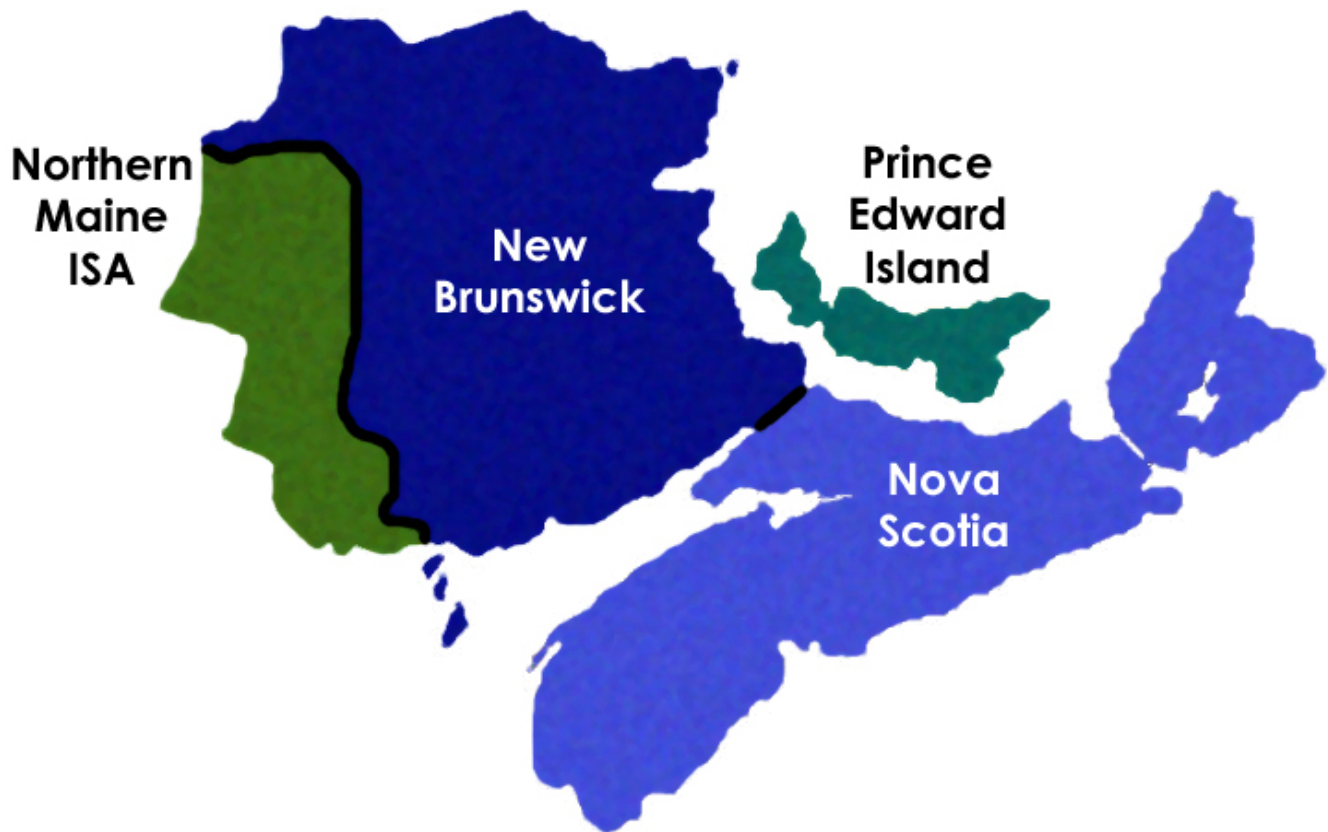


**NPCC
2017 MARITIMES AREA
INTERIM REVIEW OF RESOURCE ADEQUACY**



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Approved by RCC December 5, 2017**

December 5, 2017

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EXECUTIVE SUMMARY

The 2017 Maritimes Area Interim Review of Resource Adequacy (2017 Interim Review), covering the period of January 2018 through December 2021, has been prepared to satisfy the Reliability Assessment Program as established by the Northeast Power Coordinating Council (NPCC). This 2017 Interim Review follows the resource adequacy review guidelines as specified in the *NPCC Regional Reliability Reference Directory #1 Appendix D (Adopted: September 30, 2015)*.

The Maritimes Area will comply with the NPCC resource adequacy criterion that requires a loss of load expectation (LOLE) value of not more than 0.1 days/year for all years of this 2017 Interim Review. A summary of LOLE values for each year of the 2017 Interim Review and the 2016 Maritimes Area Comprehensive Review of Resource Adequacy (2016 Comprehensive Review) is shown in Table 1 below.

Table 1 - Summary of Major Assumptions

MAJOR ASSUMPTIONS	
Load Forecast	2017 (all jurisdictions)
Load Shape	2011/12 (all years)
Resource Adequacy Criterion	Loss of Load Expectation not more than 0.1 days/year
Maritimes Required Reserve	20% of peak firm load
Interconnection Benefits	300 MW
Area Purchases/Sales	Short term external sales of 114 MW, 110 MW and 69 MW were modeled for 2019, 2020, 2021 respectively
Maritime Link Project	153 MW of purchases from Newfoundland to Nova Scotia is forecast for mid-2020 coincident with a planned retirement of a 153 MW Nova Scotia generator

Table 2 - Maritimes Area LOLE Values from 2018 to 2021

Year	2017 Interim Review (days/year)	2016 Comprehensive Review (days/year)
2018	0.003	0.003
2019	0.004	0.003
2020	0.004	0.003
2021	0.006	0.004

Area load and capacity projections from 2018 to 2021 for this 2017 Interim Review are little changed from those projected for the 2016 Comprehensive Review resulting in LOLE values that are practically the same. LOLE results for the 2017 Interim Review were equal for 2018 and only marginally higher from 2019 to 2021 than the 2016 Comprehensive Review results.

There are no changes in this 2017 Interim Review with respect to fuel supplies, transfer capabilities, emergency operating procedures, or market rules.

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1.0 INTRODUCTION

This 2017 Interim Review is the first update of the 2016 Comprehensive Review approved by the Reliability Coordinating Committee (RCC) on December 6, 2016. The Maritimes Area is a winter peaking area with separate jurisdictions in New Brunswick, Nova Scotia, Prince Edward Island, and Northern Maine. New Brunswick Power Corporation is the Reliability Coordinator for the Maritimes Area, with its system operator functions performed by its Transmission and System Operator division under a regulator approved Standards of Conduct.

2.0 ASSUMPTION CHANGES

No changes were made in this 2017 Interim Review with respect to fuel supplies, emergency operating procedures, or market rules.

Upgrades to the transmission interface between Prince Edward Island (PEI) and New Brunswick will increase the transfer capability from 222 MW (current value) to 240 MW by 2018 and 300 MW by 2019. These transmission upgrades include

- Two new 138kV 180 MW undersea cables (complete),
- Reconfiguring two existing 138 kV feeders in New Brunswick (complete)
- Construction of a third overhead 138 kV feeder in New Brunswick to PEI (completion in Q4 2017)
- Re-termination of existing 138 kV lines in PEI (completion in Q4 2018)

As a result of this increased transfer capability, plans to mothball 57 MW of oil fired PEI capacity were included in this study.

2.1 Demand Forecast

The Maritimes Area coincident peak demand is forecast to occur during the month of January each year. Table 2 shows a comparison of the annual peak demands used in this 2017 Interim Review versus the 2016 Comprehensive Review.

Table 3 - Maritimes Area Peak Demand Forecast from 2018 to 2021

Year	2017 Interim Review (MW)	2016 Comprehensive Review (MW)	Difference (MW)
2018	5,372	5,406	-34
2019	5,377	5,416	-39
2020	5,372	5,432	-60
2021	5,381	5,426	-45
2018 to 2021 Average Compound Annual Growth Rate			

Growth Rate	0.06%	0.12%
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Forecast peak demand in the Maritimes Area is effectively flat over the period of this 2017 Interim Review and practically unchanged from the 2016 Comprehensive Review.

2.2 Resources and Sales

Resource and external sales changes for this 2017 Interim Review versus the 2016 Comprehensive Review include the following:

- PEI’s plans to mothball 57 MW of oil fired steam generator capacity by January 2019 were included in this study.
- About 20 MW of Houlton Water load is expected to be transferred from Northern Maine to the New Brunswick sub-area during late 2019.
- Installation of an 18 MW diesel generator in PEI in January 2021.
- Short term external sales of 114 MW, 110 MW and 69 MW were modeled for 2019, 2020, 2021 respectively. Sales are netted against resources.

Table 3 shows the year by year January resources forecast for this 2017 Interim Review compared to the 2016 Comprehensive Review.

Table 4 - Maritimes Area Resources Forecast for 2018 to 2021

Year	2017 Interim Review (MW, with on-peak wind)			2016 Comprehensive Review (MW, with on-peak wind)			Difference (MW)
	Conventional	Wind	Total	Conventional	Wind	Total	Total
2018	6,926	493	7,419	6,922	496	7,418	1
2019	6,723	499	7,222	6,803	496	7,299	-77
2020	6,770	499	7,269	6,958	496	7,454	-185
2021	6,828	499	7,327	6,958	496	7,454	-127

Conventional resources in Table 3 are from the peak load month of January of each year and include installed generation, contracted external purchases (added) and sales (netted), and tie benefits of 300 MW (see Section 3.5 below). Wind capacity used in Table 3 is the total amount of wind generation modeled during the hour of the Maritimes Area coincident peak load based on the load shape used for the LOLE calculations. Because of the variability of wind from hour to hour, this does not represent the effective load carrying capability or capacity value of the wind resources. Forecast hourly wind generation capacity is netted against hourly loads for LOLE analysis.

2.3 Comparison of Forecast and Required Reserve

The Maritimes Area uses a 20% reserve criterion for planning purposes. This criterion is not mandated but has historically resulted in levels of reserve that are

closely correlated to the reserve levels necessary to meet the NPCC resource adequacy criterion. A close correlation between this 20% reserve criterion and NPCC’s LOLE criterion of not more than 0.1 days per year of load losses due to resource deficiencies was established in the 2016 Comprehensive Review. Table 4 shows annual values for the forecast, minimum and required reserves at 20%. In each year of this 2017 Interim Review, the forecast reserve exceeds the 20% required reserve criterion.

Table 5 - Forecast, Minimum, and Required Reserve - January 2018 to 2021

Year	Forecast Capacity (MW)	Peak Load (MW)	Inter. Load (MW)	Forecast Reserve		Minimum Reserve		Required Reserve	
				MW	%	MW	%	MW	%
2018	7,419	5,372	263	2,310	45	2,085	45	1,022	20
2019	7,222	5,377	263	2,107	41	2,010	41	1,023	20
2020	7,269	5,372	262	2,159	42	2,036	41	1,022	20
2021	7,327	5,381	262	2,208	43	2,075	42	1,024	20

$$\text{Forecast Reserve (\%)} = \frac{[\text{Forecast Capacity} - (\text{Peak Load} - \text{Inter. Load})]}{(\text{Peak Load} - \text{Inter. Load})} * 100\%$$

$$\text{Minimum Reserve (\%)} = \frac{\text{Min. of Hourly} [\text{Capacity} - (\text{Load} - \text{Inter. Load})]}{(\text{Load} - \text{Inter. Load})} * 100\%$$

Forecast wind generation outputs during the Maritimes Area peak load hour are used for the forecast capacity totals in Table 4. Hour by hour reserve values are used for the minimum reserve calculations.

2.4 Interconnection Tie Benefits

In this 2017 Interim Review, 300 MW of interconnection tie benefits from New England are assumed. These tie benefits are based on a 2011 decision by the New Brunswick Market Advisory Committee to recognize the lowest historical Firm Transmission Capacity posted from summer peaking New England to winter peaking New Brunswick since the commissioning of the second 345 kV tie between these systems in December 2007. This is unchanged from the 2016 Comprehensive Review. In the CP-8 report *Review of Interconnection Assistance Reliability Benefits (December 31, 2015, Approved by RCC March 2, 2016)* the “As Is” estimated tie benefit potential for the Maritimes Area is 702 MW and 1012 MW for the years 2016 and 2020 with an export of 200 MW modeled in both test years. Based on this study, the 300 MW of tie benefits assumed for this 2017 Interim Review is conservative.

2.5 Support from External Interconnections

For the purposes of this 2017 Interim Review, interconnection support from neighbouring NPCC Areas was limited to 300 MW of tie benefits for all years. In addition, beginning in mid-2020, 153 MW of firm contracted capacity is expected to be available from a new 500 MW Maritimes Area HVDC link with Newfoundland and Labrador. This added external support will offset the simultaneous retirement of the same amount of coal fueled capacity in Nova Scotia. Non-firm capacity from Newfoundland and Labrador was not modeled.

3.0 FUEL SUPPLIES

The 2016 Comprehensive Review showed that the Maritimes Area has a diversified mix of resources such that there is not a high degree of reliance upon any one type or source of fuel. This diversified resource mix is unchanged for this 2017 Interim Review.

Generation fueled solely by natural gas accounts for just 7% of Maritimes Area capacity resources with supply options that include local shale gas fields, eastern off-shore production, western pipelines, and a liquefied natural gas receiving and re-gasification terminal. These supply options help to significantly reduce the exposure of the Maritimes Area to natural gas fuel disruptions.

4.0 LOLE RESULTS

Area load and capacity projections from 2018 to 2021 for this 2017 Maritimes Area Interim Review of Resource Adequacy are little changed from those predicted for the 2016 Comprehensive Review resulting in LOLE values that are practically the same.

A summary of the Maritimes Area LOLE values from 2018 to 2021 is shown in Table 5 below. All LOLE values for this 2017 Interim Review meet the NPCC resource adequacy criterion.

Table 6 - Maritimes Area LOLE Values from 2018 to 2021

Year	2017 Interim Review (days/year)	2016 Comprehensive Review (days/year)
2018	0.003	0.003
2019	0.004	0.003
2020	0.004	0.003
2021	0.006	0.004

In the 2016 Comprehensive Review, the Maritimes Area examined a high growth scenario based on adding a fixed value of 1% compounding growth to the average annual growth rate examined during the period.

As a check on this scenario for this 2017 Interim Review, a compounding load growth rate of 1.06% per year was added uniformly across all sub-areas during the three future year years of the forecast period from 2019 thru 2021 using 2018 as the base year. The LOLE values obtained for the future years of 2018 thru 2021 are shown in Table 6 and still meet the NPCC resource adequacy criterion.

Table 7 - Maritimes Area LOLE for High Load Growth Scenario

Year	2017 Interim Review (days/year)	2016 Comprehensive Review (days/year)
2018	0.003	0.003
2019	0.005	0.006
2020	0.010	0.010
2021	0.016	0.019

5.0 CONCLUSION

Results of this 2017 Interim Review show the Maritimes Area will comply with the NPCC resource adequacy criterion requiring a LOLE value of not more than 0.1 days/year for all years from 2018 to 2021.