's current energy landscape, followed by an overview the Energy Plan's five objectives, which prioritize affordability, reliability, economic growth, and clean energy.

Maine's Energy Landscape Today

Energy Consumption

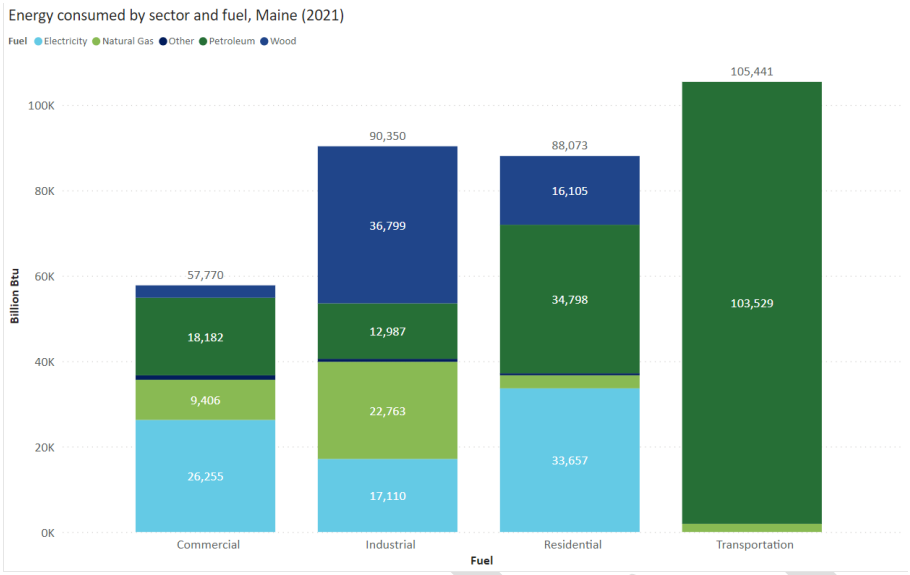
Across all sectors of the economy, Maine is highly dependent on fossil fuels for energy. Maine's total direct fuel consumption is primarily made up of petroleum, wood, and natural gas, according to the latest data from 2021. There are no extracted sources of coal, crude oil, or natural gas in Maine, so all fossil fuels consumed in Maine must be imported. 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, is derived from natural gas. The figures below utilize data from the U.S. Energy Information Agency (EIA) State Energy Data System (SEDS)[i].

Figure 1. Energy Consumed by Fuel in Maine, 2021 (source: EIA SEDS)



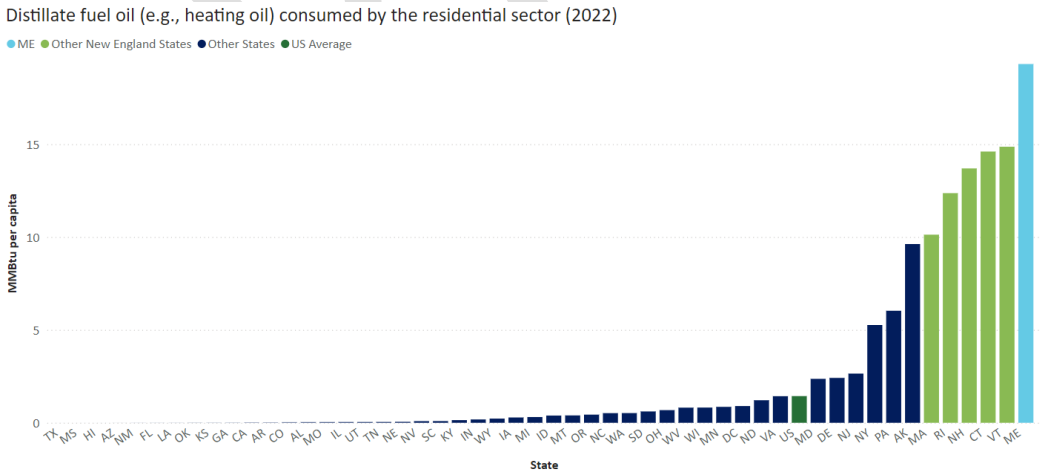
Most of Maine's petroleum consumption comes from the transportation and residential sectors. Petroleum is primarily used as gasoline, diesel, and heating oil (see figure 2 below).

Figure 2. Energy Consumed by Sector and Fuel in Maine, 2021 (source: EIA SEDS)



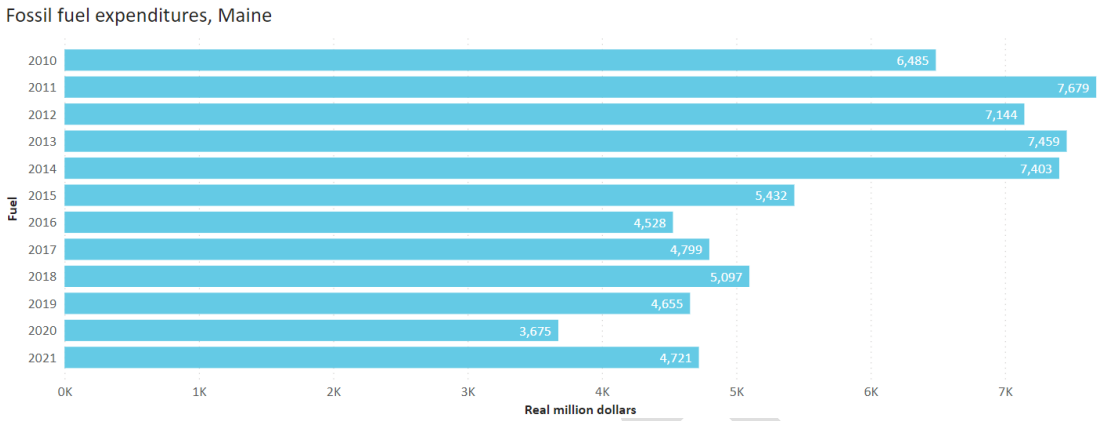
As a large, rural state, most Maine residents rely on personal vehicles as a primary mode of transportation. Roughly half of Maine's carbon emissions from fossil fuel combustion come from the transportation sector, and gasoline-powered vehicles are the most common vehicles on Maine roads. Maine is the most heating oil dependent state in the country, with the highest residential fuel oil usage per capita in 2022 (see figure 3 below).

Figure 3. Distillate Heating Oil Consumed by the Residential Sector, 2022 (source: EIA SEDS)



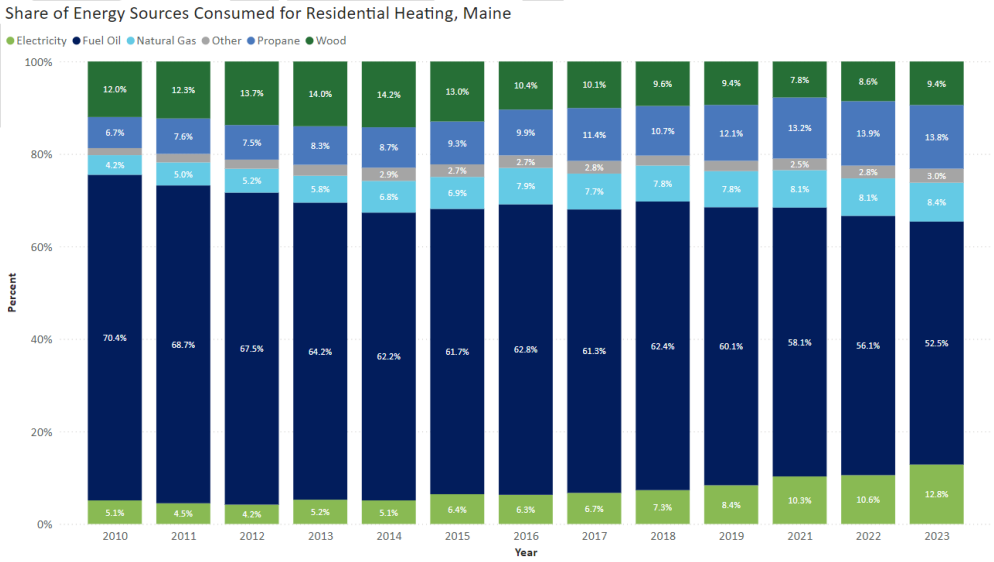
Maine's dependence on petroleum for home heating and transportation costs the state billions annually. In 2021, Maine spent over $4.7 billion on imported fossil fuels, including gasoline and heating oil (see figure 4 below).

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, the state is still the most heating oil reliant in the nation[ii] and continues to rely heavily on gasoline for transportation. From an energy security standpoint, Maine's over-reliance on imported petroleum makes Maine people particularly vulnerable to price shocks that occur in the global fossil fuel market, as the state experienced in 2022 when heating oil reached nearly $6 per gallon and kerosene jumped to over $7 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 next section.

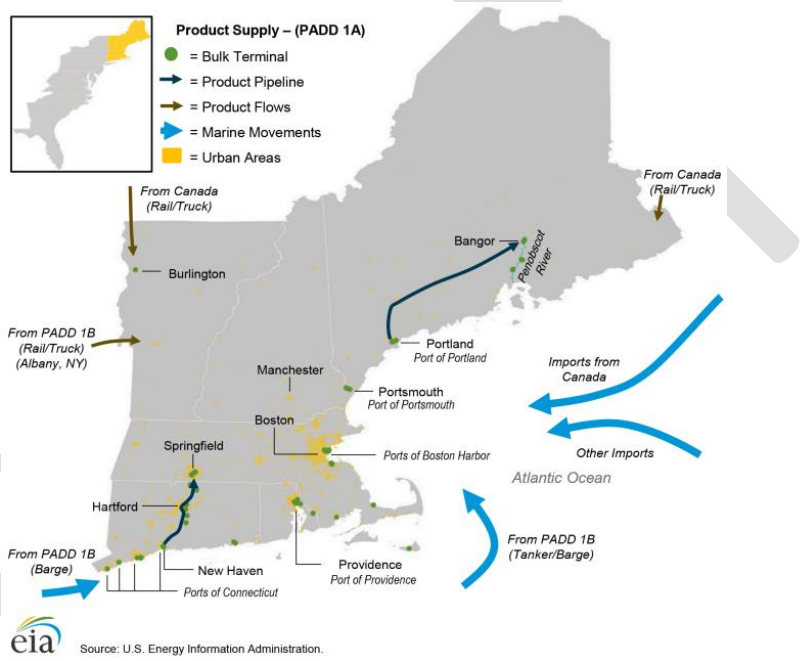
Figure 5. Share of energy sources consumed for residential heating, Maine (source: U.S. Census Bureau, American Community Survey)



Energy Supply and Production

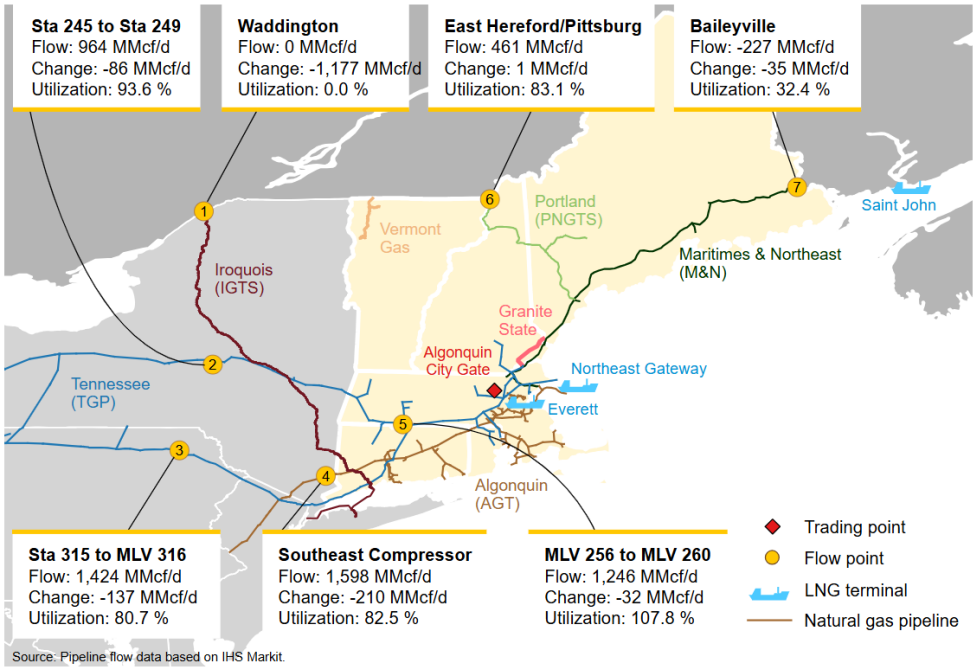
Maine does not have indigenous petroleum, natural gas or other fossil reserves, nor does it produce or refine these products[iii]. Refined petroleum products are imported to Maine through the Ports of Portland, Searsport, and Bucksport, as well as from Canadian border crossings via rail. Propane is also 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.

Figure 6: New England Petroleum Infrastructure, (source: EIA New England dashboard[iv])



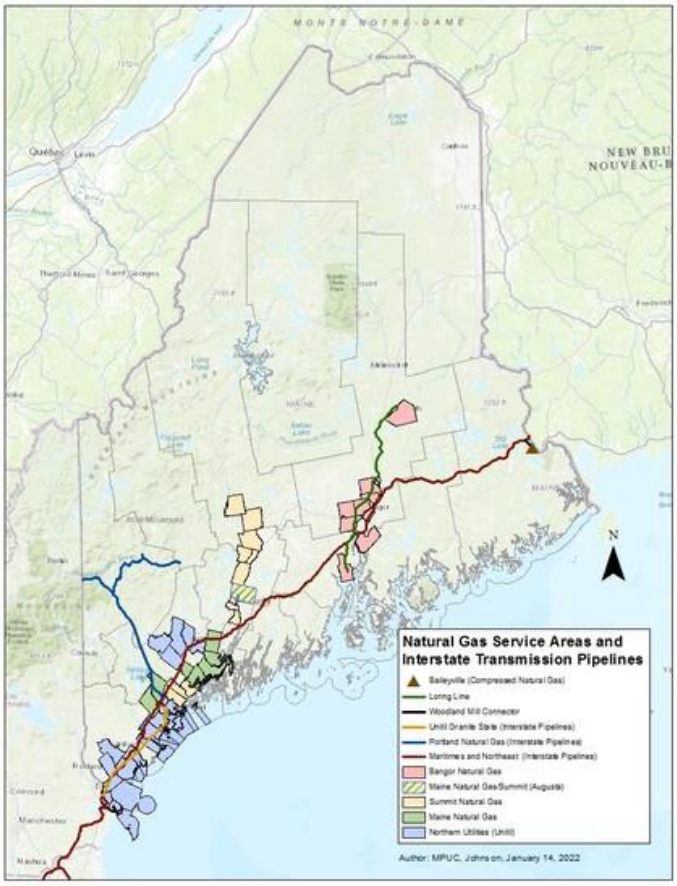
Natural gas enters Maine via pipelines from New Hampshire and Canada (see figure 7). Saint John LNG, a liquified natural gas (LNG) terminal at St. John, New Brunswick, Canada, receives LNG from overseas and delivers it by pipeline to markets that include Maine, New Hampshire, and Massachusetts. Another 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 natural gas that is generated by digestors that turn agricultural or organic waste, rather than extracting gas from underground fossil deposits, into usable gas for heating.

Figure 7: Natural Gas Infrastructure in New England (source: EIA New England Dashboard[v])



Maine has four natural gas distribution companies that service portions of Maine as is shown in figure 8 below.

Figure 8. Map of Maine Natural Gas Service Territories (source: Maine Office of the Public Advocate)



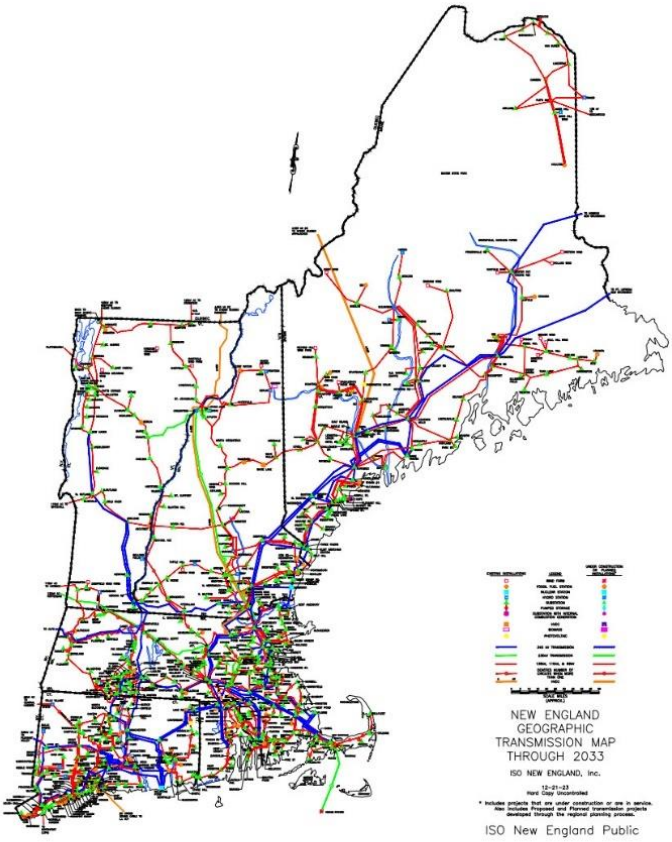
In 2022, Maine produced approximately 95 trillion Btus of energy, some of which was consumed within the state and some of which was exported in the form of wood, wood byproducts, and electricity. More than half of that energy originated from wood and wood byproducts, which accounted for a total output of more than 73 trillion Btus. Maine's noncombustible renewable energy sources including hydro, wind, and solar generated over 22 trillion Btus. As covered in the section below, 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

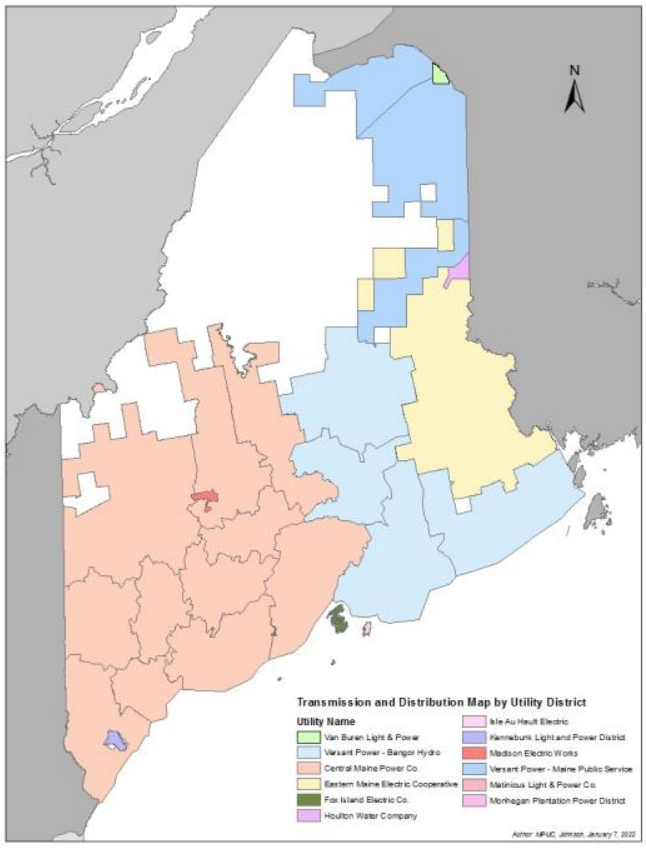
administration of the Northern Maine transmission system and electric power markets in Aroostook and Washington counties. A map of New England's transmission system can be seen in Figure 9[vi]. The ISO-NE system has 13 interconnections to neighboring power systems.

Figure 9. New England Geographical Transmission System Map (source: ISO-NE)



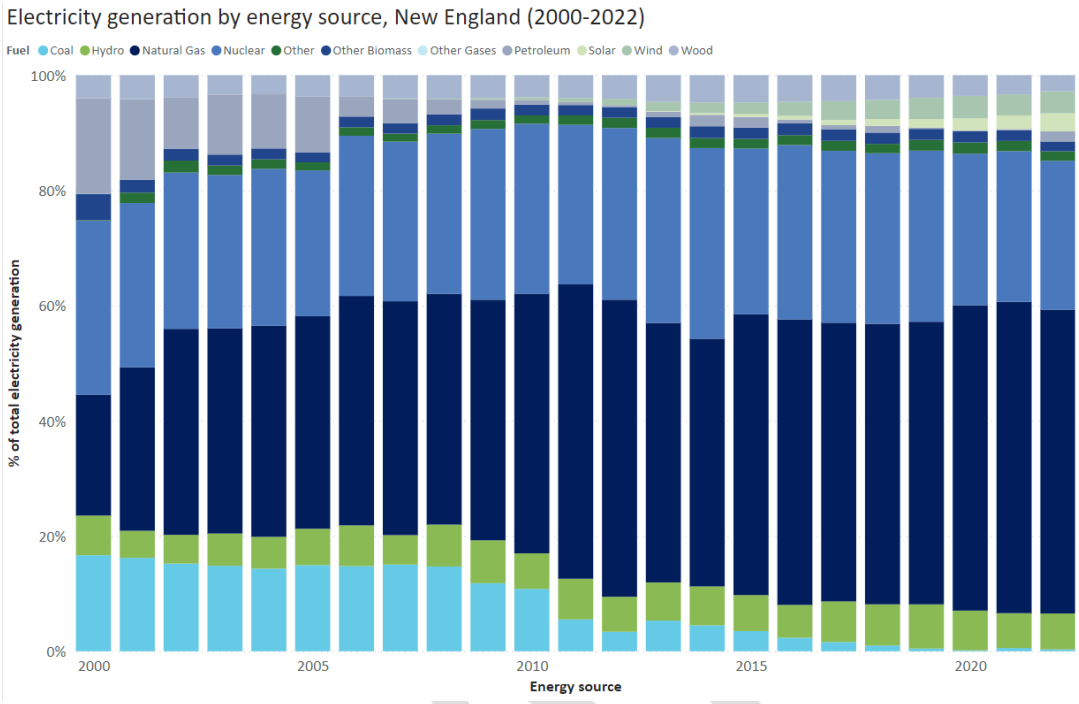
Maine has two investor-owned utilities that serve the majority of the state's customers. Central Maine Power Company (CMP) has a service territory in southern and central Maine, servicing approximately 646,000 customers, and Versant Power's territory covers almost as much land but is much more rural 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 (Hancock, Piscataquis, Washington, and most of Penobscot Counties) is part of the ISO-NE grid, while the Northern Maine District (Aroostook and a small part of Penobscot County) is connected directly to the grid in New Brunswick. The state also has several municipal and cooperative utilities that serve a smaller numbers of customers. The map of electric utilities in Maine can be seen below in Figure 10.

Figure 10. Map of Maine Electric Utilities, (source: Maine Office of the Public Advocate[vii])



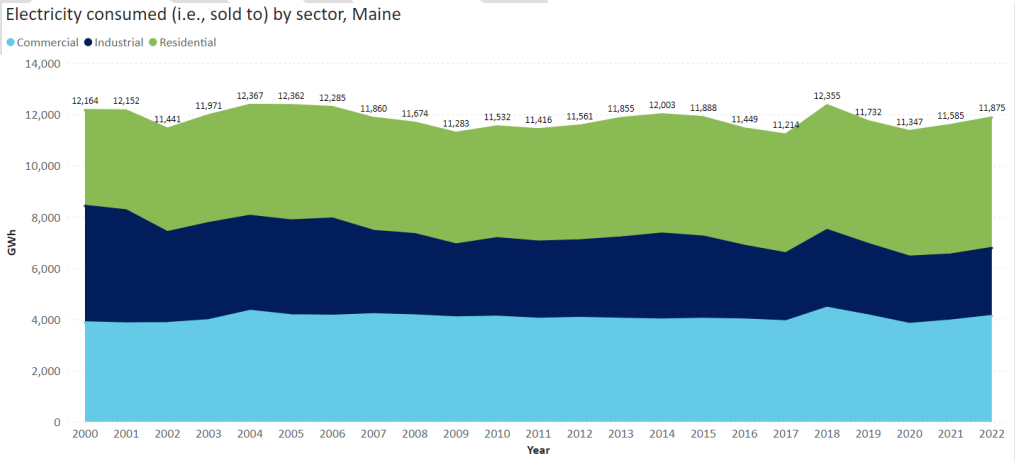
New England's electrical grid is undergoing a transformation. Over the last two decades, the New England region has seen a decline in electricity produced by oil and coal coupled with a substantial increase in natural gas-powered generation, as depicted in Figure 11. The ISO-New England states that, "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". Recent EIA analysis indicates that this follows a national trend when it comes to power plant retirements, with 85 percent of electric generation capacity retirements in the U.S. expected to be coal plants.

Figure 11. Percentage of Total Electric Energy by Resource Type in 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[viii], respectively.

Figure 12. Electricity Consumed in Maine (i.e., retail sales) by Sector, Maine (source: EIA)



Of the total electricity generated in Maine, about 63 percent is derived from renewable sources, while 37 percent is from non-renewable sources. Natural gas is the single largest source of electricity generation in Maine, representing approximately 32 percent of total

electricity generation (Figure 14). 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.

Figure 13 - Map of Maine's Electric Generating Units (EIA)

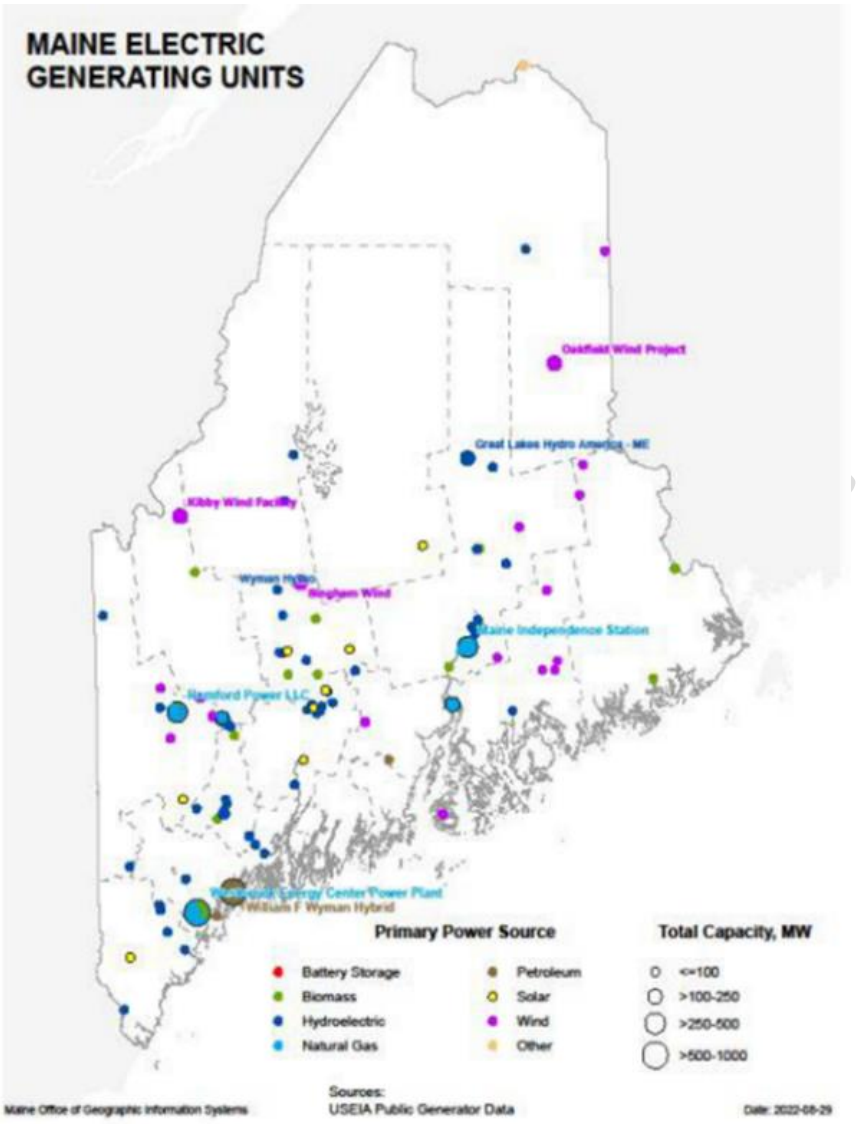
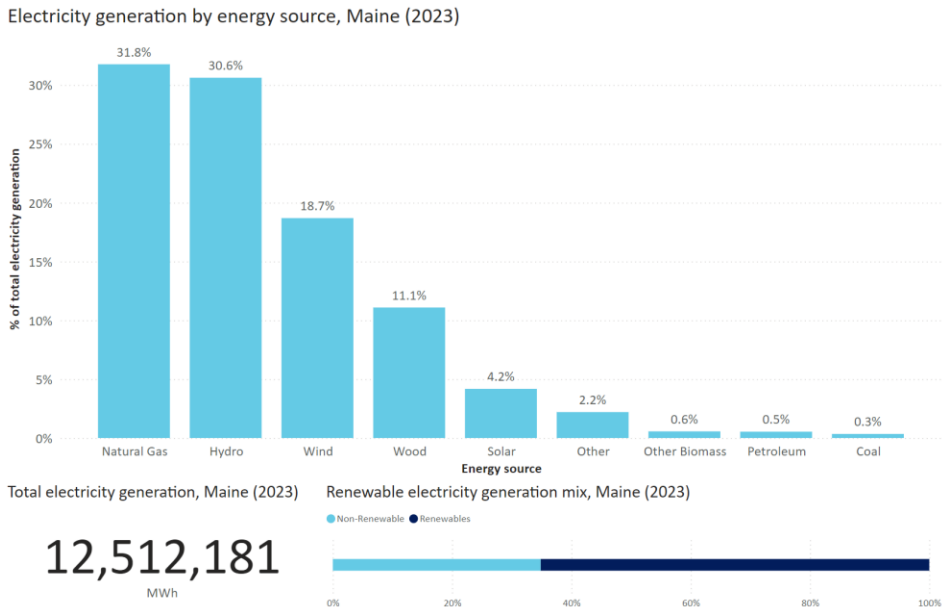
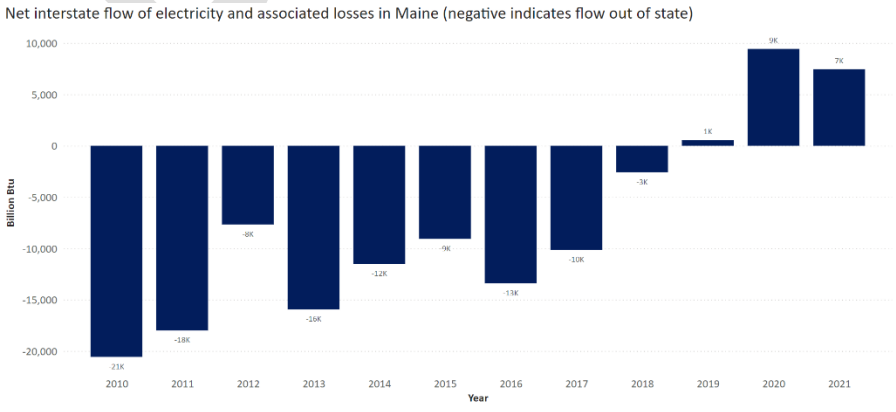


Figure 14. Electricity Generation by Energy Source, Maine, 2022



Because Maine shares a regional electricity grid, not all the electrons generated within Maine are necessarily consumed within Maine. When considering the flow of electricity throughout the New England grid, net interstate flows of electricity represent the difference between the sum of electricity sales and losses within a state and the total amount of electricity generated within that state. A positive number indicates that more electricity (including associated losses) was sold or consumed than was generated within the state during the year. Conversely, a negative number indicates that more electricity (including associate losses) was generated than sold or consumed in the state during that year. Figure 15, comparing in-state electricity sales to generation, shows that within this simplistic calculation, Maine was a net exporter of electricity from 2010-2018. Since 2019, Maine has been a net importer of electricity, importing approximately 19 percent of electricity consumed in 2021.

Figure 15. Net Interstate Flow of Electricity and Associated Losses (source: EIA)

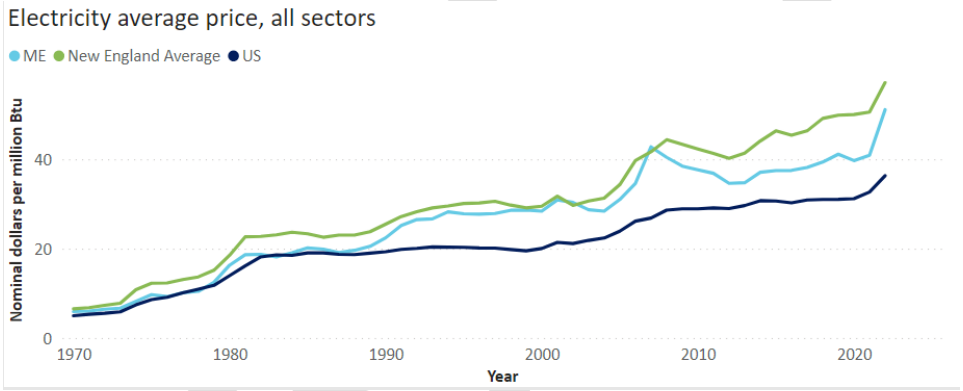


Energy Prices

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 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 costs 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 via pipelines and shipping, aging infrastructure, and population density.

Figure 16. Electricity prices in Maine, New England, and the U.S.



The COVID-19 pandemic had unprecedented impacts on Maine's energy systems and prices. 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[ix]. New England experienced these impacts as well as decreased electricity consumption.

One approach to analyzing electricity prices is to look at standard offer price trends. Electricity customers have the option of choosing an electricity supplier or using the default supplier, which is 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). 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.

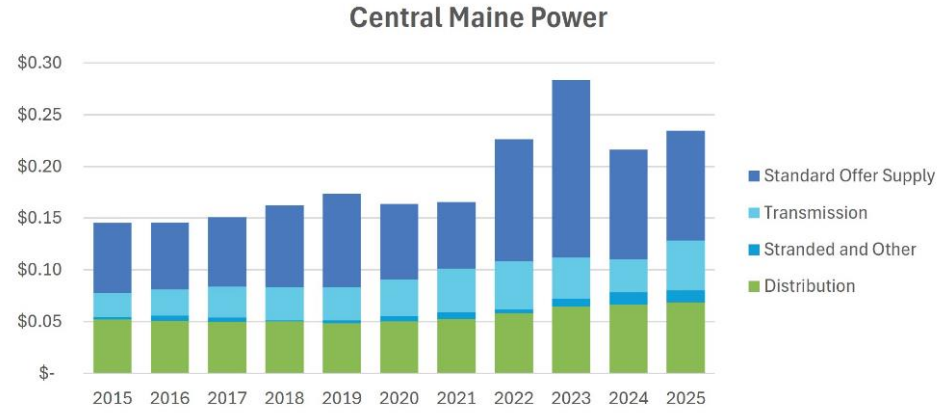
Residential electricity bills in Maine have two main components:

- Supply, which is the cost to generate the electricity used; and
- Delivery, 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 certain renewable energy 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.

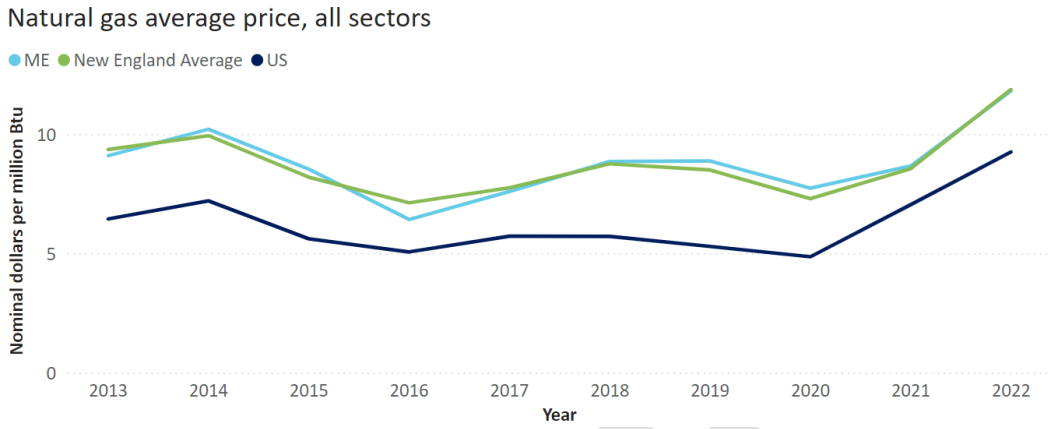
Figure 17 below provides an example of the cost components included in a typical residential energy bill for customers of Central Maine Power, effective January 1, 2025.

Figure 17. Residential electricity prices by component (source: GEO electricity prices page[x])



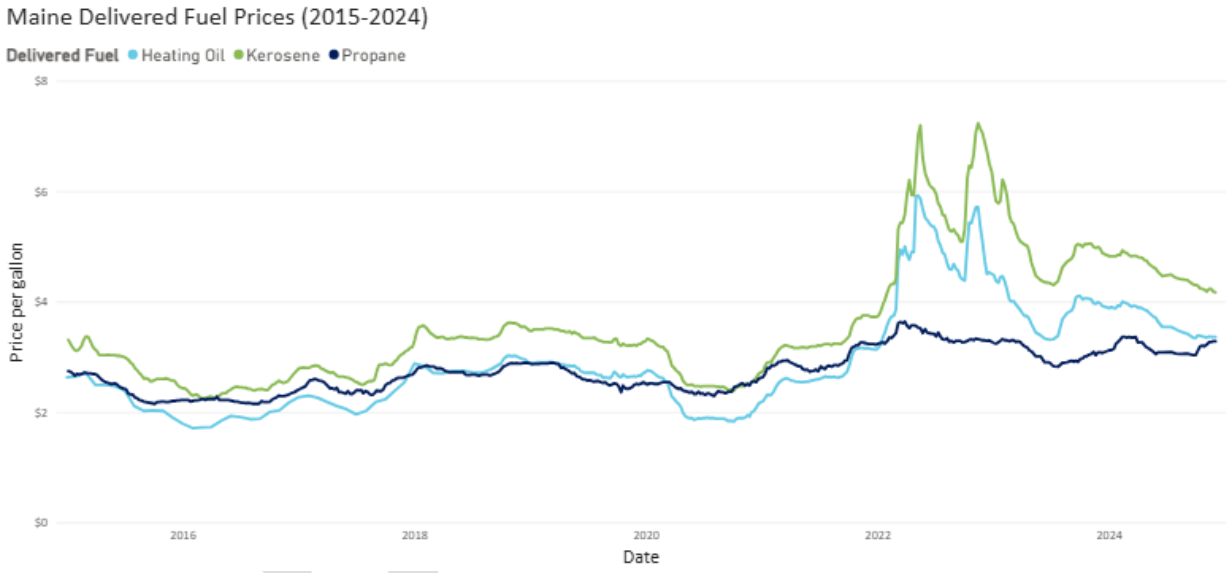
Natural gas prices in Maine continue to follow the regional average trends at the New England hub, as shown in Figure 18. This further demonstrates that while the regional energy system continues to rely heavily on natural gas, energy prices will continue to be subject to the price volatility of global fossil fuel markets.

Figure 18. Natural gas prices in Maine, New England, and the U.S.



Similar trends of pandemic impacts can be seen in heating fuel prices in Maine that are tracked weekly by the GEO, particularly for home heating oil prices which jumped in 2022 and 2023 as shown in Figure 19.

Figure 19. Maine Residential Delivered Fuels Prices, 2015-2024

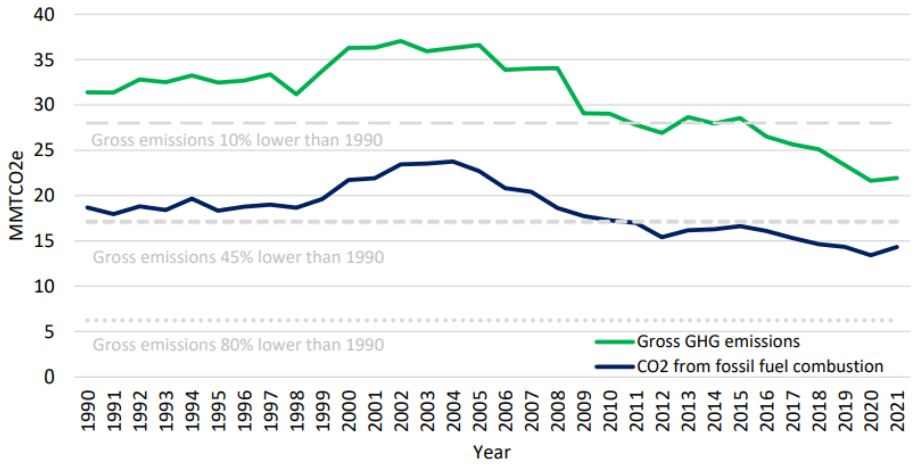


Greenhouse Gas Emissions

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 the state 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

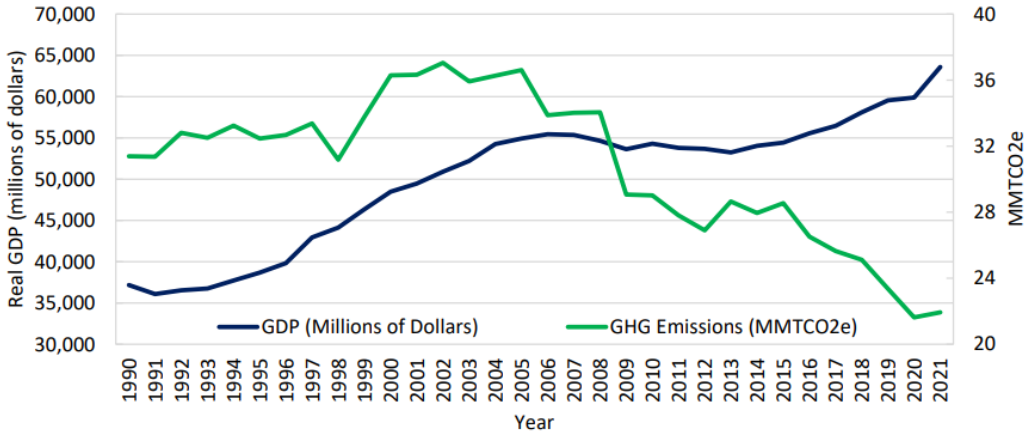
greenhouse reduction targets[xi]. Figure 20 below from this Report shows Maine's gross greenhouse gas emissions 1990-2021 (including biogenic emissions).

Figure 20. Maine's Gross Greenhouse Gas emissions from 1990-2021



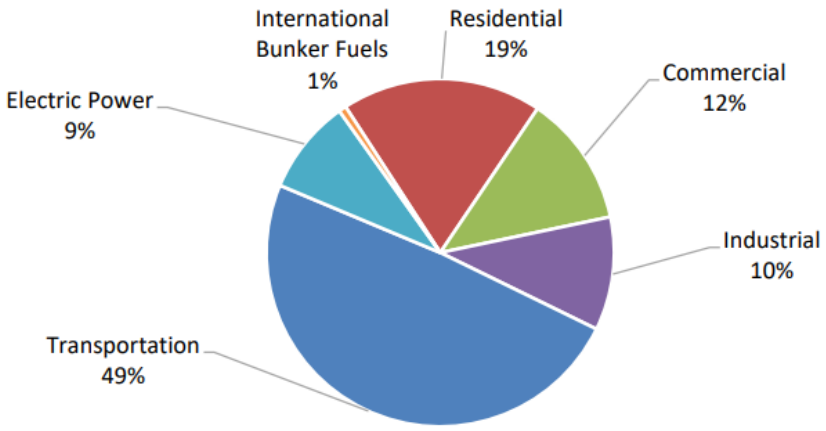
According to the analysis, these emissions have fallen while Maine's state gross domestic product (GDP) has generally increased. This is shown in Figure 21 below from the report which shows gross greenhouse gas emissions and state GDP.

Figure 21. Maine 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% 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 below in Figure 22.

Figure 22. Maine CO2 emissions from fossil fuel combustion by sector, 2021



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%"since 2005 and have "raised over $7 billion to invest into local communities". 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.

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 the pipeline. At the same time, the state continues to face challenges related to overreliance on imported fossil fuels which leads 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.

Key themes throughout the objectives include:

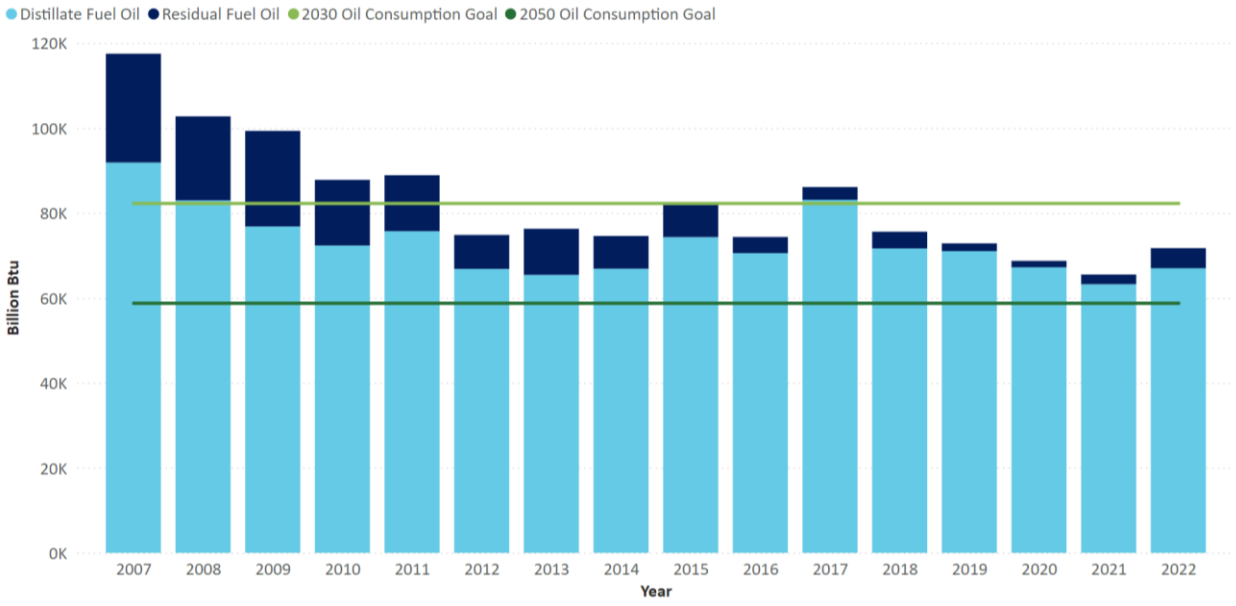
- Reducing Maine's reliance on fossil fuels to decrease price volatility and energy costs for Maine people.
- Ensuring a more equitable energy system that reduces the burden on Maine people.
- Working collaboratively with regional partners and local communities to maximize opportunities for cost-effective, responsible development of energy infrastructure.
- Planning grid improvements to responsibly 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.

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 to the future. The development and implementation of the Plan will require proactive and thorough 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 wellbeing 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 on fossil fuels 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% by 2030, and at least 50% by 2050. As shown in Figure 23 below, Maine is on track to achieve these targets, and will continue this progress through actions and goals discussed in Objective D.

Figure 23. Maine fuel oil total consumption with 2020 and 2050 goals



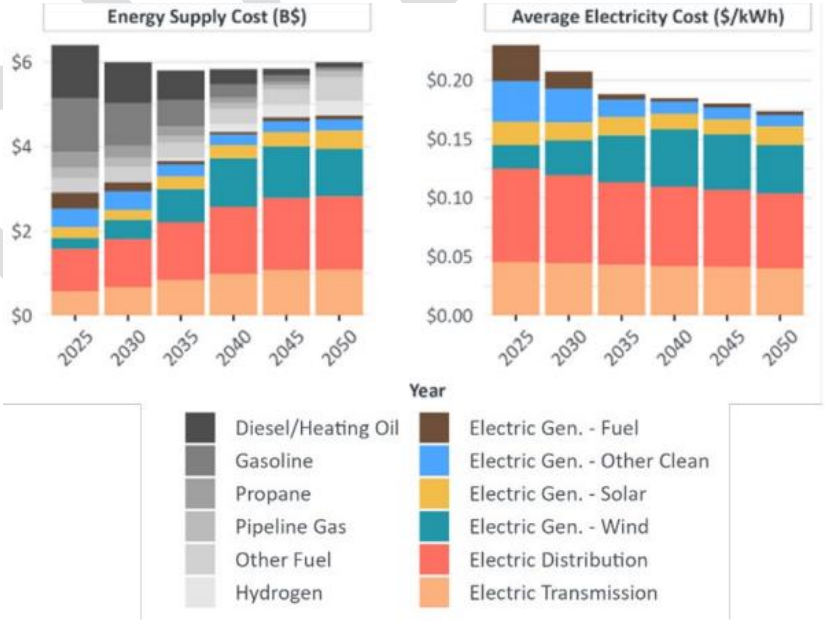
Maine is the most heating oil dependent state in the country. In the past few years, Maine has demonstrated significant progress toward reducing this dependence and experienced the largest year-over-year decrease in the share of Maine households reliant on oil as their primary heat source from 2022-2023[xii]. However, there is much work ahead with over half of households still reliant on heating oil, which includes many that still utilize kerosene.

Fossil fuel dependence in Maine impacts more sectors of the economy than 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, as well as storing 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:

> *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 24. Energy supply costs and average societal electricity cost for Maine (inflation-adjusted 2022$)



To ensure energy affordability for Maine, continued efforts will be made to reduce fossil fuel dependence across the economy. Increased beneficial electrification, which is utilizing electricity in place of fossil fuels 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. In addition, the state must address the issue of high energy burden for low- and moderate-income families and conduct a review of existing approaches across government to deliver the lowest cost energy to Maine people.

Strategies

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

Increasing clean energy production in New England and Maine has reduced New England's dependence on imported, expensive fossil fuels. Reducing Maine's reliance on oil has been a statutory goal in Maine since 2011, and Maine has made significant progress in this effort. 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.

Key Actions:

- Deploy federal funding to support clean energy development, energy efficiency, and grid modernization projects through programs and initiatives to reduce energy costs and strengthen the energy system.
- Advance regional collaboration through implementation of the New England States' Vision for a Clean, Affordable, and Reliable 21st Century Regional Electric Grid[xiii] to enable proactive, cost-effective, and efficient transmission planning to meet policy goals and enable procurements that will address long-standing grid constraints in Maine.
- Plan for and implement responsible investments in Maine that are designed to achieve policy goals, drive economic development, and prepare for electric load growth while maximizing benefits and protecting ratepayers. This work includes proactive planning to deliver cost-effective energy and grid infrastructure and building a more resilient grid while recognizing impacts from federally-required transmission upgrades, storm recovery costs, and other bill impacts.
- Consider updates to statutory oil dependence reduction goals, monitor oil dependence over time, and report annually on Maine's progress.
- Provide transparency on heating fuel and electricity prices, monitored and reported regularly, to inform Maine energy consumers decision making.
- Diversify Maine's energy resources, enhance regional collaboration, 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 summer days get hotter, affordable heating, cooling, and powering of homes 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. This is nearly three times higher than the statewide average energy burden. 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 burdens; 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 to low-to-moderate income households is essential to decreasing energy burdens and providing reliable and affordable energy to all Maine people.

Key Actions:

- Regularly conduct comprehensive analyses of household energy burden that evaluate 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 improve administration of the Low-Income Assistance Program (LIAP) and increase consumer education and outreach about existing assistance and efficiency programs, among other recommendations to reduce burdens on low-income individuals through the facilitation of new solar, heat pump, and affordable housing programs.
- Expand education, outreach, and technical assistance to increase access to and utilization of existing energy efficiency and clean energy programs such as grants, rebates, or other incentives.
- 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 including 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 making decisions that influence market behavior and costs driven by 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 have impacts as well.

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 designs or other market mechanisms can also empower consumers to reduce their electricity bills.

Key Actions:

- Continue advancing innovative mechanisms to enable customers to save money through advanced rate design and other means.
- Work with the Maine PUC to continue to review standard offer procurement strategies to lower supply costs and reduce volatility for ratepayers.
- Continue to work with the Maine PUC, OPA, and others to analyze and develop strategies to ensure customers benefit when utilizing Competitive Electricity Providers.
- Review costs 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. 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 – such as increased or more intense storms that result from climate change.

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.

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 and address 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 an integral to reducing the negative social and economic impacts of disaster events as well as helping communities recover post-disaster.

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, dual-use and 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.

Key Actions:

- Leverage microgrids powered by renewable energy to supply power to communities during extreme weather and other disruptive events.
- Explore deployment of other innovative resilience solutions, including dual-use solar PV, biomass and organic material for electricity generators, and the expansion of redundant energy systems.
- Strengthen resilience options, solutions, and support for disadvantaged and low-income communities, including remote, island, and Tribal communities, as well as 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.

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 deployment of distributed generation resources and energy storage systems.
- Prioritize energy efficiency upgrades to buildings that 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 (L.D. 1959). Among other items, L.D. 1959 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.

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 L.D. 1959.
- Engage with grid operators and technical experts to determine climate change impacts on utility infrastructure and develop strategies to mitigate those impacts while bolstering energy resiliency.
- Develop plans for 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.

Key Actions:

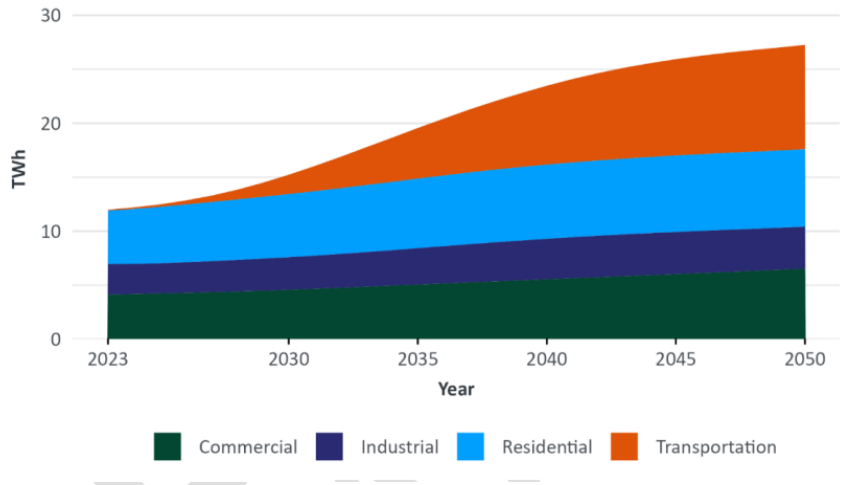
- Update and refine Maine's State Energy Security Plan in accordance with federal requirements.
- Seek and coordinate funding pathways to further support energy resiliency for Maine communities, including those rural and island communities, and Tribal governments.
- Provide technical and project management assistance to support communities to navigate state and federal grant program application and execution processes.

Objective C: Responsibly advance clean energy

Maine has a long history of producing energy from clean sources 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, in addition to more than $600 million in energy funds secured by other parties to deploy affordable, reliable, clean energy while expanding the clean energy economy and local workforce in Maine.

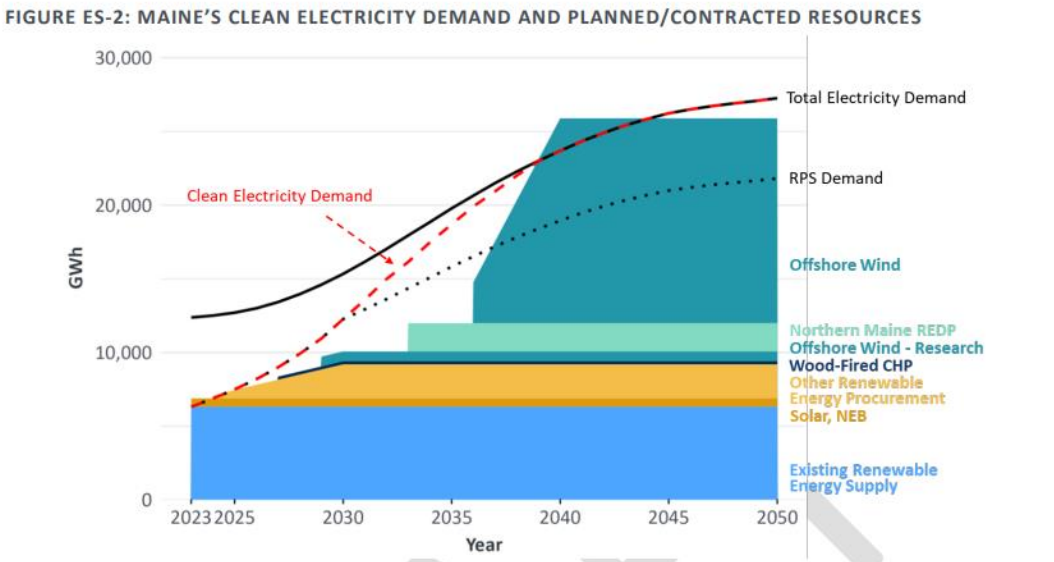
As demand for energy grows, and Maine continues to electrify the heating and transportation sectors, it is critical that the state's electricity is increasingly generated by affordable, reliable, homegrown clean energy resources. As identified in the Maine Pathways to 2040 Technical Report, electrification 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 (Figure 25).

Figure 25. Electricity consumption in Maine by sector, core pathway



To date, Maine has statutory requirements to consume 80 percent renewable energy by 2030 and has planned and contracted for the diverse mix of resources needed to meet a significant portion of that requirement (Figure 26). 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 energy and energy storage procurements will be needed to ensure long-term certainty, resource adequacy, and cost-effectiveness.

Figure 26. Maine's clean electricity demand and planned/contracted resources



Notes: Existing renewable energy resources representing Maine's current RPS compliance (51%) are assumed to continue to be available in the same quantities going forward to illustrate how incremental planned resources compare to incremental clean energy requirements.

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, thermal generators can support greater resource adequacy and reduced total infrastructure costs when compared to a 100 percent renewable 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 overtime. 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 distributed energy resources (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 Standards (RPS) to meet the 100 percent clean energy goal.

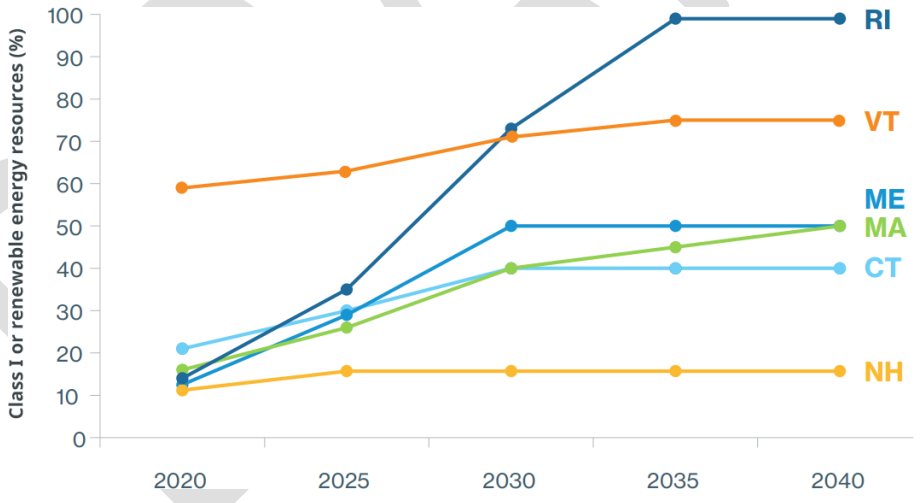
Strategies

Strategy A. Establish a new Clean Energy Standard (CES) to ensure all Maine people have affordable access to 100% 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 spending here in Maine. Maine's RPS, which requires that 80 percent of electricity sold in Maine is generated from renewable sources by 2030, is already benefiting Maine.[xiv] 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.

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 27 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.[xv]

Figure 27. RPS requirements for Class I or renewable energy resources, ISO-NE[xvi]



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, or low carbon clean fuels for thermal electricity generation, to contribute to Maine's goal of reaching 100 percent clean energy by 2040. Like the RPS, this CES would not control or dictate operations of electric generation but would rather provide an accounting mechanism for the electricity consumed in Maine through the use of clean energy certificates. These resources, on top of the renewable

resources Maine is currently utilizing for the RPS, can affordably meet most of Maine's clean electricity demand by 2040.

Key actions:

- Design and establish a CES that is compatible with other New England and complementary to Maine's existing RPS by creating a new class that allows for energy generated by zero- or low-emissions electricity resources (i.e: nuclear, clean fuels, and/or large-scale hydropower). This CES would grow reasonably over time to help meet Maine's goal of 100 percent clean energy by 2040.
- Ensure that policies and market structures continue to evolve to enable deployment and unlock value from emerging resources such as long-duration energy storage, which has the potential to contribute to cost-effectively addressing 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, including the current 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 hydrogen, or other renewable or bio-based fuels), geothermal, and other emerging zero- and low-emission technologies, and plan for them in the future through the development of roadmaps 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.

Key actions:

- Utilize Maine's biannual Comprehensive State Energy Plan, which considers the state's Climate Action Plan, ISO New England planning, and forthcoming electric utility planning, among other efforts, to determine the need for new resource

procurements to achieve state policy objectives and meet projected demand and reliability needs.

- Deliver on legislative authorities to advance procurement of new energy storage, combined heat and power, distributed and customer-sited solar, offshore wind, and additional clean energy resources as needed to meet energy needs and satisfy Maine's beneficial electrification policy.
- Before 2026, assess results of current procurements and adopt new procurement priorities 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 RPS assessment 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 clean energy, climate, and economic development goals. Maine began exploring responsible development of renewable offshore wind in 2019 with the launch of the Maine Offshore Wind Initiative. The Initiative 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.

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 offshore wind port infrastructure, proactively engaging in the federal offshore wind leasing and development processes, 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.

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 Maine Offshore Wind Research Consortium.
- Support Maine-based innovation to enhance Maine's competitiveness in the blue economy and develop a skilled workforce and supply chain ecosystem in Maine.
- Continue regional coordination and other partnership activities across multiple priorities, including transmission, procurement, ports, and supply chain development.

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 existing infrastructure as well as the construction of new projects across the state, both of which will deliver significant economic benefits while helping Maine build the grid of the future.

Key Actions

- Reduce barriers associated with both large-scale renewable energy and supporting infrastructure, as well as distrusted energy resources, to lower clean energy deployment costs and increase certainty while meeting other natural resource, wildlife, and planning priorities. This includes continued engagement 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.

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 continually 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 has engaged in regional planning activities.

In 2020, Maine joined the other five New England states in releasing the New England States Energy Vision Statement[xvii]. 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[xviii]. In 2024, Maine was a member of both the New England Heat Pump Accelerator Coalition and Power Up New England, which secured a cumulative $839 million for the region and almost $200 million for Maine. These partnerships will strengthen the regional grid and enhance Maine's pathways investment. This work will continue as Maine works to implement the objectives the Energy Plan, as outlined in the key actions below.

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 for Maine through the New England States Committee on Electricity, including the advancement of ISO-NE Long-Term Transmission Planning

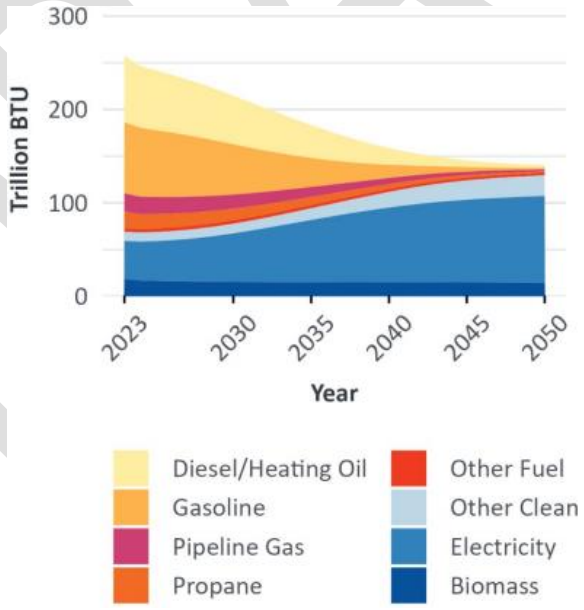
and associated Requests for Proposals, including maximizing existing transmission resources.

- Deploy federal funds awarded through regional applications, totaling hundreds of millions to support 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. The electrification of Maine's buildings and transportation is saving consumers money, ensuring buildings are comfortable year-round, helping to reduce total energy demand, and cutting Maine's reliance 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 which shows overall energy use in Maine reduced by almost half in 2040 relative to today (Figure 28), in large part due to the electrification of end uses which today rely on less efficient combustion technologies.

Figure 28. Overall energy use in Maine over time



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

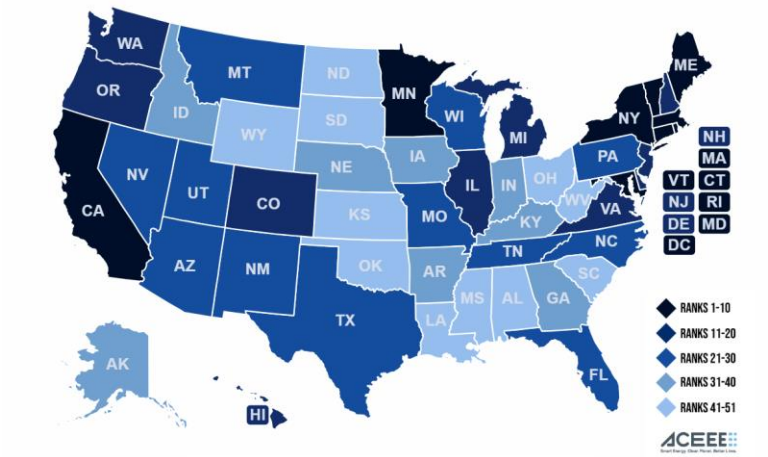
intense sunshine), it will be critical to use or store that power to ensure consumers can benefit from these low-cost periods. This underlying dynamic is referred to as load flexibility. The Technical Report highlights potentially significant cost savings for customers through load flexibility. For example, 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.

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. For the first time beginning in 2024, cost-effective electrification measures, such as heat pumps, heat pump water heaters, and EVs that are paired with smart charging, are 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.

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) put Maine at 5th in the country for state energy efficiency policies and programs[xix].

Figure 29. ACEEE State Energy Efficiency Scorecard map (2023)



Building Efficiency

GEO works closely with EMT and 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 of installation of 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. Maine also 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 60,500 heat pump water heaters installed since 2018.

Figure 30. Heat Pumps Installed in Maine, 2019-2024

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

Figure 31. Heat Pump Water Heaters Installed in Maine, 2019-2024

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

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 and nearly 12,000 since 2020. 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.

Figure 32. Dwelling Weatherized in Maine, 2019-2024

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

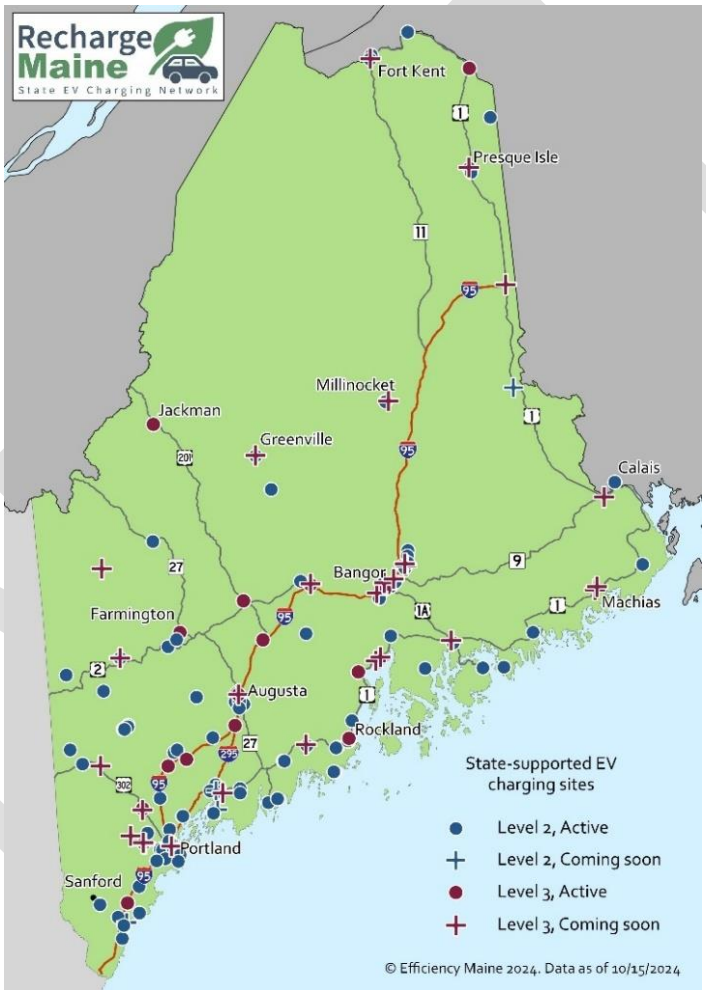
Further, Efficiency Maine's Triennial Plan VI, submitted to the Maine PUC in 2024, is forecasted to accelerate this progress over the next three years by delivering:[xxi]

- 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 businesses investments; and
- $490 million in suppression of electricity rates.

Clean Transportation

GEO is a key partner in the Recharge Maine initiative, 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 33. 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.

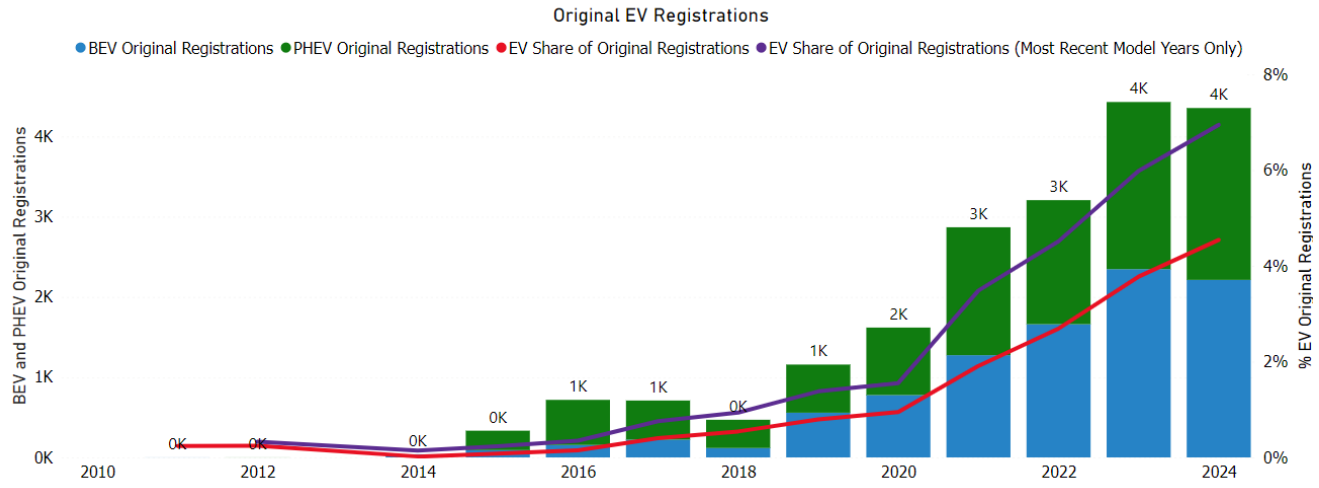
Figure 33. Map of EV charging locations from Recharge Maine



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% 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 34.

Figure 34. Registrations of EVs and Plug-in Hybrid EVs (PHEVs) in Maine[xxii]



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 reducing heating costs and improving the overall performance of the state's building stock. They also lower energy consumption, improve comfort for residents, and reduce long-term energy costs, which is particularly important for rural and underserved communities across Maine.

Electrification and weatherization are not only critical for Maine's existing building stock, but also for new construction projects. Recent analysis demonstrates Maine must accelerate new housing development to address historic underproduction and meet future needs.[xxiii] 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.

Key Actions:

- Utilize the Beneficial Electrification Policy Act (LD 1724) 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% 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 the Climate Action Plan.
- Continue efforts to lead by example in state and government buildings in line with Executive Order 5 signed by Governor Mills in 2024.[xxiv]
- Support business and leadership development among energy efficiency contractor businesses 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.

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 and technologies 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[xxv].
- 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 installing charging infrastructure in key community locations, Maine can provide residents with the opportunity to transition EVs through the expansion of convenient and reliable EV charging.

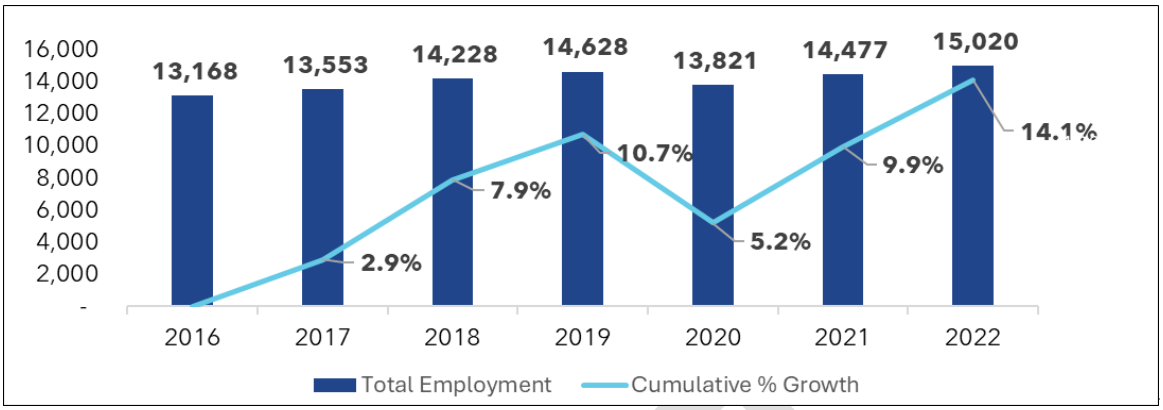
Key Actions:

- 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 and educate businesses on the benefits of installing EV charging stations while expanding 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

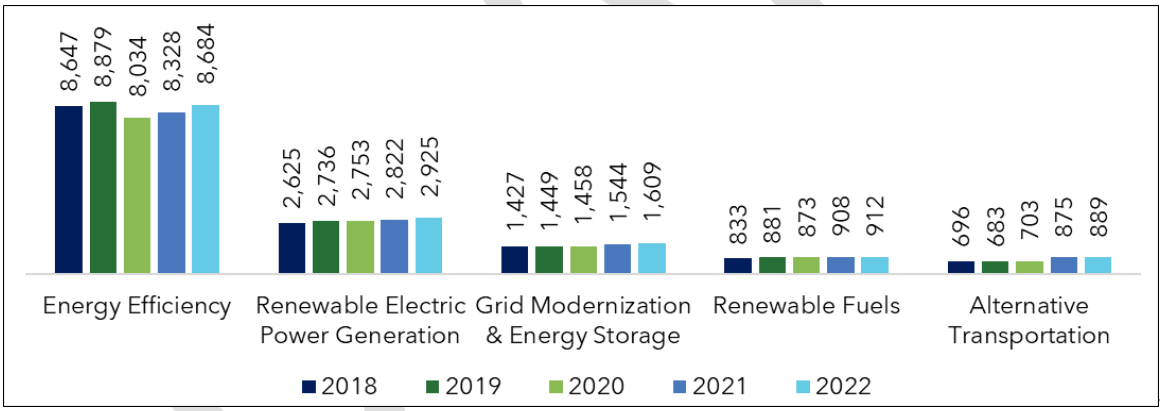
As the clean energy sector grows in Maine, so does the demand for workers to fill the growing number of jobs in the industry. With over 15,000 people currently employed, clean energy jobs in the state have surpassed pre-pandemic levels and are on track to continue this growth in the coming years (Figure 35), bolstered by state programs and initiatives. Maine's clean energy sector continues to expand, contributing more than $2.31 billion to the state economy in 2022.

Figure 35. Clean energy job growth in Maine (source: GEO)



The 2023 Maine Clean Energy Industry Report[xxvi] commissioned by GEO reports 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 36).

Figure 36. Clean energy jobs in Maine by sector (source: GEO)



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 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 must consider future opportunities associated with green hydrogen and other renewable fuels. Maine has existing strengths within its research institutions, particularly the collaborations between industry and academia in growing markets such as bioproducts, composites manufacturing, and offshore wind.

The Clean Energy Partnership (CEP) is an initiative led by GEO focused on advancing energy innovation and preparing Maine people for 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 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 in the action items below.

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.

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.

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; 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; allocate funding for trainings to support industries and occupations impacted by the adoption 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.

The CEP 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.

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.

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.

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.

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