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NEEDS SCREENING REPORT

Region: Greater Toronto Area (GTA) West
Sub-Region: Southern Sub-Region

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Prepared by: GTA West Southern Sub-Region Study Team

GTA West Southern Sub-Region Study Team

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Disclaimer

This Needs Screening Report was prepared for the purpose of identifying potential needs in the GTA West Southern 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	Paul Cook		
LEAD	Hydro One Networks Inc.		
REGION	GTA West – Southern Sub-Region		
START DATE	April 2, 2014	**END DATE**	June 1, 2014

1. INTRODUCTION

The purpose of this Needs Screening report is to undertake an assessment of the GTA West Southern Sub-Region, 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 between the relevant Local Distribution Companies (LDCs) and Hydro One, and other parties as required..

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.

2. REGIONAL ISSUE/ TRIGGER

The Needs Screening for the GTA West Southern 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 Needs Screening for this Sub-Region was triggered on April 2, 2014 and was completed on June 1, 2014.

3. SCOPE OF NEEDS SCREENING

The scope of this Needs Screening assessment was limited to the next 10 years because relevant data and information collected was up to the year 2023. Needs emerging over the next 10 years and requiring coordinated planning may be further assessed in the next planning cycle or as part of the OPA-led Scoping Assessment to develop a 20-year IRRP with strategic direction for the Region.

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 assets approaching end of useful life.

4. INPUTS/DATA

Study team participants, including representatives from LDCs, the OPA, the Independent Electricity System Operator (IESO), and Hydro One transmission, provided information for the GTA West Southern Sub-Region. The information included load forecast, historical load, Conservation and Demand Management (CDM), Distributed Generation (DG), load restoration and performance information along with end-of-useful life of any major equipment. See Section 4 for further details.

5. ASSESSMENT METHODOLOGY

The assessment primary objective over the study period (2014 to 2023) is to identify the electrical infrastructure needs in the region. The study reviewed available information, load forecast and conducted single and double contingency analysis to confirm need, if and when required. See Section 5 for further details.

6. RESULTS

I REGIONAL SUPPLY CAPACITY

A. 230 kV transmission lines

- Thermal limits for several transmission circuits between Richview TS and Trafalgar TS (R14T, R17T, R19TH & R21TH) may be exceeded in the near term during certain contingency situations. This issue is being studied by the OPA as part of the bulk system planning studies.
- Thermal limits for transmission circuits between Richview TS and Manby TS are nearing capacity and require reinforcement in the near term. While these circuits are not part of the study area, they affect the loading on the transmission circuits between Cooksville TS and Oakville TS#2. This need is being addressed as part of the Central Toronto IRRP.

B. Area Connection Capacity

- Peak load on Erindale T1/T2 27.6 kV DESN has reached normal supply capacity and requires further assessment.
- Peak load on Erindale TS T5/T6 44 kV DESN, Tomken TS T1/T2 44 kV DESN, Lorne Park TS, and Oakville TS#2 may approach normal supply capacity by the end of the 10-year study period. The loading at these stations will be monitored and assessed in the next planning cycle for GTA West.

II SYSTEM RELIABILITY, OPERATION AND RESTORATION

Generally speaking, there are no significant system reliability and operating issues for one element out of service. However, for the loss of two elements, load restoration as per Ontario Resource and Transmission Assessment Criteria (ORTAC) criteria may not be met in some cases. Further study is required.

III AGING INFRASTRUCTURE / REPLACEMENT PLAN

During the study period, plans to replace major equipment do not affect the capacity needs identified. Transformer replacements at Cooksville TS are expected to increase the normal supply capacity at the station. See Section 6.3 for details.

7. RECOMMENDATIONS

Based on the assessment, the study team's recommendation is that coordinated regional planning is further required to assess some of the needs identified in Section 6 of this Needs Screening. Accordingly, the OPA should initiate Scoping Assessment for this Sub-Region. See Section 7 for further details.

It is expected that the plan for this subregion will be appended to the overall GTA West Regional Plan.

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1 INTRODUCTION

This Needs Screening report provides a summary of needs that are emerging in the GTA West Southern 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 GTA West Southern Sub-Region, determine if there are regional needs that would lead to coordinated regional planning. Where regional coordination is not required and a wires-only only solution is necessary, such needs will be addressed between the relevant Local Distribution Companies (LDCs) and Hydro One, and other parties as required.

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 GTA West Southern 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 the Local Distribution Companies (LDCs), Ontario Power Authority (OPA) and the Independent Electricity System Operator (IESO).

Table 1: Study Team Participants for GTA West Southern Sub-Region

No.	Company
1.	Hydro One Networks Inc. (Lead Transmitter)
2.	Ontario Power Authority
3.	Independent Electricity System Operator
4.	Burlington Hydro Inc.
5.	Enersource Hydro Mississauga Inc.
6.	Hydro One Networks Inc. (Distribution)
7.	Milton Hydro Distribution Inc.
8.	Oakville Hydro Electricity Distribution Inc.

2 REGIONAL ISSUE / TRIGGER

The Needs Screening for the GTA West Southern Sub-Region was triggered in response to the OEB's new Regional Infrastructure 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, with Group 1 Regions being reviewed first. The GTA West Region belongs to Group 1.

This region is divided into two sub-regions: GTA West Northern Sub-Region and GTA West Southern Sub-Region. A Needs Screening has been triggered for the GTA West Southern Sub-Region. For the GTA West Southern Sub-Region, the Needs Screening was triggered on April 2, 2014 and was completed on June 1, 2014. The GTA West Northern Sub-Region currently has an IRRP under development and was initiated prior to the new Regional Infrastructure Planning process.

3 SCOPE OF NEEDS SCREENING

This Needs Screening covers the GTA West Southern Sub-Region over an assessment period of 2014 to 2023. The scope of the Needs Screening includes a review of system capability, which covers transformer station loading and transmission thermal and voltage analysis. System reliability, operation, load security and restoration, and asset sustainment issues were also briefly reviewed as part of this screening.

3.1 GTA West Southern Sub-Region Description and Connection Configuration

The scope of this Needs Screening covers the GTA West Southern Sub-Region. This Sub-Region is roughly bordered geographically by Highway 427 to the east, Tremaine Road to the west, Lake Ontario to the south and Highway 407 on the north. This Sub-Region comprises the municipalities of Mississauga and Oakville. The GTA West Southern Sub-Region is highlighted in yellow in Figure 1.

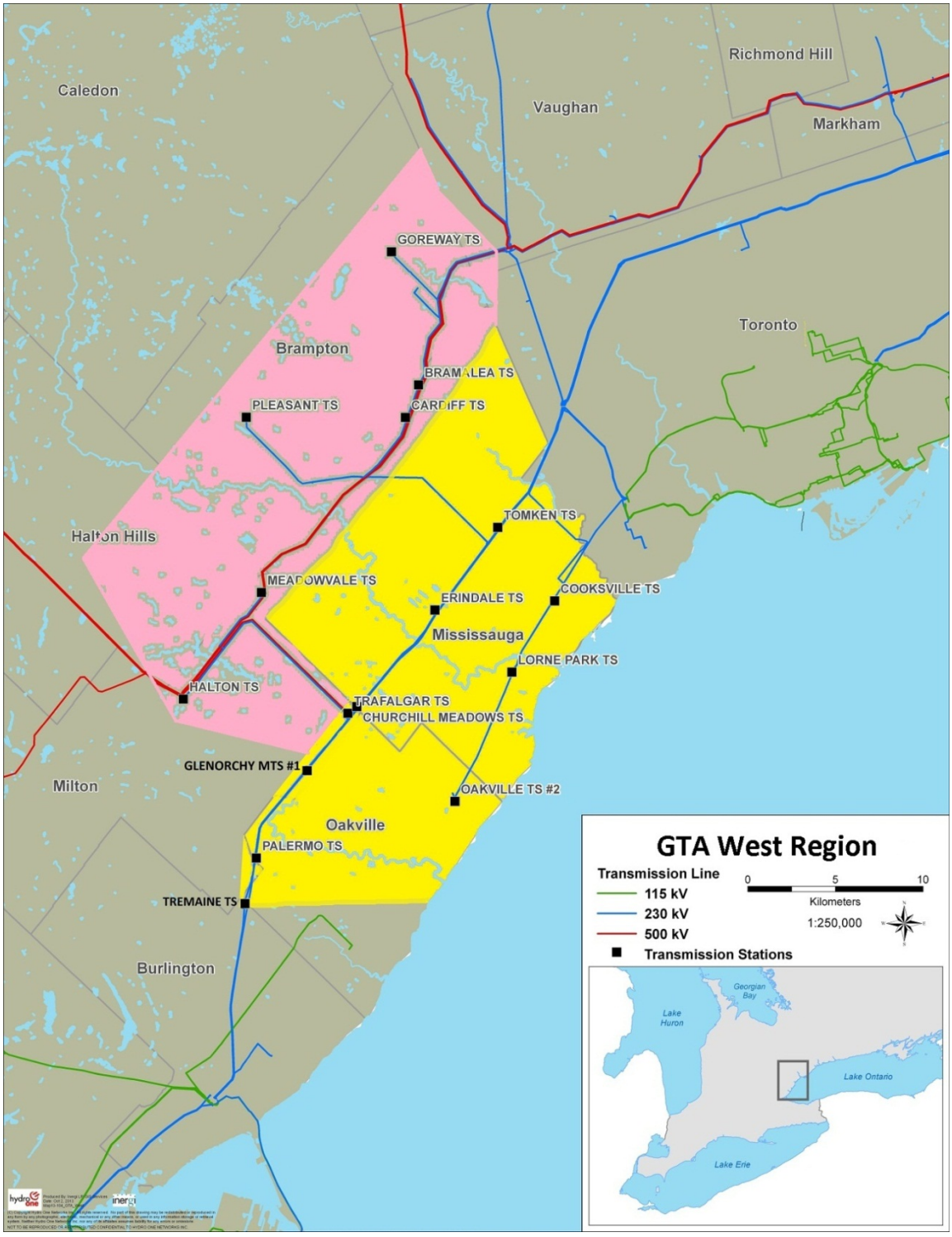

Figure 1: GTA West Southern Sub-Region Map

3.2 Electrical Areas

The GTA West Region was divided into the following electrical areas (sub-regions):

- GTA West, Northern Sub-Region
- GTA West, Southern Sub-Region

Electrical supply to the GTA West Southern Sub-Region is provided through 230 kV transmission lines and step-down transformation facilities as shown in Figure 2. This Sub-Region is roughly bounded electrically by the Richview TS to Manby TS 230 kV transmission lines on the east, the Richview TS to Trafalgar TS to Burlington TS 230 kV transmission lines on the north and the Manby TS to Cooksville TS to Oakville TS 230 kV transmission lines on the south. The distribution system in this Sub-Region is at two voltage levels, 44 kV and 27.6 kV.

The following circuits are not included in the GTA West Southern Sub-Region
- The 230 kV tap to Halton TS and Meadowvale TS, and all the circuits and stations on or north of the Parkway Belt Corridor, including the 230 kV tap to Kleinburg TS and the 230 kV tap to Jim Yarrow MTS and Pleasant TS. These circuits are included in the GTA West Northern Sub-Region.
- The circuits and stations supplied from the Richview TS to Manby TS transmission corridor. These circuits are included in the Metro Toronto Region.
- The 115 kV circuits B7 and B8, Bronte TS and Burlington TS. These circuits are included in the Burlington-Nanticoke Region.

A single line diagram of the 230 kV system in the GTA West Southern Sub-Region is shown in Figure 2 below.

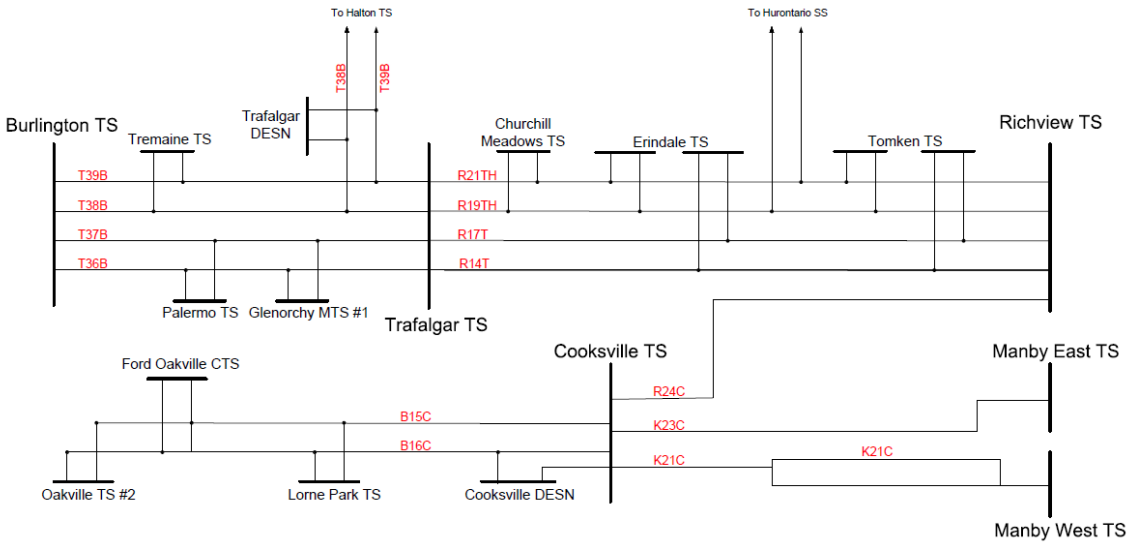

Figure 2: Single Line Diagram – GTA West Southern Sub-Region

4 INPUTS AND DATA

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

- IESO provided:
  i. Historical regional coincident peak load and station non-coincident peak load;
  ii. A list of existing reliability and operational issues.
- LDCs provided historical net load (2011-2013) and gross load forecast (2014-2023).
- Hydro One provided transformer, station and line ratings.
- Conservation and Demand Management (CDM) and Distributed Generation (DG) data provided by the OPA.
- Any relevant planned transmission and distribution investments provided by the transmitter and LDCs, etc.

4.1 Load Forecast

As per the data provided by the study team, the load growth rates at the stations in the GTA West Southern Sub-Region over the 2014-2023 study period is summarized in Table 2 below.

Table 2: Average Annual Gross Load Growth Rates

Sub-Area	Near Term (2014-2018)	Mid-Term (2019-2023)
44 kV System	1.1%	0.4%
27.6 kV System	1.4%	1.8%
Total Sub-Region	1.3%	1.4%

Note that the average load growth in the 27.6 kV system west of Trafalgar TS has been approximated due to load transfers between stations from other Regions or Sub-Regions.

5 ASSESSMENT METHODOLOGY

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

1. The Region is summer peaking so this assessment is based on summer peak loads.

2. Forecast loads are based on the anticipated forecast growth rates provided by the Region's LDCs using historical 2013 summer peak load as reference point.
3. The 2013 historical peak loads are adjusted for extreme weather conditions according to Hydro One methodology.
4. A station annual load growth rate based on LDCs forecast is assumed over the study period.
5. Gross load forecast is used to develop a worst-case scenario to identify needs. Net load forecast is only used to assess if needs can be deferred beyond the study period.
6. Review and assess the impact of any on-going or planned development project in GTA West Southern Sub-Region during the study period.
7. Review and assess the impact of any critical/major elements planned/identified to be replaced at the end of their useful life such as auto transformers, cables and stations.
8. To identify the emerging needs in each area, the study was performed observing all elements in service and one or two elements out of service.
9. Station capacity adequacy is assessed by comparing non-coincident peak load with the station's normal 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 supply capacity for transformer stations in this Sub-Region as determined by the summer 10-Day Limited Time Rating (LTR).
10. Transmission adequacy assessment is primarily based on :
    - Stations loads are coincident with relevant peak.
    - 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 or two elements 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 10-Day LTR.
    - All voltages must be within pre and post contingency ranges as per ORTAC criteria.

This needs screening assessment was conducted to identify emerging needs and to determine whether further coordinated regional planning should be undertaken or not for the Sub-Region. It is expected that studies in the subsequent regional planning process will undertake detailed analysis and also assess ORTAC performance requirements, including loss of two elements.

6 RESULTS

This section summarizes the results of the Needs Screening in the GTA West Southern Sub-Region.

6.1 Transmission Capacity Needs

6.1.1 230kV Region Supply

With one element out of service, loading on the Richview TS to Trafalgar TS circuits may exceed their LTE ratings in the near term, while under high FETT flows. This issue requires further assessment and is being dealt with by OPA-led bulk power system planning.

The loading on the 230 kV Richview TS to Manby TS circuits is expected to exceed the circuit LTE rating over the near-term. This issue is being assessed as part of the OPA-led IRRP for Central Toronto.

6.1.2 230kV Connection Facilities

There are several needs emerging in this subregion. Some of the needs identified during the study period include, but not limited to, the following:

- Existing peak load on the Erindale TS T1/T2 27.6 kV DESN is above that DESN's normal supply capacity. Peak load at this station is forecast to exceed capacity by about 40 MW by the end of the 10-year study period. Therefore, further assessment is required.
- Palermo TS is currently loaded up to its normal supply capacity. The load at the station is forecast to remain constant for the next 10 years as load growth in the area will be managed by transfers to Tremaine TS and to Glenorchy MTS #1.
- The forecast peak loads at Erindale TS T5/T6 44 kV DESN, Tomken TS T1/T2 DESN, Lorne Park TS and Oakville TS #2 may approach, but do not exceed, their respective normal supply capacity by the end of the 10-year study period.

6.2 System Reliability, Operation and Load Restoration

Generally speaking, there are no significant system reliability and operating issues for one element out of service.

The load interrupted due to the loss of a double-circuit line is well below the limit of 600 MW during the study period. The total load on 230kV transmission circuits R19TH and

R21TH may approach, but will not exceed, 600 MW for loss of a double-circuit line by the end of the 10-year study period.

Load restoration under peak load conditions as per ORTAC criteria may not be met for the loss of two elements and requires further study.

6.3 Aging Infrastructure and Replacement Plan of Major Equipment

During the study period:

- All four transformers at Cooksville TS are scheduled to be replaced by end of 2014. The 10-day LTR of the new transformers is expected to be higher than that of the existing transformers, thus increasing the normal supply capacity of both DESNs. No transmission issues are expected as a result.
- There are no significant lines sustainment plans scheduled in the near term for circuits in this subregion.

6.4 Other Considerations

The stations in southern Mississauga and east Oakville, namely Cooksville TS, Lorne Park TS and Oakville TS, are supplied radially from Richview TS via five 230kV circuits, which also terminate at Manby TS. On July 8, 2013, a severe rainstorm caused flooding and complete station outages at Richview and Manby transformer stations. As a result of this extreme event, customers normally supplied from Cooksville TS, Lorne Park TS, and Oakville TS experienced prolonged power outage. Subsequent steps in the planning process for this area will investigate the technical and economic feasibility of options for mitigating this risk.

7 RECOMMENDATIONS

Based on the Needs Screening assessment, the study team's recommendations are as follows:

a) Coordinated regional planning is further required by the OPA to undertake Scoping Assessment for the following needs identified in Section 6.
    - Erindale TS T1/T2 27.6kV DESN – there is an immediate need for increased transformation capacity. This issue may be managed in the interim by distribution load transfers.
    - Load restoration for the loss of two elements.

As part of its Scoping Assessment process, the OPA will determine if the OPA-led IRRP process and/or the transmitter-led RIP process (for wires solutions) should be further undertaken.

b) The following potential needs in Section 6 will be monitored and assessed in the next Regional Planning cycle for the GTA West area.
    - Normal supply capacity at Erindale TS T5/T6 44 kV DESN, Tomken TS T1/T2 DESN, Lorne Park TS and Oakville TS #2.
    - Monitor and assess load growth on 230kV transmission circuits R19TH and R21TH for loss of a double-circuit line (600MW limit)

The Northern subregion of GTA West region currently has an OPA-led IRRP study underway. It is expected that the plan for this subregion will be appended to the overall GTA West Regional Plan.

8 NEXT STEPS

Following the Needs Screening process, the next regional planning step, based on the results of this report, is for OPA to initiate a Scoping Assessment(s) to determine which of the needs in Section 7a) require an IRRP and/or RIP.

9 REFERENCES

- Planning Process Working Group (PPWG) Report to the Board The Process for Regional Infrastructure Planning in Ontario – May 17, 2013
- Tremaine TS SIA and CCRA
- Glenorchy MTS #1 SIA and CCRA
- IESO 18-Month Outlook

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
GTA	Greater Toronto Area
GS	Generating Station
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Planning
kV	Kilovolt
LDC	Local Distribution Company
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