NEEDS ASSESSMENT REPORT

North of Moosonee

Revision:

Date June 16, 2021

Prepared by: Five Nations Energy Inc. Operations Department

DISCLAMER

This Needs Assessment Report was prepared for the purpose of identifying potential needs in the Nort of Moosonee Region and to assess whether those needs require further coordinated regional planning. The potential needs that have been identified through this Needs Assessment Report may be studied further through subsequent regional planning processes and may be reevaluated based on the findings of further analysis. The load forecast and results reported in this Needs Assessment Report are based on the information and assumptions provided by study team participants.

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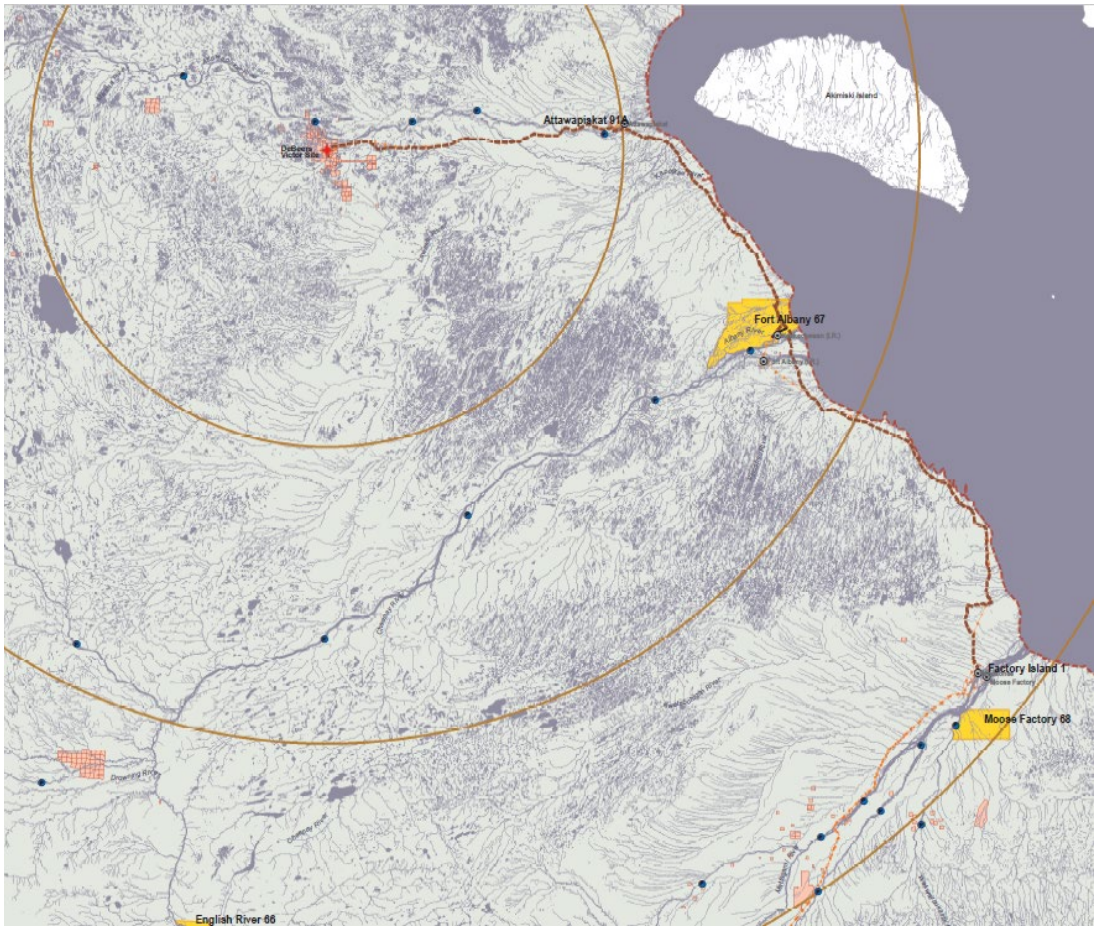


NEEDS ASSESSMENT SUMMARY REPORT			
NAME	North of Moosonee Region Study		
LEAD	Five Nations Energy Inc.,		
REGION	Group 3 - North of Moosonee		
START DATE	April 20, 2021	**END DATE**	June 7, 2021

1. INTRODUCTION

The purpose of this Needs Assessment report is to undertake an assessment of the North of Moosonee Region (WJB-Region) to determine if there are regional needs that would lead to coordinated regional planning. Where regional coordination is not required and a "wires" only solution is necessary such needs will be addressed among the relevant Local Distribution Companies (LDCs), FNEI and other parties as required.

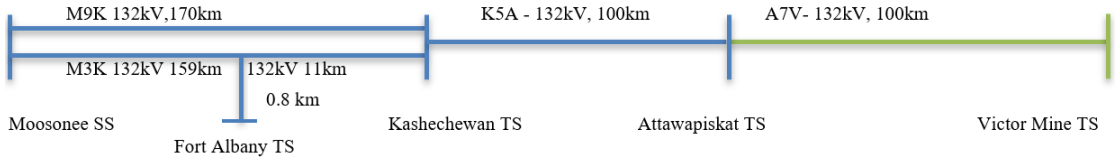
For needs that require further regional planning and coordination, the Independent Electricity System Operator (IESO) will initiate the Scoping process to determine whether an IESO-led Integrated Regional Resource Planning (IRRP) process or the transmitter-led Regional Infrastructure Plan (RIP) process (wires solution) is required, or whether both are required.

2. REGIONAL ISSUES/TRIGGER

The Needs Assessment for the North of Moosonee Region was triggered in response to the Ontario Energy Board's (OEB) new Regional Planning process approved in August 2013. To prioritize and manage the regional planning process, Ontario's 21 regions were assigned to one of three groups. North of Moosonee belongs to Group 3 and the Needs Assessment for this Region was triggered on April 20, 2021 and was completed on June 7, 2021.

3. SCOPE OF NEEDS ASSESSMENT

The scope of this Needs Assessment was limited to the next 10 years and, hence, relevant data and information was collected up to the year 2031. Needs emerging over the near-term (0-5 years) and mid-term (6-10 years) that require coordinated regional planning would be further assessed as part of the IESO-led Scoping Assessment and/or IRRP, or in the next planning cycle to develop a 20-year plan and strategic direction for the Region.
This Needs Assessment included a review of transmission system connection facilities capacity which covers station loading, thermal and voltage analysis, system reliability, operational issues such as load restoration and asset sustainment plans. The electricity supply to the North of Moosonee region is via two single circuit 132 kV transmission lines M9K and M3K from Moosonee SS to Kashechewan TS with Fort Albany TS tapped to circuit M3K. A single circuit 132 kV transmission line K5A connects Attawapiskat TS. The area includes four transformer stations, Attawapiskat TS (132/4.16kV), Kashechewan TS, Fort Albany TS (132kV/8.32kV) as well as single transmission line (A7V) and station to service the Victor mine on the western edge of the region owned and operated by De Beers Canada. The area includes three LDCs, Attawapiskat Power Corporation, Fort Albany Power Corporation, and Kashechewan Power Corporation, as well as De Beers - Victor Mine.



The only generation facilities of note are communities remaining diesel generators, which are on occasion used for backup purposes. These are two 1.285MW units at Attawapiskat TS, and three 1.1MW units at Kashechewan TS. Victor Mine backup generators, is 6MW in total. These generation facilities are not considered as load modifiers or as generating resources in this study.

4. INPUTS/DATA (INFORMATION REQUIRED TO COMPLETE ASSESSMENT)

Study team participants, the IESO, local LDCs and FNEI provided information and input to FNEI for the Western James Bay Region. The information provided includes the following:

- Actual 2020 regional non-coincident peak load and historical load;
- Community development plans and forecast;
- Conservation and Demand Management (CDM) data provided by IESO; note that no Distributed Generation (DG) data was provided by the IESO because there is no DG within the region that is contracted with the IESO
- Any known reliability and/or operating issues conditions identified by LDCs or the IESO[1];
- Planned transmission and distribution investments provided by the transmitter and LDCs, etc.

As per the data provided by the study team, the residential load is expected to grow for the communities at different seasonal levels for each community, from 2.8% to 7.14% for summer and 1.55% to 5.16% winter. Energy efficiency and conservation programs may keep zero growth or even negative growth for summer season, with estimated rates: from (-1.6%) to 2.77% for summer and (-2.85%) to 0.76% for winter, annually from 2021 to 2031.The industrial loads will be close to zero, with DeBeers Victor Mine closure and no new development in the area by 2025.

[1] No operational concerns were identified by the IESO.

5. ASSESSMENT

The assessment's primary objective over the study period (2021 to 2031) is to identify the electrical infrastructure needs in the region. The study reviewed available information; load forecast and conducted single contingency analysis to confirm need, if and when required.

The following methodology and assumptions are made in this Needs Assessment:

1. The region typically has a winter peak; therefore, this assessment is based on a winter peak load. Non-coincident forecasts by station are assumed to be conservative.

2. The gross demand is used to develop a worst/stress case scenario to identify needs; gross demand and net demand (considering conservation) are both used to determine timing of needs as applicable. All assessments are made using the non-coincident peak load. Note that the CDM estimates provided for the purposes of this Needs Assessment are based on the CDM estimates for the Northeast zone, and allocated to the region based on station peak load. The resulting CDM estimates may be more reflective of the customer segmentation within the zone than within the North of Moosonee region. For this reason, the gross demand forecasts are also used for the assessments to test the identification of needs.

3. Consider impact of any planned developments, including planned work on the transmission system in the area.

4. Station capacity is assessed by comparing the non-coincident peak load with the station's normal planning supply capacity by assuming a 90% lagging power factor. Normal planning supply capacity is determined by the 10-day Limited Time Rating (LTR), which is not expected to be reached in the planning period.

5. Transmission adequacy assessment is primarily based on the following criteria:
    a. With all elements in service, the system is to be capable of supplying forecast demand with equipment loading within continuous ratings and voltages within normal range.
    b. With one element out of service, the system is to be capable of supplying forecast demand with circuit loading within their long-term emergency (LTE) ratings and transformers within their summer 10-Day LTR.
    c. All voltages must be within pre- and post-contingency ranges as per Ontario Resource and Transmission Assessment Criteria (ORTAC).
    d. The system is capable of meeting the load restoration time limits as per ORTAC criteria.

6. RESULTS

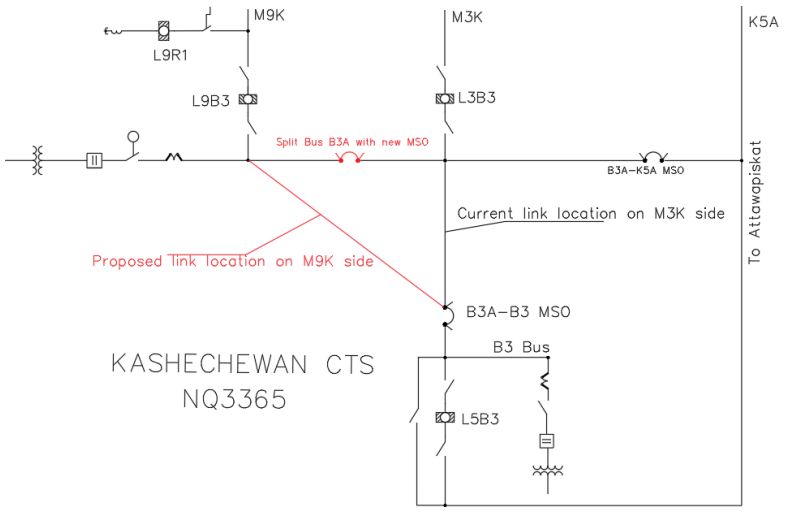
A. Connection Facilities

- Based on the demand forecast, there are sufficient capacity at all three 132kV connected load stations throughout the study period. No action is required at this time and the capacity needs will be reviewed in the next planning cycle. Each station equipped with two, 10 MVA transformers, is not expected to be loaded beyond 50% capacity of one transformer, considering peak loads and CDM factors. Main load limitation is feeder capacity, which is currently being addressed with additional feeder installation and reconfigurations on the LDC side, as noted below.

- The 4.16kV distribution side in Attawapiskat was upgraded in 2018 with feeder #3 and will have feeder #4 by winter 2021 and the 8.32 kV distribution side in Kashechewan may require an additional feeder by 2024, depends on new house construction progress.

- Based on the demand forecast over the study period, no overload or capacity need was identified for the loss of a single 132kV circuit in the region.

- The 132 kV side of the transformer stations in Kashechewan require small modification as an extension of previously completed work, for better flexibility in switching for regular maintenance procedures. Kashechewan TS incoming twin lines are connected to the same bus; this can be split and the bypass line section installed for previous modifications can be used for rerouting power during maintenance. This modification will reduce the frequency and duration of planned outages otherwise required for regular station maintenance work. This upgrade is planned to be completed in 2022.



B. System Reliability, Operation and Restoration Review

- There are no significant system reliability and operating issues identified for one element out of service for the sections of the system where there are two or more parallel elements.

- In the case of a single line failure from Kashechewan TS to the Attawapiskat TS, the Ontario Resource and Transmission Assessment Criteria (ORTAC) restoration criteria of 8 hours (plus travel time) cannot always be met due remoteness, lack of all-season road access and the often, extreme weather conditions that accompany an unplanned outage. ORTAC recognizes that restoration times are intended for locations that are near staffed centers and that in more remote locations, restoration times should be commensurate with travel times and accessibility. For this reason, solutions to enhance restoration (such as additional wires or non-wires alternatives) are typically driven by integrated needs to ensure cost-effectiveness. While there are no other regional needs in the North of Moosonee area, this should be monitored in future planning cycles.

C. Sustainment Replacement Plans

Sustainment activities are scheduled within the study period at the stations listed below. The new equipment ratings at these stations were considered in this need assessment. Plans to replace major equipment do not change the supply capacity of FNEI Stations.

- Attawapiskat TS (equipment, relaying & communication)
- Kashechewan TS (equipment, relaying & communication)
- Fort Albany TS (equipment, relaying & communication)
- Moosonee Fiber shelter (communication equipment)

7. RECOMMENDATION

Based on the findings of the Needs Assessment, the study team's recommendations are that no further coordinated regional planning is required for this region at this time. FNEI will continue with planned station work as well as planned sustainment work. The next regional planning cycle is expected to be undertaken in Q1 2026 or earlier if a new need emerges.

PREPARED BY: FNEI Operations Manager: Vladimir Govorov