Northern Maine & Rural Energy Monitoring Report

Submitted to the Joint Standing Committee on Energy, Utilities and Technology, Pursuant to LD 682: Resolve, to Monitor Northern & Rural Energy

February 1, 2023

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Abbreviations

BHD: Bangor Hydro District

CMP: Central Maine Power Company

EMEC: Eastern Maine Electric Cooperative

EMT: Efficiency Maine Trust

GEO: Governor's Energy Office

HWC: Houlton Water Company

ISO-NE: ISO New England

MPD: Maine Public District

NMISA: Northern Maine Independent System Administrator

OPA: Office of the Public Advocate

PUC: Public Utilities Commission

VBL&PD: Van Buren Light & Power District

Introduction

This report is presented pursuant to the requirements as defined in LD 682 directing the GEO to monitor, in coordination with the Office of the Public Advocate and the Public Utilities Commission, factors that directly affect energy supply and costs in the service territory of the northern Maine independent system administrator and in other rural or geographically isolated communities in the State, including, but not limited to, electric grid reliability, availability and costs of electric generation resources, electricity rates and heating fuel supplies and costs. The Governor's Energy Office may monitor and engage in related activities, including examining regulatory or utility planning processes and convening stakeholder groups to examine related issues, and may take appropriate actions, including actions to ensure relevant energy data is publicly accessible.

The information presented in this report aims to reflect key factors influencing northern and rural energy presently in the state, including recent regional updates, energy prices, heating and weatherization, and ongoing grid planning efforts.

Background

The Northern Maine Independent System Administrator (NMISA) was established in 1999 following the restructuring of the electric industry to allow retail competition for electric supply. NMISA is a non-profit entity responsible for administering the transmission systems of the investor-owned and cooperatively owned utilities across Aroostook and Washington counties. The NMISA territory is unique in that it is not directly connected to the rest of the United States electric grid and is the only area of New England not included in the service area of ISO New England, the independent operator that performs grid operation, market administration, and power system planning for the rest of New England.

As described in NMISA's 2022 Seven Year Outlook report, "the dominant characteristics of the Northern Maine Market are its electrical isolation, large geographic size, small electric demand, and modest population." The territory is home to 90,000 residents consisting of approximately 42,000 electricity accounts, according to NMISA's seven-year outlook reports from 2019, 2020, and 2021, and 2022. Three cooperatively owned utilities (Van Buren Light & Power District, Houlton Water Company, and Eastern Maine Electric Cooperative) operate in the NMISA territory. The majority of the area is served by investor-owned utility Versant Power (Versant), which serves the Maine Public District (MPD) and Bangor Hydro District (BHD). The 2022 Seven Year Outlook report describes the three regions of which NMISA territory is comprised: the north region, or Versant's Maine Public District (MPD) region, the central region, or Houlton Water Company (HWC) region, and the south region, or the Eastern Maine Electric Cooperative (EMEC) region. NMISA activities are managed by a Board of Directors, which consists of representatives from the following entities: MPD, EMEC, HWC and VBL&PD, large customers located in Northern Maine, the designee of the Maine Public Advocate, generators located in Northern Maine, and competitive electric providers (CEPs) located in Northern Maine.[1]

[1] https://www.nmisa.com/wp-content/uploads/2017/11/NMISA_Tariff_11_26_12.pdf

Northern Maine is not only unique due to its lack of direct interconnection to other domestic electric systems, but also in the fact that the majority of generation resources in the region are renewable resources.

Table 1: NMISA Generation Resources[2]

Plant		Capacity (MW)	Capacity (%)	Source	Status
Tinker Station		4.00	3.8%	Hydro #1	Existing
		1.80	1.7%	Hydro #2	Existing
		1.80	1.7%	Hydro #3	Existing
		4.00	3.8%	Hydro #4	Existing
		23.00	21.9%	Hydro #5	Existing
Caribou Station		0.50	0.5%	Hydro #1	Mothballed
		0.50	0.5%	Hydro #2	Mothballed
Sco Pan Hydro		1.40	1.3%	Hydro	Existing
Other Resources	Evergreen Wind	42.00	40.0%	Wind	Existing
	Woodland Pulp	20.00	19.9%	BLQ, Biomass, NG	Existing
	Distributed Generation	6.00	5.7%	Solar	Existing
Total		105.00	100%		

Recent Updates

During its 2021 session, the Legislature passed an Act to Require Prompt and Effective Use of the Renewable Energy Resources of Northern Maine, PL 2021, ch. 380. This established the Northern Maine Renewable Energy Development Program. Pursuant to this legislation, the PUC issued an RFP for the following:

- Development and construction of a 345 kV double circuit generation connection line or a transmission line or lines of greater capacity to connect renewable energy resources located in northern Maine with the ISO-NE grid;
- The development and construction of renewable energy generation projects that are designed to connect to and transmit power across the transmission line or lines procured.

Maine received bids for transmission lines on March 1, 2022 and bids for renewable energy generation projects on May 2, 2022. On November 1, 2022, the PUC announced the selection of the transmission and renewable energy generation project proposals. The PUC selected the transmission proposal submitted by LS Power Grid Maine. The project is a 345 kV double circuit transmission line and associated interconnection facilities. The transmission line will connect a new substation to the south and in the north a new substation in southern Aroostook County. The PUC selected the King Pine Wind Generation Project submitted by Longroad Development Company.[3] While the PUC approved the bids submitted by for the LS Power transmission project and the Longroad King Pine Wind project, the Commission reserved for later determination how much of the projects Maine ratepayers should fund

[2] NMISA 2022 Seven Year Outlook Report

[3] https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/ViewDoc.aspx?DocRefId={9FE4725D-8760-4A42-A424-B5E45DE84D69}&DocExt=pdf&DocName={9FE4725D-8760-4A42-A424-B5E45DE84D69}.pdf

when the bids were announced in November 2022. The PUC noted that this approach would allow LS Power and Longroad to move forward and seek partners, which could include Massachusetts or other entities, while not committing Maine ratepayers to an unknown share of the total cost for these projects.

Recent legislation passed in Massachusetts, An Act Driving Clean Energy and Offshore Wind (C. 179 of the Acts of 2022), authorized the Massachusetts Department of Energy Resources (DOER) to coordinate with New England states undertaking competitive bids for renewable energy projects and to consider the benefits to the Commonwealth and the region resulting from long-term clean energy generation projects. In December 2022, the DOER in consultation with the Massachusetts Attorney General determined the LS Power and the Longroad projects would meet the beneficial standards established in the Act. As a result of this finding, Massachusetts may enter into long-term contracts for up to 40% of the King Pine Wind Generation Project's generation and renewable energy credit (REC) production, and up to 40% of the LS Power Transmission Project. The Maine PUC had reserved final approval of term sheets for the projects pending this determination from Massachusetts.

On January 31, 2023, the PUC approved the Maine portion of the Northern Maine renewable energy projects with Massachusetts agreeing to share the aforementioned up to 40% cost of the projects.

Additionally, in March 2022, the GEO finalized a report as required by LD 1796: Resolve, to Study Transmission Grid Reliability and Rate Stability in Northern Maine. The GEO convened a stakeholder process as directed by LD 1796. The group was directed to lead the discussion regarding the continued need to assess reliability in the northern Maine service territory, the shutdown of the biomass plants in the region, the region's fuel security, competitive supply and rate volatility resulting from its reliance on generation sources in the region, and opportunities for transmission and non-transmission alternatives to address the current and projected reliability and rate stability needs of the region.

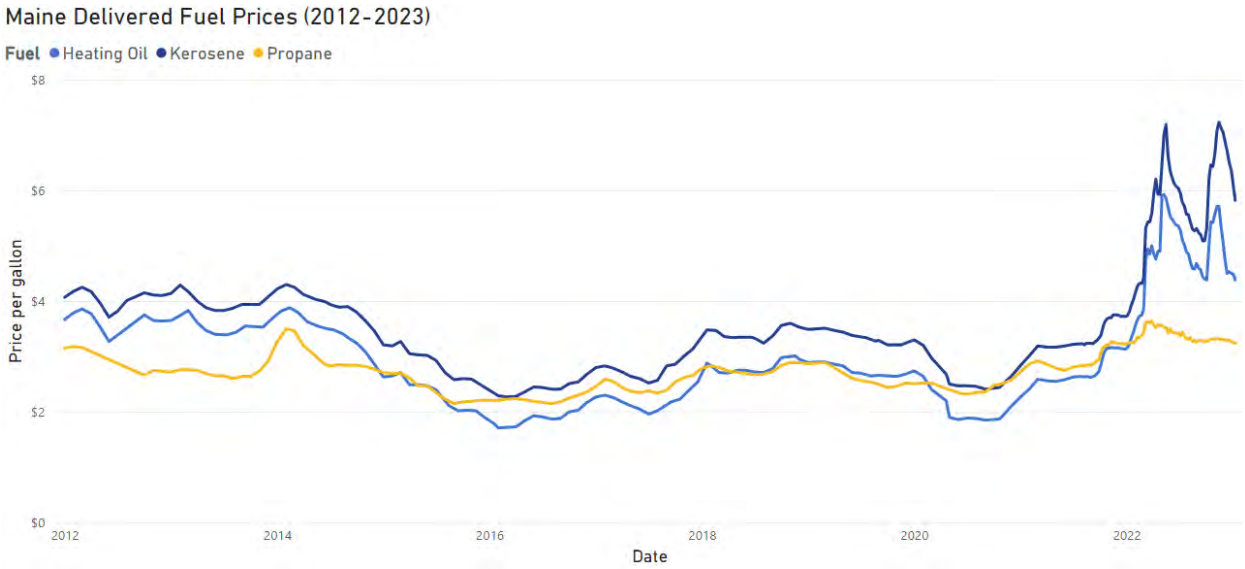
Energy Profile: Supply, Costs and Trends

In response to the COVID-19 pandemic, energy demand decreased significantly across the globe, resulting in a "historic energy demand shock that led to lower greenhouse gas emissions, decreases in energy production, and sometimes volatile commodity prices" according to EIA.[4] In 2022, the energy system became increasingly volatile following Russia's – a major global supplier of fossil fuels – invasion of Ukraine. These impacts are reflected in both electricity prices and heating fuel prices.

Maine is the most heating-oil dependent state in the country, with 58% of homes heated by fuel oil, compared to the national average of 4%. Over 71% of homes in Maine utilize delivered fuels (i.e., heating oil, kerosene, and propane) for home heating.[5] This means that Maine is distinctly vulnerable to the increased fossil fuel prices and volatility.

[4] https://www.eia.gov/todayinenergy/detail.php?id=46636
[5] https://www.eia.gov/state/data.php?sid=ME

Figure 1: Delivered Fuel Prices (i.e., heating oil, kerosene, and propane, Maine (2012 – 2023)



Fuel prices are a key driver in the wholesale price of electricity in ISO New England, where natural gas is the dominant resource comprising 53% of power produced in 2021 by New England's power plants.[6] Recent electric supply cost increases in Maine in 2021 and 2022 demonstrate the impacts of domestic and global factors on the electric system, such as regional reliance on natural gas and supply challenges during cold periods including, for example, the extreme cold temperatures and winter storm weather in January 2022 which led to substantial price increases in ISO New England.[7]

Electricity Prices

A residential electric bill has two components: electric supply, which is the cost charged for quantity of electric energy delivered to an end-use consumer, and electric delivery, which is the cost of delivering the electricity to a home or business (e.g., wires, poles, equipment, and operations). Supply and delivery are each about half of a monthly bill, respectively. Delivery rates include costs for transmission upgrades, which are typically set using a formula. Versant Power, as the investor-owned utility providing electric transmission services to the Maine Public District in NMISA, holds an annual open customer meeting to discuss planned system upgrades and annual transmission rate updates.[8] This meeting process, called the "Planning Advisory Group" is discussed in the "Planning Initiatives" section of this report.

In Maine, the supply price for default electric service is set annually through a "standard offer" process administered by the PUC, except for exceptions applicable to consumer-owned utilities discussed later in this report In this process, the PUC solicits competitive bids for the price of electricity for the following year. About 90 percent of residential and small business customers in Maine receive standard offer service.

[6] https://isonewswire.com/2023/01/03/monthly-wholesale-electricity-prices-and-demand-in-new-england-november-2022/
[7] https://www.eia.gov/todayinenergy/detail.php?id=55139
[8] https://www.versantpower.com/media/77513/MPD-2022-Open-Customer-Meeting.pdf

Energy suppliers bidding to provide standard offer service largely base their proposals to the PUC on their expectations for wholesale electricity prices in the coming year, as well as other market factors. The PUC routinely considers how to most cost effectively provide energy supply, including reviewing the contract lengths and other mechanisms to bring the lowest cost to ratepayers. Descriptions of the criteria the PUC utilizes in making this determination can be found in the respective dockets for new standard offer bidding cycles.[9]

To illustrate this process, the timeline for the solicitation and selection of standard offer rates between 2019—2023 in Maine Public District (MPD) are described below. It is important to note that MPD retail load represents approximately 65% of the total NMISA load with the remaining 35% represented by the consumer-owned utilities – VBL&PD, HWC, and EMEC. These entities are able to secure their own supply charges – either through selecting their own standard offer providers or entering into one or more contracts to purchase power at wholesale for the purpose of providing retail generation service within their own service territory – independent of the Maine PUC. For example, in 2019, HWC signed a five-year contract for electricity supply, allowing it to have some of the lowest electricity rates in state until 2024.[10] While participants in consumer-owned utilities experience supply prices set by the individual utility, other residents of the NMISA territory are still subject to the standard offer set by the Maine PUC for investor-owned utilities like Versant serving the MPD.

Northern Maine Standard Offer Bid Process (2019 – 2023)

In September 2019, the PUC issued a request for proposals (RFP) to provide standard offer service to Versant (formerly Emera) MPD, looking for one, two, or three-year terms. In November 2019, the PUC announced New Brunswick Energy Marketing Corporation (New Brunswick Energy Marketing), a wholly-owned subsidiary of New Brunswick Power (NB Power) as the standard offer provider to MPD residential, small non-residential, and medium non-residential classes for a three-year term. The prices for residential and non-residential small customers are indexed to standard offer prices in the comparable classes for Central Maine Power and Bangor Hydro District customers for 2020, 2021 and 2022.

In November 2020 and 2021, the PUC set the standard offer prices for the comparable standard offer classes for CMP and BHD customers for 2021 and 2022. New Brunswick Energy Marketing remained the standard offer provider, carrying out the three-year term as designated in the 2019 RFP bid selection.

In September 2022, the PUC posted an RFP seeking proposals for retail standard offer service for Maine Public District beginning January 1, 2023. The Commission additionally noted they would consider "alternative proposals for standard offers that would mitigate the price impacts on customers that may otherwise result from these 2023 prices, including proposals for terms of six months, eighteen months, and two years." New Brunswick Energy Marketing was selected as the most competitive provider in November 2022. New Brunswick Energy Marketing will provide standard offer service to all the MPD

[9] For example, see Maine Public District small customer class webpage, which includes the docket number, dates for the rate, and price ($/kWh), as well as the accompanying press release. Information specific to each customer class for each investor owned utility can be found on the PUC's Standard Offer Rates webpage.

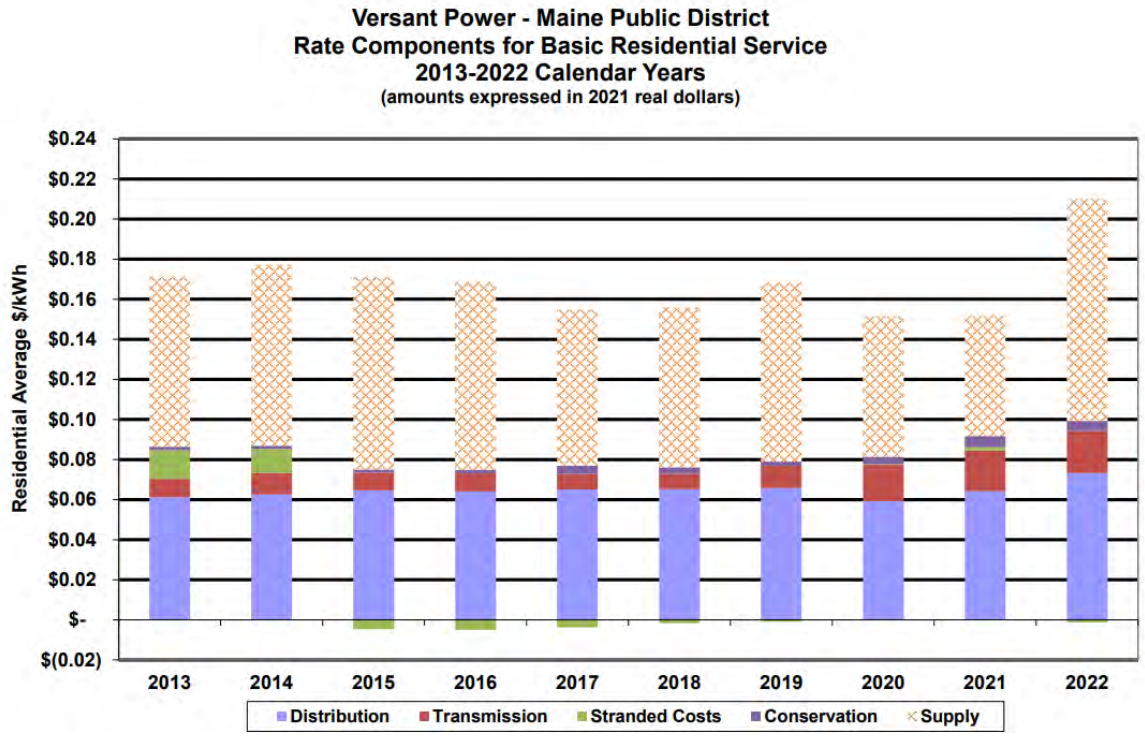
[10] https://www.bangordailynews.com/2021/11/21/news/aroostook/houlton-power-customers-escape-huge-spike-in-electricity-rates/

residential, small non-residential, medium non-residential, and large commercial/industrial classes of customers.[11]

The 2021 standard offer rate increases for MPD, BHD and CMP ranged from approximately 66-89% depending on the utility and customer class (i.e., small, medium, or large customers). The 2013-2021 standard offer rates for residential and small commercial customers ranged from $0.06-0.09 per kWh. In 2021, the standard offer rate for 2022 increased to roughly $0.11-0.12 per kWh. In the fall of 2022, the PUC announced the new standard offer prices per kilowatt-hour beginning January 1, 2023 for residential and small commercial customers in fall of 2022. For Versant's Maine Public District, the standard offer will increase 34% to $0.148 per kWh from $0.1108 in 2022. This represents a typical bill increase of 17%, or about $21 per month for a typical household using 550 kWh per month. For Central Maine Power, the standard offer will increase by 49% to $0.176 from $0.118 in 2022. This will mean an overall bill increase of 27%, or an increase of about $32/month for a typical household. For Versant's Bangor Hydro District, the standard offer will increase on January 1, 2023 41% to $0.164, representing a typical bill increase of 21% or $26 per month for a typical household.

Figure 2 below represents a breakdown of the different components of residential electric rates in Maine Public District.

Figure 2: Maine Public District (MPD) Rate Components (2013 – 2022)[12]



Source: *PAG Open Customer Meeting Slides, June 2022*.

[11] New Brunswick Energy Marketing has provided standard offer service to MPD small residential and small commercial customers since 2009

[12] PAG Open Customer Meeting Slides, June 2022.

Standard Offer Generation Resources

Under Maine law, disclosure labels providing consumer information about electricity supply are made available to every residential and small commercial customer. These fact sheets contain generation resource and emission information to compare supply offers and are updated four times annually. Standard offer disclosure labels can be found on the PUC website.[13]

In January 2023, MPD's fact sheet shows that the New Brunswick Energy Marketing supply mix is 81.5% hydro and 18.5% coal. In terms of emissions impact, this supply mix produces 457.63% more sulfur dioxide emissions than the New England average, 87.57% more nitrogen oxide and 37.33% less carbon dioxide.[14] These numbers represent a snapshot of the power sources and air emissions of the electric service provided by the standard offer supplier. In January of 2022, New Brunswick Energy Marketing's supply mix was 83.6% hydro and 16.4% coal, producing 139.49% more sulfur dioxide emissions than the New England average, 50.503% more nitrogen oxide, and 44.15% less carbon dioxide.

Competitive Electricity Supply

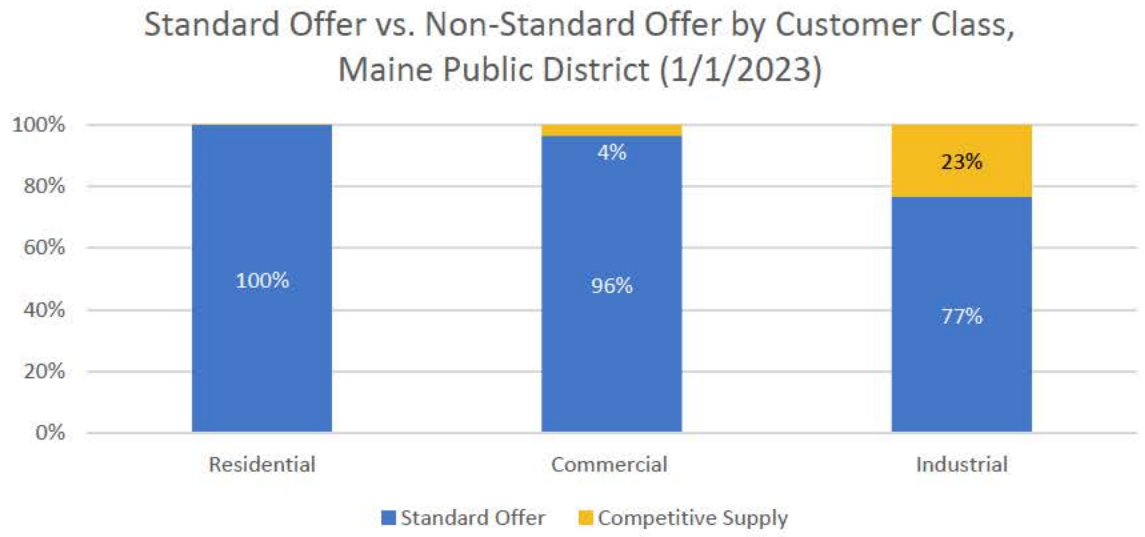
In the late 1990s, the state of Maine undertook a restructuring of its electric utility industry. The state mandated that all electricity consumers in Maine must have the opportunity to participate in a competitive retail market for electric service. The formation of NMISA was borne out of a need for independent monitoring and control of market participants and was required due to the fact the electric system in Northern Maine is not directly interconnected with ISO New England or other domestic electric systems. As described in the NMISA tariff:

> "Northern Maine's electric load is very small (130 MW in 1998) relative to the load of other markets. As such, the [Independent System Administrator] cannot be burdened with either the complexity or expense associated with larger system operators, such as ISO-NE."[15]

NMISA's small overall load leads to barriers in expansion of competition – during the years since deregulation, Northern Maine has not had more than two active competitive suppliers.[16] As shown in Fig 5 below, nearly all residential customers in the NMISA territory are on the standard offer rate.

[13] https://www.maine.gov/mpuc/regulated-utilities/electricity/standard-offer/disclosure-labels
[14] https://www.maine.gov/mpuc/sites/maine.gov.mpuc/files/inline-files/Maine%20Public%20District%20Disclosure%20Label%20January%202023.pdf
[15] https://www.nmisa.com/wp-content/uploads/2017/11/NMISA_Tariff_11_26_12.pdf
[16] https://www.maine.gov/energy/sites/maine.gov.energy/files/inline-files/Northern%20Maine%20Report_09MAR2022.pdf

Figure 3: Standard Offer vs. Non-Standard Offer by Customer Class, Maine Public District (1/1/2023)[17]



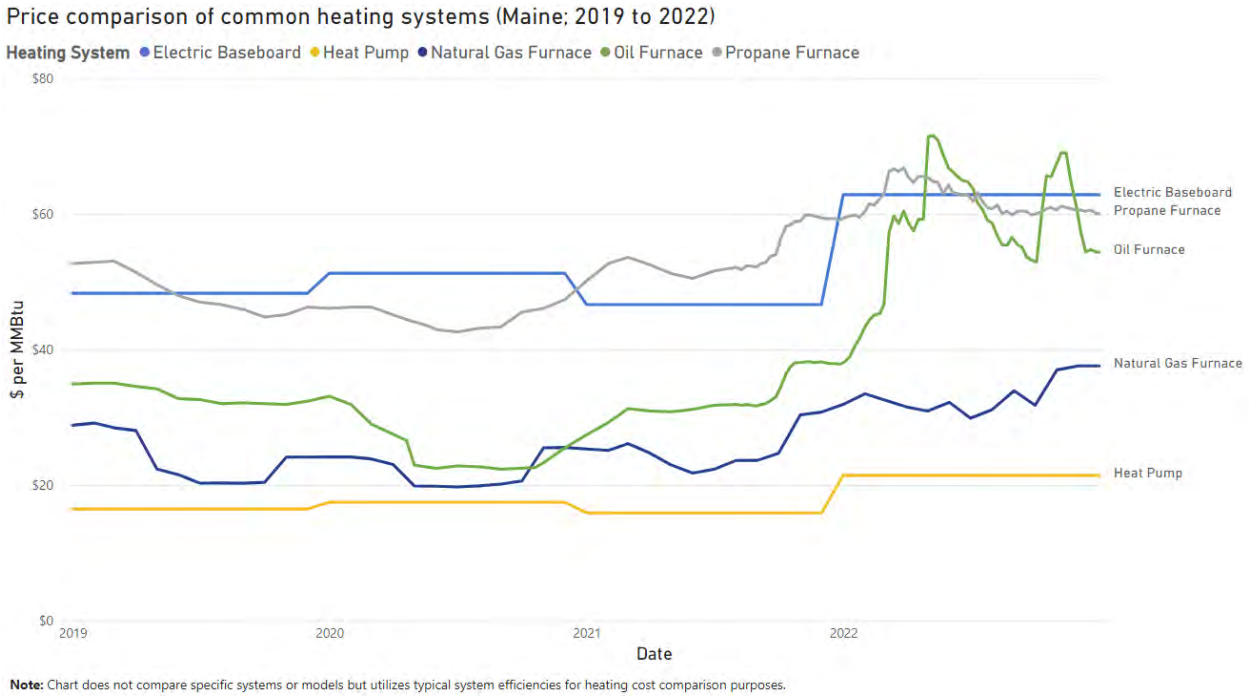
As described in the GEO's March 2022 report, several previous studies of the northern Maine market have been conducted in the decades since the industry restructuring. In 1998, the PUC first investigated northern Maine market issues by contracting with Synapse Energy Economics (Synapse) to assess competition and market power in the northern Maine electricity market. The PUC investigations performed in 1998[18] and again in 2003, 2004, 2008, 2012[19] and 2014 document the lack of a competitive energy market, NMISA's reliance on New Brunswick for transmission, and/or involve proposed transmission solutions or new supply options. A forthcoming report prepared on behalf of the Maine Office of the Public Advocate (OPA) pursuant to 2021 P.L. Ch. 164 (LD 318) focuses on potential improvements to standard offer service available to Maine customers, including customers in MPD.

Heat Pumps and Weatherization

Heat pumps provide energy efficient heating and cooling to Maine's homes and businesses in addition to decreasing the state's high reliance on fossil fuels for heating. The benefits of heat pump adoption and weatherization not only include lower prices as compared to other common heating systems (which in Maine are predominately delivered fuel), but also climate benefits including reduced greenhouse gas emissions and increased resilience to fossil fuel price swings. Figure 4 below shows this comparison of heat pumps to other common heating systems based on a statewide average.

[17] Versant Power, Office of the Public Advocate.
[18] Docket 1997-00586
[19] Docket 2012-00589

Figure 4: Price comparison of common heating systems, Maine (2019 – 2022)



Weatherization benefits a building's energy efficiency through the installation of insulation to retain indoor temperature and air sealing, weather-stripping, caulking, and more to reduce air leakage through the building envelope. Maine has approximately 570,000 homes, with over half of owned and two-thirds of rented dwellings built in 1960 or earlier suffering from energy inefficient weatherization.

Oftentimes, additional barriers exist for weatherization and efficiency improvements in rural areas. A 2018 study published by the Island Institute in partnership with the GEO and supported through DOE funding found that "energy burden, or percentage of income spent on energy bills, is 33% higher in rural areas and that participation in residential energy efficiency financing and rebate programs can be significantly lower."[20] Data supporting this finding was collected from Alaska, Maine, New Hampshire, and Vermont.

Table 2, Figure 5, and Figure 6 below begin to show the extent to which heat pump and weatherization efforts are underway in different regions of the state.

[20] https://www.islandinstitute.org/wp-content/uploads/2021/03/Bridging-the-Rural-Efficiency-Gap-final-report.pdf

Table 2: Number of Heat Pumps and Weatherization Projects in Maine (2019-2022)

Year[21]	Heat Pumps		Weatherization	
	EMT[22]	MaineHousing	EMT[23]	MaineHousing
2019	11,420	0	2,201	489
2020	12,758	7	1,553	316
2021	27,326	921	1,807	283
2022	28,571	1,323	2,230	233
Total	80,075	2,251	7,791	1,321
Grand Total	82,326		9,112	

7% of total heat pump projects and 24% of weatherization projects are in low-income households.[24]

Figure 5 and Figure 6 below reflect the geographic distribution of weatherization improvements and heat pump rebates. In both figures, the map on the left reflects concentrations of weatherization improvements, while the map on the right accounts for the number of weatherization improvements or heat pump rebates relative to population size.

[21] EMT's reported numbers are aggregated to their fiscal year which runs from July 1 of the previous year to June 30 of the stated year (e.g., FY23 runs from July 1, 2022 – June 30, 2023). MaineHousing's reported numbers are based on a given calendar year.

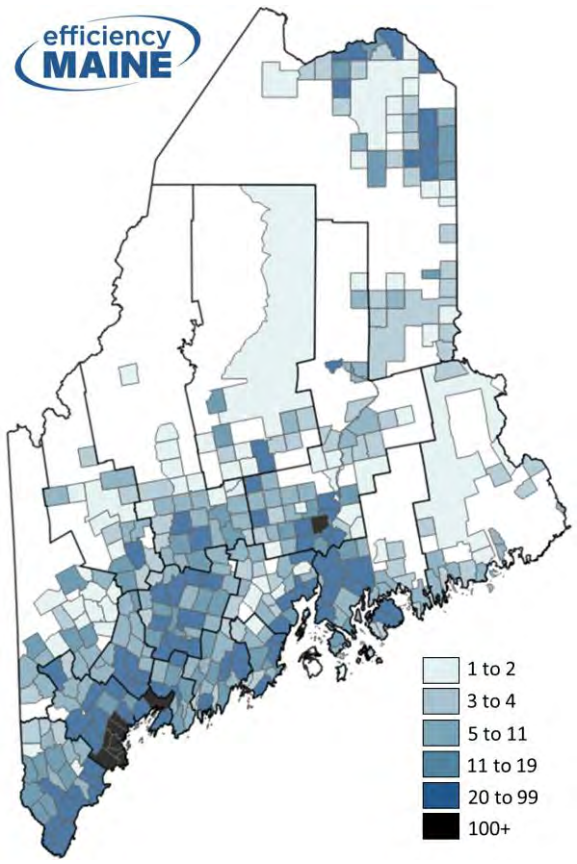
[22] EMT counts heat pumps by "heat pump equivalents" (HPe) where 1 HPe = 25.1 MMBTU / year modelled offset. This is equivalent to EMT's Tier 1 residential first units, but not directly equivalent to our total number of rebates or physical heat pumps. EMT track their rebates this way to compare large VRF systems (>1 heat pump equivalent) and smaller packaged terminal heat pumps (<1 heat pump equivalent) accurately.

[23] Weatherization totals are based on the total number of homes that received at least one air sealing or insulation upgrade in the year, regardless of how many of these measures they received.

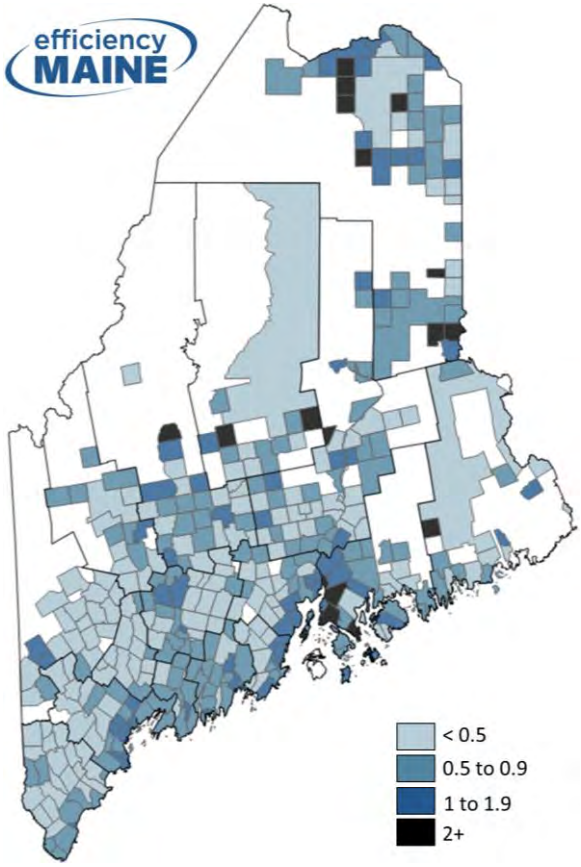
[24] https://www.maine.gov/climateplan/dashboard/buildings

Figure 5: Number of weatherization improvements rebated, Maine (7/1/2020-6/30/2022)

Weatherization improvements



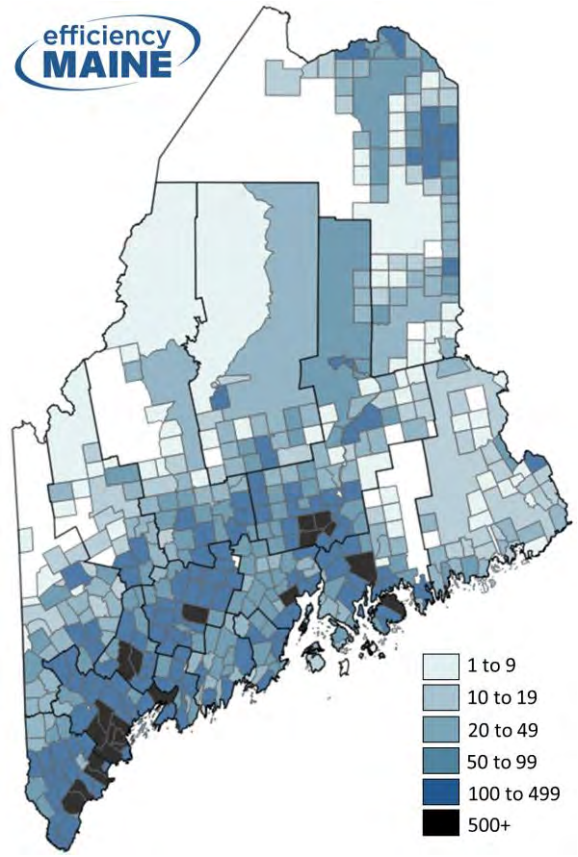
Weatherization improvements per 100 population



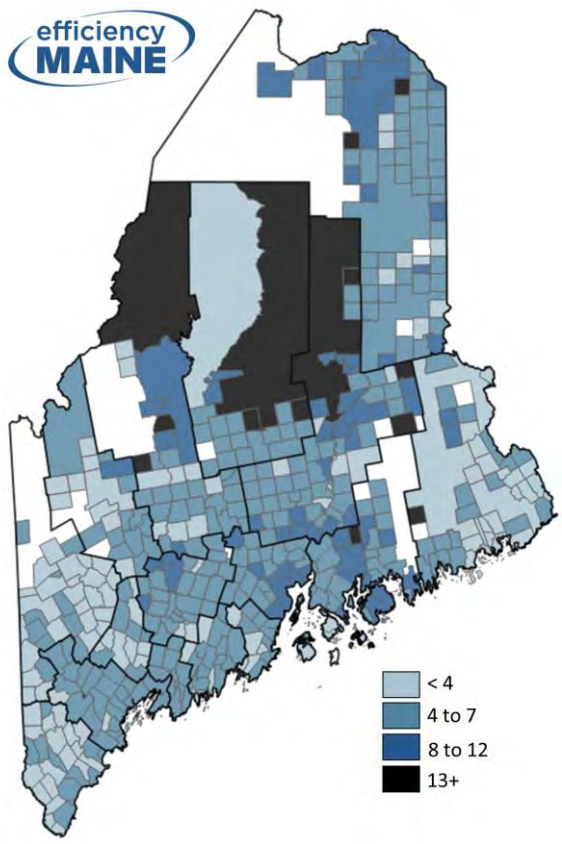
Looking at weatherization improvements per capita shows a different trend than looking solely at number and location of improvements. A similar trend is observed looking at heat pump rebates, as indicated in Fig 7 below.

Figure 6: Number of heat pumps rebated, Maine (7/1/2020-6/30/2022)

Heat pumps rebated[25]



Heat pumps rebated per 100 population



The number of heat pumps rebated per 100 people shows a high concentration of heat pump rebates in the northern parts of the state. Understanding the factors behind this trend may help to reveal additional information about heat pump adoption and fuel switching patterns in Northern Maine and other rural areas. The concentration may perhaps be attributable in part to a pilot program funded by EMT and managed by EMT in coordination with Maine Public District and Versant in 2012 – 2013.[26] The pilot was successful and informed the statewide heat pump programs that have been administered in subsequent years.

[25] See Footnote 22.
[26] https://www.efficiencymaine.com/docs/2013-Efficiency-Maine-Annual-Report.pdf

Energy Burden & Heating Assistance

A 2019 analysis prepared for the OPA found that low-income residents in Maine, similar to low-income residents across the United States, experience greater energy burdens than other residents.[27] The study found that Maine's low-income households have an average energy burden of 19%, which far exceeds the thresholds for several definitions of energy poverty. The report highlights several findings unique to Maine, including that those heating their homes primarily with propane experience an average home energy burden of 41% -- more than twice as high as the heating fuel associated with the second highest home energy burden, which is wood. The recommendations of the study emphasize policies that target the most expensive and least efficient heating systems. This study utilizes 2015 data from the DOE LEAD tool, which has since been updated through 2018, and therefore may not be reflective of current trends.

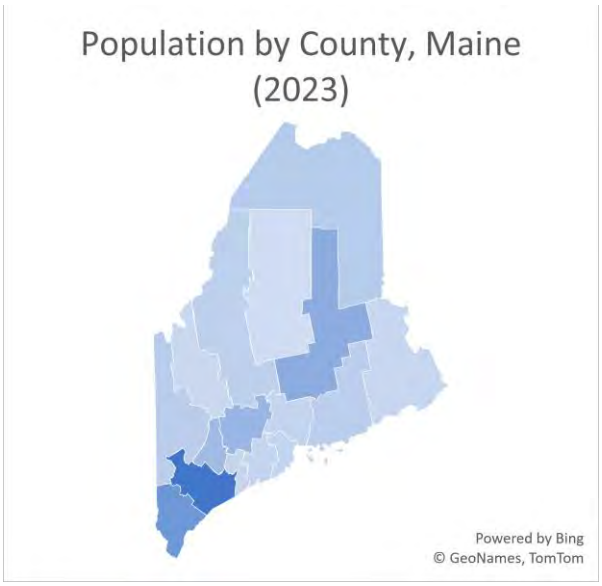
The GEO is currently preparing an analysis that builds upon and updates this 2019 report, examining energy burden in Maine households and providing recommended next steps. The analysis will utilize additional data sources including MaineHousing Heating Energy Assistance Program (HEAP) data.

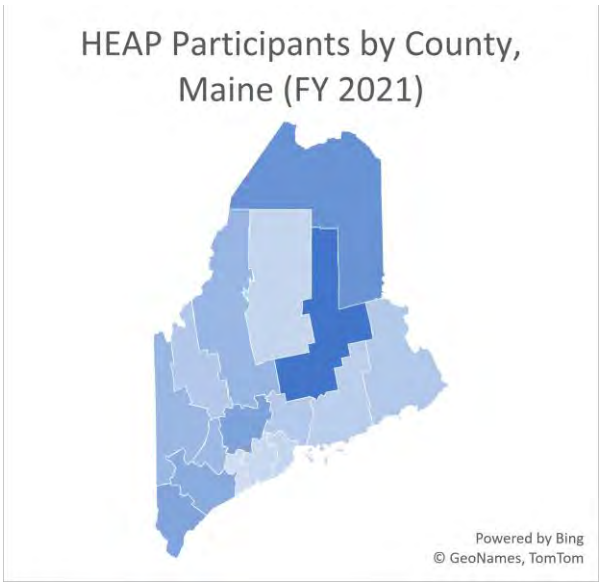
The HEAP program, administered by MaineHousing, helps qualified homeowners and renters pay for home heating costs.[28] The program benefits include assistance paying for fuel and emergency fuel delivery, as well as qualifying energy-related repairs. Household eligibility for benefits varies depending on size, income and other factors. Applications are processed through local Community Action Agencies (CAAs). Households that are eligible for HEAP may also be eligible for the Low Income Assistance Plan (LIAP) offered through electric utility providers.[29]

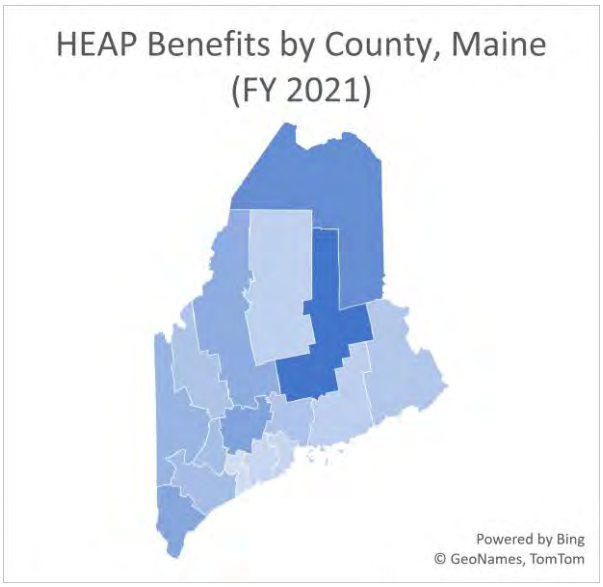
The three maps in Figure 7 below reflect population by county, HEAP participants by county, and HEAP benefits (which represent total dollars dispersed to HEAP eligible residents for their primary fuel) by county. Population is concentrated in the southern portions of the state in the more urban and suburban counties of Cumberland and York, while western, northern and eastern Maine are more rural. Penobscot and Aroostook counties are shown to have higher relative concentrations of HEAP participants and greater relative amounts of HEAP benefits.

[27] https://www.maine.gov/meopa/sites/maine.gov.meopa/files/inline-files/Maine%20Low%20Income%20Energy%20Burden%20Study%20June%202019.pdf
[28] https://www.mainehousing.org/programs-services/energy/energydetails/home-energy-assistance-program
[29] https://www.mainehousing.org/programs-services/energy/energydetails/low-income-assistance-program

Figure 7: Population, HEAP Participants, and HEAP Benefits by County, Maine







As shown in Table 3 below, 58.1% of homes in the state utilize heating oil or kerosene for home heating. 71.3% of all homes in the state utilize delivered fuels (i.e., heating oil, kerosene, and propane).

When looking at HEAP data, 68.6% of homes list heating oil or kerosene as their primary fuel for home heating. 78.7% of HEAP homes throughout the state list any delivered fuel as their primary fuel for home heating. For Northern Counties in NMISA territory (i.e., Aroostook, Washington, and Penobscot) 72.2% list heating oil and kerosene as their primary fuel and 79.1% list any delivered fuel as their primary fuel for home heating.

Table 3: Distribution of home heating, Maine

Fuel[30]	HEAP		State
	State	NMISA Counties[31]	
Heating Oil	41.7%	46.6%	58.1%
Kerosene	26.9%	25.6%	
Propane	10.1%	6.9%	13.2%
Electricity	8.5%	8.5%	10.3%
Gas	7.0%	5.5%	8.1%
Wood	4.1%	4.6%	7.8%
Wood Pellets	1.6%	2.2%	
Coal	0.1%	0.1%	0.2%
Biomass	0.0%	0.0%	
Other			2.3%

Transportation

MaineDOT has been working with EMT to expand electric vehicle charging infrastructure across the state since 2018. Transportation is the source of over half of all greenhouse gas emissions in Maine.[32] Reducing emissions in the transportation sector is a critical piece in achieving Maine's goal to reduce state emissions by 45% by 2030 and 80% by 2050. In 2021, Governor Janet Mills signed an executive order calling for a Clean Transportation Roadmap to "identify necessary policies, programs, and regulatory changes needed to meet the state's electric vehicle and transportation emission reductions goals, including strategic planning, incentive programs, charging infrastructure, utility rate policy, as well as transition and equity considerations."[33]

In 2022, the Maine Department of Transportation (MaineDOT) submitted and received approval on Maine's Plan for Electric Vehicle Infrastructure Deployment (PEVID) to the Federal Highway Administration.[34] This plan leveraged findings from the Clean Transportation Roadmap as well as other ongoing state efforts to address climate change and reduce greenhouse gas emissions. With the recently developed PEVID, federal funds will be used to develop and connect the charging network across the State, specifically in rural areas. Recently, MaineDOT and EMT reviewed proposals to install DC fast chargers in northern and eastern Maine. Awards were announced for sites located in Van Buren, Baileyville, Presque Isle, and Fort Kent.

[30] This table is meant to reflect difference in sources of home heating in Maine by HEAP and total population. HEAP data reflects only the primary fuel for the recipient. Statewide data is derived from EIA SEDS. Statewide data is reported in categories that differ from MaineHousing (e.g., EIA SEDS combines heating oil and kerosene, does not report on wood pellets or biomass, etc.).

[31] Aroostook, Penobscot, and Washington counties

[32] https://climatecouncil.maine.gov/maines-climate

[33] https://www.maine.gov/governor/mills/sites/maine.gov.governor.mills/files/inline-files/EO%2094%2036.pdf

[34] The final plan can be accessed here: https://www.maine.gov/mdot/climate/docs/pevid-2022.pdf

Planning Initiatives

Several ongoing and emerging planning efforts pertaining to the evolving needs of the Northern Maine transmission system are described below. NMISA, Versant Power, NB Power, the Maine PUC and additional entities across the state, through the LD 1959 grid modernization process, are engaged in various level of planning. NB Power's planning initiatives are discussed as well.

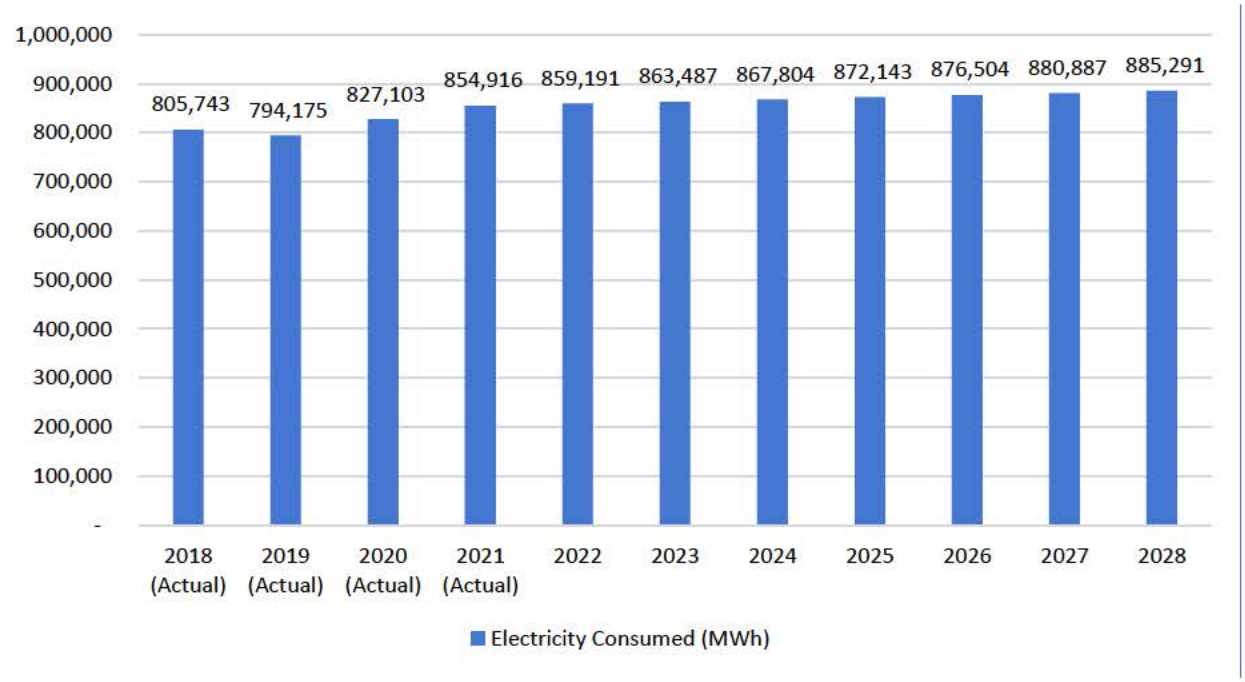
NMISA's Seven-Year Outlook

As required by its governing tariff and market rules, NMISA prepares a seven-year long term planning analysis for the planned development of the Northern Maine Transmission System (NMTS).[35] This annual analysis is comprised of a load forecast, generation resources, resource adequacy, and transmission planning. Overall, the 2022 report found that the MPD region will rely on the Maine/New Brunswick interface over the next seven years to account for any deficiencies, as well as that routine annual capital projects will increase system reliability while decreasing transmission operations and maintenance expenses. The four major components of the 2022 report are summarized below.

Load Forecast

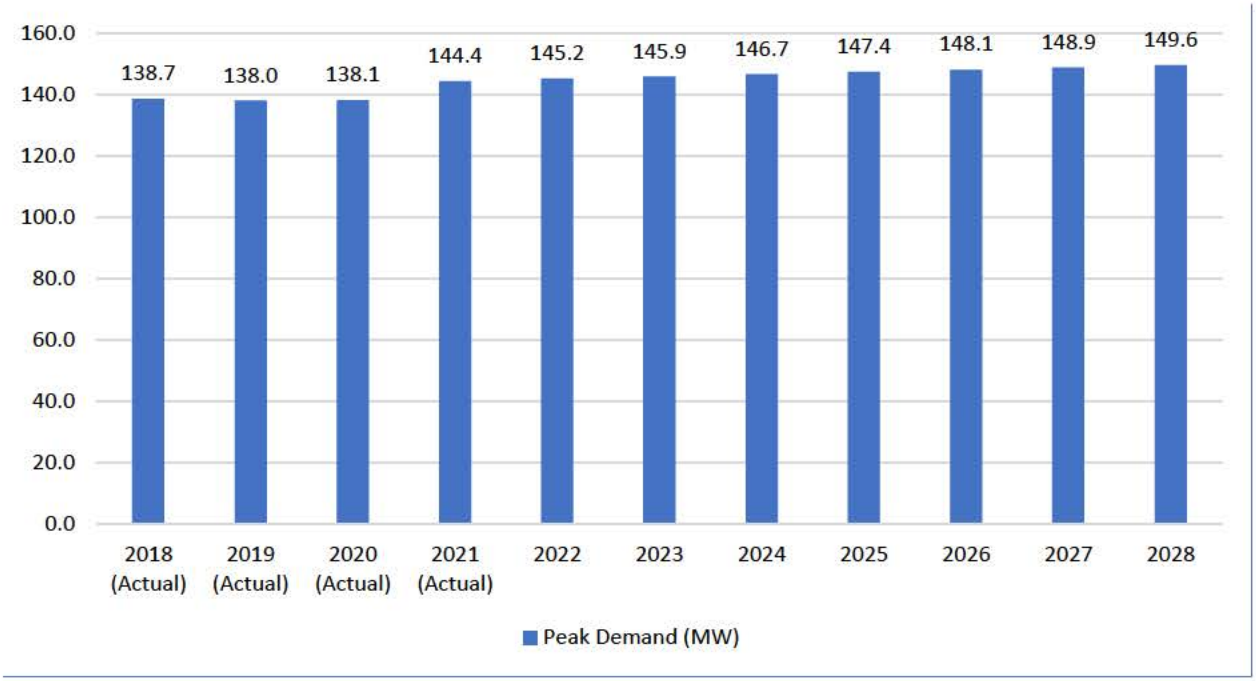
The average annual load growth (MWh) from 2001 to 2021 for the combined loads of MPD, HWC, EMEC and VBP&L was 0.4%, while the peak demand (MW) annual load growth was 0.53% for this same period.[36] The projected energy load for 2022 was 859,191 MWh with a 0.5% escalation used to calculate forward-looking energy and peak demand growth for the next seven years.

Figure 8: NMISA electricity consumed (Actual: 2018-2020; forecast: 2021-2028)



[35] https://www.nmisa.com/wp-content/uploads/2022/04/2022-Seven-Year-Outlook-final-1.pdf
[36] https://www.nmisa.com/wp-content/uploads/2022/04/2022-Seven-Year-Outlook-final-1.pdf

Figure 9: NMISA electricity peak demand (Actual: 2018-2020; forecast: 2021-2028)



Generation Resources

The 2022 Seven Year Outlook report provides an overview of current resources, retirements, and proposed resource additions. As evidenced by the current resource profile, the majority of generation sources in Northern Maine are renewable – namely, wind and hydropower. 2017 – 2019 saw the retirement of the Fort Fairfield and Ashland biomass plants, as well as the retirement of the Caribou Steam Station and Caribou Diesel Station.

As of April 2022, there were 168.5 MW of distributed energy resource (DER) projects in the queue to interconnect with the MPD distribution system, 97.9 MW of which had fully executed Interconnection Agreements. In 2021, a System Impact Study completed by Versant in coordination with NMISA assessed the impact of a 113 MW cluster of distributed energy resource projects interconnected to the MPD service territory. The study found no significant adverse impact the reliable operations of the grid. Efforts are currently ongoing to conduct a second study for another 40MW cluster of distributed energy resources.[37]

Resource Adequacy

NMISA utilizes a process established by the Northeast Power Coordinating Council (NPCC)'s "18-month Load and Capacity Assessment" to ensure resource adequacy. As described in the Seven Year Outlook, the analysis compares load forecast to net resources[38], considering the operating reserve:

> **"Weekly, the information from [the NPCC process] for the coming week is updated with current information and provided to the [New Brunswick Transmission and System Operator**

[37] https://www.nmisa.com/wp-content/uploads/2022/04/2022-Seven-Year-Outlook-final-1.pdf

[38] Defined as installed capacity adjusted for firm sales, demand response, forced and unplanned outages, and unit deratings

("NBT&SO"), which is the [regional coordinator] for the Balancing Authority Area, in preparation for the NPCC-wide conference call... NMISA's Operating Reserve requirement is its proportionate share of the Maritimes Area Operating Reserve Requirement. The NBT&SO calculates the Operating Reserve requirement for the region by maintaining adequate Operating Reserve capacity to cover 100% of the single largest contingency plus 50% of the second largest contingency. The NMISA's responsibility is based upon its monthly coincident peak share of the total Maritimes Area load. The average annual Operating Reserve responsibility is approximately 25 MW."

NBT&SO also sets the "planning reserve," a factor (most recently 20%) used to project reserve requirements over the long-term, as opposed to the Operating Reserve, which projects near-term actual requirements.

NMISA has historically been a winter-peaking system, with peak load occurring between 5-6pm. There are currently no major demand side management projects on the Northern Maine transmission system. Small scale demand side management projects are run through Efficiency Maine programs.

Transmission Planning

The Northern Maine Transmission System is comprised of two distinct transmission systems: Maine Public District (MPD) and Eastern Maine Electric Cooperative (EMEC). The two systems are interconnected through NB Power. The MPD is connected to New Brunswick via three transmission lines. A maximum of 110 MW can be imported to MPD from New Brunswick, while a maximum of 129 MW can be exported from MPD to New Brunswick.

The MPD's annual Maine PUC Chapter 330 filing provides an overview of all maintenance projects. In the 2022 Seven Year Outlook, NMISA found no emerging or potential transmission constraints for the planning period (2022 – 2028). The transmission assessment regarding the impact of distributed energy resources interconnecting with MPD will be conducted through a cluster study. NB Power completed an assessment of impacts to the New Brunswick system from the Versant list of active DER interconnected applications, which will be included in the annual update of transfer limits between Northern Maine and New Brunswick.

Versant's Planning Advisory Group (PAG)

Transmission system procedures are defined by tariffs approved by the Federal Energy Regulatory Commission (FERC). Attachment R in Versant's Open Access Transmission Tariff (OATT) for the Maine Public District specifies the process through which the transmission provider can conduct system planning. The purpose of the process as described in the tariff is to establish the process for the "enhancement and expansion of the Transmission system."[39] The Planning Advisory Group (PAG), as described in Section 2.1 of Attachment R in the tariff, is established to provide input and feedback to the transmission provider during development of a transmission plan. The purpose of PAG meetings is to "provide an opportunity for the group members to provide input regarding: i) data gathering and customer input into study development; ii) review of study results; iii) review of draft transmission plans; and (iv) coordination of draft plans with those of neighboring transmission providers."

[39] https://www.versantpower.com/media/66468/Versant-Power-MPD-OATT.pdf

Section 4 provides the methodology, criteria, and process for developing the plan. A transmission system needs assessment should be completed on a biennial basis, looking ahead to a five-year planning horizon. The plan "shall reflect transmission enhancements and expansions, load and energy forecasts, including expected demand response, and generation additions and retirements for at least the ensuing five years. The Plan shall also consider transmission needs driven by Public Policy Requirements."

Section 5.1 stipulates that information, data and assumptions shall be made available to the PAG, customers, and other stakeholders throughout the planning process.

The tariff requires biennial meetings of the PAG. Versant has facilitated PAG meetings annually since 2018 in order to align with the annual requirements under 35-A M.R.S.A. § 3132(3), (3-A), and Chapters 330 § 8 and 308 § V of the Maine Public Utilities Commission Rules. The annual "Chapter 330 Report" provides an overview of Transmission Line Rebuild or Relocation Projects (69 kV and above) and Minor Transmission Line Construction Projects (69 kV and above) anticipated over the next five years.

In June 2022, Versant Power hosted a meeting of the PAG attended by representatives from the GEO, the OPA, the PUC and others. In addition to providing a summary of Chapter 330 projects and reliability performance, Versant representatives introduced new component of the PAG process to include integrated grid planning efforts aligned with state policy goals and LD 1959, which was passed in 2021 and requires that utilities undergo a new process for grid planning that begins with robust stakeholder engagement to identify priorities that the utilities must address.

LD 1959 – Utility Accountability and Grid Planning for Maine's Clean Energy Future

The legislature recently required that utilities undergo a new process for grid planning that begins with robust stakeholder engagement to identify priorities that the utilities must address. Public Law 2022, ch. 702 requires this process to occur every 5 years going forward. The process began in November 2022.

Transmission and distribution utilities conduct grid planning to predict how much electric demand ("load") there will be, whether their current assets and equipment are sufficient to meet that need, and, if not, what investments will be required. Stakeholder engagement in the grid planning process provides an opportunity to ensure that the grid will meet Maine's needs in the coming years. This is an opportunity to address the challenges posed by climate change and aging infrastructure while creating a more resilient, modern, clean, and affordable grid where customers are empowered to make energy decisions.

Versant anticipates having a series of meetings with the PAG around the integrated grid planning process in 2023 and plans to initiate those meetings once the planning study framework is more defined as a result of the ongoing PUC Docket No. 2022-00322.

New Brunswick Power

New Brunswick Power (NB Power) is the electric utility owned and operated by the Province of New Brunswick, Canada, that owns the only direct transmission interface with Northern Maine. NB Power conducts Integrated Resource Plans (IRPs) every three years and serves as the reliability coordinator for the Maritime Area, which is defined by the Northeast Power Coordinating Council as New Brunswick, Nova Scotia, Prince Edward Island, and Northern Maine.[40]

[40] https://www.nbpower.com/media/1490323/2020-irp-en-2020-11-17.pdf

More broadly, in March 2019, the Atlantic Provinces and Canadian federal government initiated the development of a Clean Power Roadmap for Atlantic Canada, in part motivated by the federal mandate in Canada that requires all coal generation be retired by 2030. This Roadmap development is being overseen by an Atlantic Clean Power Planning Committee. As outlined in the Interim Report from the Atlantic Clean Power Planning Committee released in August 2020, "a key element of achieving this vision is the strengthening of the Atlantic Regional Transmission Loop to serve as a clean power superhighway connecting existing and new power supplies across the region…". This transmission initiative is commonly referred to as the Atlantic Loop.

While an announcement this fall indicated Emera, Inc., the parent company of Nova Scotia Power, is pausing spending on the Atlantic Loop, the Canadian government has indicated the project will proceed.[41] [42]

Findings and Recommendations

Northern Maine and rural areas of the state face unique energy realities. The overview above is not intended to represent a fully comprehensive analysis, but rather builds on previous findings and presents several key trends and factors contributing the unique qualities of the NMISA region.

The GEO underscores the findings and recommendations resulting from the stakeholder process per LD 1796: Resolve, to Study Transmission Grid Reliability and Rate Stability in Northern Maine, and put forth in the March 2022 Northern Maine report, including:

- Evaluation of the current and future energy grid needs at geographic locations in the NMISA territory to better understand the potential role and economic impacts of cogeneration, renewable energy, load management and energy inertia for residents and businesses in Northern Maine.
- Further investigation of power quality challenges which may exist at greater distances from load, including the benefits and costs of measuring nuisance trips in shorter intervals to better understand and mitigate the root cause of the power outage.
- Continue investigation into economic, environmental, technical, and social effects of reliance on Canada for electricity as well as what the impacts of bridging the gap between the NMISA territory and ISO-NE would be

The GEO additionally recommends the following:

Continued exploration by the PUC into alternative standard offer procurement options for electricity supply may be appropriate to consider, given the unique demand and generation characteristics of the NMISA territory. Additionally, a forthcoming report prepared for the OPA may reference considerations for potential improvements, including recommendations specific to the Maine Public District.

Entities engaged with the multiple planning efforts described here should continue to seek alignment, such as through coordination of PAG integrated grid planning with grid planning priorities identified

[41] https://www.cbc.ca/news/canada/nova-scotia/trudeau-government-atlantic-loop-project-pause-emera-1.6646208

[42] https://www.cbc.ca/news/canada/nova-scotia/emera-pauses-atlantic-loop-after-ns-power-rate-cap-1.6624183

through open PUC Docket No. 2022-00322, Proceeding to Identify Priorities for Grid Plan Filings, in shaping the integrated grid planning process for the NMISA region. These processes should incorporate equity as a key focus. Grid planning informed by diverse stakeholders presents the opportunity to address the challenges posed by climate change and aging infrastructure while creating a more resilient, clean, and affordable grid where customers are empowered to make energy decisions. The PUC's Investigation of the Design and Operation of Maine's Electric Distribution System, Docket No. 2021-00039, and in particular the EPE Report: Roadmap for Versant Power's Distribution System[43] provides a basis for further discovery through the PAG and PUC Docket No. 2022-00322 around needs to support renewable energy deployment. By conducting a planning process specific to MPD, the PAG is well positioned to identify unique needs of the region and align with LD 1959 planning requirements.

LD 1679, which established the Maine Climate Council, highlights equity as a core objective of the climate action plan. The GEO points to ongoing efforts to ensure an equitable transition to a decarbonized electric grid, such as through the work of the Equity Subcommittee of the Maine Climate Council.[44]

Federal funding programs present a significant opportunity to support continued fuel switching, beneficial electrification, and transitioning to renewable sources in Maine's most rural areas and areas highly dependent on fuels. Agencies should continue to coordinate on opportunities benefiting rural areas as funding becomes available. Maine is the most heating oil dependent state in the country, and the areas of the state that are most dependent on fuels are therefore particularly vulnerable to price swings. Weatherization and heat pump trends indicate electrification of heating sources is underway in the northernmost and rural regions of the state, and efforts should be taken to continue to understand potential barriers to beneficial electrification in these areas.

The Inflation Reduction Act (IRA) presents significant opportunity for Maine to receive funding and tax credits to support this transition to cleaner heating and cooling systems, in alignment with the state climate action plan goal of installing 100,000 heat pumps by 2025 including at least 15,000 in income-eligible households.[45] Maine is scheduled to receive $35.9M for the Home Energy Performance-Based, Whole-House Rebates (HOME Rebates), which provides incentives for individual and multifamily dwellings for energy efficiency retrofits. Maine will additionally receive $37.5M under the High-Efficiency Electric Home Rebate Act (HEEHRA), which provides point-of-sale rebates for energy efficiency measures in low-to-moderate income dwellings.

Additional opportunities have been announced under the Bipartisan Infrastructure Law (BIL) and the IRA focusing specifically on rural areas, such as the Energy Improvements in Rural Areas program under Section 40103(c) of the BIL, and the Rural Cooperative Loan and Grant Program under Section 22004 of the IRA. Information on federal funding opportunities under the BIL can be found at www.maine.gov/bil and on the GEO's website at http://www.maine.gov/energy/initiatives/infrastructure

[43] PUC Docket No. 2021-00039, Filing #17, Attachment C
[44] https://www.maine.gov/future/initiatives/climate/climate-council/equity-subcommittee
[45] https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_2YearProgressReport.pdf