Northern Maine Reliability and Rate Stability Stakeholder Group – Summary Report

March 9, 2022

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Acronyms

BHD: Bangor Hydro District
CMP: Central Maine Power
EMEC: Eastern Maine Electric Cooperative
GEO: Governor's Energy Office
HWC: Houlton Water Company
ISO-NE: Independent System Operator of New England
MPD: Maine Public District
NB Power: New Brunswick Power Corporation
NBSO: New Brunswick System Operator
NMISA: Northern Maine Independent System Administrator
NMTS: Northern Maine transmission system
OPA: Office of the Public Advocate
PUC: Public Utilities Commission
VBL&PD: Van Buren Light & Power District

Introduction

In 2019, the Maine Legislature passed LD 1796: Resolve, to Study Transmission Grid Reliability and Rate Stability in Northern Maine[1] which directed the GEO, with participation by the OPA, the PUC, to convene a stakeholder group to discuss and advise the office on four topics:

- The continued need to assess reliability in the northern Maine service territory
- The shutdown of the biomass plants in the region, such as those in Fort Fairfield and Ashland, that have been in the past been essential to addressing reliability concerns
- The region's fuel security, competitive supply and rate volatility resulting from its reliance on generation sources in the region
- Opportunities for transmission and non-transmission alternatives to address the current and projected reliability and rate stability needs of the region

This report fulfills the obligations required under LD 1796. The GEO took the lead in assembling and leading the stakeholder group as well as compiling the results from this stakeholder engagement. Pursuant to LD 1796, the GEO invited representatives from the following organizations to participate:

- The GEO
- The PUC
- The OPA
- The NMISA
- A municipal government in northern Maine
- A large industrial electric utility customer located in northern Maine
- A trade association representing businesses located in northern Maine
- A trade association representing the forest products industry
- An investor-owned transmission and distribution utility serving northern Maine
- Two different consumer-owned transmission and distribution utilities located in northern Maine
- An energy generator located in northern Maine

The GEO publicly posted these meetings, sought for these meetings to be inclusive and open to the public, and met multiple times with the stakeholder group. During the public meetings with the stakeholder group, the following organizations provided presentations:

- The GEO
- The NMISA
- HWC
- NB Power
- Versant Power
- ISO-NE
- Aroostook Partnership

Funding was not provided for this effort and the COVD-19 pandemic did distort the ability of the group to meet in person and a survey was sent seeking to catalog the feedback from individual members of the stakeholder group. Results from this survey and additional engagement informed this report.

[1] Maine Public Law 2019, Chapter 71

Background

Since 2019, NMISA has produced an annual NMISA seven-year outlook[2] that reports on load forecasts, generation resources, and transmission planning for the territory. The 2021 version of the seven-year outlook provides the following background for NMISA[3]:

> *The Northern Maine Independent System Administrator was created in 1999 in response to the mandate of the legislature of the State of Maine that effective retail electric competition be available to all of Maine's electricity consumers by March 1, 2000. The NMISA's size, scope, purpose and electricity market were designed to facilitate the development and implementation of retail electric competition and foster regional reliability efforts in the electrically isolated area of the state in portions of Aroostook, Washington, and Penobscot Counties. Northern Maine is characterized by low population density and a very low electric demand in comparison with other electricity markets.*
>
> *The dominant characteristics of the Northern Maine Market are its electrical isolation, large geographic size, small electric demand, and modest population. The electric system in Northern Maine is not directly interconnected electrically with the rest of New England, including any Maine or other domestic United States electric system. NMISA participants, therefore, are not participants in the New England Power Pool and are not subject to the control of ISO New England. The region's only access to the electric system that serves the remainder of Maine and the rest of New England is through the transmission facilities of New Brunswick Power Corporation. In October 2013, the New Brunswick System Operator functions were merged into and amalgamated with functions of NB Power. The New Brunswick Transmission and System Operator is the Balancing Authority and Reliability Coordinator for the Balancing Authority Area that includes the Northern Maine and Maritimes regions.*
>
> *The NMISA region is made up of the north, central, and south regions. The north region, or Versant Power, Maine Public District region, central region, or Houlton Water Company region, and south region, the Eastern Maine Electric Cooperative region, are interconnected solely through the transmission facilities of NB Power.*

According to the 2021, 2020, and 2019 NMISA seven-year outlook, the territory is home to 90,000 residents which make up roughly 42,000 electricity accounts. ***The territory is unique to the United States in that it is the only territory physically located in the country but not directly connect to any United States grid.*** The region is indirectly connected to the rest of Maine and the United States via transmission ties with New Brunswick, Canada as shown in Figure 2. Further detail of the MPD transmission network and interconnections with NB Power are included in Figure 3.[4]

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[2] https://www.nmisa.com/documents-2/

[3] Acronyms in original text have been either (1) removed if established for the first time in the original text or (2) replaced with acronym meaning from the original text.

[4] This map does not include the radial transmission interconnection for the EMEC network in Washington County.

Figure 1: New England Geographic Transmission Map Through 2031 (ISO-NE)

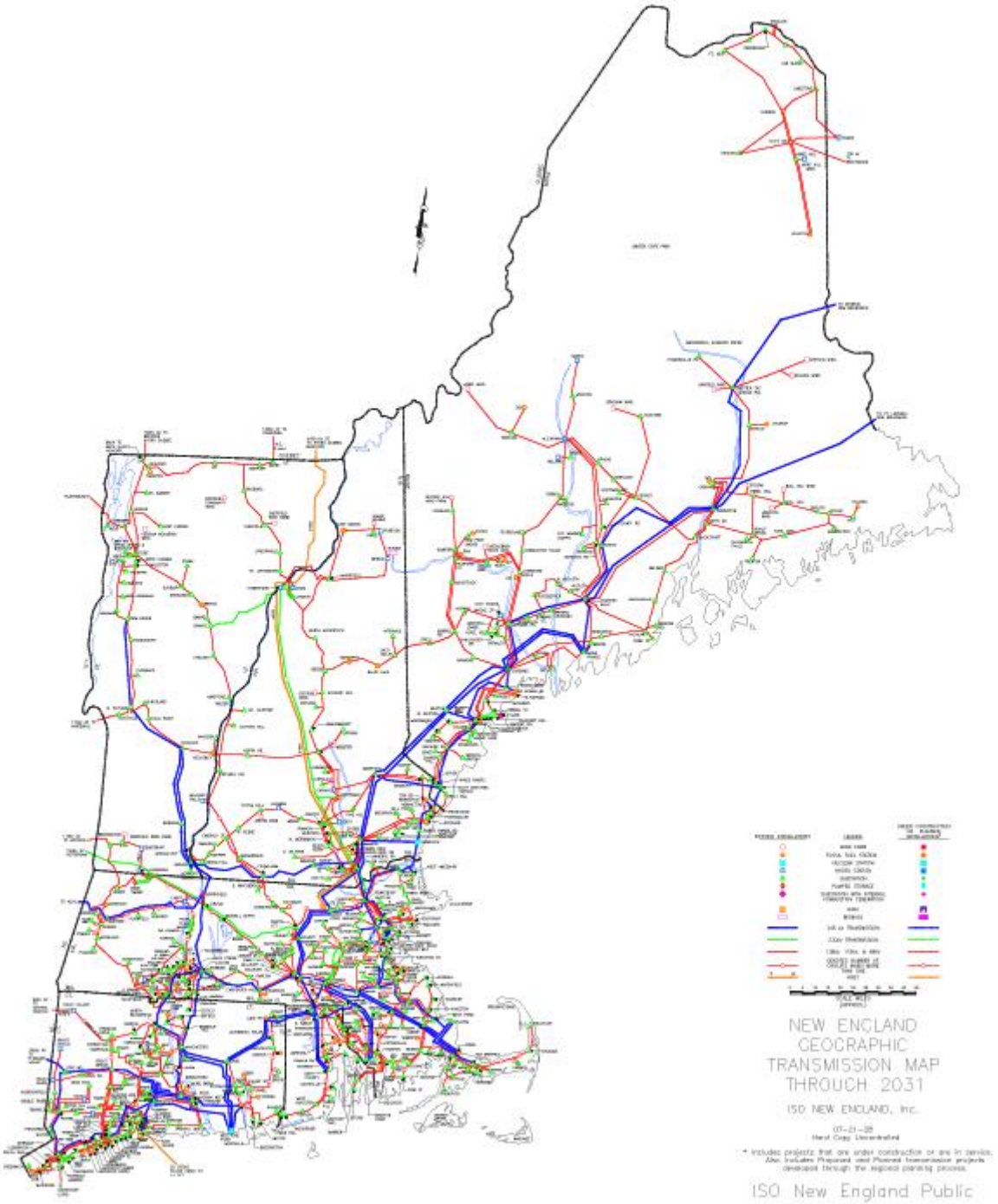


Figure 2: NB Power geographical transmission system

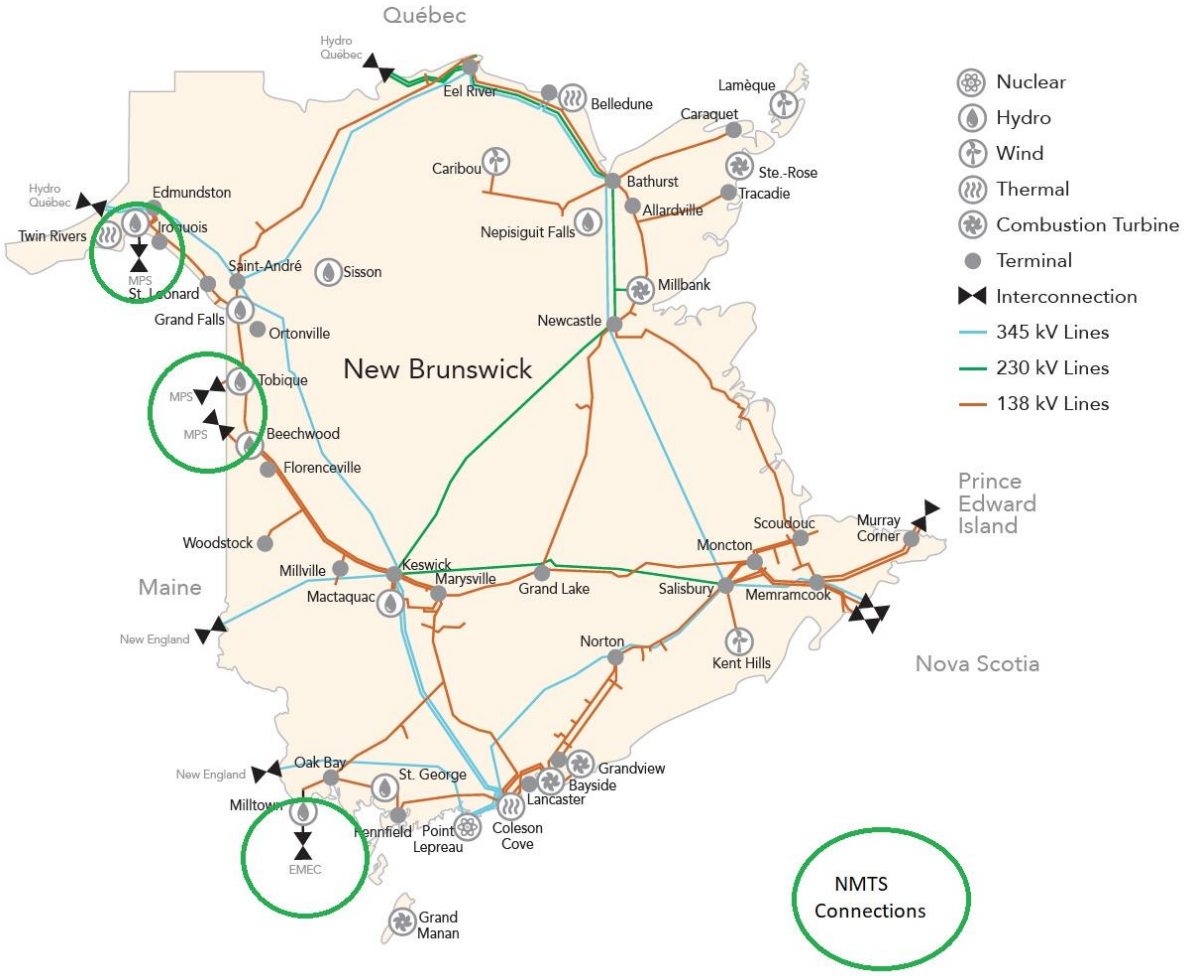


Figure 3: Versant Power – MPD geographical transmission system

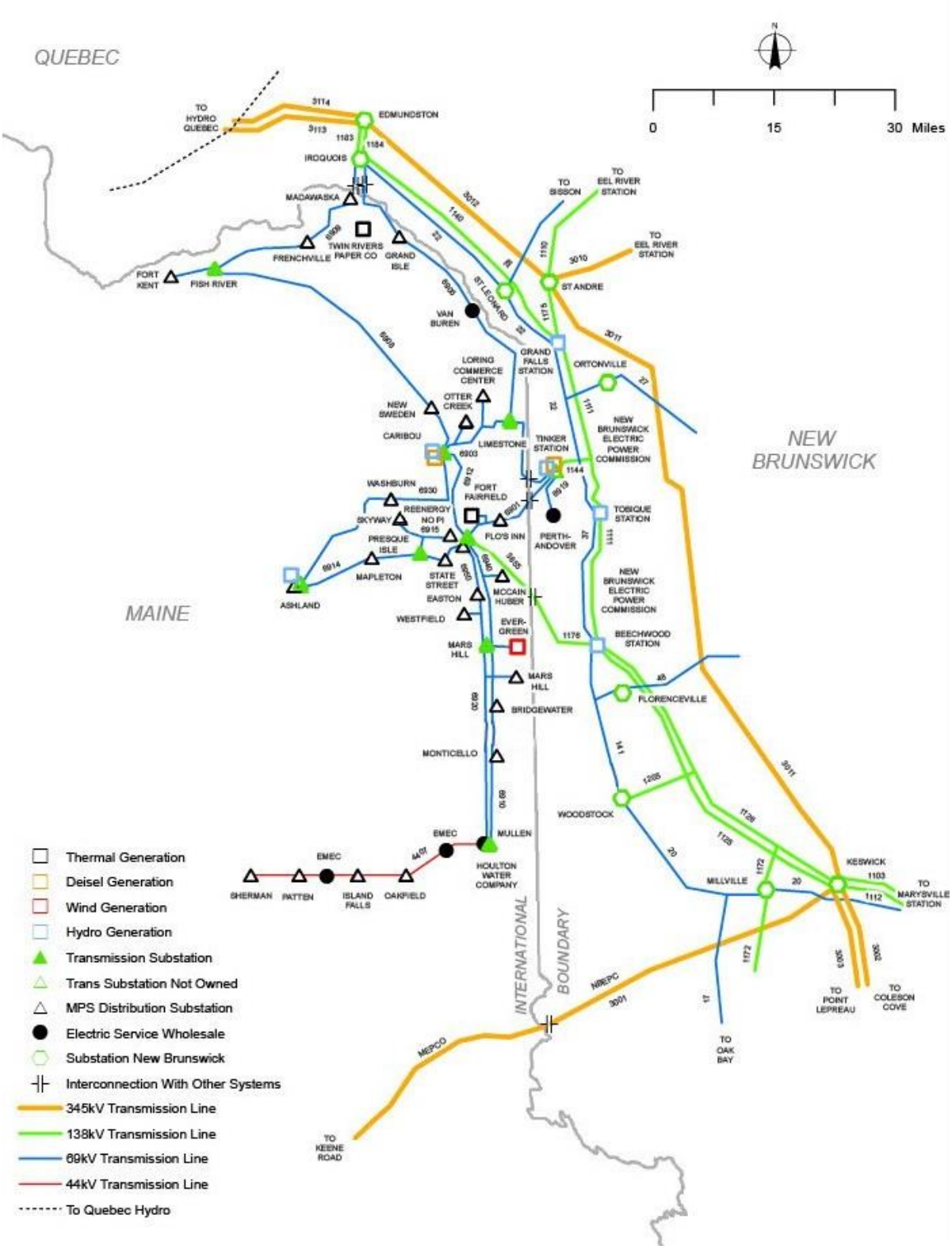


Figure 4 and Figure 5 below shows actual (2018-2020) and forecasted (2021-2027) annual electricity consumed and peak load. From 2018-2020, the territory consumed an annual average of 809,007 MWh with an average peak demand of 138.3 MW. For future load forecasts, NMISA assumes an annual growth in both electricity consumed and peak demand of 0.5%.

Figure 4: NMISA electricity consumed (Actual: 2018-2020; forecast: 2021-2027)

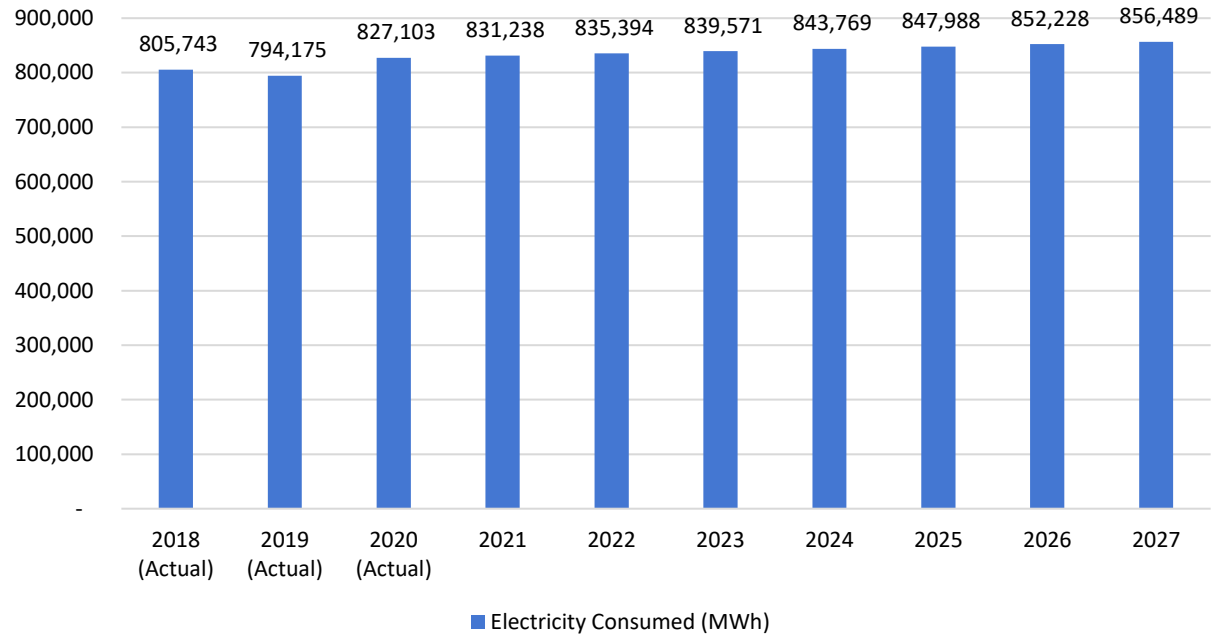
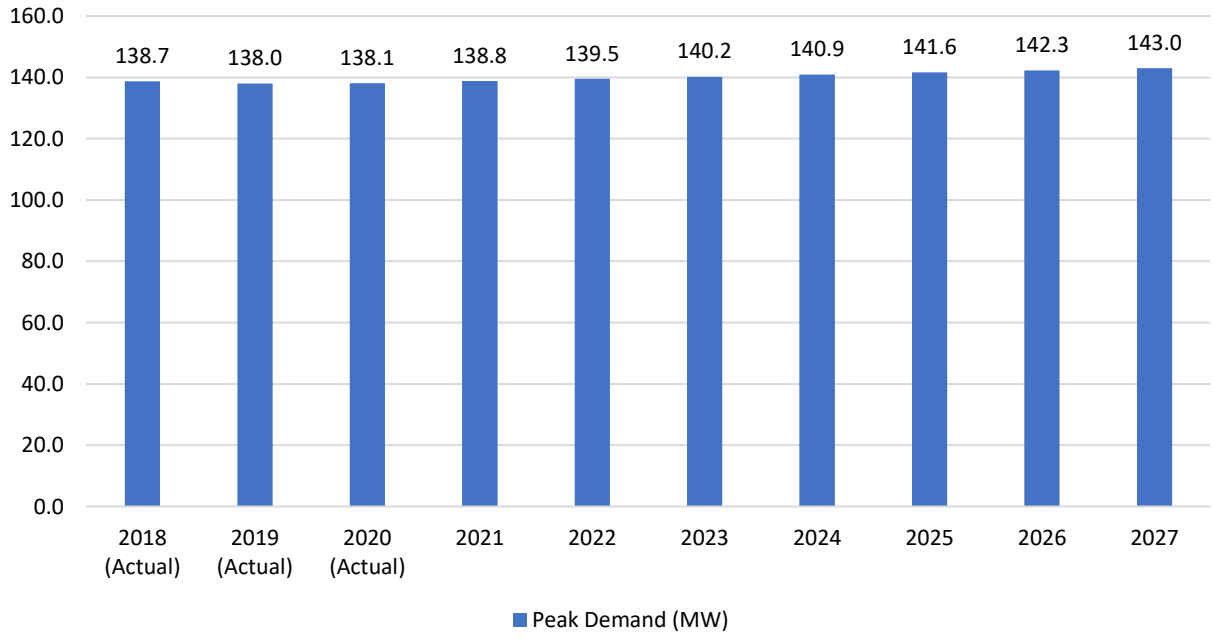


Figure 5: NMISA electricity peak demand (Actual: 2018-2020; forecast: 2021-2027)



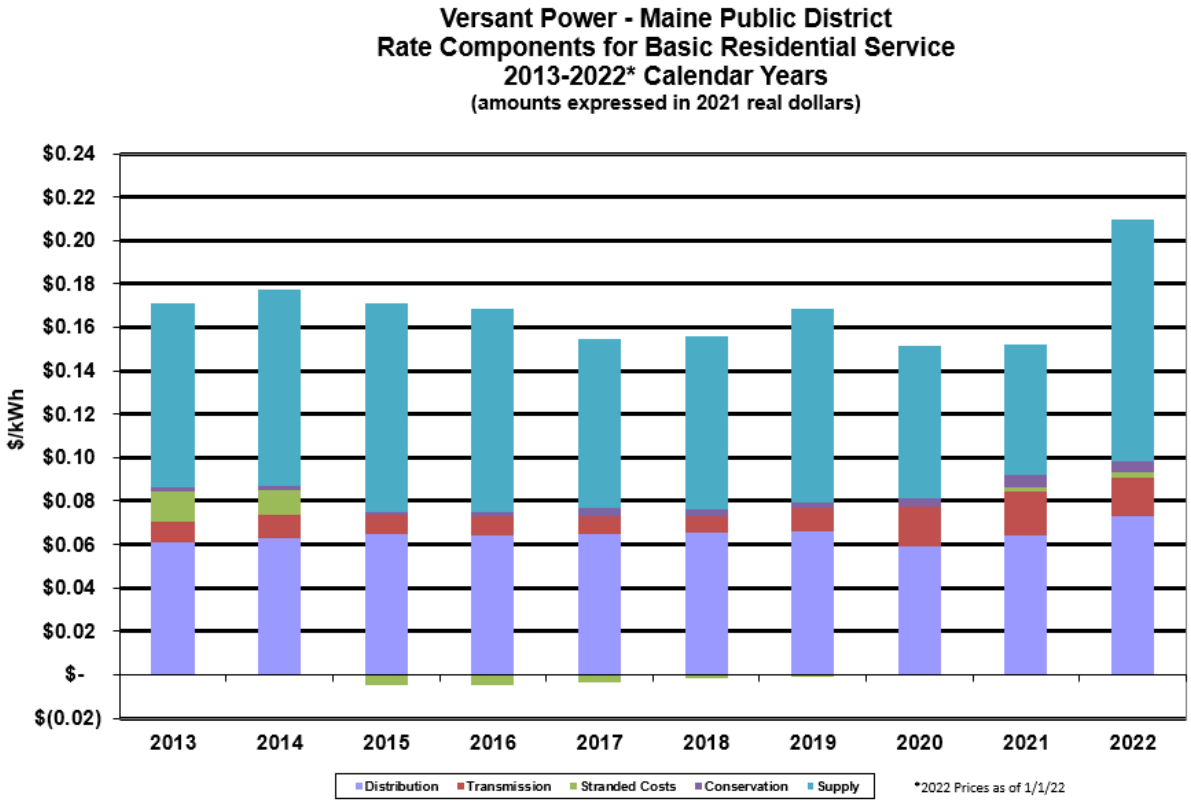
NMISA's territory is large geographically, has a modest population, and small electric demand – these characteristics and the unique nature of the grid's connectivity have created challenges for competitive supply market entry. During the last twenty plus years since deregulation, northern Maine has generally experienced lower competitive supply rates despite not being interconnected to ISO-NE directly and not having more than two active competitive suppliers. Like ISO-NE, the region relies on external transmission ties for reliability and to deliver additional competitive generation supply from external regions, particularly New Brunswick. The recent closures of the region's two remaining stand-alone biomass electric generators located in Fort Fairfield and Ashland and the sizeable amount of distributed generation recently proposed for the region add additional uncertainty, complexity, and challenges to competitive supply prices and reliable distribution operations. The stakeholder engagement process directed under LD 1796 begins to identify those challenges, as described in more detail below.

The COVID-19 pandemic has had unprecedented impacts on our way of life as well as our energy systems. Around the world energy demand decreased significantly, 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[5]. While New England experienced these impacts as well with decreased electricity consumption and lower than average fuel prices.

The result of recent standard offer (i.e., electricity supply cost) increase in Maine demonstrates the impacts of the pandemic on the electric system, in addition to regional reliance on natural gas and supply challenges during cold periods. Following two years of low standard offer rates when compared to prior years, in late 2021, the Maine PUC announced increased standard offer rates for MPD, BHD and CMP ranging from approximately 66-89% depending on the utility and customer class (i.e., small, medium, or large customers). The effect of this change and historical rates for residential customer in MPD can be found below in Figure 6.[6] This increase is due primarily to the increased global market prices of natural gas and fossil fuels as the economy recovers from the initial impacts of the pandemic, and the New England grid's reliance on said fuels. The 2013-2021 standard offer rates for residential and small commercial customers[7] 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 as a result.

[5] https://www.eia.gov/todayinenergy/detail.php?id=46636
[6] MPD standard offer service rates are indexed and discounted to BHD and CMP standard offer service rates
[7] Detailed information regarding medium and large commercial customer can be found at https://www.maine.gov/mpuc/regulated-utilities/electricity/standard-offer-rates

Figure 6: Maine Public District rate history



Another characteristic of the NMISA territory is the presence of the consumer-owned utilities – VBL&PD, HWC, and EMEC. These entities are able to secure their own supply charges independent of the Maine PUC. For example, in 2019, HWC signed a five-year contract for electricity supply, allowing it to have of the lowest electricity rates in state until 2024.[8] 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 and the BHD. The MPD retail load represents approximately 65% of the total NMISA load with the remaining 35% represented by the consumer-owned utilities. Overall, the weighted average of the standard offer service in northern Maine is approximately $0.0925 per kWh for 2022.

The issues discussed in this report are changing but are not new and can be traced at least as far back as 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. [9] The PUC investigations performed in 1998,[10] and again in 2003, 2004, 2008, 2012,[11]

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

[9] Synapse Energy Economics report – Competition and Market Power in the Northern Maine Electricity Market *https://www.synapse-energy.com/sites/default/files/SynapseReport.1998-11.ME-PSC.Competation-in-Northern-ME..98-08.pdf*

[10] Public Utilities Commission investigation into Competition and Market Power in the Northern Maine Electricity Market, Docket #1997-00586.

[11] Public Utilities Commission Investigation into Reliability of Electric Service in Northern Maine, Docket #2012-00589.

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. However, two new market changes brought this issue back to the forefront. In 2017, HWC announced[12] plans to disconnect from the NMTS and connect to the New Brunswick system directly, thereby reducing the number of customers over which to spread fixed transmission costs. Despite this, HWC continues to be a NMISA market participant. In 2018-2019, the remaining NMISA territory standalone biomass generators in Fort Fairfield and Ashland closed which significantly reduced the amount of locally sited generation, and the associated wheeling revenue as discussed below. To mitigate potential future issues with these events, the Maine Legislature passed LD 1796 in 2019.[13]

Many of the underlying issues considered in the first report remain today. The specifics regarding the current state of generation and transmission have changed, but the central issues have not. Competition with respect to energy supply is limited to two active Competitive Energy Suppliers with New Brunswick continues to have a dominant role providing both supply and transmission to the region.

Table 1: NMISA generation resources[14]

Plant	Capacity (MW)	Capacity (%)	Source	Status
Tinker Station	4.00	4%	Hydro #1	Existing
	1.80	2%	Hydro #2	Existing
	1.80	2%	Hydro #3	Existing
	4.00	4%	Hydro #4	Existing
	23.00	23%	Hydro #5	Existing
Caribou Station	0.50	1%	Hydro #1	Mothballed
	0.50	1%	Hydro #2	Mothballed
Scopan Hydro	1.40	1%	Hydro	Existing
Other Resources	42.00	42%	Wind	Existing
	20.00	20%	BLQ, Biomass, NG	Existing
	0.65	1%	Solar	Existing
Total	99.65	100%		

Wheeling Issue Overview

As described by Versant, and other stakeholders, wheeling revenues are another source of income to fund the overall transmission system and relate to the use of the transmission grid to move energy from a source of generation to another destination such as outside of the NMISA system into New Brunswick and beyond to New England or sometimes the Maritimes. This specific transmission service is used by generators to facilitate their business model of moving energy to other markets for better opportunity, and the cost for that is paid to the utility which in turn applies the funds to reduce the overall revenue requirement needed from all other customers to fund the care and maintenance of the transmission system. When the adjacent region's wholesale price for the Energy and associated Renewable Energy

[12] https://bangordailynews.com/2016/12/16/news/houlton-utility-gets-ok-to-build-line-to-connect-to-new-brunswick-power/

[13] Maine Public Law 2019 Chapter 71 Resolves *(LD 1796 Resolve, to Study Transmission Grid Reliability and Rate Stability in Northern Maine)*

[14] https://www.nmisa.com/wp-content/uploads/2021/04/2021-Seven-Year-Outlook-1.pdf

Certificates or Capacity create a financial incentive for a generator to 'wheel' its energy, it makes a transmission reservation onto Versant's transmission lines to move the energy out of the NMISA region.

Depending on the generating units in service and their business model, wheeling can range from $0 to several million, and in 2021 it was approximately $380,000. Versant had instituted a discount of $0 when the biomass generators were nearing their final operating months, and market forces went beyond the price of transmission in terms of viability for these units. Versant has discounted (but not zero) prices currently for wheeling transactions out of Maine Public District. These charges are governed by FERC. The utility does not profit or lose based upon this wheeling revenue because the revenue is treated as another source of funds to suppress transmission rates for other customers.

An open FERC complaint is active whereby NMISA has requested reciprocal waiving of transmission fees between itself and ISO-NE where the supply from ISO-NE pays the full transmission rate with no discount. Reciprocity will provide for equal treatment of transmission costs for transactions in both directions benefiting exporting generators in northern Maine and reducing competitive supply costs to customers in northern Maine.

Recent Updates

Several legislative and policy efforts have moved forward in recent years that impact residents and businesses of NMISA.

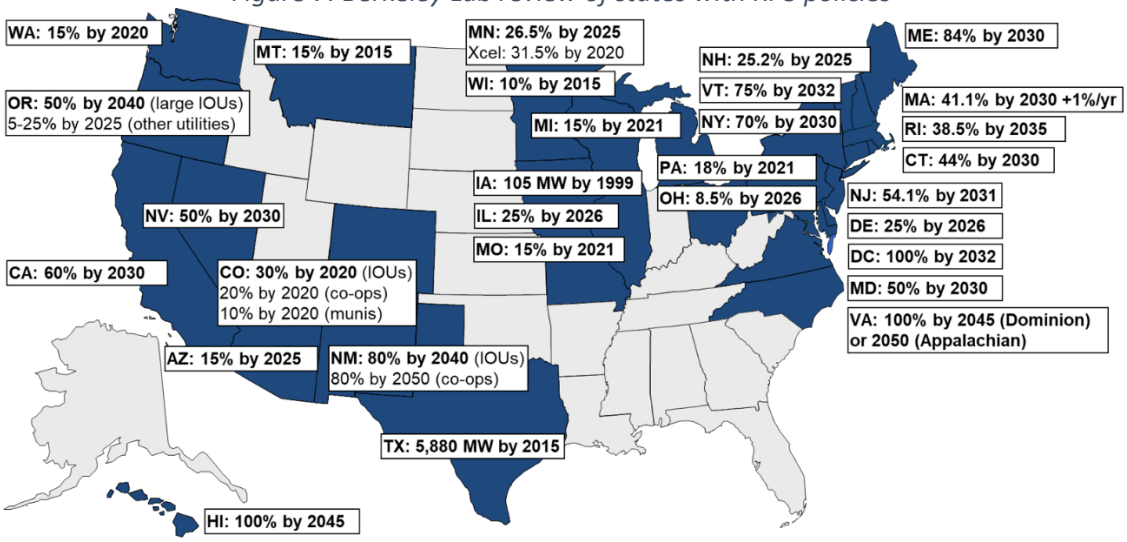
Renewable Energy

Renewable Portfolio Standards

Maine's renewable portfolio standard (RPS) establishes the portion of electricity sold in the state that must be supplied by renewable energy resources. In June 2019, Governor Mills signed legislation that increased Maine's RPS to 80% by 2030 and set a goal of 100% by 2050. Shown in Figure 7, states across the country have RPS programs and according to Berkley Lab's 2021 annual status report on standards in the U.S., "Roughly half of all growth in U.S. renewable electricity (RE) generation and capacity since 2000 is associated with state RPS requirements".[15]

[15] https://eta-publications.lbl.gov/sites/default/files/rps_status_update-2021_early_release.pdf

Figure 7: Berkeley Lab review of states with RPS policies



Solar and Storage

Maine has seen robust growth in solar photovoltaic (PV) installation since 2019, with generally consistent growth in small-scale, typically behind-the-meter installations, including on rooftops; a significant number of community-scale distributed projects; and growth in larger utility-scale solar installations. Solar growth is attributable to multiple factors, including:

- Continued cost decreases driven by efficiencies of scale and industry maturity.
- Effective policy supporting development of clean energy.
- Increasing awareness and demand for clean energy among some customers.

Large scale solar projects are under development across the state, driven by demand in the state and across regional markets. These projects include a total of 773 MW from 20 projects awarded contracts by the Maine PUC through procurements conducted as required by LD 1494 signed in 2019, all of which are located within the portion of the state administered by ISO-New England, as well as various projects developed under contract with independent power purchasers. Figure 8 shows total operational solar capacity by zip code in the Maine Public District.

Additionally, there are 162 MW of solar generation facilities in the Maine Public District distribution interconnection queue, with projects in Northern Maine being given additional development time per LD 936. Figure 9 illustrates these proposed projects, which can range from early planning stages to pre-construction, by zip code.

Figure 8: Operational solar capacity by zip code in Maine Public District (2021)

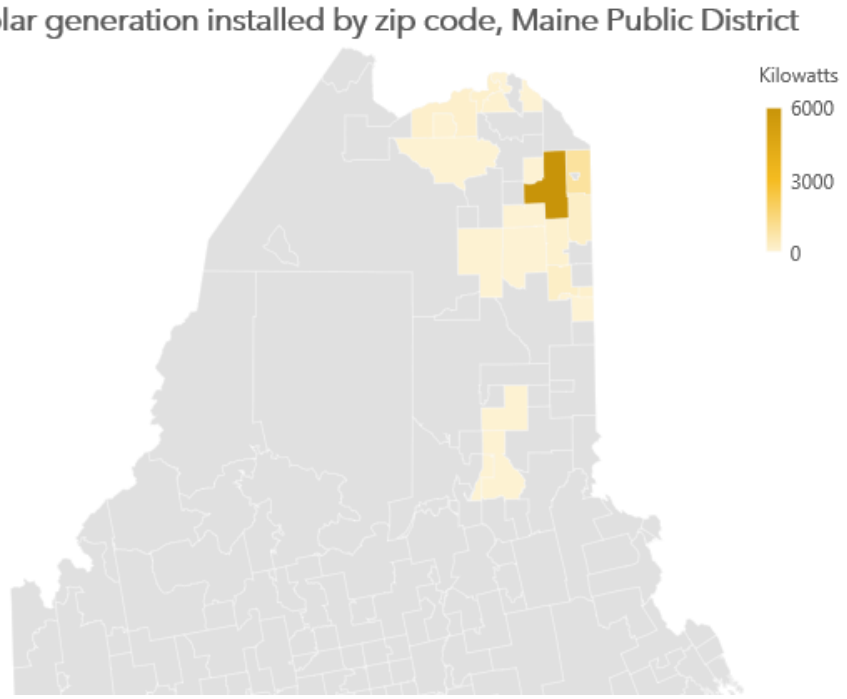
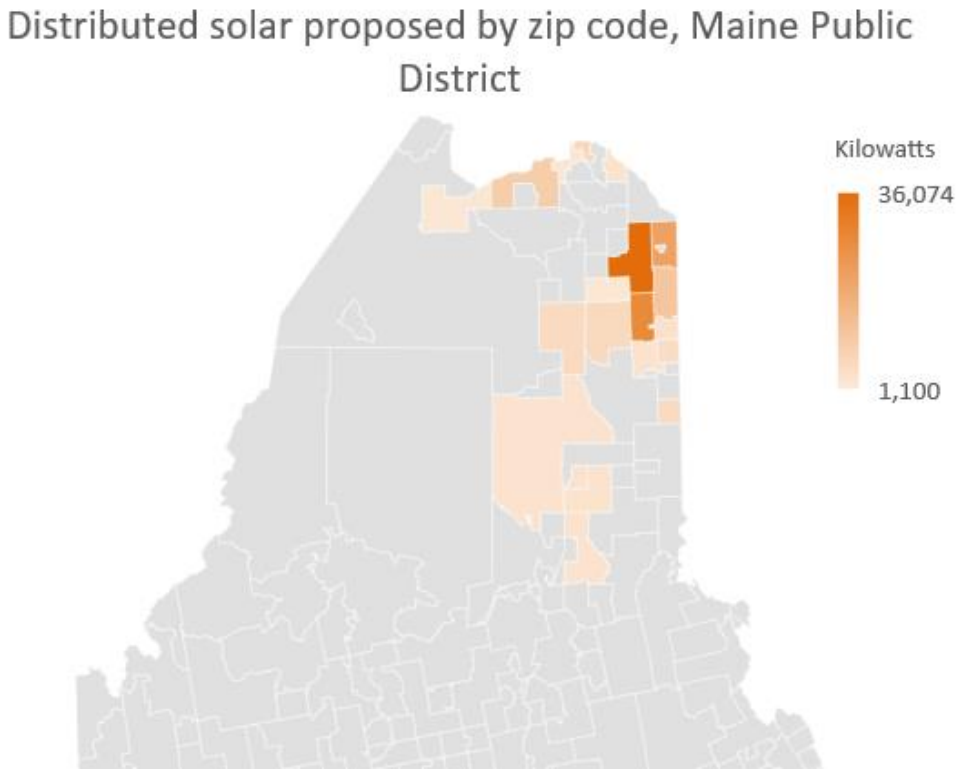


Figure 9: Proposed distributed solar capacity by zip code in Maine Public District (2021)



Energy storage technologies are designed to absorb energy and store it for use at a later time. A storage system may use mechanical, chemical, or thermal processes to store power. These types of technologies

can provide significant benefits to the grid and its resiliency. Benefits can include the ability to provide backup power during an outage, the ability to manage a customer's electric load, or lower peak demand. An energy storage system can also help increase the availability of renewable energy like wind and solar by absorbing excess energy when it is being produced, reducing the need for curtailment, and discharging it at a later time when the energy is needed, for example during the evening hours when the sun is no longer shining.

In states such as California and Hawaii, with large and increasing amounts of distributed renewable energy resources in comparison to load, it has become clear that energy storage will play a key role in order to regulate frequency, balance energy and capacity needs and simply provide power system stability.

In June of 2021, Governor Mills signed P.L. 2021 ch. 298 (LD 528), An Act To Advance Energy Storage in Maine, which set the following goals for energy storage capacity:

- 300 MW of installed capacity located within the state by December 31, 2025
- 400 MW of installed capacity located within the state by December 31, 2030

At the end of 2021, there was approximately 50 MW of operational energy storage in Maine and more than 450 MW in the development queue. Though it's unlikely all of the storage in the queue will be developed, it shows that there is notable interest from developers in investing in storage assets in Maine. The 2030 storage goal of 400 MW represents about 20% of Maine's peak electricity demand in 2020.

LD 528 also directs the GEO to conduct an Energy Storage Market Assessment to review the opportunities and potential challenges faced by the state in achieving its energy storage goals. This assessment, which will include an examination of commercially viable energy storage technologies, the market opportunities for storage, and a cost-benefit analysis for the 10-year period between 2020 and 2030, will be delivered to the Energy, Utilities, and Technology Committee in March 2022.

Onshore Wind

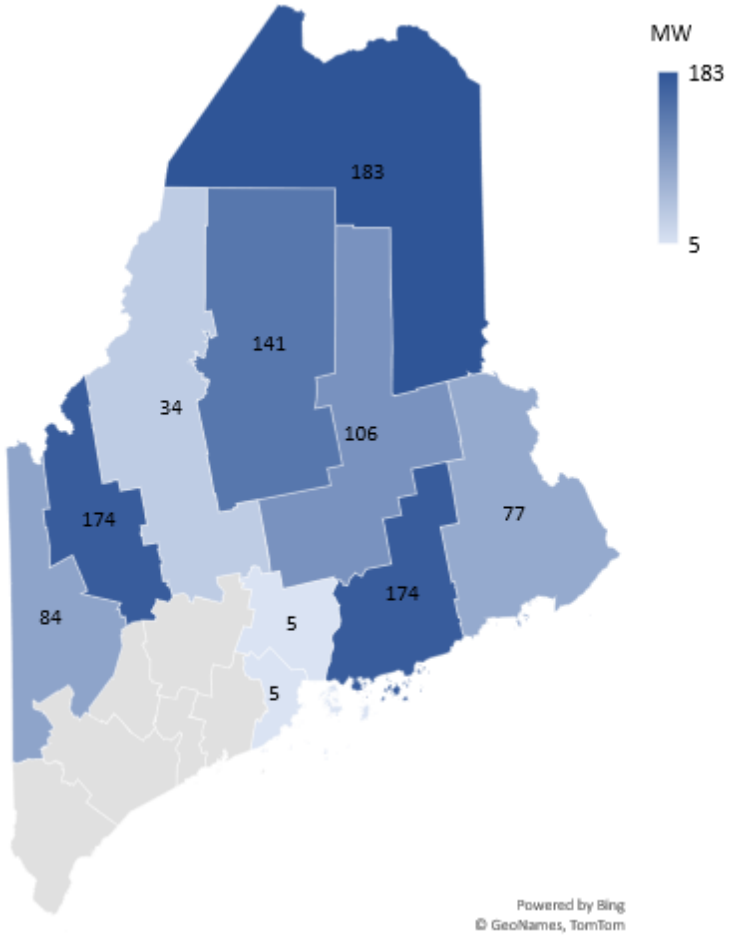
Maine currently leads New England states in onshore wind energy generation, helping New England power its electricity grid with clean electricity generation. The GEO's recent Renewable Energy Goals Market Assessment, released in 2021[16], found that the potential for onshore wind development in Maine continues to be significant. The analysis also found, however, that Maine's high-quality onshore wind potential is largely inaccessible absent investments in transmission, as is the case with much of the generation development in Maine due to a highly constrained transmission system.

Currently 8% of Maine's in-state electricity is generated by onshore wind resources, the most wind generation of the New England states, with 983 MW of onshore wind energy capacity operational in Maine in 2021 as shown in Figure 10. In 2009, Maine set wind energy generation goals as part of the Maine Wind Energy Act directing the installed capacity for wind generation of: at least 2,000 MW installed by 2015; at least 3,000 MW installed by 2020, including 300 MW or more from offshore wind; and at least 8,000 MW of installed capacity by 2030, including 5,000 MW from offshore wind.

[16] https://www.maine.gov/energy/studies-reports-working-groups/current-studies-working-groups/renewable-energy-market-assessment

Of the 983 MW of onshore wind energy capacity in the state, Aroostook, Penobscot, and Washington County have a combined 366 MW of onshore wind energy capacity. While the NMISA territory does not cover the entirety of these counties, the counties make up over 37% of the states total onshore wind energy capacity. However, only 42 MW – Evergreen Wind, located in Mars Hill – is interconnected to the NMISA system; the remainder, from facilities including Oakfield Wind in Aroostook County and Stetson Wind in Washington County, is interconnected to ISO-New England.

Figure 10: Operational wind generation in Maine by county (2021)



LD 1710

In 2021, the Maine Legislature passed LD 1710[17] to establish the Northern Maine Renewable Energy Development Program to remove obstacles to the use of and to promote the development of substantial renewable energy resources in northern Maine, defined as Aroostook County and other areas served by NMISA. The intent is to accomplish this through a procurement by the PUC for both a transmission line from Northern Maine connecting to the ISO-NE system, as well as a procurement for renewable energy generation for at least 18% of the retail electric load in the state. Contracts for both generation and transmission are required to be signed by November 2022, if deemed to be in the public

[17] Maine Public Law 2021 Chapter 380 Resolves *(LD 1710 An Act To Require Prompt and Effective Use of the Renewable Energy Resources of Northern Maine)*

interest, and the PUC is taking steps towards completing this requirement. The resources that may be procured under this requirement will likely not interconnect to the NMISA territory. However, development could lead to significant economic development in the region and potential opportunities to deliver supply to the NMISA territory in the future. The procurement schedule of key events as published by the PUC[18] is shown below in Table 2.

Table 2: LD 1710 procurement schedule of key events

Event	Expected Date
Request for Proposals Issued	November 29, 2021
Transmission Project Proposals Due	March 1, 2022
Transmission Project Relevant Information Available to Generation Bidders	Beginning March 7, 2022
Generation Project Proposals Due	May 1, 2022
Commission Decision Regarding Procurement Results	No later than November 1, 2022

Energy Efficiency

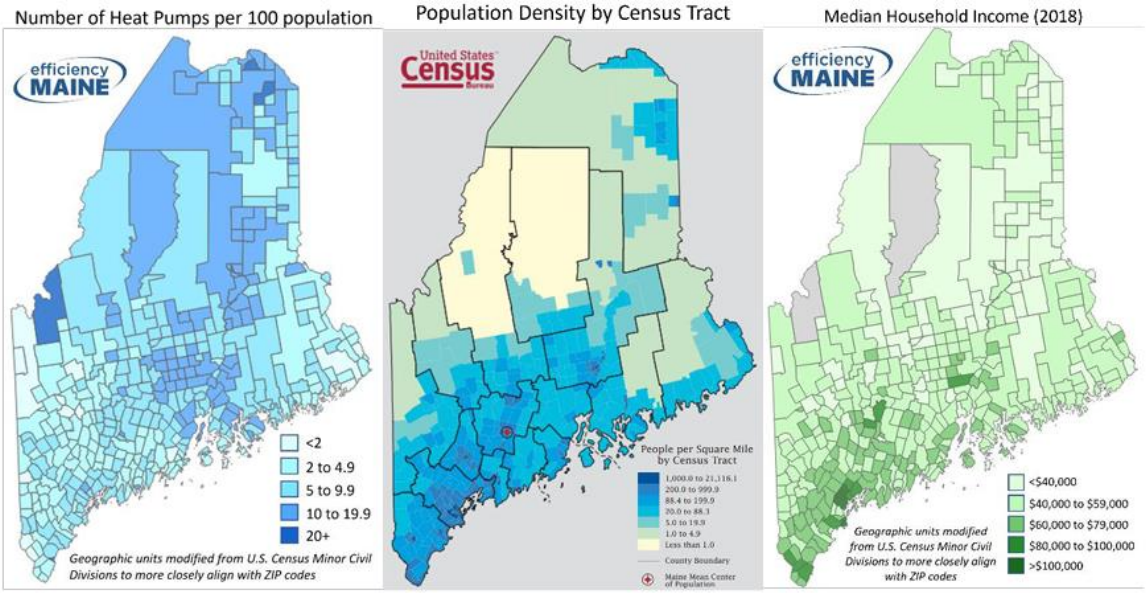
Energy efficiency is an important and economical tool to reduce greenhouse gas emissions, reduce energy costs, reduce growing energy demand, and create clean energy jobs. With close to one-third of Maine's emissions attributed to buildings, efficiency improvements in energy consumption for heating, cooling, and lighting technologies can aid in reducing energy needs, costs, and associated emissions. Maine has been recognized by the American Council for an Energy-Efficient Economy in 2020 as being in the top one-third of states in the country for energy efficiency policies and efforts

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. Pursuant to 35-A MRSA § 10119 signed in 2019, the Climate Action Plan seeks to achieve the required goal for the installation of 100,000 new heat pumps by 2025 with 15,000 new heat pumps being provided to income-eligible households throughout the state. This goal will ensure that by 2030, 130,000 homes will be using 1-2 heat pumps and an additional 115,000 homes will be using whole-home heat pump systems throughout the state. Since the inception of that goal and with combined efforts between Efficiency Maine Trust and MaineHousing, over 40,000 new heat pumps have been installed in Maine, with 28,000 occurring between July 2020 – June 2021, more than doubling the pace of installations from the prior year. The geographic distribution of heat pump installations throughout the state can be found in Figure 11 which highlights the heat pump installations in the NMISA territory.

[18] https://www.maine.gov/mpuc/regulated-utilities/electricity/rfp-awarded-contracts/northernmainerfp

Figure 11: Efficiency Maine Heat Pump Installations vs. Population Density vs. Income Distribution[19]



Left: Geographic distribution of Efficiency Maine's heat pump program from 2013 to 2021, representing more than 75,000 heat pump rebates (cumulative heat pump rebates per 100 population, where each rebate is equivalent to a single-head, mini-split air source heat pump); **Center:** US Census 2010 - Population density of Maine.; **Right**: Median income in Maine.

In addition to the Efficiency Maine Trust rebate programs for heat pumps, EMEC introduced a program offering an additional $250 per heat pump for residential and commercial customers. These heat pumps are limited to (1) one per dwelling or business location and (2) offered for 300 heat pumps or until December 23, 2023, whichever comes first.

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 a housing stock of 550,000 homes, with over half of owned and two-thirds of rented dwellings built in 1960 or earlier suffering from energy inefficient weatherization. Pursuant to 35-A MRSA § 10104 as amended in 2021, the Climate Action Plan seeks to double the pace of home weatherization so that by 2025, 17,500 additional homes and businesses will be weatherized, with an end goal of 35,000 homes and businesses weatherized by 2030 throughout the state. These goals include at least 1,000 low-income residential units per year. In 2021, 2,043 homes in Maine were weatherized with combined efforts between Efficiency Maine Trust and MaineHousing. Efficiency Maine Trust estimates weatherizing an additional 14,874 additional homes by 2025 with at least 4,236 being low-income dwellings throughout the state. In addition to this progress, the Governor announced in November of 2021 that $25 million from the Maine Jobs and Recovery Plan will be allocated to Efficiency Maine Trust for home weatherization for low to moderate income Maine people, serving both homeowners and renters.

[19] https://www.efficiencymaine.com/triennial-plan-v/

Transportation

Electric Vehicles and Charging Stations

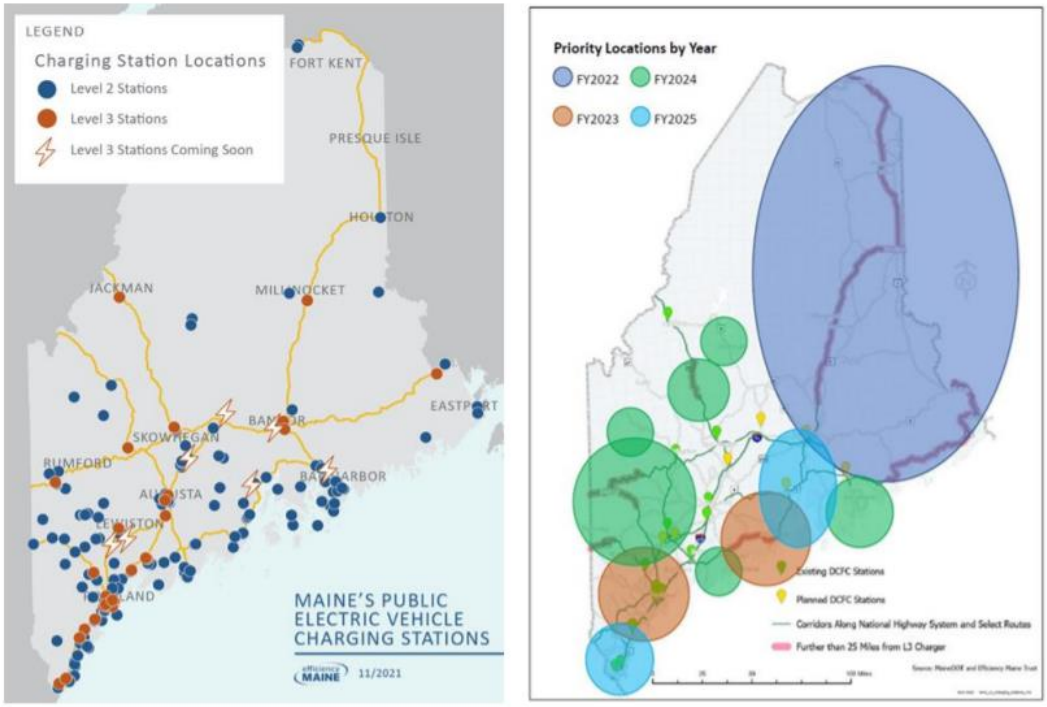
Maine's transportation sector produced 54% of statewide greenhouse gas emissions in 2017, or approximately 8 million metric tons of carbon dioxide equivalent. In order to meet the state's greenhouse gas emissions reduction targets, it is pivotal to decarbonize the transportation sector. Decarbonizing this sector presents challenges, as well as opportunities – clean transportation can help to meet the State's greenhouse gas emissions reduction targets, improve public health by reducing particulate emissions, and drive the use of innovative grid and demand management strategies. Maine Won't Wait estimates Maine needs 219,000 light-duty electric vehicles (EVs) on the road by 2030 to meet its emissions targets. As with the heating, one major tool for the transition to a decarbonized transportation sector is electrification, which requires the continued expansion of renewable resources to power our electricity grid.

As the transportation market shifts to electric vehicles, charging infrastructure is a key component for adoption of this technology. Maine currently has 417 publicly accessible level 2 charging stations and 131 publicly accessible DCFC plugs, or level three fast chargers, as shown below in Figure 12. These values are likely underestimated due to the number of chargers in workplaces (i.e., office parking) or similar settings. Priority locations for additional electric vehicle charging stations from 2022-2025 can be found in the Clean Transportation Roadmap[20].

Going forward, the GEO will continue to work on ways to incentivize electric vehicles and electric vehicle charging stations to decarbonize the transportation sector, in a way that ensures equitable access for all Maine people. This work will include consideration of changes to rate design structure, demand charging challenges, and other programmatic roadblocks to transitioning Maine's transportation sector, including larger fleets, to zero-emission vehicles. A review of opportunities and pilots to utilize increased electric vehicle batteries connected to Maine's distribution grid for demand management, as well as grid management and reliability improvement opportunities, should be considered as the state seeks to further understand opportunities to optimize power flows, quality and resilience.

[20] https://www.maine.gov/future/initiatives/climate/cleantransportation

Figure 12: Maine's Public Electric Vehicle Charging Stations (Left) and Priority Locations for Future Chargers by Fiscal Year (Right)



Stakeholder Feedback

LD 1796 included language specifying members of the stakeholder group, which were to include state agencies, municipal government, NMISA, industrial users, trade associations, and others. Due to the size of the population in norther Maine, the GEO permitted all interested parties of the public to attend the stakeholder meeting.

The GEO convened a robust and knowledgeable group of stakeholders[21] over the course of multiple meetings. During these meetings and through a survey sent to the stakeholder group, stakeholders identified numerous issues, and proposed recommendations for addressing the issues of (1) reliability, (2) biomass generation, (3) fuel security, competitive supply, and rate volatility, and (4) transmission and non-transmission alternative. Below is a list of responses from the survey and issues identified by the group, followed by recommendations by various stakeholders. These issues and recommendations identify and address various issues from supply quality to fuel security and market power. This survey predates some of the new market dynamics discussed previously but are still of value to inform the recommendations.

[21] Northern Maine stakeholders included but was not limited to representatives from local commercial and industrial customers; market participants and consultants; Versant Power; Van Buren Light and Power; Houlton Water Company; Eastern Maine Electric Cooperative; New Brunswick Energy Marketing; NMISA; economic development and energy organizations (such as Aroostook Partnership and the Aroostook Energy Association); and, federal and state policymakers and staff

Stakeholder Group Results

The following section summarizes the stakeholder survey results from the 21 members across 19 organization of the stakeholder group. These survey questions, while not scientific, were structured to collect specific feedback from the group regarding the requirements of LD 1796.

Reliability Assessment

Stakeholders were first asked if they felt there are system reliability issues in Northern Maine and to note their specific definition of reliability with relevant metrics. Comments from the responses were reviewed based on either direct response to the questions or by ascertaining positive vs. negative comments associated with the question. Five (24%) of the stakeholders either had no response or deferred the response to local customers. Of the remaining 16 members, 6 (38% of those with a response; 29% overall) of the comments or responses agreed that there were system reliability issues, 5 (31% of those with a response; 24% overall) of the comments or responses agreed that there were no system reliability issues, and 5 (31% of those with a response; 24% overall) had mixed responses.[22]

Responses from those that stated there were reliability issues were categorized into 9 different groups. The number of times each different group was mentioned by those who stated there were reliability issues is shown below in Table 3.

Table 3: Mentions by group of reliability issue metrics as provided by stakeholders

Metric	n
Nuisance trips	5
Power quality	4
Geographic dispersion and local generation	3
Mitigation of exogenous disruptions	2
Consistency in rates	2
Trip measurements and mitigation	2
Technically sustainable renewable energy generation	2
System planning and international RPS	2
Demand management	1

Overall themes and examples cited by stakeholders included:

- **Power Quality:** Stakeholders commented that, for those at the end of the radial grid, there are intermittency and nuisance trips that can cause power quality issues. Counties in the NMISA territory lack local generation causing a heavy reliance on international energy imports. These challenges with power quality related to nuisance trips, in particular for industrial customers such as (e.g., potato processing plants and waste disposal, lumber mills and high energy ramp up processes, etc.) that have highly automated processes. In these facilities a short period of power loss (i.e., 5 seconds) which have the same effect to commercial processes as a long period of power loss (i.e., 30 minutes or over). Root cause of power quality issues (i.e., international imports, local T&D system issues, etc.) was not determined.

[22] Mixed responses from individual members included both positive and negative statements regarding the system reliability.

- **Rates:** Stakeholders commented on the need to keep electricity rates low to ensure regional sustainability and to attract economic development to the region. Others commented on the need for consumer-owned utilities to manage increased requirements and potential costs from policy makers, the PUC, and energy markets overall.

- **Renewable Energy:** Some stakeholders were supported of increased investments in renewable energy, if cost-effective, to provide additional resources and economic development into the region.

- **System Planning:** Stakeholders commented that stakeholders in the NMISA territory have limited input into system planning of NB Power and that this could cause misalignment and challenges in planning. Others indicated that reliability standards and transmission planning criteria are not as rigid in NMISA territory as they are in Maine's ISO-NE territory or may have different requirements in NB.

- **Demand Management:** Multiple stakeholders pointed to beneficial electrification, including electric home heating and electric vehicle charging, as important to consider when planning for NMISA's future and that additional demand could cause challenges related to reliability if not managed.

Stakeholders who noted there were no issues of reliability issues typically noted that the system was reliable with no definition or provided positive aspects about the system. The following are cited examples of positive aspects regarding system reliability in Northern Maine and includes the positive mentions from those with mixed responses:

- The system has a good track record of uptime
- The system has a robust root causes analyses process for system issues
- Canadian utilities supplying power to Northern Maine has a robust physical system
- Operational assets (e.g., transformers, lines, poles, etc.) are robust and reliable

The stakeholder group additionally stated that reliability should be thought of in a holistic manner and not focused on physical infrastructure (e.g., poles, wires, etc.). Integrated resource planning - with agreed upon - metrics would be beneficial with trade-offs between reliability and cost being a key consideration. Additionally, continued collaboration and stakeholder understanding of Canadian reliability standards and transmission planning criteria would likely provide benefits to NMISA territory.

Stakeholders were then asked if they had recommendations for addressing the reliability concerns. Ten (48%) of the 21 stakeholder group members either had no response or specific recommendations for the NMISA territory system. Recommendations from the remaining 11 stakeholders for addressing system reliability concerns are shown below in Table 4

Table 4: Recommendations by stakeholders to address reliability concerns

Recommendation	n
Develop local generation facilities (e.g., renewable, combined heat and power, etc.)	6
Shorter trip measurement intervals	2
Support C&I facilities to manage their energy load against what is available	2
More system inertia	1

Management of areas around physical infrastructure (e.g., tree trimming, etc.)	1
Ensure Maine utilities are not passing along debt to consumers	1
Develop KPIs on power interruption and quality	1
Develop source agnostic policies for renewable generation	1
Seek solutions for reductions in energy cost	1
Look into increasing ties between NMISA territory and (1) New Brunswick or (2) ISO-NE	1
No response or recommendation	10

Biomass Generation

The stakeholder group was then asked to describe how shutdowns of biomass electric generation facilities have impacted the Northern Maine region and provide recommendations to address the impacts. Four (19%) of the 21 stakeholder members either stated there was no impact or provided no response. Of the 17 (81%) who stated impacts associated with these shutdowns, 82% (14 stakeholders) of comments were related to negative economic impacts on NMISA territory and 59% (10 stakeholders) of comments were related to a decrease in the electric grid reliability. Overall themes and examples cited by stakeholders included:

- **Negative Economic Impact:** Stakeholders commented on job losses, both direct and indirect, in forestry and electric power industry including in-woods, transportation, capital investments, forest residuals, and wood ash jobs. Lack of an outlet for mill residues was also mentioned.

- **Decrease in Local Generation:** Stakeholders indicated that this decrease in local generation has reduced power quality due to geographic distribution; several concerns of over-reliance on Canada for energy, and concerns of the impact loss of local baseload supply of electricity.

To mitigate these issues, some stakeholders suggested increase biomass subsidies, preparing an economic development plan for NMISA, and seeking ways to mitigate any potential increased costs. Others suggested establishing cogeneration (i.e., CHP) facilities at large industrial sites or even joining ISO-New England.

Impacts of Reliance and Rate Volatility

The stakeholder group was then asked about the impact Northern Maine's current reliance on out-of-region generation resource impacts the region. Results can be found below in Table 3. The most frequently cited impact from out-of-region reliance on energy generation from the perspective of the stakeholder group was the market power it gives to New Brunswick and Quebec energy generators.

Table 3: NMISA region impacts from reliance on out-of-region energy generation

Impact	n
Too much market power given to New Brunswick and Quebec which causes economic and technical risks to the NMISA territory	13
The reliance is a positive relationship for RPS development, exporting energy, or energy rates	4
Risk of external energy issues from outside the region is exacerbated	3
This issue needs further study to fully understand implications of reliance	3
Energy generation upgrades and decommissioning in New Brunswick and Quebec may be passed to NMISA customers	2

The reliance on non-Maine utilities is worth increasing or exploring	1
No response/Don't know	2

Following the discussion on impacts from reliance on out-of-region energy generation, the group was asked if they felt there were rate volatility or stability issues for Northern Maine and, if so, how they would be addressed. Fourteen (67%) of respondents agreed that there were rate volatility or stability issues and Northern Maine while 5 (24%) did not feel there were any issues and 2 (10%) either did not know or would defer to local customer responses. The group provided the following recommendations for addressing rate volatility and stability issues:

- **Local Generation:** Stakeholders suggested local generation would increase market competition and there should be a focus on development of these projects, particularly those that can help meet baseload, including cogeneration facilities (i.e., CHP), biomass generation, wind, solar, and energy storage. Commenters expressed the need to ensure solar development was cost-effective, suggesting behind-the-meter projects would be useful and that cost-benefit analysis may be useful.

- **Policy and Markets:** Some stakeholders suggested revising market rules between NMISA and Canada to limit retail activity, others suggested a focus on the impact of load growth and long-term fixed supply to reduce costs, and still other suggested further analysis of interconnection to ISO-NE.

Future Electric System

The stakeholder group was asked to identify additional characteristics of a future electric system to meet area needs that you feel are important for consideration in Northern Maine. Three (14%) did not provide a response. The remaining 18 (86%) provided the following characteristics for a future electric system to meet area needs. Overall themes and examples cited by stakeholders included:

- **General Characteristics:** Stakeholders commented that a future electric system needs to be complementary to the local economy and seek low cost, quality supply that can also support Maine's environmental goals.

- **Technologies:** Stakeholder feedback including seeking a diverse mix of generation in the region including biomass, solar, wind, hydro, storage, and other technologies. Others commented that cogeneration (i.e., CHP) at facilities in the NMISA territory should be prioritized. Others commented that the current connection to New Brunswick is robust, reliable, and clean.

- **Planning and Regulation:** Stakeholders felt that policy makers closely consider costs of energy supply while ensuring stable and competitive rates. This included feedback on ensuring solar penetration was sustainable and cost effective. Others indicated further analysis of connecting NMISA to ISO-NE would be useful as well as a review market power of the New Brunswick and Quebec in Northern Maine.

Under this effort, the stakeholder group was also asked to identify the opportunities available for transmission and non-transmission alternatives to help meet the needs of the region. Non-transmission alternative (sometimes called non-wires alternatives) enables the grid to consider and employ solutions to meet grid needs (e.g., distributed generation, energy storage, demand response, etc.) while

transmission opportunities would involve traditional infrastructure projects involving poles, wires, transformers, and so on. Eight (38%) of the respondents either provided no response or deferred the question to others. The remaining 13 (62%) noted the following for transmission and non-transmission alternatives:

- **Distributed Generation:** Biomass cogeneration (i.e., CHP) and consideration of industrial facilities, manufacturing, or large facilities, and community projects. Others commented that consideration between tillable agricultural fields (i.e., farmland) and renewable energy generation.

- **Further Analysis:** Stakeholders also suggested there be additional research implemented by an independent third-party, or the utility, to examine transmission and non-transmission alternative and consideration of microgrid development in NMISA.

Future Studies

The stakeholder engagement survey concluded by asking the stakeholder group about considerations for future studies. Ten (48%) of the stakeholder group did not have any recommendations for future studies. The remaining 11 (52%) provided the following responses:

Topic	Future study	n
Generation	Benefit-cost analysis for cogeneration (i.e., CHP) for industrial, commercial, and municipal users	5
	Economic and social impact of biomass generation in the region	1
	Explore payback periods for all renewables relevant to the NMISA territory	1
Market	Benefit-cost analysis for the NMISA territory connecting to ISO-NE	3
	Benefit-cost analysis on market power controlled by New Brunswick and Quebec on the NMISA territory	3
	Conduct a comprehensive market study, integrated resource plan, and action plan of the NMISA territory	3
	Benefit-cost analysis for Versant - Bangor Hydro District territory connecting to NMISA	1
Policy	Conduct a study on the effect of net metering to the residual load and the potential for stranded cost passed on by rate class.	3

Recommendations and Areas of Further Study

Given the issues brought to light in this stakeholder process, the GEO recommends more detailed study and consideration of the following:

- Evaluate 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 investigate 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 to investigate 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.

There are multiple pathways for which this analysis could be achieved. A state entity (GEO, OPA, PUC) could be provided with funding and direction to hire a consultant to conduct the detailed analysis, modeling and outreach needed. In addition, Versant Power utilize the existing planning mechanisms and authority contained within its Northern Maine transmission tariff[23], including engagement of key stakeholders through the Planning Advisory Group (PAG) and NMISA, to complete this planning process to result in a multi-year plan for northern Maine. Versant has also expressed a desire to partner with the GEO in this collaborative planning process.

Such a planning process would essentially involve two tracks. First, a technical an engineering phase, conducted by the utility, which would be aimed at understanding the future needs of the transmission and distribution systems, compared to the current state of the system and interconnection queue. This would lead to a variety of different scenarios being modeled over time, with probable solutions being determined over a 10-15 year period. Second, a broad array of relevant stakeholders would be engaged to provide guidance and feedback about the proposed solutions. The ultimate goal of the process is to collaboratively arrive at a range of widely-supported solutions, which could then be advanced by the utility, overseen, as usual, by regulators.

Further, there is federal funding that is now available, or will be in the coming months, that could benefit the NMISA territory that should be considered. The U.S. Department of Energy has a suite of programs and initiatives, including more than $62 billion from the recent Infrastructure Investment and Jobs Act, that could support a variety of projects and upgrades.[24] The dynamics of the global energy transition provide stakeholders and policy makers with a need to continue to get the latest information, consider policy modifications and evolve planning processes – with these challenges come opportunity and this is especially true for the unique energy situation of Northern Maine.

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

[24] https://www.energy.gov/articles/doe-fact-sheet-bipartisan-infrastructure-deal-will-deliver-american-workers-families-and-0