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## NEEDS SCREENING REPORT

**Region: Greater Ottawa Area**  
**Sub-Region: Outer Ottawa Sub-Region**

**Revision: FINAL**  
**Date: July 28, 2014**

**Prepared by: Outer Ottawa Sub-Region Study Team**



**Study Team Participants for Greater Ottawa, Outer Ottawa Sub-Region**

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**Disclaimer**

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

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## NEEDS SCREEN EXECUTIVE SUMMARY

<b>REGION</b>	Greater Ottawa Region - Outer Ottawa Sub-Region		
<b>LEAD</b>	Hydro One Networks Inc.		
<b>START DATE</b>	May 26, 2014	<b>END DATE</b>	July 28, 2014
<b>1. INTRODUCTION</b>			
<p>This Needs Screening report identifies needs in the Outer Ottawa Sub-Region. 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. It may also be determined that the need(s) can be addressed more directly through local planning between the transmitter and the specific distributor or other transmission connected customer.</p>			
<b>2. REGIONAL ISSUE/ TRIGGER</b>			
<p>The Needs Screening for the Outer Ottawa Sub-Region was triggered in response to the Ontario Energy Board's (OEB) 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, where Group 1 Regions are being reviewed first. The Needs Screening for this Sub-Region was triggered on May 26, 2014 and was completed on July 28, 2014.</p>			
<b>3. SCOPE OF NEEDS SCREENING</b>			
<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> <p>The eastern portion of the Sub-Region is bordered by the city of Clarence-Rockland, municipality of Casselman and eastward to Champlain Township. Along the Ottawa River there are several LDC owned distribution stations supplied by the 115kV circuit 79M1. This area also includes two Hydro One owned transformer stations, Longueil TS and St Isidore TS, and an industrial customer supplied by 230kV circuits D5A and B5D.</p> <p>The western portion of the Sub-Region is located to the West of Kanata. Two stations, Arnprior TS and Stewartville TS, located near the Ottawa River are supplied by 115kV circuits C7BM, W6CS and W3B. To the south, in Mississippi Mills, Almonte TS is supplied by the 230kV circuit M29C.</p>			
<b>4. INPUTS/DATA</b>			
<p>Study team participants, including representatives from Local Distribution Companies (LDC), the Ontario Power Authority (OPA), and the Independent Electricity System Operator (IESO), provided information and input to Hydro One for the Outer Ottawa Sub-Region. The information provided includes the following:</p> <ul style="list-style-type: none"> <li>• Actual 2013 regional coincident peak load and station non-coincident peak load provided by IESO;</li> <li>• Historical net load and gross load forecast (which is the forecasted load from the historical net load) provided by LDCs and other Transmission connected customers;</li> <li>• Conservation and Demand Management (CDM) and Distributed Generation (DG) data provided by OPA;</li> <li>• Any known reliability and/or operating issues conditions identified by LDCs or the IESO;</li> <li>• Planned transmission and distribution investments provided by the transmitter and LDCs, etc.</li> </ul>			

## 5. ASSESSMENT METHODOLOGY

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 on assessment criteria.

## 6. RESULTS

### A. 230kV Connection Facilities

- Based on the demand forecast, there is sufficient capacity at all 230kV DESN stations throughout the study period. No action is required at this time and the capacity needs will be reviewed in the next planning cycle.
- The voltage and line loading are acceptable and within assessment criteria limits on all 230kV circuits throughout the study period.
- Hydro One is currently installing a new inline breaker on M29C at Almonte TS. This will significantly improve supply reliability at Almonte TS and Terry Fox MTS.

### B. 115kV Connection Facilities

- Based on the demand forecast, there is sufficient capacity at all 115kV DESN stations throughout the study period except Stewartville TS. The summer gross demand forecast shows that Stewartville TS will be exceeded by 2018. However the net demand forecast shows that Stewartville TS is within allowable limits. No action is required at this time and the capacity needs will be reviewed in the next planning cycle.
- The voltage on circuit 79M1 and in the Stewartville TS area is approaching the assessment criteria limits near the end of the study period. The voltage needs to be continuously monitored and reactive compensation may be installed if required.
- Loading on all 115 kV circuits is within assessment criteria limits throughout the study period.

### C. Load Restoration

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 assessment criteria. Further assessment is required.

### D. Sustainment Replacement Plans

- Significant 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.
  - a) Stewartville TS
  - b) St Isidore TS
  - c) Almonte TS
  - d) Hawkesbury MTS

## 7. RECOMMENDATIONS

The study team recommends that “localized” wire only solutions be developed in the medium-term to adequately and efficiently address the above needs through planning between Hydro One Networks Inc. and the impacted distributors. See Section 7.0 for further details.

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## TABLE OF CONTENTS

Needs Screen Executive Summary .....	iii
Table of Contents .....	v
List of Figures and Tables.....	vi
1 Introduction.....	1
2 Regional Issue / Trigger.....	2
3 Scope of Needs Screening .....	3
3.1 Outer Ottawa Sub-region Description and Connection Configuration.....	3
4 Inputs and Data .....	5
4.1 Load Forecast.....	5
5 Assessment Methodology .....	5
6 Results.....	7
7 Recommendations.....	9
8 Next Steps .....	9
9 References.....	9
10 Key Terms and Definitions.....	10
11 Acronyms.....	12

**LIST OF FIGURES AND TABLES**

Figure 1: Greater Ottawa, and Outer Ottawa Sub-Region..... 2  
Figure 2A: Single Line Diagram – Outer Ottawa Sub-Region, Eastern section ..... 4  
Figure 2B: Single Line Diagram – Outer Ottawa Sub-Region, Western section ..... 4  
  
Table 1: Study Team Participants for Greater Ottawa, Outer Ottawa Sub-Region ..... 1

# 1 INTRODUCTION

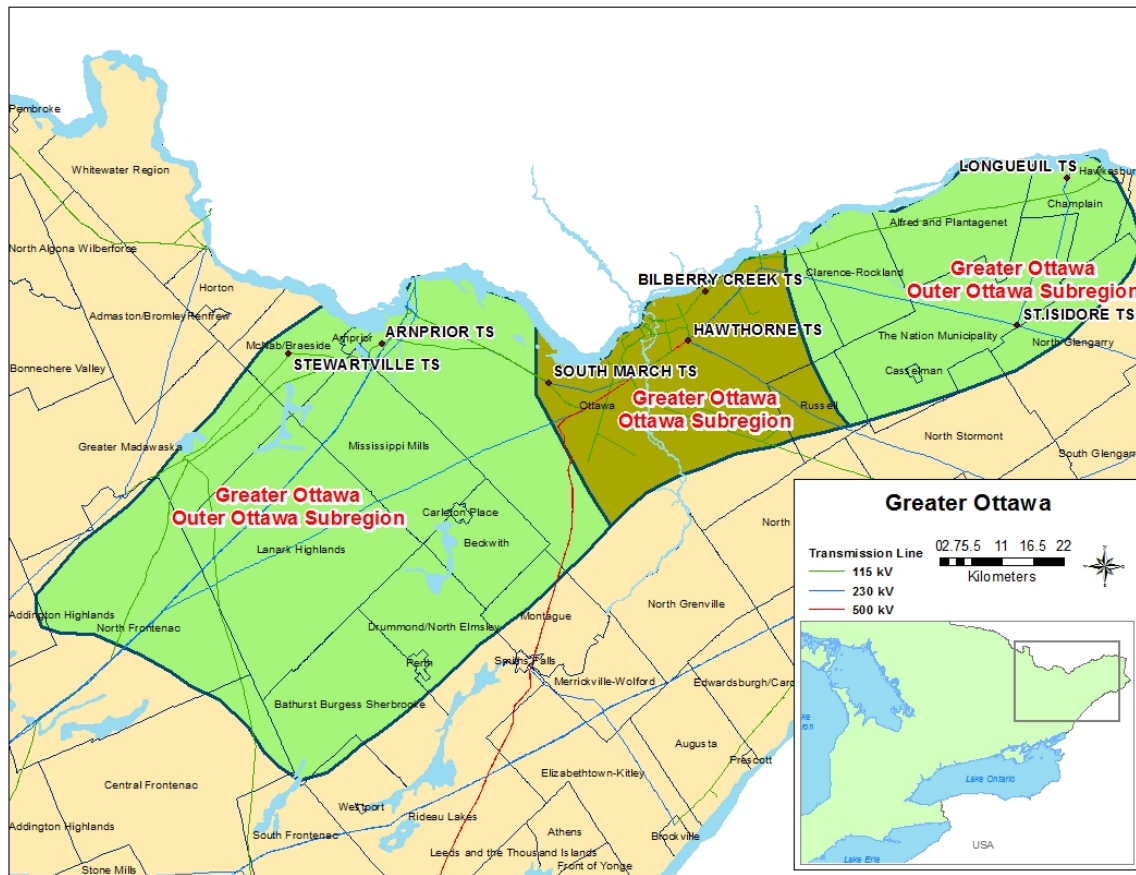
This Needs Screening report identifies needs in the Outer Ottawa Sub-Region of the Greater Ottawa Region (“Sub-Region”). For needs that require coordinated regional planning, the OPA will initiate the Scoping process to determine the appropriate regional planning approach. The approach can either be the OPA-led Integrated Regional Resource Planning (IRRP) process or the transmitter-led Regional Infrastructure Plan (RIP), which focuses on the development of “wires” solutions. It may also be determined that the needs can be addressed more directly through localized planning between the transmitter and the specific distributor(s) or transmission connected customer(s). 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.

This report was prepared by the Outer Ottawa 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) to determine possible needs in the Sub-Region.

**Table 1: Study Team Participants for Greater Ottawa, Outer Ottawa Sub-Region**

No.	Company
1.	Hydro One Networks Inc. (Lead Transmitter)
2.	Ontario Power Authority
3.	Independent Electricity System Operator
4.	Hydro One Networks Inc. (Distribution)
5.	Hydro Hawkesbury Inc.





**Figure 1: Greater Ottawa, and Outer Ottawa Sub-Region**

## 2 REGIONAL ISSUE / TRIGGER

The Needs Screening for the Greater Ottawa, Outer Ottawa Sub-region was triggered in response to the Ontario Energy Board's (OEB) 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, where Group 1 Regions are being reviewed first. The Outer Ottawa Sub-Region belongs to Group 1. The Needs Screening for this Sub-Region was triggered on May 26, 2014 and was completed on July 28, 2014.

The Greater Ottawa Region consists of 2 sub-regions: The City of Ottawa and the Outer Ottawa Sub-Regions. The City of Ottawa Sub-Region currently has an IRRP under development, which was initiated prior to the new Regional Infrastructure Planning process. Please refer to the following website:

<http://www.hydroone.com/RegionalPlanning/Pages/RegionalPlans.aspx>

### **3 SCOPE OF NEEDS SCREENING**

This Needs Screening covers the Greater Ottawa, Outer Ottawa 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. A reliability assessment was also conducted. Asset sustainment issues and other considerations were taken into account as deemed necessary.

#### **3.1 Outer Ottawa Sub-region Description and Connection Configuration**

This Sub-Region comprises the eastern and western portions of the Greater Ottawa Region.

The eastern portion of the Sub-Region is bordered by the city of Clarence-Rockland, municipality of Casselman and eastward to Champlain Township. Along the Ottawa River there are several LDC owned distribution stations supplied by the 115kV circuit 79M1. This area also includes two Hydro One owned transformer stations, Longueil TS and St Isidore TS, and an industrial customer supplied by 230kV circuits D5A and B5D.

The western portion of the Sub-Region is located to the West of Kanata. Two stations, Arnprior TS and Stewartville TS, located near the Ottawa River are supplied by 115kV circuits C7BM, W6CS and W3B. To the south, in Mississippi Mills, Almonte TS is supplied by the 230kV circuit M29C.

The distribution system in this Sub-Region operates at both 27.6 kV and 44 kV.

A single line diagram of the Outer Ottawa Sub-Region is shown in Figure 2 (a) and (b) below.

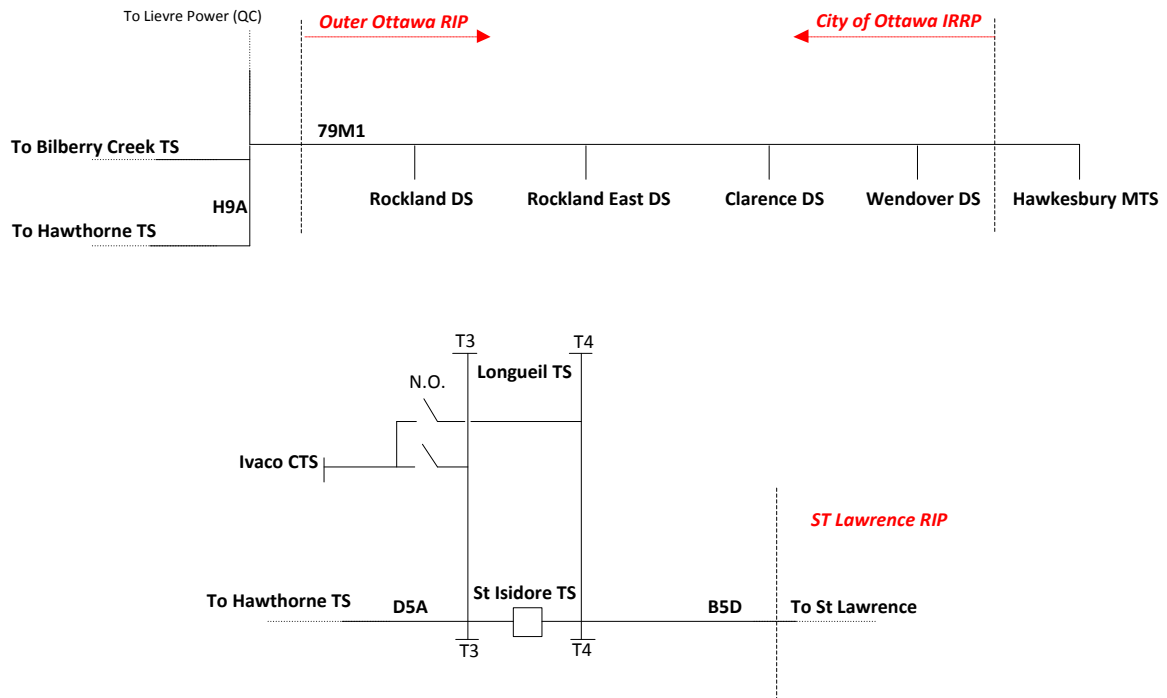


Figure 2A: Single Line Diagram – Outer Ottawa Sub-Region, Eastern section

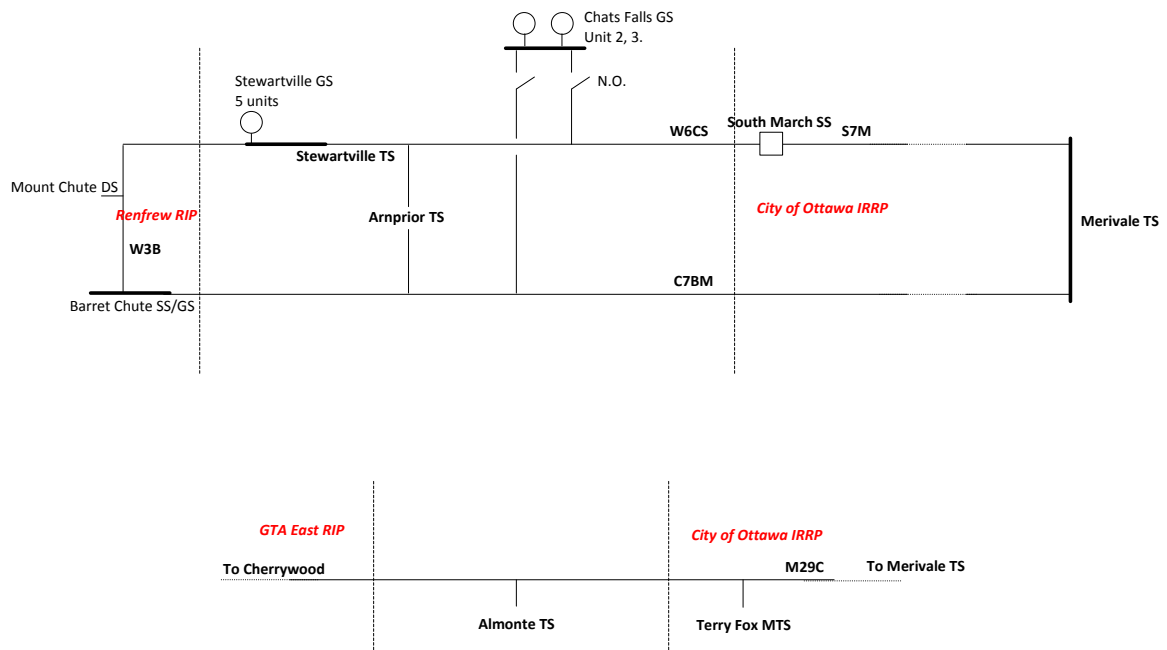


Figure 2B: Single Line Diagram – Outer Ottawa Sub-Region, Western section

## **4 INPUTS AND DATA**

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

- Actual 2013 regional coincident peak load and station non-coincident peak load provided by IESO;
- Historical net load and gross load forecast (which is the forecasted load from the historical net load) provided by LDCs and other Transmission connected customers;
- Conservation and Demand Management (CDM) and Distributed Generation (DG) data provided by OPA;
- Any known reliability and/or operating issues conditions identified by LDCs or the IESO;
- Planned transmission and distribution investments provided by the transmitter and LDCs, etc.

### **4.1 Load Forecast**

As per the data provided by the LDCs, the load in the outer Ottawa Sub-Region is expected to grow at a rate varying from 0.2% to 1.5%.

## **5 ASSESSMENT METHODOLOGY**

1. This particular Sub-Region is winter peaking, but this assessment includes both summer and winter peak loads for completeness.
2. Forecast loads are provided by the LDCs.
3. The 2013 summer peak loads are adjusted for extreme weather conditions according to Hydro One's methodology.
4. 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. The capacity factors applied to the types of generation are as follows:
  - Hydro – 71%
  - Biomass/Landfill – 98%
  - Solar – 30%
  - Wind – 14%

5. Review and assess impact of any on-going and/or planned development projects in the Sub-Region during the study period.
6. 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.
7. 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 for summer peaks and 95% lagging power for winter peaks. The power factors assumed are based on historical station data in the area. None of the stations in the Sub-Region have LV capacitor banks. Normal planning supply capacity for transformer stations in this Sub-Region is determined by the summer 10-Day Limited Time Rating (LTR).
8. To identify the emerging needs in each Sub-Region, the study was performed observing all elements in service and only one element out of service.
9. 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 assessment criteria defined in ORTAC.
  - Load restoration criteria as defined in ORTAC.
10. The study for this area was done for both summer and winter peak conditions. As shown in Figure 2B, the Stewartville TS – Anprior TS area includes generating stations. The generators are hydroelectric and to represent the change in seasonal operating conditions different levels of generation were assumed for the winter and summer peaks:
  - Based on 98% dependability, 11MW of generation is assumed at Stewartville GS and 0MW at Barrett Chute GS for summer conditions.
  - Based on historical output, 40MW of generation is assumed at Stewartville GS and 50MW at Barrett Chute GS for winter conditions.

## **6 RESULTS**

This section summarizes the results of the Needs Screening in the Outer Ottawa Sub-Region.

### **6.1 Transmission Capacity Needs**

#### **6.1.1 230 kV Connection Facilities**

Based on the demand forecast, there is sufficient capacity at all 230kV DESN stations throughout the study period. The voltage and line loading are within assessment criteria limits on all 230kV circuits throughout the study period. No action is required at this time and the capacity needs will be reviewed in the next planning cycle.

#### **6.1.2 115 kV Connection Facilities**

Based on the demand forecast, there is sufficient capacity at all 115kV DESN stations throughout the study period except Stewartville TS.

The summer gross demand forecast shows that Stewartville TS will be exceeded by 2018 due to the addition of a large load. However the net demand forecast shows that Stewartville TS is within allowable limits. In addition, the new load may require reactive power support which will be identified as part of the connection assessment. No action is required at this time and the capacity needs will be reviewed in the next planning cycle.

The voltage on circuit 79M1 at Hawkesbury MTS and in the Stewartville TS area is approaching the assessment criteria limits near the end of the study period. The voltage needs to be continuously monitored and reactive compensation may be installed if required.

The loading on the 115kV circuits was assessed for the study period with and without CDM and DG. Loading on all the 115 kV circuits is within assessment criteria limits throughout the 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.

Inherent to radial configuration, loss of radial 115 kV circuits 79M1 (or H9A) may result in loss of load. Load restoration for the loss of this circuit is being assessed as part of the OPA led Integrated Regional Resource Plan (IRRP) for the City of Ottawa.

The combined loss of D5A and B5D can result in a load loss of more than 150MW. Load restoration requires further assessment.

Hydro One is currently installing a new inline breaker on M29C at Almonte TS. The breaker is expected to reduce the amount of transmission related outages by 80% from the present 7-10 outages/year. This will significantly improve supply reliability at Almonte TS and Terry Fox MTS.

M29C opened at Merivale TS may result in low voltage at Almonte TS/Terry Fox MTS. The peak load cannot be supplied from Cherrywood TS since the line is approximately 320km. The voltage will slightly improve with the incorporation of Clarington TS in 2017 however reactive compensation could still be required.

### **6.3 Aging Infrastructure and Replacement Plan of Major Equipment**

The following significant sustainment activities are scheduled within the study period. Other non impactful work is not listed.

- a) The transformer T4 replacement at Almonte TS is expected to increase the station LTR.
- b) Stewartville TS is scheduled for a significant refurbishment including transformer, breaker, and protection replacement.
- c) St Isidore TS is scheduled for a significant refurbishment including transformer and protection replacement. This is expected to increase the station LTR.
- d) Hawkesbury MTS is scheduled for a significant refurbishment including transformer and protection replacement.

Arnprior TS is currently not scheduled for sustainment work but may be the next station in the western region where sustainment work could occur. The load growth of the area will be monitored and if additional transformation capacity is needed, Arnprior TS could be considered for upsizing its transformers.

### **6.4 Other Considerations**

As part of the Expedited SIA for the replacement of T3 at Almonte TS, IESO identified the need to address low power factor at Almonte TS.

## 7 RECOMMENDATIONS

This Needs Screening Report identifies potential needs in the Greater Ottawa, Outer Ottawa Sub-Region during the study period and determines whether or not Regional Infrastructure Planning is required to address some or all of these needs. At this time, some of the potential needs identified do not require further regional coordination. Rather, these potential needs can be adequately and more efficiently addressed through localized planning between Hydro One Networks Inc. and the distributors, Hydro Hawkesbury and Hydro One Distribution.

- The study team’s recommendations are that Hydro One Networks Inc, Hydro Hawkesbury and Hydro One Distribution assess the following need. Voltage on 79M1 and install reactive compensation as required
- Voltage after Hydro One Distribution connects the new load at Stewartville TS.
- The power factor at Almonte TS and install reactive compensation as required.
- Voltages at Almonte TS/Terry Fox MTS and install reactive compensation as required.
- Load Restoration for the loss of B5D+D5A.

## 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 assess and develop local solutions for any relevant near and midterm needs that require to be addressed prior to the next planning cycle.

## 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 Almonte TS (CAA ID#: 2013-EX684)



## **10 KEY TERMS AND DEFINITIONS**

Key terms and definitions associated with this Needs Screening are cited here.

### **Normal Supply Capacity**

The maximum loading that electrical equipment may be subjected to continuously under nominal ambient conditions such that no accelerated loss of equipment life would be expected.

### **Coincident Peak Load**

The electricity demand at individual facilities at the same specific point in time when the total demand of the region or system is at its maximum.

### **Contingency**

The prevalence of abnormal conditions such that elements of the power system are not available.

### **Conservation and Demand Management (CDM)**

Programs aimed at using more of one type of energy efficiently to replace an inefficient use of another to reduce overall energy use, and influencing the amount or timing of customers' use of electricity.

### **Distributed Generation (DG)**

Electric power generation equipment that supplies energy to nearby customers with generation capacity typically ranging from a few kW to 25 MW.

### **Gross Load**

Amount of electricity that must be generated to meet all customers' needs as well as delivery losses, not considering any generation initiatives such as CDM and DG. It is usually expressed in MW or MVA.

### **Limited Time Rating (LTR)**

A higher than nameplate rating that a transformer can tolerate for a short period of time

### **Load Forecast**

Prediction of the load or demand customers will make on the electricity system

### **Net Load**

Net of generation (e.g. CDM and DG) deducted from the Gross load

### **Non-Coincident Peak Load**

The maximum electricity demand at an individual facility. Unlike the coincident peak, non-coincident peaks may occur at different times for different facilities.

**Peak Load**

The maximum load consumed or produced by a unit or group of units in a stated period of time. It may be the maximum instantaneous load or the maximum average load over a designated interval of time.

**Weather Corrected Data**

Load data that is adjusted to account for extreme weather conditions using an adjustment factor.

## 11 ACRONYMS

BES	Bulk Electric System
BPS	Bulk Power System
CDM	Conservation and Demand Management
CIA	Customer Impact Assessment
DESN	Dual Element Spot Network
DG	Distributed Generation
DSC	Distribution System Code
GTA	Greater Toronto Area
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Planning
kV	Kilovolt
LDC	Local Distribution Company
LTR	Limited Time Rating
LV	Low-voltage
MW	Megawatt
MVA	Mega Volt-Ampere
NERC	North American Electric Reliability Corporation
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
TSC	Transmission System Code