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NEEDS SCREENING REPORT

Region: Metro Toronto
Sub-Region: Northern

Revision: Final
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Prepared by: Metro Toronto Northern Sub-Region Study Team



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Disclaimer

This Needs Screening Report was prepared for the purpose of identifying potential needs in the Metro Toronto Northern Sub-Region and to assess whether those needs require further coordinated regional planning. The potential needs that have been identified through this Needs Screening 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 Screening Report are based on the information and assumptions provided by study team participants.

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NEEDS SCREEN EXECUTIVE SUMMARY

NAME	Metro Toronto Northern Sub-Region Study Team		
LEAD	Hydro One Networks Inc.		
REGION	Metro Toronto Northern Sub-Region		
START DATE	April 14, 2014	END DATE	June 11, 2014
1. INTRODUCTION			
<p>The purpose of this Needs Screening report is to undertake an assessment of the Metro Toronto Northern Sub-Region and determine if there are regional needs that require coordinated regional planning.</p> <p>Where regional coordination is not required, and a “localized” wires solution is necessary, such needs will be addressed between relevant Local Distribution Companies (LDCs) and Hydro One and other parties as required.</p> <p>For needs that require further regional planning and coordination, the Ontario Power Authority (OPA) will initiate the Scoping process to determine whether an OPA-led Integrated Regional Resource Planning (IRRP) process, or the transmitter-led Regional Infrastructure Plan (RIP) process (wires solution), or whether both are required.</p>			
2. REGIONAL ISSUE/ TRIGGER			
<p>The Needs Screening for the Metro Toronto Northern Sub-Region was triggered in response to the Ontario Energy Board’s (OEB) Regional Infrastructure Planning process that was approved in August 2013. To prioritize and manage the regional planning process, Ontario’s 21 regions were assigned to one of three groups, with Group 1 Regions being reviewed first. The Metro Toronto Northern Sub-Region belongs to Group 1 and the Needs Screening for this Sub-Region was triggered on April 14, 2014 and was completed on June 11, 2014.</p>			
3. SCOPE OF NEEDS SCREENING			
<p>The scope of this Needs Screening assessment was limited to the next 10 years because relevant data and information was collected up to the year 2023. Needs emerging over the near-term (1-5 years) and mid-term (6-10 years) should be further assessed as part of the OPA-led Scoping Assessment and/or IRRP, or in the next planning cycle to develop a 20 year IRRP with strategic direction for the Sub-Region.</p> <p>The assessment included a review of transmission system connection facilities capability, which covers station loading, thermal and voltage analysis, system reliability, operational issues such as load restoration, and any relevant asset replacement plans.</p>			
4. INPUTS/DATA			
<p>Study team participants, including representatives from LDCs, the OPA, the Independent Electricity System Operator (IESO), and Hydro One transmission provided information for the Metro Toronto Northern Sub-Region. The information included historical load forecast, conservation and demand management (CDM), distributed generation (DG), load restoration and performance information along with identification of major equipment approaching end-of-useful life. See Section 4 for further details.</p>			
5. ASSESSMENT METHODOLOGY			
<p>The assessment’s primary objective over the study period (2014 to 2023) is to identify the electrical infrastructure needs in the Sub-Region over the study period (2014 to 2023). The assessment reviewed available information, including load forecasts, and included a contingency analysis to confirm the need(s), if and when required. See Section 5 for further details.</p>			

6. RESULTS

Transmission Capacity Needs

A. 230 kV Transmission Lines

- Circuit C10A is a 230 kV radial circuit from Cherrywood TS that supplies both Agincourt TS and Cavanagh TS. Following certain contingencies, the flow on this circuit may exceed its long-term emergency (LTE) rating. Further assessment is required.

B. 230kV Connection Facilities

- The following DESN stations approach their normal supply capacity in the study period based on the gross demand forecast, but the net demand forecast shows that there is sufficient capacity at these stations throughout the study period. No action is required at this time and the capacity needs will be reviewed in the next planning cycle.
 - Sheppard TS (T3/T4)
 - Leslie TS (T1/T2, 27.6kV windings)
 - Cavanagh MTS

System Reliability, Operation and Restoration Needs

Generally speaking, there are no significant system reliability and operating issues identified for one or two elements out of service in this sub-region. There are contingencies where the loss of load exceeds 150 MW by configuration which must be restored within 4 hours as per the Ontario Resource and Transmission Assessment Criteria (ORTAC). Further assessment is required.

Aging Infrastructure / Replacement Plan

During the study period, plans to replace major equipment do not affect the needs identified. Planned replacement of the T3/T4 DESN at Sheppard TS may provide opportunities for additional capacity at that station.

7. RECOMMENDATIONS

The study team recommends that “localized” wires only solutions be developed in the near-term to adequately and efficiently address the needs associated with 230 kV circuit C10A and replacement/upgrading of Sheppard TS through planning between Hydro One Networks Inc. and the impacted distributors.

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1 INTRODUCTION

This Needs Screening report provides a summary of needs that are emerging in the Metro Toronto Northern Sub-Region (“Sub-Region”) over the next ten years. The development of the Needs Screening report is in accordance with the regional planning process as set out in the Ontario Energy Board’s (OEB) Transmission System Code (TSC) and Distribution System Code (DSC) requirements and the “Planning Process Working Group (PPWG) Report to the Board”.

The purpose of this Needs Screening report is to undertake an assessment of the Metro Toronto Northern Sub-Region to identify near term and/or emerging needs in the area and determine if these needs require a “localized” wires only solution(s) in the near-term and/or a coordinated regional planning assessment. Where a local wires only solution is necessary to address the needs, Hydro One, as transmitter, with local distribution companies (LDC) or other connecting customer(s) will further undertake planning to develop options and recommend solution(s). For needs that require further regional planning and coordination, the Ontario Power Authority (OPA) will initiate the Scoping process to determine whether an OPA-led Integrated Regional Resource Planning (IRRP) process, or the transmitter-led Regional Infrastructure Plan (RIP) process (wires solution), or both are required.

This report was prepared by the Metro Toronto Northern Sub-Region Needs Screening study team (Table 1) and led by the transmitter, Hydro One Networks Inc. The report captures the results of the assessment based on information provided by LDCs, the OPA and the Independent Electricity System Operator (IESO).

Table 1: Study Team Participants for Metro Toronto Northern Sub-Region

No.	Company
1.	Hydro One Networks Inc. (Lead Transmitter)
2.	Independent Electricity System Operator
3.	Ontario Power Authority
4.	Hydro One Networks Inc. (Distribution)
5.	PowerStream Inc.
6.	Toronto Hydro-Electric System Limited
7.	Veridian Connections Inc.

2 REGIONAL ISSUE / TRIGGER

The Needs Screening for the Metro Toronto Northern Sub-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, where Group 1 Regions are being reviewed first. The Metro Toronto Northern Sub-Region belongs to Group 1. The Needs Screening for this Sub-Region was triggered on April 14, 2014 and was completed on June 11, 2014.

The Metro Toronto Region can be divided into two sub-regions: Metro Toronto Northern Sub-Region and Metro Toronto Central Downtown Sub-Region. The Metro Toronto Central Downtown Sub-Region currently has an IRRP under development, which was initiated prior to the new Regional Infrastructure Planning process.

3 SCOPE OF NEEDS SCREENING

This Needs Screening covers the Metro Toronto Northern Sub-Region over an assessment period of 2014 to 2023. The scope of the Needs Screening includes a review of transmission system connection facility capability which includes transformer station capacity, thermal capacity, and voltage performance. System reliability, operational issues such as load restoration, and asset replacement plans were also briefly reviewed as part of this Needs Screening.

3.1 Metro Toronto Northern Sub-Region Description and Connection Configuration

The Metro Toronto Northern Sub-Region comprises the northern portion of the municipality of Toronto. It includes the area roughly bordered geographically by Highway 401 on the south, Steeles Avenue on the north, Highway 427 on the west and Regional Road 30 on the east in addition to the area east of the Don Valley Parkway and north of O'Connor Dr. The boundaries of the Metro Toronto Northern Sub-Region are shown below in Figure 1.

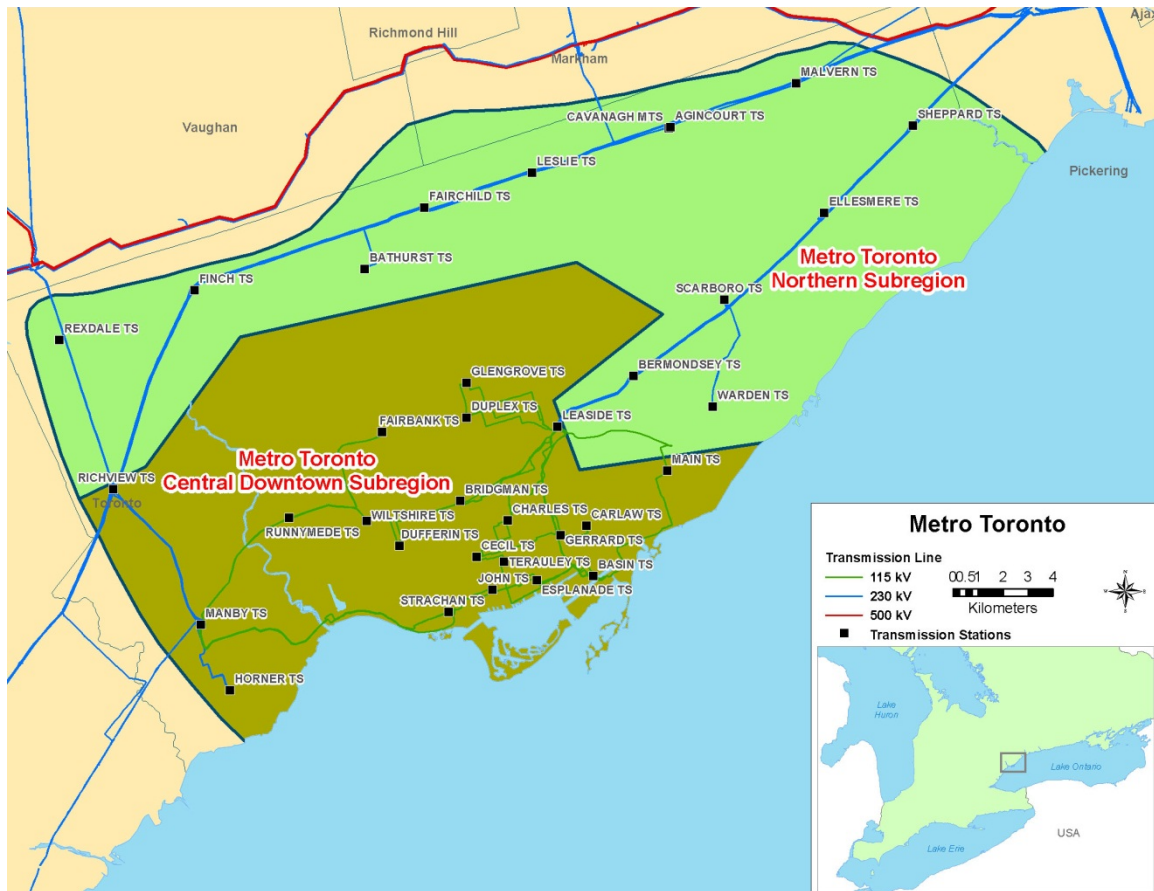


Figure 1: Metro Toronto Region

Electrical supply to the Metro Toronto Northern Sub-Region is provided through 230 kV transmission lines and step-down transformation facilities. Supply to this sub-region is provided from a 230 kV transmission system consisting of the Richview TS to Parkway TS, the Richview TS to Cherrywood TS, the Richview TS to Claireville TS, as well as the Cherrywood TS to Leaside TS system. The distribution system in this sub-region is predominantly at 27.6 kV and small pockets at 13.8 kV.

The 230-115kV autotransformers at Leaside TS and Manby TS, the 115 kV transmission lines in Toronto, the Richview TS to Manby TS 230 kV transmission lines, and the stations supplied from all of these lines are not included in the Metro Toronto Northern Sub-Region, but are included in the Metro Toronto Central Downtown Sub-Region. In the Cherrywood TS to Leaside TS system only the station capacity needs are reviewed in this report; the transmission lines and all other needs for this system are part of the Metro Toronto Central Downtown Sub-Region.

A single line diagram of the 230 kV system in the Metro Toronto Northern Sub-Region is shown in Figure 2 below.

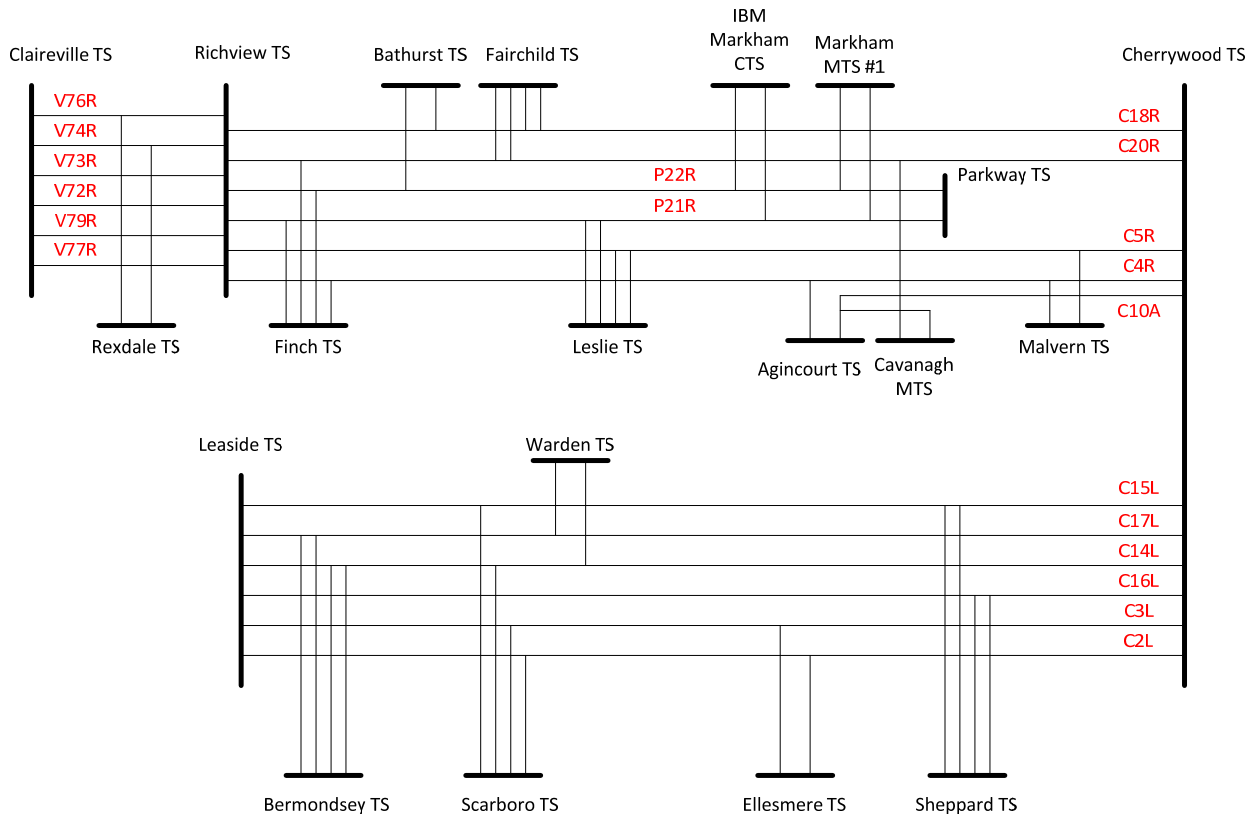


Figure 2: Single Line Diagram – Metro Toronto Northern Sub-Region

4 INPUTS AND DATA

In order to conduct this Needs Screening, study team participants provided the following information and data to Hydro One:

- IESO:
 - i. Historical 2013 regional coincident peak load and station non-coincident peak load
 - ii. List of existing reliability and operational issues
- LDCs and Transmission Connected Customers: Historical (2011-2013) net load, gross load forecast (2014-2023) and any relevant planned distribution investments;
- Hydro One (Transmission): Circuit and transformer ratings
- OPA: Conservation and Demand Management (CDM) and Distributed Generation (DG) data
- Hydro One: Any relevant planned transmission investments.

4.1 Load Forecast

As per the data provided by the LDCs the load in the Metro Toronto Northern Sub-Region is expected to grow at an average rate of approximately 1.6% annually from 2013-2018, and 0.6% from 2018-2023.

5 ASSESSMENT METHODOLOGY

The following methodology and assumptions are made in this Needs Screening assessment:

1. The Sub-Region is summer peaking, so this assessment is based on summer peak loads.
2. Forecast loads are provided by the LDCs.
3. The LDC's load forecast is translated into load growth rates, and is applied onto the 2013 summer peak load as a reference point.
4. The 2013 summer peak loads are adjusted for extreme weather conditions according to Hydro One's methodology.
5. The needs were first identified based on the gross demand forecast which is deemed to be the worst case scenario. Both the gross demand forecast and the net demand forecast (which includes forecasted CDM and DG contributions) were used to determine the timing of the needs.
6. Review and assess impact of any on-going and/or planned development projects in the Sub-Region during the study period.
7. Review and assess impact of any critical/major elements planned/identified to be replaced at the end of their useful life such as lines and stations.
8. Station capacity adequacy is assessed by comparing the non-coincident peak load with the station's normal planning supply capacity, assuming a 90% lagging power factor for stations having no low-voltage capacitor banks and 95% lagging power factor for stations having low-voltage capacitor banks. Normal planning supply capacity for transformer stations in this Sub-Region is determined by the summer 10-Day Limited Time Rating (LTR).
9. To identify the emerging needs in each Sub-Region, the study was performed observing all elements in service and one or two elements out of service, in accordance with ORTAC.

10. Transmission adequacy assessment is primarily based on but is not limited to, the following criteria:

- 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.
- 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.
- All voltages must be within pre and post contingency ranges as per ORTAC criteria.
- With two elements out of service, the system is capable of meeting the load loss limits and restoration guidelines of ORTAC.

6 RESULTS

This section summarizes the results of the Needs Screening in the Metro Toronto Northern Sub-Region.

6.1 Transmission Capacity Needs

6.1.1 230 kV Transmission Lines

C10A is a 20 km long radial circuit from Cherrywood TS. This circuit's capacity is thermally limited by a section approximately 4 km long between Duffin Jct. and Agincourt Jct. This need was also identified in the IESO's System Impact Assessment for Clarington TS (CAA ID 2012-462) which states that flow on this circuit may exceed its LTE rating under peak load conditions.

The conductor on this section is comprised of 795 kcmil, 26/7 ACSR and the Long-Term Emergency (LTE) rating for this type of conductor is typically based on 127°C. However, the thermal limit for this section is based on a lower temperature of 63°C and a technical assessment is required to determine if and how this limit can be removed.

6.1.2 230kV Connection Facilities

The 230kV connection capacity needs identified during the study period include, but may not be limited to the following:

- Sheppard TS consists of two DESN stations and the T3/T4 DESN may reach its normal supply capacity in the near term based on the gross demand forecast.

However, the normal supply capacity is not exceeded in the study period based on the net demand forecast.

It is worth noting that the Sheppard TS T3/T4 DESN is currently scheduled for replacement and upgrade options should be considered. Additionally, the T1/T2 DESN can also be expanded, if needed, by connecting the second pair of transformer secondary windings and adding feeder breakers.

- In the near term (1-5 years), Leslie TS T1/T2 DESN (27.6kV windings) is forecast to reach its normal supply capacity based on the gross demand forecast. However, the normal supply capacity is not exceeded in the study period based on the net demand forecast. No action is required at this time and the capacity need will be reviewed in the next planning cycle.
- In the medium term (6-10 years), Cavanagh MTS is forecast to reach its normal supply capacity based on the gross demand forecast. However, the normal supply capacity is not exceeded in the study period based on the net demand forecast. No action is required at this time and the capacity need will be reviewed in the next planning cycle.

The station capacity needs outlined above are not expected to require further coordinated regional planning.

6.2 System Reliability, Operation and Load Restoration

Generally speaking, there were no significant system reliability and operating issues identified for this sub-region. Load loss exceeding 250 MW and 150 MW for design criteria contingencies must be restored within 30 minutes and 4 hours respectively, according to ORTAC. Based on the net coincident demand forecast, there were no contingencies identified in this sub-region where more than 250 MW would be lost by configuration. Some contingencies may result in load loss that is approaching 250 MW in the study period, and this should be reviewed in the next planning cycle. However, there are contingencies in the sub-region where load lost by configuration may exceed 150 MW. Further assessment is required by the transmitter.

Based on the net demand forecast there are contingencies in the Cherrywood x Leaside transmission system that may result in load loss in excess of 250 MW. Load restoration issues for this system are being further assessed as part of the Metro Toronto Central Downtown study.

6.3 Aging Infrastructure and Replacement Plan of Major Equipment

Hydro One reviewed the sustainment initiatives that are currently planned for the replacement of any auto-transformers, power transformer and high-voltage cables. There are no major refurbishment or replacement plans that will affect capacity needs in the

Sub- Region with the exception of transformers (T3 and T4) and associated switchyard at Sheppard TS.

7 RECOMMENDATIONS

The study team’s recommendations are as follows:

- a) At this time, the potential needs identified above do not require further regional coordination. Rather, these potential needs can be adequately and more efficiently addressed by Hydro One Networks Inc. and the relevant LDCs.

The Metro Toronto Central Downtown Sub-Region currently has an OPA-led IRRP study underway. OPA will later append the results of this sub-region’s Needs Screening to the Regional IRRP.

The needs that have been identified through this Needs Screening may be re-evaluated based on the findings of subsequent analysis.

8 NEXT STEPS

Following the Needs Screening process the next regional planning step, based on the results of this report, is for Hydro One Transmission and impacted LDCs to develop and implement local solutions for the aforementioned near-term needs.

9 REFERENCES

- Planning Process Working Group (PPWG) Report to the Board
- IESO 18-Month Outlook
- IESO Ontario Resource and Transmission Assessment Criteria (ORTAC)
- IESO System Impact Assessment Report for Clarington TS (CAA ID#: 2012-462)

10 ACRONYMS

BES	Bulk Electric System
BPS	Bulk Power System
CDM	Conservation and Demand Management
CIA	Customer Impact Assessment
CGS	Customer Generating Station
CTS	Customer Transformer Station
DESN	Dual Element Spot Network
DG	Distributed Generation
DSC	Distribution System Code
FETT	Flow East Towards Toronto
GS	Generating Station
GTA	Greater Toronto Area
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Planning
kV	Kilovolt
LDC	Local Distribution Company
LTE	Long Term Emergency
LTR	Limited Time Rating
LV	Low-voltage
MTS	Municipal Transformer Station
MW	Megawatt
MVA	Mega Volt-Ampere
NERC	North American Electric Reliability Corporation
NGS	Nuclear Generating Station
NPCC	Northeast Power Coordinating Council Inc.
NS	Needs Screening
OEB	Ontario Energy Board
OPA	Ontario Power Authority
ORTAC	Ontario Resource and Transmission Assessment Criteria
PF	Power Factor
PPWG	Planning Process Working Group
RIP	Regional Infrastructure Planning
SIA	System Impact Assessment
SS	Switching Station
TS	Transformer Station
TSC	Transmission System Code
ULTC	Under Load Tap Changer