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LOCAL PLANNING REPORT

CIRCUIT C10A TRANSMISSION LINE CAPACITY MITIGATION

Region: Metro Toronto
Sub-Region: Northern

Revision: Final
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METRO TORONTO NORTHERN SUB-REGION LOCAL PLANNING STUDY TEAM
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Disclaimer

This Local Planning Report was prepared for the purpose of developing wires-only options and recommending a preferred solution to address the local need identified in the Needs Assessment (NA) report for the Metro Toronto Northern Sub-Region that do not require further coordinated regional planning. The preferred solution that has been identified through this Local Planning Report may be reevaluated based on the findings of further analysis. The load forecast and results reported in this Local Planning Report are based on the information and assumptions used in the NA for the Metro Toronto Northern Sub-Region.

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LOCAL PLANNING EXECUTIVE SUMMARY

REGION	Metro Toronto Region – Northern Sub-Region
LEAD	Hydro One Networks Inc.

1. INTRODUCTION

The purpose of this Local Planning (LP) report is to develop wires-only options and recommend a preferred solution that will address the local need identified in the Needs Assessment (NA) report for the Metro Toronto Northern Sub-Region. The development of the LP 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".

2. LOCAL NEED ADDRESSED IN THIS REPORT

C10A is a 20 km long radial circuit from Cherrywood TS supplying Agincourt TS and Cavanagh MTS. The capacity of this circuit is thermally limited by a section approximately 4 km long between Duffin Jct. and Agincourt Jct. The flow on this section of the circuit may exceed its long-term emergency (LTE) rating under peak load conditions following certain contingencies.

3. STUDY RESULT / OPTIONS CONSIDERED

The NA report for the Metro Toronto Northern Sub-Region had identified that the flow on a section of the C10A circuit could exceed the circuit ratings of 197MVA (at 242kV) under contingency conditions during summer peak load period. The conductor on this section is comprised of 795 kcmil, 26/7 ACSR and the LTE rating for this type of conductor is typically based on 127ºC. However, the LTE rating for this section is based on a lower temperature of 63ºC.

Preliminary studies have indicated that the conductor operating temperature is being restricted due to reduced sag clearances from underbuilt street light and distribution line. Removing these restrictions will allow the line to operate at a higher operating temperature and increase the loading limit to 369MVA (at 242kV).

It is therefore proposed that circuit rating for this section be uprated. To achieve this objective a line field survey will be carried out to confirm the results of the preliminary analysis and to identify if there are any other limitations. In the case where the restrictions cannot be eliminated by relocating the underbuilds without incurring significant costs, other options will be studied, such as re-tensioning the line section or tower upgrade. Further planning will be performed at that point as required.

The "Status Quo" alternative was not considered since violation of circuit ratings is not acceptable.

4. PREFERRED SOLUTION

Uprating of the circuit capacity is the preferred solution. To achieve this objective , it is required to:

- Conduct a field survey of the line section from Duffin Jct. to Agincourt Jct. to ensure that data for the circuit C10A is up-to-date.
- Remove the restrictions due to clearances with underbuilds, as required, to uprate the circuit C10A from 63 °C (197MVA LTE) to 98°C (369MVA LTE).

5. NEXT STEPS

Conduct a new field survey and develop a plan to eliminate the restrictions due to underbuilds and/or any other action after data verification. This should allow the line rating to be increased and be able to utilize the full capacity of Agincourt TS and Cavanaugh MTS – well beyond the study period of 2023. The line uprating work is expected to be completed by Q4 2016 given the new field survey is consistent with the preliminary study. This date will be revised if the new survey shows other limiting factors that need more effort to resolve.

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The purpose of this Local Planning (LP) report is to develop wires-only options and recommend a preferred solution that will address the local need identified in the Needs Assessment (NA) report for the Metro Toronto Northern Sub-Region. The development of the LP 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 Metro Toronto Region is part of the Group 1 Regions that are being reviewed first as per the Ontario Energy Board's (OEB) Regional Infrastructure Planning process approved in August 2013. This region is divided into two sub-regions: Metro Toronto Northern Sub-Region and Metro Toronto Central Downtown Sub-Region. As planning work in the Central Downtown Sub-Region was already underway before the Regional Infrastructure Planning process, Ontario Power Authority (OPA) led and completed the Integrated Regional Resource Planning (IRRP) process for the Central Downtown Sub-Region on April 28, 2015. The Needs Assessment (NA) for the Metro Toronto Northern Sub-Region ("Sub-Region") was triggered on April 14, 2014 and was completed on June 11, 2014.

The NA for the Metro Toronto Northern Sub-Region ("Sub-Region") was prepared jointly by the study team, including LDCs, Independent Electric System Operator (IESO), Ontario Power Authority (merged with IESO as of January 2015 and herein referred to as IESO), and Hydro One. The NA report can be found on Hydro One's Regional Planning website. The study team identified needs that are emerging in the Sub-Region over the next ten years (2014 - 2023) and recommended that there is no requirement for further regional coordination for this Sub-Region at this time. Based on the net demand forecast, there will not be any new transformation capacity need in this Sub-Region over the study time period. Further technical assessment is required only for the thermal limit issue on a section of a radial circuit from Cherrywood TS (C10A).

1.1 METRO TORONTO NORTHERN SUB-REGION AND CIRCUIT C10A DESCRIPTION

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 in Figure 1 below.

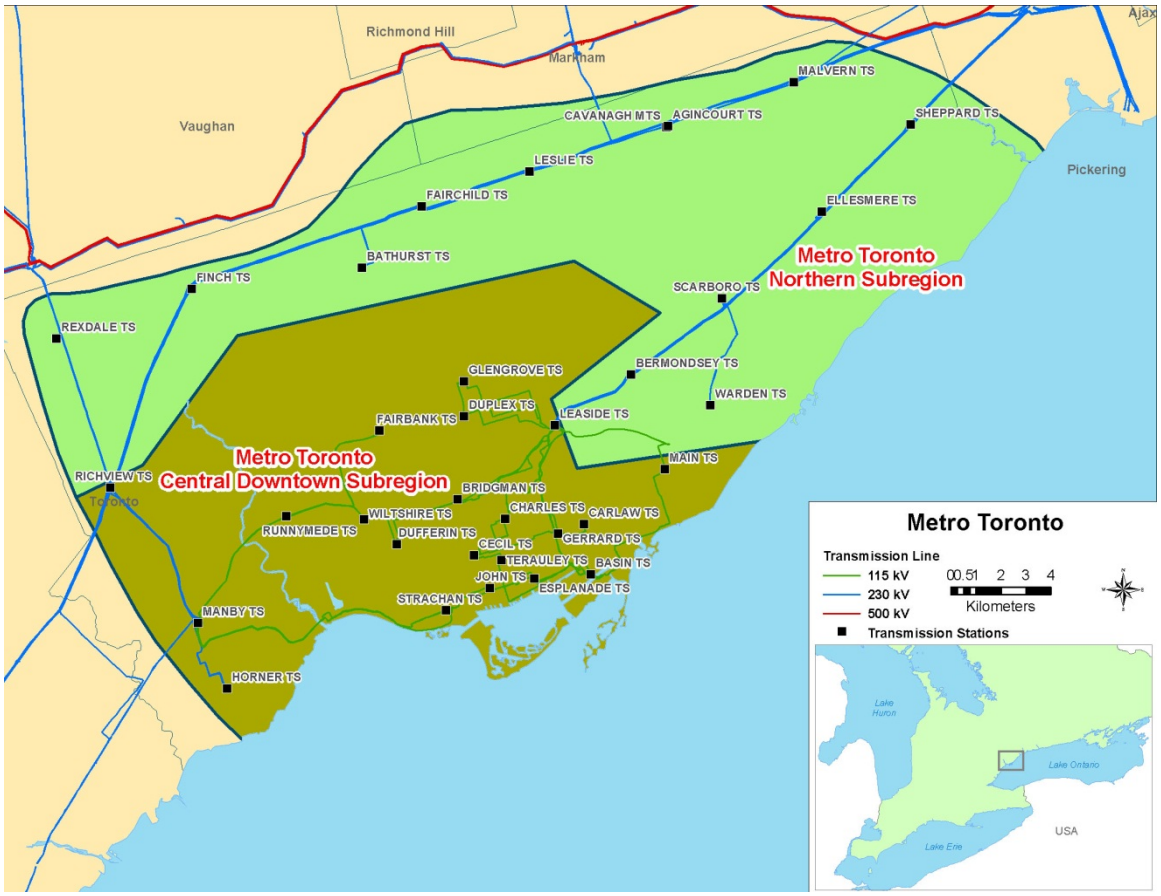

Figure 1: Metro Toronto Region and Approximate Sub-Region Boundaries

Electrical supply to this Sub-Region is provided through 230 kV transmission lines and step-down transformation facilities. Supply to this sub-region is provided through a 230 kV transmission system consisting of lines 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 230-115 kV autotransformers at Leaside TS and Manby TS, the 115kV transmission lines in Central Downtown 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 Cherrywood TS to Leaside TS system only the station capacity needs are reviewed in the NA 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.

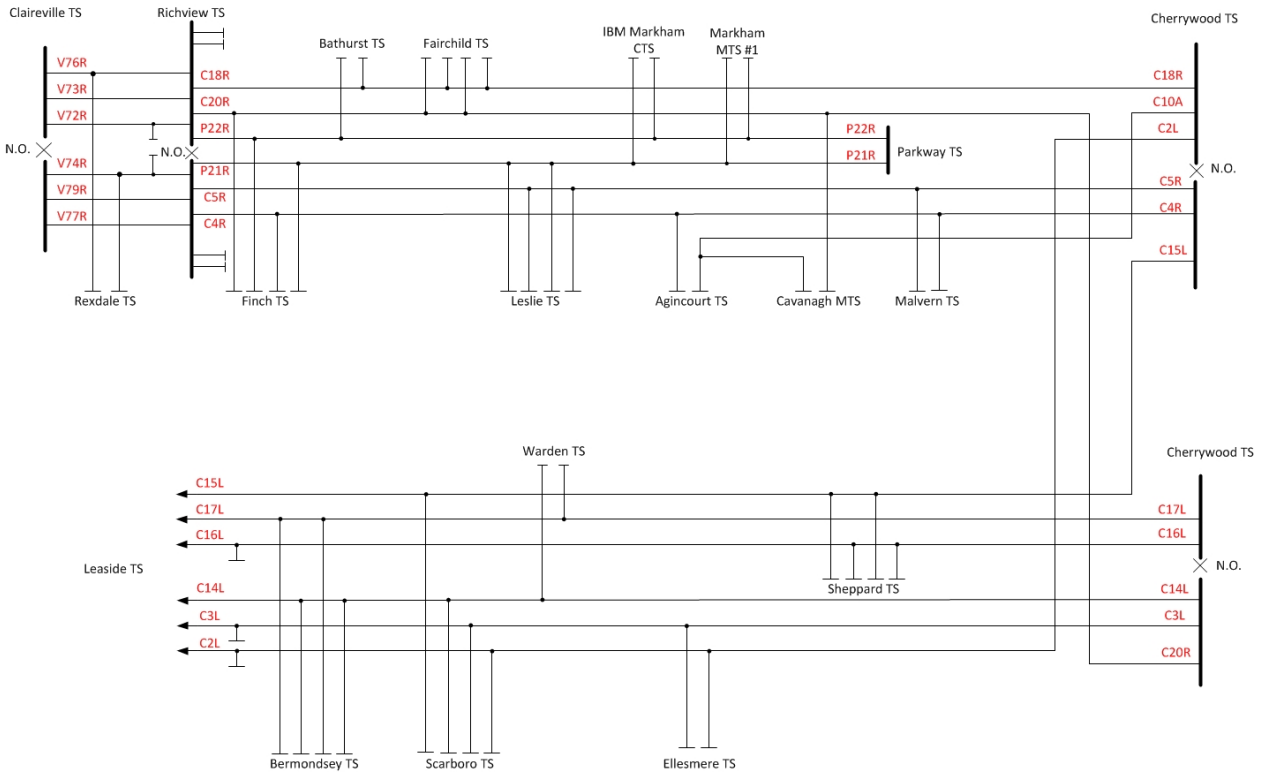

Figure 2: Single Line Diagram – Metro Toronto Northern Sub-Region

From the NA report for the Northern Sub-Region, a thermal limit issue on a section of the circuit C10A was identified. C10A is an approximately 20 km long, 230kV radial circuit from Cherrywood TS, supplying Agincourt TS and Cavanaugh MTS.

2 METRO TORONTO NORTHERN SUB-REGION NEED (C10A)

The conductor on a section of the circuit C10A between Duffin Jct. and Agincourt Jct. is comprised of 795 kcmil, 26/7 ACSR. Typically, the Long-Term Emergency (LTE) rating for this type of conductor is based on 127°C. However, the LTE rating for a section approximately 4 km long between the aforementioned junctions is limited to a lower operating temperature of 63°C. Currently, the summer LTE rating for this section is 470A, or 197MVA calculated at 242kV. Based on the load forecast provided by the LDCs during the NA process, the flow on this circuit may exceed its LTE rating under peak load conditions following certain contingencies.

3 STUDY RESULT / OPTIONS CONSIDERED

Engineering had conducted an analysis using the Line Condition Survey Program (LCSP), which has been populated with a field survey conducted on the circuit C10A in 1989. The preliminary analysis indicated that the lower 63°C rating restriction may be due to:
a) a underbuilt street light between two structures within the Duffin Jct. and Agincourt Jct and
b) a underbuilt distribution line between another two structures on this line section.
Eliminating these underbuilds will allow the Duffin Jct. x Agincourt Jct. line section of the circuit C10A to be uprated to 98°C, i.e. 880A (or 369MVA at 242kV) LTE rating.

However, creep and icing load on the conductors over past 25 years may result in lower sags than at the time of measurement. The Markham area has undergone extensive development over the past 25 years and it is possible that additional underbuilds may have been constructed under the line in that time and may not be reflected in LCSP. Therefore, a new line field survey is required to confirm the results of the preliminary analysis and to identify if there are any other limitations.

In the case where the restrictions cannot be eliminated by relocating the underbuilds without incurring significant costs, other options will be studied, such as re-tensioning the line section or tower upgrade. Further planning will be performed at that point as required.

Status Quo is not an option because there is a risk that the line will be operated above its maximum sag temperature under contingency conditions during summer peak load period, and thus does not meet the clearance requirement.

4 PREFERRED SOLUTION

Based on the existing data, the study result indicates that an ampacity of 880A (or 369MVA at 242kV) for LTE is achievable by removing underbuilds alone without incurring significant costs. Therefore, elimination of the restrictions due to underbuilt structures on this line is the preferred and most cost effective solution. Hydro One transmission will initiate a new field survey to verify the existing data and identify if there are any additional underbuilds and undertake any necessary investments to uprate the line section by Q4 2016. This date will be revised if the new survey shows other limiting factors that need more effort to resolve. Further planning will be performed at that point as required.

5 NEXT STEPS

HONI will proceed with conducting a new field survey and remove the underbuilds to uprate the circuit C10A after data verification. This will provide adequate capacity to supply both Agincourt TS and Cavanagh TS to their maximum capability and well beyond the end of study period (2023). It is planned to complete this line uprating work by Q4 2016. In the case where the restrictions cannot be eliminated by relocating the underbuilds without incurring significant costs, other options will be studied. Further planning will be performed at that point as required.

6 REFERENCES

i) Planning Process Working Group (PPWG) Report to the Board: The Process for Regional Infrastructure Planning in Ontario – May 17, 2013
ii) IESO Ontario Resource and Transmission Assessment Criteria (ORTAC) – Issue 5.0
iii) Metro Toronto Northern Sub-Region Needs Assessment Report
iv) 2015 Central Toronto Area IRRP

7 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
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
NA	Needs Assessment
NERC	North American Electric Reliability Corporation
NGS	Nuclear Generating Station
NPCC	Northeast Power Coordinating Council Inc.
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