NORTHERN MAINE INDEPENDENT SYSTEM ADMINISTRATOR, INC.

SEVEN-YEAR OUTLOOK:

AN ASSESSMENT OF THE ADEQUACY OF

GENERATION AND TRANSMISSION FACILITIES

ON THE NORTHERN MAINE

TRANSMISSION SYSTEM

April 2020

INTRODUCTION

The Northern Maine Independent System Administrator ("NMISA") 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.[1] 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 ("ISO-NE"). 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 ("NB Power").[2] In October 2013, the New Brunswick System Operator ("NBSO") functions were merged into and amalgamated with functions of NB Power. The New Brunswick Transmission and System Operator ("NBT&SO") is the Balancing Authority and Reliability Coordinator ("RC") for the Balancing Authority Area that includes the Northern Maine and Maritimes regions.

The NMISA region is made up of the north and south regions. The north region, or Emera Maine, Maine Public District ("MPD") region, and south region, the Eastern Maine Electric Cooperative ("EMEC") region, are interconnected solely through the transmission facilities of NB Power. The maximum peak demand for the NMISA region in 2019 was 138.0 MW for the combined regions, matching the peak demand for 2018. The 2019 energy consumed was 794,175 MWh – a 2.90% decrease from 2018. There are approximately 90,000 residents and approximately 42,000 electricity consumers in Northern Maine.

The NMISA is a Federal Energy Regulatory Commission ("FERC")-approved independent system administrator and regional transmission group that encompasses the transmission systems of all FERC-jurisdictional and non-jurisdictional utilities in Northern Maine. The NMISA operates as an independent, objective and non-discriminatory administrator of transmission access, transmission information access, and related functions, and monitors and operates the electricity markets in Northern Maine for energy, ancillary services, and other services. The NMISA is governed by a seven member stakeholder Board of Directors comprising representatives of MPD and EMEC, municipal utilities (Houlton Water Company ("HWC") and Van Buren Light & Power District ("VBL&P")), large customers, generators,

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1 P.L. 1997 ch. 316, 35-A M.R.S.A. §§ 3201, *et seq.*

2 The NB Power transmission system connects to two 345 kV transmission lines, one of which is owned and operated by Maine Electric Power Company ("MEPCO"). MEPCO is jointly owned by Central Maine Power Company and Emera Maine.

Competitive Electricity Providers ("CEPs"),[3] and the Maine Public Advocate as representative of all other retail electric consumers.

A tariff and the Northern Maine Market Rules ("NMMRs") govern the NMISA. NMMR 9, System Planning, sets forth provisions relating to the responsibilities of the NMISA, Transmission Owners ("TOs"), Demand-Side Management ("DSM") program operators/providers, and Generators in relation to the adequacy and reliability of the Northern Maine Transmission System ("NMTS"). NMMR 9.2 -- Long-Term System Planning-- states that the NMISA will prepare a Base Case for the planned development of the NMTS for the following seven years, beginning April 1 of each year. The Base Case comprises four sections: Load Forecast, Generation Resources, Resource Adequacy, and Transmission Planning.

LOAD FORECAST

The load forecast for the region includes the combined loads of MPD, EMEC, and VBL&P. The average annual load growth for energy (MWh) from 2001 to 2019 was 0.05%. The peak demand (MW) annual load growth for same period was 0.32%. Both exclude the Perth Andover load in New Brunswick that is fed from the NMTS. Perth Andover was part of the NMISA system until January 1, 2005, when the NBSO assumed responsibility for that load. In 2020, HWC will no longer be interconnected to the NMTS; HWC will be interconnected with the New Brunswick transmission grid with the NBT&SO responsible for the HWC load.

The forecast used in the Base Case includes an annual load growth of 0.5%, resulting in 2020 projected energy load of 680,222 MWh. The remainder of the period was simply escalated by 0.5% per year. The peak load for each year was calculated using the same growth factor for energy. Although HWC is removed for 2020, the interconnection between HWC and MPD will be maintained in the event the HWC interconnection with NBT&SO is unavailable.

Table 1 reflects the seven-year load forecast.

Table 1
NMISA 7-Year Load Forecast

Year	MWh	Peak
2020	680,222	118.9
2021	683,623	119.4
2022	687,041	120.0
2023	690,477	120.6
2024	693,929	121.2
2025	697,399	121.9
2026	700,886	122.5

[3] A CEP is any marketer, broker, aggregator or other entity that is legally entitled in the State of Maine to sell, and that is selling or that will sell, electric energy, capacity or Ancillary Services to the public at retail in the Northern Maine Market. A CEP includes only competitive electricity providers as they are defined under 35-A M.R.S.A. § 3201.5.

GENERATION RESOURCES

A. CURRENT RESOURCES

Table 2 (below) lists the generation resources located on the NMTS. Northern Maine is unique in that it receives most of its generation from renewable resources. In the MPD region the majority of the generation consists of one wind plant and several hydropower facilities.

In the EMEC region there is 20 MW of Black Liquor/Biomass/NG capacity available from Woodland Pulp, a local paper mill.

Table 2
NMISA Generation Resources

Plant	Capacity (MW)	Type	Status
Tinker Station			
Hydro #1	4.0	Hydro	Existing
Hydro #2	1.8	Hydro	Existing
Hydro #3	1.8	Hydro	Existing
Hydro #4	4.0	Hydro	Existing
Hydro #5	23.0	Hydro	Existing
Diesel	1.0	Diesel	Retired
Caribou Station			
Steam #1	9.0	Oil	Retired
Steam #2	14.0	Oil	Retired
Diesel #2	2.8	Diesel	Retired
Diesel #3	1.0	Diesel	Retired
Diesel #4	2.8	Diesel	Retired
Diesel #5	1.3	Diesel	Retired
Hydro #1	0.5	Hydro	Existing
Hydro #2	0.5	Hydro	Existing
Scopan Hydro	1.4	Hydro	Existing
Other Resources			
ReEnergy – Fort Fairfield	33.0	Biomass	Retired
ReEnergy - Ashland	37.0	Biomass	Retired
Evergreen Wind	42.0	Wind	Existing
Woodland Pulp	20.0	BLQ, Biomass, NG	Existing

B. RETIREMENTS

In September of 2017 ReEnergy notified the NMISA that it intended to mothball the two biomass plants. In November of 2018 the Fort Fairfield facility ceased operation and was retired. The Ashland facility ceased operation in March of 2019 and the facility was retired in October of 2019. The current status of the generation facilities is reflected in Table 2 and both units have been removed from all NMISA planning criteria.

In July of 2019 Merlin One notified the NMISA that it intended to retire the Caribou Steam Station and Caribou Diesel Station effective August 1, 2019. The current status of the generation facilities is reflected in Table 2 and both units have been removed from all NMISA planning criteria.

C. PROPOSED RESOURCE ADDITIONS

There are no projects under study through MPD's Large Generator Interconnection Procedure. For more information see the following link: http://www.emeramaine.com/oasis/.

As a result of recent changes in Maine state law related to solar energy projects and distributed generation resources, there are several projects requesting interconnection to the MPD distribution system. NMISA is working with developers, the Maine Public Utilities Commission ("MPUC"), and MPD to ensure NMISA Reliability Standards are maintained as new projects are added, and to ensure all project developers (or their designee) operate in accordance with the NMMRs. Follow the links below for more information:

MPUC Chapter 311, Chapter 312, and Chapter 313
https://www.maine.gov/mpuc/legislative/rules/part3-electric.shtml

Emera Maine Small Generator Interconnection Information
https://www.emeramaine.com/energy-solutions/connecting-renewable-resources/small-generator-interconnection-process/

RESOURCE ADEQUACY

The purpose of the Base Case is to provide information to Market Participants and potential Market Participants of any forecasted long-term deficiency. The calculation by which the NMISA ensures resource adequacy is based upon the Northeast Power Coordinating Council's ("NPCC's") Document C-13, "18-month Load and Capacity Assessment." The C-13 process determines Gross Margin and Net Margins weekly for the 18-month period. The analysis is conducted twice a year, in the spring and fall, for the coming capability periods. Essentially, the analysis compares the load forecast to net resources plus operating reserve. Net resources are the installed capacity adjusted for firm sales, demand response, forced and unplanned outages, and unit deratings. Weekly, the information from the C-13 for the coming week is updated with current information and provided to the NBT&SO, which is the RC for the Balancing Authority Area, in preparation for the NPCC-wide conference call. The C-13 is published in the Documents section of the NMISA web site. The load forecast in this document may differ from the C-13 due to timing differences and the different planning horizons.

The NMISA is part of NPCC's New Brunswick Balancing Authority Area, with NBT&SO acting as the Balancing Authority as well as the RC. 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 23 MW.

For the Base Case, a 20% planning reserve criterion was used. The difference between planning reserve and Operating Reserve is that the planning reserve process projects reserve requirements over a long-term horizon while the Operating Reserve process plans for actual requirements in the near term to operate the system. The NBT&SO also determines the planning reserve. The amount is based upon NPCC generation reliability criterion that a loss of load expectation shall be, on average, no more than 0.1 days per year. NMISA also participates in the NBT&SO *Maritimes Area Comprehensive Review of Resource Adequacy*. As with prior studies, a 20% planning reserve margin was used.

The Load and Resources Review attempts to determine if adequate resources will be available over the long run to meet the projected annual peak plus the 20% planning reserve. The resources are the sum of the installed capacity plus firm purchases less firm sales. A positive number indicates resources are adequate and a negative indicates a deficiency. Also, transfer capacity is included to show the system's capability to import resources to relieve any deficits. Table 3 reflects the NMISA's Load and Resources Review from 2020 to 2026.

Table 3
Load and Resources Review

Year	2020	2021	2022	2023	2024	2025	2026
Peak	118.9	119.4	120.0	120.6	121.2	121.9	122.5
+Reserve 20%	142.6	143.3	144.1	144.8	145.5	146.2	147.0
Installed Capacity	73.9	73.9	73.9	73.9	73.9	73.9	73.9
Firm Purchases	131.0	131.0	131.0	131.0	131.0	131.0	131.0
Firm Sales	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0
Total	197.9	197.9	197.9	197.9	197.9	197.9	197.9
Deficiency (+/-)	55.3	54.6	53.8	53.1	52.4	51.7	50.9
Firm Transfer Capacity	131	131	131	131	131	131	131

Historically, the peak has occurred in December. Firm Transfer Capacity includes the MPD and EMEC interfaces.

DEMAND SIDE MANAGEMENT

There are no major DSM projects on the NMTS. Most DSM projects are at the local level through the Efficiency Maine program that each utility supports. For more information, the website can be found at the following link: http://www.efficiencymaine.com.

TRANSMISSION PLANNING

Transmission System

The NMTS consists of two independent transmission systems, MPD in Aroostook County and EMEC in portions of Washington County and Penobscot County. The two systems are interconnected only through the NB Power transmission system.

The MPD system is interconnected with New Brunswick via three transmission lines, a 100 MVA import rated interconnection from Flo's Inn to Beechwood, a 100 MVA import rated interconnection at Tinker Station, and a 56 MVA import rated interconnection from Iroquois to Madawaska. In 2020, the HWC load will be transferred to the New Brunswick transmission system, after which the rated Total Transfer Capability ("TTC") between the NB Power system and the MPD system is unlimited for imports to Northern Maine and 128 MW for exports to New Brunswick in the winter. The TTC calculation for the MPD-New Brunswick interface assumes a single contingency loss of the Flo's Inn to Beechwood transmission line. See Exhibit 1 for more details regarding MPD's transmission system.

The EMEC transmission system consists of an approximately 40 mile radial 69 kV transmission line that originates at the Oak Bay, NB substation and terminates at Topsfield, ME substation. There are five load substations that are connected by this line, including Woodland Pulp, which is also a generator. The majority of the line is 266.8 ACSR Partridge conductor, and there is a five-mile section of 1/0 AAAC between Woodland and Princeton. The EMEC system has a TTC of 32 MW for both imports from and exports to New Brunswick in the winter.

Transmission Upgrades

A series of capitalized maintenance projects is planned by MPD. A summary of these projects can be found in MPD's annual MPUC Chapter 330 filing. The most recent version can be found at: https://www.emeramaine.com/oasis/. The effect of such capitalized maintenance projects is expected to be reduction in transmission Operations and Maintenance ("O&M") expenses, reduction in the probability of outages along these segments, and extension of the useful lives of these facilities. These projects are not expected to increase the TTC of the system.

In 2017 ATG upgraded the Tinker Transformer to 100 MVA and rebuilt lines 6901 and 6904. Emera Maine rebuilt Line 6901 on the US side. The TTC of the MPD and EMEC interfaces are reflected in Table 4[4]:

[4] From MOD-008-1 Total Transfer Capability Report MPS Interface Version 018 and Eastern Maine Electric Cooperative Interface Version 010 (Confidential Report)

Table 4
Summary of TTC and TRM values for the MPS Interface

	Winter 2020 After HWC transfer		Summer	
	TTC (MW)	**TRM (MW)**	**TTC (MW)**	**TRM (MW)**
MPS to NB	**128**	**13**	**102**	**11**
NB to MPS	**No Limit**	**0**	**No Limit**	**0**
-Radial	No Limit	0	No Limit	0
-Non-Radial	n/a	n/a	No Limit	0

(Summary of TTC and TRM Values for the EMEC Interface)

	Winter		Summer	
	TTC (MW)	**TRM (MW)**	**TTC (MW)**	**TRM (MW)**
EMEC to NB	37	0	39	0
NB to EMEC	37	16	39	11

Potential Transmission Deficiencies

As with generation resources, the purpose of the Base Case is to provide information to Market Participants, including the TOs, and potential Market Participants of any forecasted transmission deficiencies to allow such Market Participants to bring forward proposals to address potential deficiencies. Pursuant to NMMR 9.3.2, NMISA is required to analyze whether any potential investments in the transmission system are necessary to maintain reliability in accordance with NMISA Reliability Standards (see NMMR 8), which include NPCC Reliability Standards, improve the performance of the Northern Maine Market, or reduce the cost of congestion constraints. Pursuant to NMMR 9.3.5, where the Base Case identifies that action is or will be required to alleviate an existing or emerging transmission constraint, the NMISA is directed to take the actions described in NMMR 9.4.1 when, in the NMISA's independent judgment, no adequate proposal exists to address the problem. Pursuant to NMMR 9.3.7, a transmission constraint is considered "emerging" if the NMISA identifies it to be likely to occur within one to five years, and it is considered "potential" if the NMISA identifies it to be likely to occur within six to seven years. NMISA does not identify any emerging or potential constraints for the planning period.

The NMISA is not aware of any planned deactivation, disconnection or retirement of any existing transmission facilities.

Conclusion

The NMISA finds that there are no emerging or potential transmission constraints.

SUMMARY OF RESULTS

Load Forecast

The load forecast for Northern Maine projects an average growth rate of 0.5% per year over the seven-year planning period covered in the Base Case for both energy and demand. However, with the transfer of the HWC load to the New Brunswick transmission system, there will be a decrease in load over the planning horizon.

The removal of HWC and an annual load growth of 0.5% for the remaining load results in an anticipated peak hourly demand for Northern Maine of 122.58 MW in 2026, an increase from 118.9 MW in 2020. 2026 is the final year covered in the Base Case.

Generation Resources

NMISA projects that based upon committed generation resources, the MPD region will rely on the MPD/NB interface through the planning period to account for any deficiencies.

Transmission Planning

Routine annual capital projects that are currently projected for the planning period consist of a series of capitalized maintenance projects that should generally increase system reliability and decrease transmission O&M expenses.

EXHIBIT 1

Summary of MPD Transmission Lines

MPD has 376.84 circuit miles and pole miles of transmission lines. It serves an area of approximately 3,600 square miles and 36,500 retail customers through transmission and distribution level systems. A breakdown of transmission mileage is as follows:

Voltage	Circuit Miles	Pole Miles
34,500	12.31	12.29
44,000	46.57	46.57
69,000	310.87	310.87
138,000	11.89	11.89

The main trunk portion of Line 3470 has been classified as transmission by FERC. Most of this line mileage is for subtransmission lines, i.e. it serves the 28 MPD distribution substations. Two lines, 6904 and 3855, are true transmission lines that do not serve any distribution stations.