Hydro One Networks Inc.
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483 Bay Street
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www.HydroOne.com

Tel: (416) 345-5707
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Andrew.skalski@HydroOne.com

Andrew Skalski
Director – Major Projects and Partnerships
Regulatory Affairs

BY COURIER

June 6, 2013

Ms. Kirsten Walli
Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
Toronto, Ontario
M4P 1E4

Dear Ms. Walli:

EB-2013-0053 – Hydro One Networks' Section 92 – Guelph Area Transmission Refurbishment Project – Application and Evidence Update Filing

I am attaching two paper copies of the Hydro One Networks' updated Application and Prefiled Evidence that was filed with the Board on March 8, 2013.

The update is the final Customer Impact Assessment dated May 28, 2013 (Exhibit B, Tab 6, Schedule 4).

An electronic copy of the complete application, including the attached updates has been filed using the Board's Regulatory Electronic Submission System.

Sincerely,

ORIGINAL SIGNED BY JOANNE RICHARDSON FOR ANDREW SKALSKI

for Andrew Skalski

Attach.

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Susan.E.Frank@HydroOne.com

Susan Frank
Vice President and Chief Regulatory Officer
Regulatory Affairs

BY COURIER

March 8, 2013

Ms. Kirsten Walli
Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
P.O. Box 2319
Toronto, ON.
M4P 1E4

Dear Ms. Walli:

EB-2013-0053 – Hydro One Networks' Section 92 – Guelph Area Transmission Refurbishment Project – Application and Evidence

I am attaching two (2) copies of the Hydro One Networks' Application and Prefiled Evidence in support of an Application pursuant to Section 92 of the Ontario Energy Board Act for an Order or Orders granting leave to upgrade 5 km of transmission line facilities in the Kitchener-Waterloo-Cambridge-Guelph area.

An electronic copy of the complete application has been filed using the Board's Regulatory Electronic Submission System (RESS) and the proof of successful submission slip is attached.

Hydro One Networks' contacts for service of documents associated with this Application are listed in Exhibit A, Tab 1, Schedule 1.

Sincerely,

ORIGINAL SIGNED BY SUSAN FRANK

Susan Frank

Attach.

c. Nancy Marconi (electronic only)

ONTARIO ENERGY BOARD

In the matter of the *Ontario Energy Board Act, 1998*;

And in the matter of an Application by Hydro One Networks Inc. for an Order or Orders granting leave to upgrade transmission line facilities ("Guelph Area Transmission Refurbishment Project") in the Kitchener-Waterloo-Cambridge-Guelph ("**KWCG**") area in southwestern Ontario.

APPLICATION

1. The Applicant is Hydro One Networks Inc. ("**Hydro One**"), a subsidiary of Hydro One Inc. The Applicant is an Ontario corporation with its head office in the City of Toronto. Hydro One carries on the business, among other things, of owning and operating transmission facilities within Ontario.

2. Hydro One hereby applies to the Ontario Energy Board ("**the Board**") pursuant to Section 92 of the *Ontario Energy Board Act, 1998* ("**the Act**") for an Order or Orders granting leave to upgrade approximately 5 kilometers of transmission line facilities in the KWCG area. These facilities are required to:

   a) reinforce the electricity supply to the KWCG area; and

   b) minimize the impact of major transmission outages on customers in the area.

3. The proposed transmission line project is to upgrade approximately 5 km of the existing 115 kV double circuit transmission line section between CGE Junction and Campbell TS to a 230 kV double circuit transmission line and to replace

approximately 2 km of Optic Ground Wire on the existing 230 kV structures between Cedar TS and CGE Junction, both located in the City of Guelph.

The proposed in-service date is December 2015.

4. The majority of the line upgrade work will involve replacing the existing double wood pole 115 kV line, B5G/B6G, between CGE Junction and Campbell TS, with a 230 kV line utilizing a combination of steel lattice towers and steel pole structures. The project lands consist of a mix of provincially-owned properties, easement rights on private properties and municipal road corridors. Although the project will continue to utilize the existing 115 kV corridor, new permanent land rights will be required at various locations, and some temporary access rights will be required during the construction period. A map showing the general location of the proposed facilities is provided in **Exhibit B, Tab 2, Schedule 2**.

5. The Ontario Power Authority (**"OPA"**) has identified the need for the project and the alternatives that were considered as part of the integrated plan for the KWCG area. The OPA's evidence is filed at **Exhibit B, Tab 1, Schedule 5**.

6. The Independent Electricity System Operator ("**IESO**") has provided a draft System Impact Assessment ("**SIA**") of the proposed facilities and has concluded that the project is expected to have no material adverse impact on the reliability of the integrated power system. The draft SIA report is filed at **Exhibit B, Tab 6, Schedule 3**.

7. Hydro One will file a Customer Impact Assessment ("**CIA**") in accordance with its customer connection procedures by end of March 2013. The CIA will be filed as **Exhibit B, Tab 6, Schedule 4**.

8. The total cost of the line facilities for which Hydro One is seeking approval is estimated to be $28 million. The details are provided in **Exhibit B, Tab 4, Schedule 2**. The project economics, as filed in **Exhibit B, Tab 4, Schedule 3,** estimate that the line facilities, over a 25-year time horizon, will result in a maximum 3 cent increase in the network pool rate and have minimal impact (0.04%) on the overall average Ontario consumer's electricity bill.

9. The Guelph Area Transmission Refurbishment (**"GATR"**) Project is expected to have no s ignificant environmental impacts. A Class EA was completed for the Project under the *Class Environmental Assessment for Minor Transmission Facilities* ("**Class EA**") approved by the Ministry of the Environment ("**MOE**"). The Class EA process is described in **Exhibit B, Tab 6, Schedule 1**.

10. Hydro One has consulted with property owners in the Project area and stakeholders in the City of Guelph, Township of Centre Wellington and County of Wellington areas to identify potential concerns associated with the construction of the proposed transmission facilities. The feedback received from stakeholders was considered and incorporated into the preparation of this Application. The stakeholder consultation process is described in **Exhibit B, Tab 6, Schedule 5**. Hydro One will continue to communicate with stakeholders and the local community to ensure that potential concerns raised during the construction and commissioning stages of the proposed facilities are addressed.

11. Details on the Hydro One engagement process with neighbouring First Nations communities are filed in **Exhibit B, Tab 6, Schedule 6**.

12. This Application is supported by written evidence which includes details of the Applicant's proposal for the transmission refurbishment work. The written evidence

is prefiled as attached and may be amended from time to time prior to the Board's final decision on this Application. Further, the Applicant may seek meetings with Board Staff and intervenors in an attempt to identify and reach agreements to settle any issues arising out of this Application.

13. Coincident with the transmission line upgrade, work will be carried out at Cedar TS and at Guelph North Junction to install new autotransformers, circuit breakers and associated equipment, consistent with the OPA's recommendations. The transmission-related cost of the station work is estimated at $60 million.

14. Hydro One requests a written hearing for this proceeding.

15. Hydro One requests that a copy of all documents filed with the Board be served on the Applicant and the Applicant's counsel, as follows:

a) The Applicant:

Mr. Jamie Waller
Regulatory Coordinator
Hydro One Networks Inc.

Mailing Address: 8th Floor, South Tower
483 Bay Street
Toronto, Ontario
M5G 2P5
Telephone: (416) 345-6948
Fax: (416) 345-5866
Electronic access: regulatory@HydroOne.com

b) The Applicant's counsel:

Michael Engelberg
Assistant General Counsel
Hydro One Networks Inc.

Mailing Address:	15th Floor, North Tower
483 Bay Street	
Toronto, Ontario	
M5G 2P5	
Telephone:	(416) 345-6305
Fax:	(416) 345-6972
Electronic access:	mengelberg@HydroOne.com

EXHIBIT LIST

Exh	Tab	Schedule	Contents
A			**Administration**
	1	1	Application
	2	1	Exhibit List
	3	1	Summary of Prefiled Evidence
	4	1	Procedural Orders/Affidavits/Correspondence
	5	1	Notices of Motion
B			**Applicant's Prefiled Evidence**
	1	1	Project Location and Existing Transmission System
		2	Map of Existing Facilities
		3	Schematic Diagram of Existing Facilities
		4	Need for the Proposed Facilities
		5	OPA Evidence on Need and Alternatives
	2	1	Description of the Proposed Facilities
		2	Map of Proposed Facilities
		3	Schematic Diagram of Proposed Facilities
		4	Cross Section of the Tower Types - Existing and Proposed

SUMMARY OF PREFILED EVIDENCE

Hydro One Networks Inc. ("**Hydro One**") is applying to the Board for an order granting leave to upgrade transmission line facilities in the Kitchener-Waterloo-Cambrige-Guelph **("KWCG")** area pursuant to Section 92 of the *Ontario Energy Board Act, 1998* ("**the Act**").

The proposed facilities, to be constructed, owned and operated by Hydro One are as described in **Exhibit B, Tab 2, Schedule 1** (Description of Proposed Facilities). A map showing the location of the proposed transmission facilities is provided in **Exhibit B, Tab 2, Schedule 2**.

The planned in-service date for the Guelph Area Transmission Refurbishment (**"GATR"**) Project is December 2015. A construction schedule for the project is shown at **Exhibit B, Tab 5, Schedule 2**.

Near-and medium-term supply capacity and other reliability needs have been identified in the KWCG area. Specifically, three of the KWCG subsystems (the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems) are expected to exceed their supply capacity within the next 10 years. Additionally, two subsystems (the Kitchener and Cambridge, and Waterloo-Guelph subsystems) do not comply with prescribed service interruption criteria. Further evidence on need is found in **Exhibit B, Tab 1, Schedule 4** and **Exhibit B, Tab 1, Schedule 5**.

The Independent Electricity System Operator ("**IESO**") has granted conditional approval for connection of the GATR project in its Draft System Impact Assessment ("**SIA**") filed as **Exhibit B, Tab 6, Schedule 3**.

Hydro One will file a Customer Impact Assessment ("**CIA**") in accordance with its customer connection procedures, in late March 2013. The CIA document will be filed as **Exhibit B, Tab 6, Schedule 4**.

The total cost of the GATR Line Project is estimated to be $28 million. The proposed new transmission facilities will be included in the network pool revenue requirement as the new facilities perform a network function, establish a new independent network path, form a network loop, and new 115/230 kV autotransformers and associated switchgear will be installed at Cedar TS. Details of the project economics are filed in **Exhibit B, Tab 4, Schedule 3**.

The design of the proposed facilities is in accordance with good utility practice and meets the requirements of the *Transmission System Code* for licensed transmitters in Ontario.

The GATR Project is subject to the *Class Environmental Assessment for Minor Transmission Facilities* process, in accordance with the Ontario *Environmental Assessment Act*. All Agency and public comments received during the draft Environmental Study Report (**"ESR"**) review and comment period were addressed and documented in the final ESR, which was filed with the Ministry of the Environment (**"MoE**") in October 2012. No Part II order requests (for an Individual Environmental Assessment, i.e. a h igher level of assessment), were submitted to the MoE. Prior to construction, Hydro One will obtain all regulatory approvals, licences and permits, as required. Details on the environmental assessment process are filed in **Exhibit B, Tab 6, Schedule 1**.

Hydro One has consulted with property owners in the Project area and stakeholders in the City of Guelph, Township of Centre Wellington and the County of Wellington. The purpose of the consultation was to identify potential concerns associated with the construction activities of the proposed transmission facilities. The feedback received from stakeholders was considered and incorporated into the preparation of this Application. Details regarding the consultation process are filed as **Exhibit B, Tab 6, Schedule 5**. Hydro One will continue to work with the local community and landowners and will ensure that potential concerns identified as part of the Environmental Approval process and during the construction phase are addressed.

Hydro One is undertaking an engagement process with neighbouring First Nations communities. In 2008 Hydro One advised the Ontario Ministry of Aboriginal Affairs ("**MAA**") and Indian and Northern Affairs Canada ("**INAC**") of the project and requested input on First Nation and Métis interests in the area. The MAA advised that the project did not appear to be located in an area where First Nation existing or asserted rights could be impacted by the Project. INAC advised Hydro One to apprise the Mississaugas of the New Credit and Six Nations of the Grand River First Nations of the Project. Further information on Hydro One's engagement process with First Nations and Métis is filed in **Exhibit B, Tab 6, Schedule 6**.

A detailed construction schedule is filed as **Exhibit B, Tab 5, Schedule 2**. This schedule assumes Board approval of the leave to construct application under Section 92 of the Act by July 2013. This should enable Hydro One to meet the anticipated December 2015 in-service date.

Hydro One requests a written hearing for this proceeding and submits that the evidence supports granting the requested Order based on the following grounds:

- The need for additional supply in the KWCG area and the need to minimize the impact of supply interruptions has been established;
- There are no adverse system or anticipated customer impacts from the project;
- The project will be fully compliant with the relevant codes, rules and licences;

- There will be a minor customer total bill impact (approximately 0.04%) as a result of the new network line facilities.

In order for the proposed project to proceed, it must be considered to be in the "public interest". Subsection 96(2) of the Act specifies that, for section 92 purposes, "the Board shall only consider the interests of consumers with respect to prices and the reliability and quality of electricity service" and "where applicable and in a manner consistent with the policies of the Government of Ontario, the promotion of the use of renewable energy sources." Hydro One submits that the proposed facilities are in the public interest because:

- The existing capability of the transmission system in the KWCG area is not sufficient to serve the anticipated future electricity demand resulting from population growth and economic activity;
- The GATR Project is a cost-effective solution to achieving this objective;
- The need for the GATR project has been determined by the OPA and is supported by the KWCG area working group; and
- There will be no material impact on the price of electricity.

For the reasons provided above, Hydro One respectfully submits that the proposed transmission line facilities should be approved under section 92 of the Act. Accordingly, Hydro One requests an Order from the Board pursuant to section 92 of the Act granting leave to construct the proposed transmission line facilities.

Coincident with the transmission line upgrade, work will be carried out at Cedar TS and at Guelph North Junction to install new autotransformers, circuit breakers and associated equipment, consistent with the OPA's recommendations. The cost of the station work is estimated at $60 million.

PROCEDURAL ORDERS / AFFIDAVITS / CORRESPONDENCE

NOTICES OF MOTION

PROJECT LOCATION AND EXISTING TRANSMISSION SYSTEM

1.0 PROJECT LOCATION

The transmission project described in **Exhibit B, Tab 2, Schedule 1**, is located in the Kitchener-Waterloo-Cambridge-Guelph (**"KWCG"**) area, in southwestern Ontario. The transmission elements of this project extend from Guelph Cedar Transformer Station (**"TS"**) located in the City of Guelph to Guelph North Junction **("Jct"**) located in the County of Centre Wellington. The 115 kV transmission corridor comprises the B5G/B6G, F11C/F12C and D7F/D9F lines that connect Burlington TS (in Burlington) to Detweiler TS (in Kitchener) (please refer to Figure 1 below). Approximately five kilometers of 115 kV line B5G/B6G in this corridor, between Central Guelph (CGE Jct) and North Guelph (Campbell TS), will be upgraded to 230 kV.

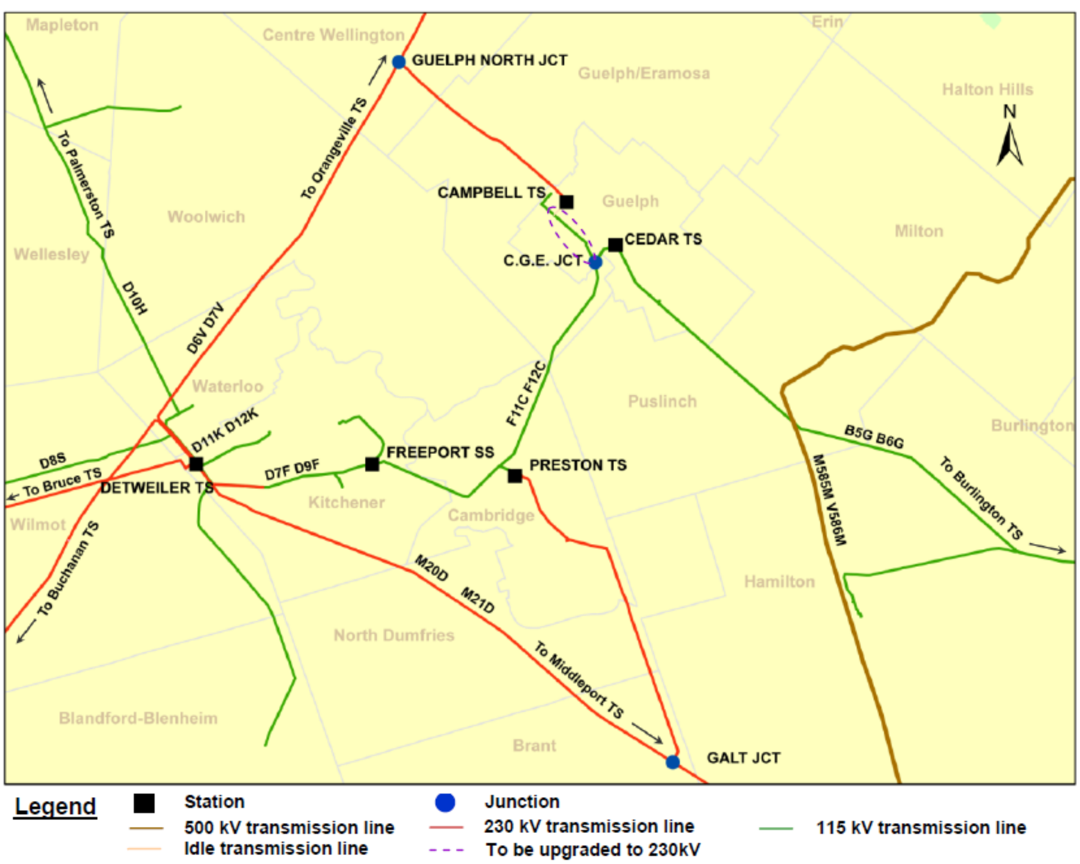


Figure 1 – The KWCG area *Source: Hydro One TLGIS*

A geographical map showing the existing facilities of south-central Guelph and KWCG areas is provided in **Exhibit B, Tab 1, Schedule 2**.

2.0 EXISTING TRANSMISSION FACILITIES IN SOUTHWESTERN ONTARIO

The transmission assets in the broad southwestern Ontario region connect the major generation and load centers in the southwest to the interconnected grid. This is a tightly interconnected system, where the availability and performance of each major element (especially the 230 kV facilities) can affect the integrity of the entire network and neighboring jurisdictions.

Despite the major generating resources within the broad southwestern Ontario region, the KWCG area relies predominately on the transmission system to deliver electricity to its customers as there is no major source of generation supply in the area.

2.1. Transmission Resources in the KWCG Area

The KWCG area is located in southwestern Ontario and consists of: the cities of Kitchener, Waterloo, Cambridge, and Guelph; the townships of Wellesley, Woolwich, Wilmot, and North Dumfries; and the County of Centre Wellington. Much of this area is within the Regional Municipality of Waterloo. In the summer of 2012 the demand for electricity in the area peaked at over 1,400 MW. While the economic downturn in 2008 and 2009 impacted growth in the region, the demand for electricity recovered to pre-recession levels in the summer of 2010 and is expected to grow at a pace of nearly 3% per year between 2010 and 2023, inclusive of natural conservation[1]. Within the KWCG area, the strongest growth in demand is expected in the Cambridge and North Dumfries and South-Central Guelph areas.

There are no major sources of generation supply within the KWCG area. As a result, the area relies predominately on the transmission system to deliver electricity to its customers.

[1] Exhibit B, Tab 1, Schedule 5, pg. 8

The transmission system supplying the KWCG area includes the 230 kV circuits between Detweiler TS (in Kitchener), Orangeville TS (in Orangeville) and Middleport TS (near Hamilton), as well as eight 115 kV circuits emanating from Detweiler TS and Burlington TS (in Burlington). High voltage autotransformers tie the 115 kV and 230 kV systems together at Detweiler TS, Burlington TS and Preston TS (in Cambridge). The 230 kV and 115 kV transmission lines in the KWCG area are as follows:

- the 230 kV Detweiler TS x Orangeville TS double-circuit tower line, D6V and D7V;
- the 230 kV Middleport TS x Detweiler TS and Preston TS double-circuit tower line, M20D and M21D;
- the 115 kV Burlington TS x Cedar TS double-circuit tower line, B5G and B6G;
- the 115 kV Detweiler TS x Freeport SS double-circuit tower line, D7F and D9F;
- the 115 kV Detweiler TS x St. Mary’s TS single-circuit tower line, D8S;
- the 115 kV Detweiler TS x Palmerston TS single-circuit pole line, D10H;
- the 115 kV Detweiler TS x Kitchener TS double-circuit tower line, D11K and D12K; and
- the 115 kV Freeport SS x Cedar TS double-circuit tower line, F11C and F12C.

Other major 230 kV facilities connected to the KWCG area include transformer and switching stations at Detweiler TS, Burlington TS, Orangeville TS, Middleport TS, Freeport SS and Preston TS.

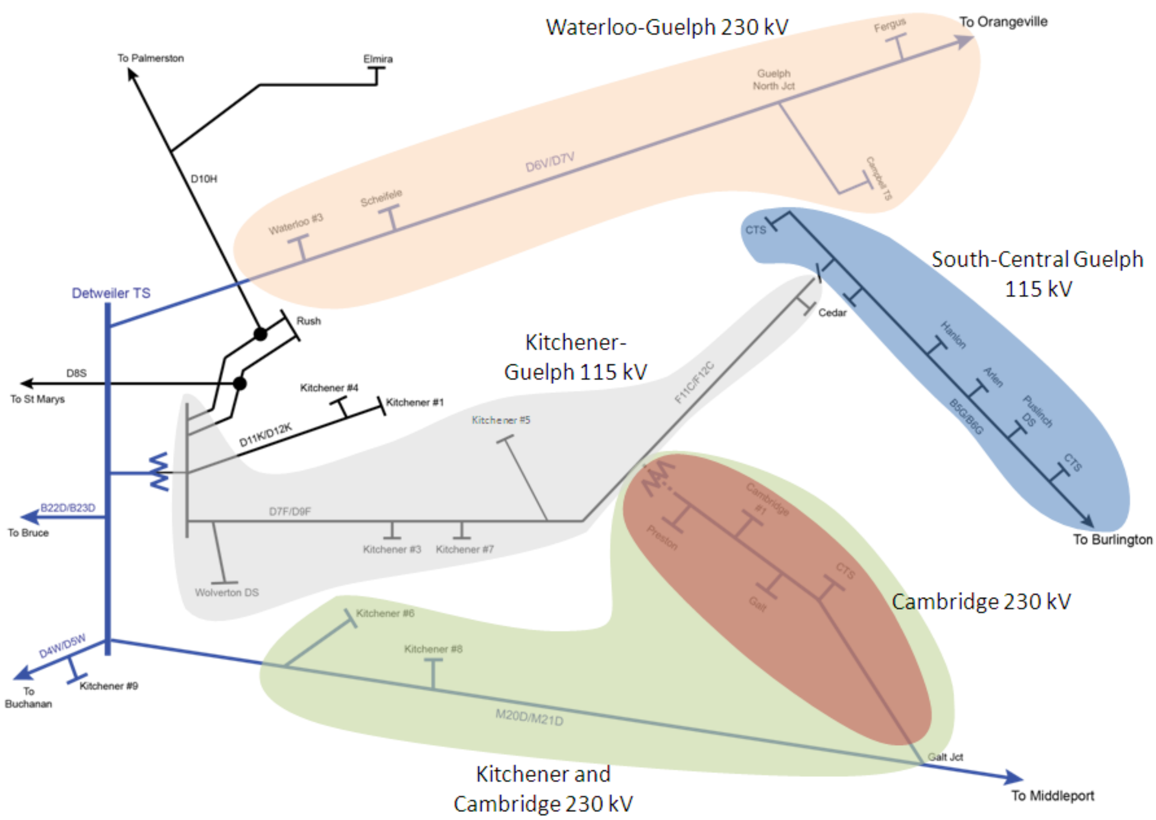
For the purpose of this submission, the transmission system in the KWCG area can be divided into the following subsystems:

- the South-Central Guelph 115 kV Subsystem (South-Central-Guelph): customers supplied from Burlington TS via B5G/B6G;
- the Kitchener-Guelph 115 kV Subsystem (Kitchener-Guelph): customers supplied from Detweiler TS via D7F/D9F and F11C/F12C;
- the Waterloo-Guelph 230 kV Subsystem (Waterloo-Guelph): customers supplied from D6V/D7V;

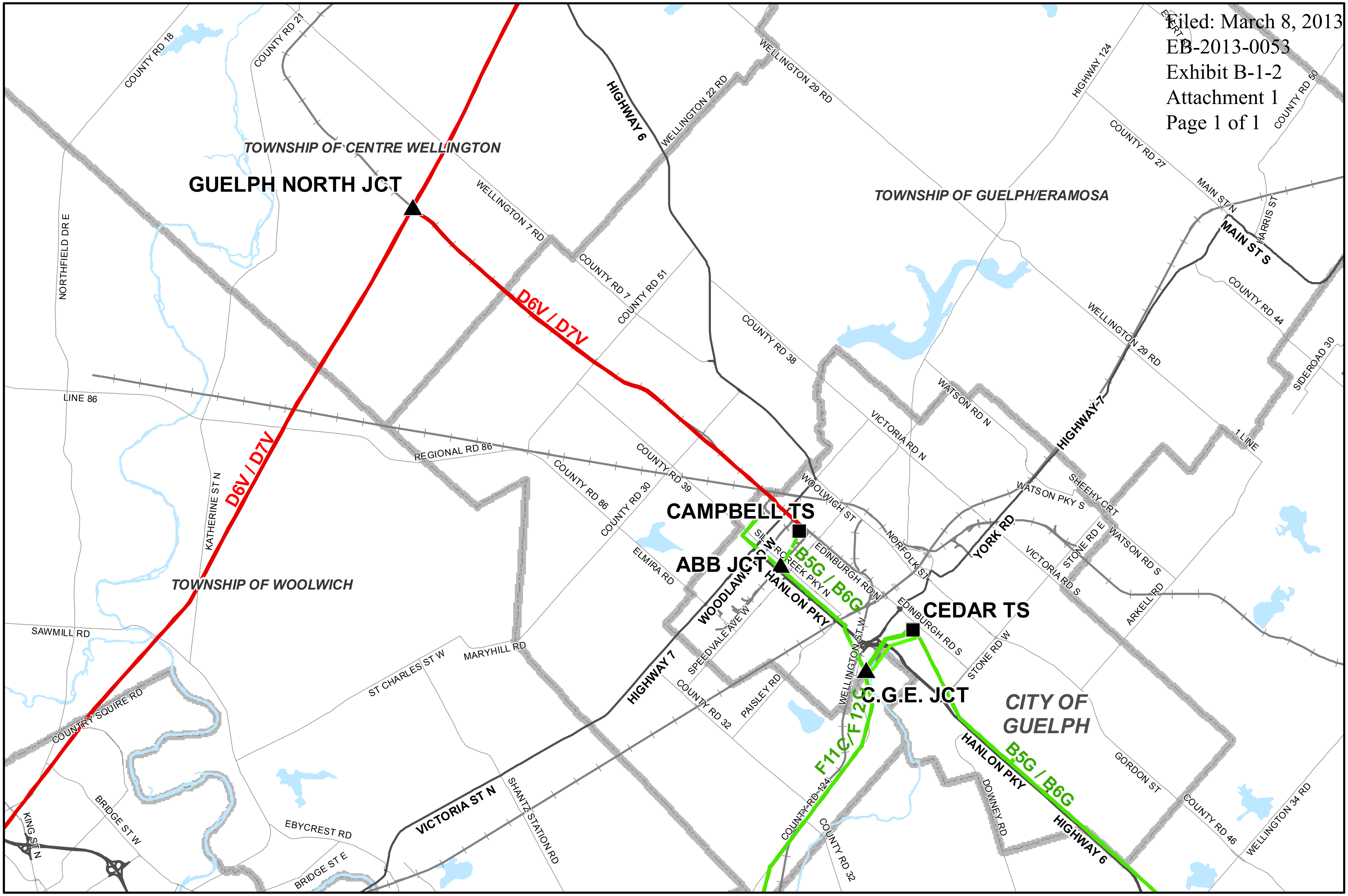
- the Cambridge 230 k V Subsystem (Cambridge): customers supplied from M20D/M21D via the "Preston Tap"; and
- the Kitchener and Cambridge 230 kV Subsystem (Kitchener and Cambridge): customers supplied from M20D/M21D, including the Preston Tap.

Although part of the overall KWCG area, Rush MTS (which supplies a part of the City of Waterloo), Elmira TS and Kitchener-Wilmot MTS #1, 4, and 9 are not included in any of these subsystems as there are no adequacy issues with the transmission facilities that supply these stations.

Figure 2 provides a graphical representation of these subsystems.



MAP OF EXISTING FACILITIES



Transformer Stations

Junctions

Idle 115 kV Existing Transmission Line

115 kV Existing Transmission Line

230 kV Existing Transmission Line

Major Highways

Roads

Railway

Water

Municipal Boundary

hydro one

inergi

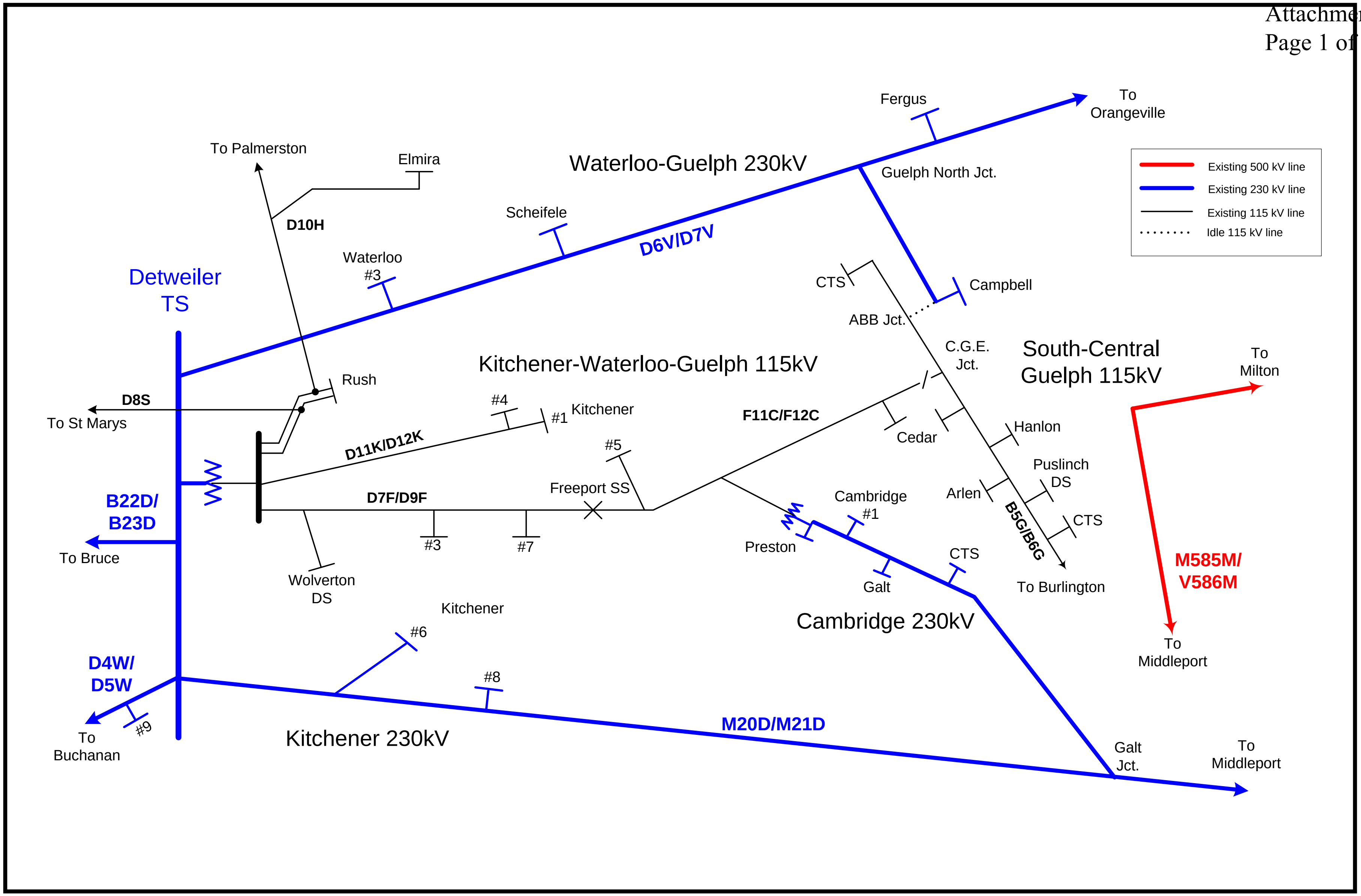
Date: Oct 12, 2012
Produced By: Inergi LP, GIS Services
Map08-46_GATR_ExistingFacilities_v2a

Guelph Area Transmission Refurbishment - Existing Facilities

1:125,000

0 2.5 5 km

SCHEMATIC DIAGRAM OF EXISTING FACILITIES



Schematic Diagram of Existing Facilities

NEED FOR THE PROPOSED FACILITIES

1.0 BACKGROUND

In 2008 and 2009, Hydro One commenced work on a project that would refurbish parts of the aging high-voltage electricity infrastructure serving Guelph and the surrounding area based upon electricity needs at the time. In 2010, as a result of the economic recession and the initiation of a regional supply plan undertaken by the OPA in consultation with the local distribution companies, this project was put on hold.

In 2010, the Kitchener-Waterloo-Cambridge-Guelph (**"KWCG"**) area working group was established to develop a regional plan to address electricity supply and reliability needs in the KWCG area. The working group consists of members from the Ontario Power Authority (**"OPA"**), the Independent Electricity System Operator (**"IESO"**), local distribution companies and Hydro One Networks Inc. (**"Hydro One"**). The working group identified certain near - and medium-term supply capacity and other reliability needs that need to be addressed. On March 8, 2012, the OPA sent Hydro One a letter recommending that Hydro One proceed with the Guelph Area Transmission Refurbishment (**"GATR"**) Project's development work, with the expectation that the project will take three to four years to complete. The OPA also provided the scope of the project. This letter is filed as **Exhibit B, Tab 1, Schedule 4, Attachment 1**. On October 10, 2012, as a result of ongoing efforts, the OPA sent Hydro One refinements to the March 2012 recommendations, updating the switching facilities and arrangements at Cedar TS and Guelph North Junction. This letter is filed as **Exhibit B, Tab 1, Schedule 4, Attachment 2**.

2.0 NEED

Near- and medium-term supply capacity and other reliability needs have been identified in the KWCG area. Specifically, there is a need for additional supply capacity in the South-Central Guelph, Kitchener-Guelph and Cambridge areas, and a need to minimize the impact of supply interruptions to customers in the Waterloo-Guelph, and Kitchener and Cambridge areas. The OPA has provided evidence on the need for the GATR project in **Exhibit B, Tab 1, Schedule 5**.

3.0 RELEVANT TRANSMISSION PLANNING GUIDELINES

The Transmission System Code (**"TSC"**) and the IESO's Ontario Resource and Transmission Assessment Criteria (**"ORTAC"**) require that loadings on transmission circuits not exceed the circuit ratings for the loss of a single circuit.

To meet the TSC and the IESO ORTAC, Hydro One as a transmitter is required to ensure that adequate transmission supply capability is maintained following the loss of any of the existing transmission circuits without interrupting customers.

The ORTAC Load Restoration Criteria (**Exhibit B, Tab 6, Schedule 3, Appendix A**, Section 7.2 c)) requires that the transmission system must be planned such that affected loads, when the amount of load interrupted is greater than 250 MW, must be restored within 30 minutes. The load in excess of 150 MW must be restored within approximately 4 hours, and all load must be restored within approximately 8 hours. The installation of two 230 kV circuit breakers at Guelph North Junction will contribute to meeting this criteria.

4.0 PROJECT CATEGORIZATION

4.1 Project Classification (Development, Connection, Sustainment)

Per the Board's Filing Guidelines, the first stage of project categorization is the classification of a project as development, connection, or sustainment :

- Development projects are those for providing (i) an adequate supply capacity and/or maintaining an acceptable or prescribed level of customer or system reliability for load growth meeting increased stresses on the system; or (ii) enhancing system efficiency such as minimizing congestion on the transmission system and reducing system losses.
- Connection projects are those for providing connection of a load or generation customer or group of customers to the transmission system.
- Sustainment projects are those for maintaining the performance of the transmission network at its current standard or replacing end-of-life facilities on a "like for like" basis.

Based on the above criteria this project is classified as a Development Project, as it:

- provides a supply capacity increase to contribute to meeting the needs of the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems until 2024 or beyond;
- will reduce the exposure of customers supplied by Cedar TS to supply outages, provide increased supply diversity and reliability of supply, lower losses and improves operational flexibility to the area; and
- will minimize the impact of supply interruptions to customers in the Waterloo-Guelph area with the installation of two 230 kV breakers at Guelph North Junction.

4.2 Need Classification

The second stage of project categorization is to distinguish whether the project need is determined beyond the control of the Applicant ("non-discretionary") or determined at the discretion of the Applicant ("discretionary"). Non-discretionary projects may be triggered or determined by such things as:

a) mandatory requirement to satisfy obligations specified by regulatory organizations including NPCC/NERC or by the Independent Electricity System Operator (IESO);
b) a need to connect new load (of a distributor or large user) or new generation (connection);
c) a need to address equipment loading or voltage/short circuit stresses when their rated capacities are exceeded;
d) projects identified in a Board or provincial government approved plan;
e) projects that are required to achieve provincial government objectives that are prescribed in governmental directives or regulations; and
f) a need to comply with direction from the Ontario Energy Board in the event it is determined that the transmission system's reliability is at risk.

The GATR project is considered non-discretionary, as the upgrade of the 115 kV double-circuit transmission line to a 230 kV double-circuit transmission line between CGE Junction and Campbell TS kV will:

- Enable ORTAC requirements set by the IESO and TSC requirements set by the Board to be met;
- accommodate new load; and,
- relieve system elements where the load has exceeded capacity.

The following table captures these two dimensions of the project categorization.

		PROJECT NEED	
		Non-discretionary	Discretionary
Project Class	Development	**X**	

ONTARIO POWER AUTHORITY

120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1

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F 416-967-1947
www.powerauthority.on.ca

COPY

March 8, 2012

Mr. Mike Penstone
Vice President, Transmission Project Development
Hydro One
483 Bay Street
Toronto, Ontario M5G 2P5

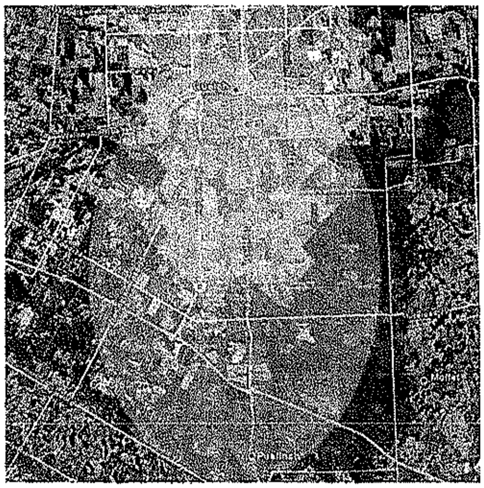
Dear Mike:

Continuing with the Project Development Work for the Guelph Area Transmission Refurbishment Project

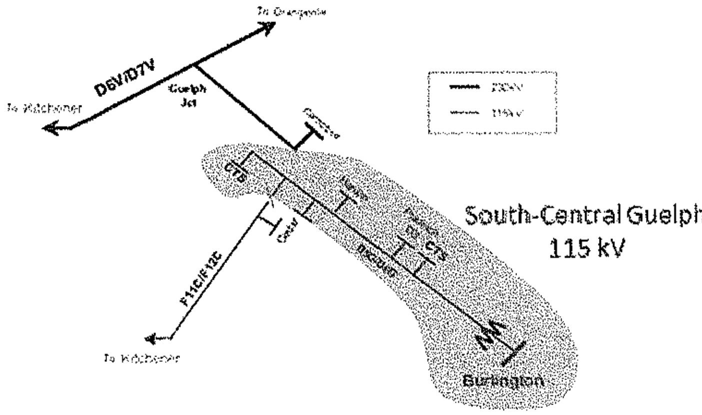
The purpose of this letter is to recommend continuing with the project development work for the Guelph Area Transmission Refurbishment project, including completion of the necessary environmental and regulatory approval processes.

In 2009, Hydro One Networks Inc. (Hydro One) began the necessary environmental approvals for the upgrading of an existing 115 kV transmission line, approximately 5 km in length, from Cedar TS to near Campbell TS along the Hanlon Expressway in the City of Guelph, and the installation of transformers at either Cedar TS or Campbell TS. This project is referred to as the Guelph Area Transmission Refurbishment (GATR) project. Two public information centers were held in Guelph to present the need and options for this project and to solicit feedback from the public. Since then, Hydro One has been developing study estimates for a number of transmission alternatives and working with the OPA and Guelph Hydro Electric Systems to determine the preferred option for the GATR project. As well, a broader regional planning study, initiated in 2010, examined and confirmed the need for the GATR project as part of the 20-year study, in consideration of updated demand forecast and recent conservation and distributed generation developments.

The purpose of the GATR project is to reinforce the electricity supply to a portion of the City of Guelph, as well as the neighboring town of Puslinch, known as South-Central Guelph, as shown in Figure 1. This area has experienced significant growth in electricity demand and is forecast to continue to grow over the next 20 years. Continuing development of the Hanlon Industrial Park is one of the key contributors to this growth.



Source: OPA
Figure 1: South-Central Guelph



Source: Hydro One Networks and OPA
Figure 2: South-Central Guelph Transmission System

The existing electricity supply to the South-Central Guelph area is primarily through a double circuit 115 kV transmission line from Burlington, B5G/B6G, as shown in Figure 2 above. This transmission line was originally built starting in 1910, and for planning purposes, has a supply capacity of approximately 100 MW. In the summer of 2011 peak demand in the South-Central Guelph area was about 115 MW, which exceeded the capability of the supply circuits for planning purposes.

Over the past several months the OPA has worked closely with Hydro One staff to review the cost and feasibility of options for reinforcing the supply to South-Central Guelph. Based on technical considerations, it is the OPA's recommendation that the preferred option is comprised of the following:

- two 230/115 kV autotransformers at Cedar TS;
- revitalization of the existing 115 kV transmission line between Campbell TS and CGE Junction near Cedar TS (approximately 5 km) to 230 kV;
- connection of the existing F11C/F12C and B5G/B6G 115 kV circuits at Cedar TS; and
- initial switching facilities at Guelph North Junction to facilitate sectionalization of the existing D6V/D7V 230 kV circuits.

This recommendation has the support of the Kitchener-Waterloo-Cambridge-Guelph (KWCG) area working group.

The proposed arrangement of Cedar TS, as well as the proposed transmission upgrade, are shown in Figure 3 and Figure 4 below.

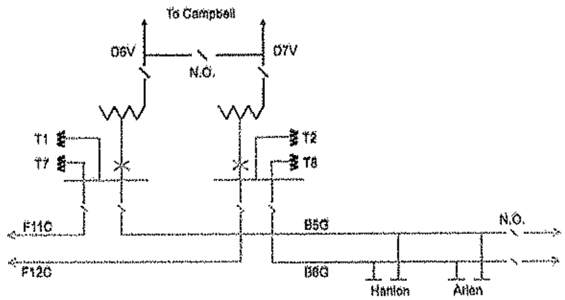


Figure 3 Proposed Cedar TS Arrangement

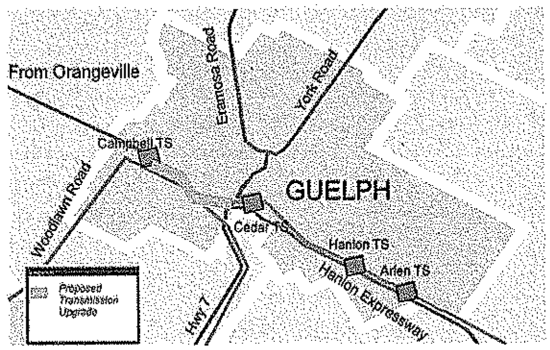


Figure 4 Map of Proposed Transmission Upgrade

Upon completion, Cedar TS will become an additional strong source of supply within the KWCG region, providing improved supply capability to both South-Central Guelph as well as neighbouring Kitchener. Additionally, it will provide an opportunity to improve the reliability of supply to customers in the Cambridge area. Hence, the addition of a second 230/115 kV autotransformer at Preston TS in Cambridge will also be required.

The above recommendation is subject to the outcome of the project's environmental assessment.

It is our understanding that the GATR project will take approximately 3-4 years to complete, including the necessary environmental and regulatory approvals. The OPA recommends Hydro One proceed with the project's development work.

We look forward to the opportunity to continue working with Hydro One to further develop these options.

Regards,

Amir Shalaby
Vice President, Power System Planning
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October 10, 2012

Mr. Mike Penstone
Vice President, Transmission Project Development
Hydro One
483 Bay Street
Toronto, Ontario M5G 2P5

Dear Mike:

The Guelph Area Transmission Refurbishment Project

The purpose of this letter is to update the recommended scope of the Guelph Area Transmission Refurbishment (GATR) project.

In March 2012, the OPA recommended that Hydro One continue with the project development work for the GATR project. This project will reinforce the electricity supply to a portion of the cities of Guelph, Kitchener, and the surrounding area, and minimize the impact of major transmission outages on customers in the area. The scope of the GATR project specified in this recommendation was comprised of the following:

- install two 230/115 kV autotransformers at Cedar TS;
- revitalize the existing 115 kV transmission line between Campbell TS and CGE Junction near Cedar TS (approximately 5 km) to 230 kV operation;
- re-connect the existing F11C/F12C and B5G/B6G 115 kV circuits at Cedar TS; and
- install initial switching facilities at Guelph North Junction to facilitate the sectionalization of the existing D6V/D7V 230 kV circuits.

Since the March 2012 recommendation, refinements to the project scope have been made as the result of more detailed design work by Hydro One, updated cost estimates, and ongoing efforts between Hydro One and the OPA. Such refinements include updates to the switching facilities and arrangements at Cedar TS and Guelph North Junction, as described below. The scope of the other GATR facilities remains unchanged. This recommendation has the support of the Kitchener-Waterloo-Cambridge-Guelph (KWCG) area working group.

Cedar TS Switching Arrangement

Two 115 kV in-line circuit breakers are now recommended to be installed at Cedar TS to provide improved switching capability for the F11C, F12C, B5G and B6G 115 kV circuits. The previous arrangement tied the F11C and B6G, and F12C and B5G circuits together at Cedar TS and provided a normally open point on B5G and B6G south of Arlen MTS. The two proposed circuit breakers at Cedar TS, at an incremental cost of approximately $4 million, will provide the KWCG 115 kV system with additional capacity to supply the South-Central Guelph area, reduce the exposure of customers in Central Guelph to supply outages, and provide increased supply diversity and operational flexibility.

The switching arrangement proposed in the March 2012 recommendation letter, as well the current recommended arrangement, are shown in Figure 1 below.

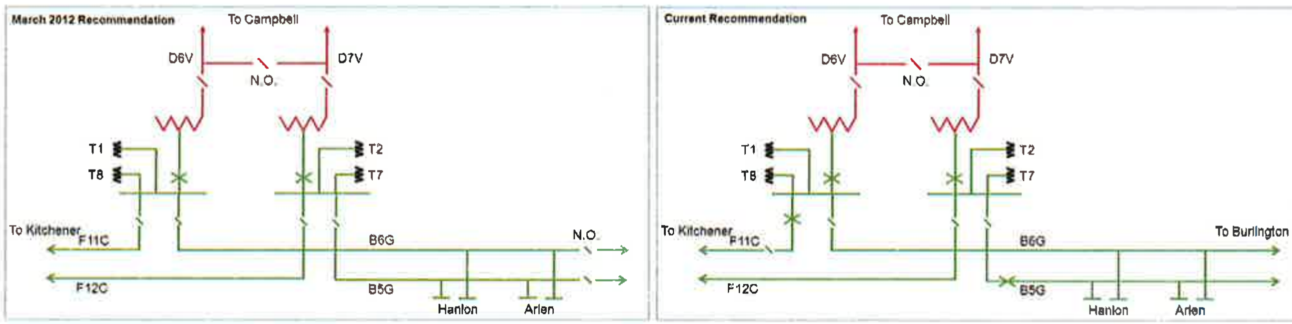

Figure 1. Cedar TS Switching Arrangement: Recommended Scope March 2012 and Current Recommendation

Guelph North Switching Facilities

Additionally, the switching facilities identified to be installed at Guelph North Junction are now recommended to consist of two 230 kV breakers and associated station facilities. The cost of the two circuit breakers is approximately $15 million, as compared to approximately $9 million to $12 million for motorized disconnect switches at the same location. Installing circuit breakers instead of motorized disconnect switches at Guelph North Junction reduces the exposure of customers in the area to supply outages, and provides faster restoration capability for a similar cost in the long-term, given that circuit breakers will be required to segment the large load served by the D6V and D7V circuits in the future.

The Guelph North Junction switching arrangement proposed in the March 2012 recommendation letter, as well the current recommended arrangement, are shown in Figure 2 below.

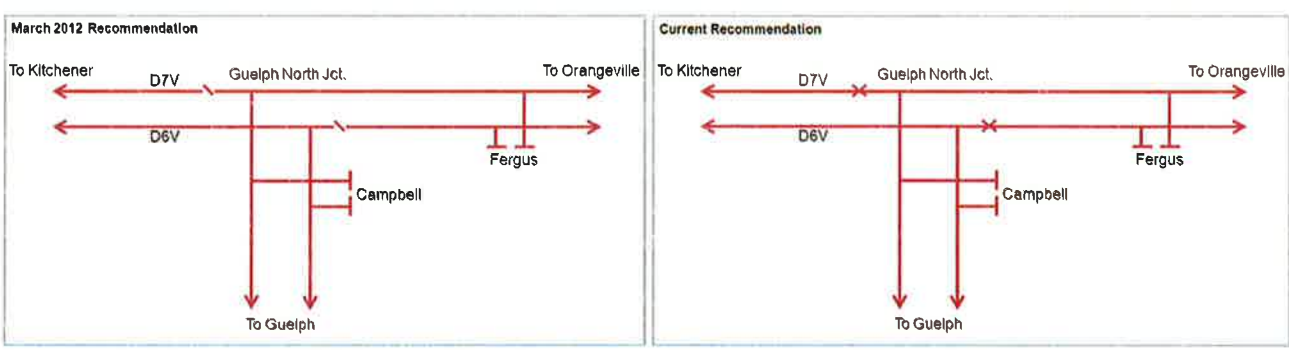

Figure 2. Guelph North Switching Facilities: Recommended Scope March 2012 and Current Recommendation

Based on Hydro One's latest estimates, the GATR project, with this refined project scope, has a total cost of approximately $90 million, and is expected to be completed by the end of 2015. The

OPA recommends that Hydro One proceed with project implementation, including completion of the necessary environmental and regulatory approval processes.

We look forward to the opportunity to continue working with and supporting Hydro One throughout the implementation of this project.

Regards,

Amir Shalaby
Vice President, Power System Planning
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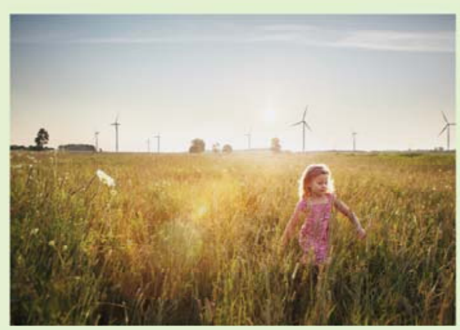
Nancy Marconi
Charlene de Boer

Kitchener-Waterloo-Cambridge-Guelph Area

March, 2013



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Contents

1 Executive Summary

Near- and medium-term supply capacity and other reliability needs have been identified in the Kitchener-Waterloo-Cambridge-Guelph (KWCG) area. Specifically, three of the KWCG subsystems (the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems) are expected to exceed their supply capacity within the next ten years. Additionally, two subsystems (the Kitchener and Cambridge, and Waterloo-Guelph subsystems) do not comply with prescribed service interruption criteria. To address these needs, the OPA recommends an integrated package composed of 1) conservation, 2) distributed generation resources, and 3) transmission reinforcements in the KWCG area.

Conservation and distributed generation resources are important contributors to the integrated solution for addressing the needs of the KWCG area. Together, these resources are expected to off-set more than 35% of the forecast load growth in the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems between 2010 and 2023. By 2023 achievement from provincial conservation efforts within these subsystems is expected to reduce peak demand by over 130 MW at an estimated delivery cost of $65 million (based on an allocation of forecast expenditures for provincial conservation programs). Over the same time period, approximately 16 MW of distributed generation facilities are expected to come into service in South-Central Guelph, Kitchener-Guelph and Cambridge subsystems, representing a capital investment of approximately $70 million.

The transmission reinforcements recommended in the near-term include the Guelph Area Transmission Refurbishment (GATR) project, as well as a project to install a second 230/115 kV autotransformer at Preston TS and associated switching and reactive support. The GATR project includes the installation of two new 230/115 kV autotransformers, four 115 kV circuit breakers, and the advancement of the relocation of the existing Hydro One Distribution Operating Centre at Cedar TS (approximately $52 million), rebuilding approximately 5 km of existing 115 kV double circuit transmission line between Campbell TS and CGE junction in Guelph to a 230 kV double circuit configuration (approximately $27.5 million), and installing two new 230 kV circuit breakers at a new station (Inverhaugh SS) at Guelph North Junction in Centre Wellington (approximately $16 million). Project completion for the GATR project is expected by the end of

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2015. The installation of the Preston TS autotransformer facilities is a separate project that will be coordinated with completion of the GATR project and it is estimated to cost approximately $15 million to $25 million. Together these facilities will meet the near- and medium-term needs of the KWCG area, and substantially meet the KWCG area needs over the longer-term.

It is the OPA's view that this integrated solution is a cost-effective and technically-effective solution for meeting the capacity and reliability needs of the KWCG area.

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2 Introduction

The KWCG area is one of the larger population and electrical demand centres in Ontario. The existing electrical facilities in the area serve a diverse range of commercial, industrial and residential customers. The demand for electricity in the area is expected to grow substantially over the next 20 years, driven by population growth and strong economic activity. Much of the existing electricity infrastructure in the area is reaching capacity and therefore plans for future conservation, distributed generation and electricity infrastructure expansion and investment need to be developed and, as necessary, implemented in order to maintain a reliable supply of electricity to the area.

Planning to meet the electrical needs of a large area or region is done through a regional planning process that considers the multi-faceted needs of the region and seeks to address them through an integrated range of solutions. The plan takes into consideration, among other things, the electricity requirements, anticipated growth and existing electricity infrastructure. The outcome of the regional planning process is an integrated plan to guide electricity infrastructure, resource development and procurement decisions for the region. The plan's recommendations are typically organized into three timeframes: near-term (first 5 years), medium-term (5-10 years out) and longer-term (10-20 years out or longer). Solutions to address near-term and medium-term needs are presented as action items for immediate or early deployment, while solutions to address potential longer-term needs are identified along with the conditions that would trigger their implementation and the key development work required to maintain their viability. In this sense, regional plans are not static documents, but rather dynamic processes which evolve and are adapted as circumstances and conditions change.

A working group (the KWCG Working Group) was established in 2010 to develop a regional plan for the KWCG area. The KWCG Working Group was formed in a manner consistent with the process described by the Planning Process Working Group's Report to the OEB as part of the Renewed Regulatory Framework for Electricity. The KWCG Working Group is comprised of members from the Ontario Power Authority (OPA), Hydro One Networks Inc. (Hydro One), the Independent Electricity System Operator (IESO) and local distribution companies (LDCs).

In the course of developing a regional plan for the KWCG area, the Working Group identified certain near- and medium-term supply capacity and other reliability needs to be addressed. The purpose of this evidence is to explain those needs and to recommend solutions – i.e., planned conservation and existing and committed distributed generation, along with transmission reinforcements – to address them. Based on expected growth in electricity demand in the KWCG area, these recommended solutions will provide a significant improvement to the reliability of electricity supply. They will also defer the potential need for additional major infrastructure (such as new transmission or large generation) in the area to beyond the study horizon, and will provide time to explore opportunities for increased cost effective conservation, distributed generation, and transmission investments (such as switching facilities). Monitoring of growth in electricity demand, as well as the achievement of conservation and distributed generation in the KWCG area will also be key components of ongoing electricity planning in the region.

3 Background

3.1 Kitchener-Waterloo-Cambridge-Guelph Area Population and Electricity Demand

The KWCG area is located to the west of the greater Toronto area in southwestern Ontario. It is a growing community with an estimated population of over 625,000 people.[1] The region includes the municipalities of Kitchener, Waterloo, Cambridge and Guelph, as well as portions of Perth and Wellington counties. In 2011, the Region of Waterloo[2] (which does not include Guelph) was Canada's 13th and Ontario's 7th largest urban centre[3]. The region was also noted as one of Ontario's Places to Grow.[4] The area's electricity demand is a mix of residential, commercial and industrial loads, encompassing diverse economic activities ranging from educational institutions to automobile manufacturing.

A large part of the area's electricity supply is serviced by four LDCs: Kitchener Wilmot Hydro, Waterloo North Hydro, Cambridge & North Dumfries Hydro and Guelph Hydro Electric

[1] 2011 Statistics Canada
[2] Waterloo Region contains the cities of Kitchener, Waterloo, and Cambridge, as well as the Townships of North Dumfries, Wellesley, Wilmot and Woolwich
[3] 2011 Statistics Canada
[4] Ontario Ministry of Infrastructure, Places to Grow

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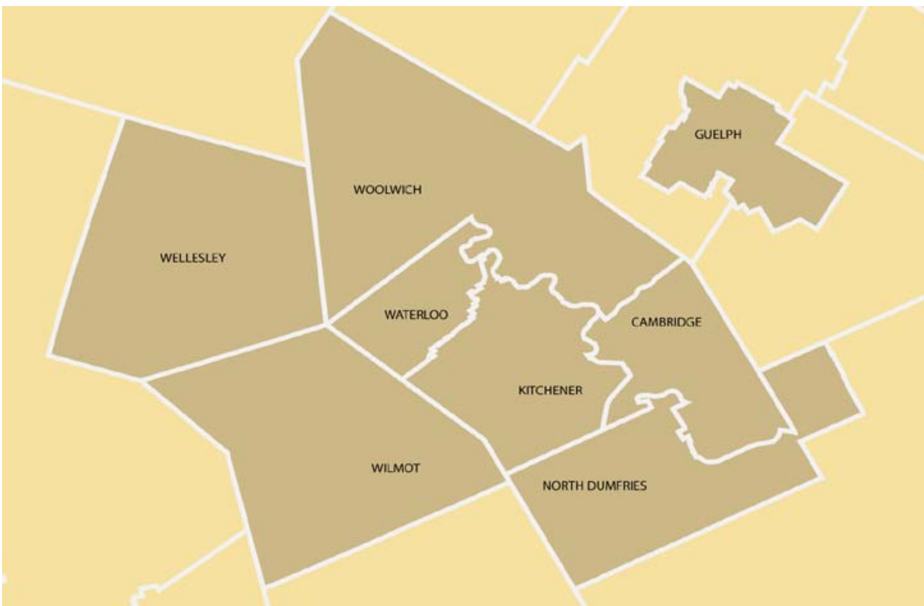
Systems. Figure 1 highlights, in dark brown, the area served by these four KWCG LDCs. Hydro One Distribution generally provides service to loads outside of these municipal areas (shown in light brown). Additionally, there are three directly-connected industrial customers in the area served by Hydro One Transmission.

Figure 1: The KWCG Area



In the summer of 2012 the demand for electricity in the KWCG area peaked at over 1,400 MW. Of this, the KWCG LDCs served approximately 1,300 MW: Kitchener Wilmot Hydro served approximately 380 MW, Waterloo North Hydro approximately 290 MW, Cambridge & North Dumfries Hydro approximately 290 MW, Guelph Hydro Electric Systems approximately 290 MW, and Hydro One Distribution approximately 60 MW. While the economic downturn in 2008 and 2009 impacted growth in the region, the demand for electricity recovered to pre-recession levels in the summer of 2010.

3.2 KWCG Area Generation and Transmission Facilities

There are no major sources of generation supply within the KWCG area. As a result, the area relies predominantly on the transmission system to deliver electricity to its customers. This system includes the 230 kV circuits between Detweiler TS (in Kitchener), Orangeville TS (in Orangeville), and Middleport TS (near Hamilton), as well as eight 115 kV circuits emanating from Detweiler TS and Burlington TS (in Burlington). High voltage autotransformers tie the

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115 kV and 230 kV systems together at Detweiler TS, Burlington TS, and Preston TS (in Cambridge). For the purpose of this evidence, the transmission system in the KWCG area can be divided into the following subsystems:

- The South-Central Guelph 115 kV Subsystem (South-Central Guelph): customers supplied from Burlington TS via B5G/B6G;
- The Kitchener-Guelph 115 kV Subsystem (Kitchener-Guelph): customers supplied from Detweiler TS via D7F/D9F and F11C/F12C;
- The Waterloo-Guelph 230 kV Subsystem (Waterloo-Guelph): customers supplied from D6V/D7V;
- The Cambridge 230 kV Subsystem (Cambridge): customers supplied from M20D/M21D via the "Preston Tap"; and
- The Kitchener and Cambridge 230 kV Subsystem (Kitchener and Cambridge): customers supplied from M20D/M21D, including the Preston Tap.

Figure 2 provides a graphical representation of these five subsystems.

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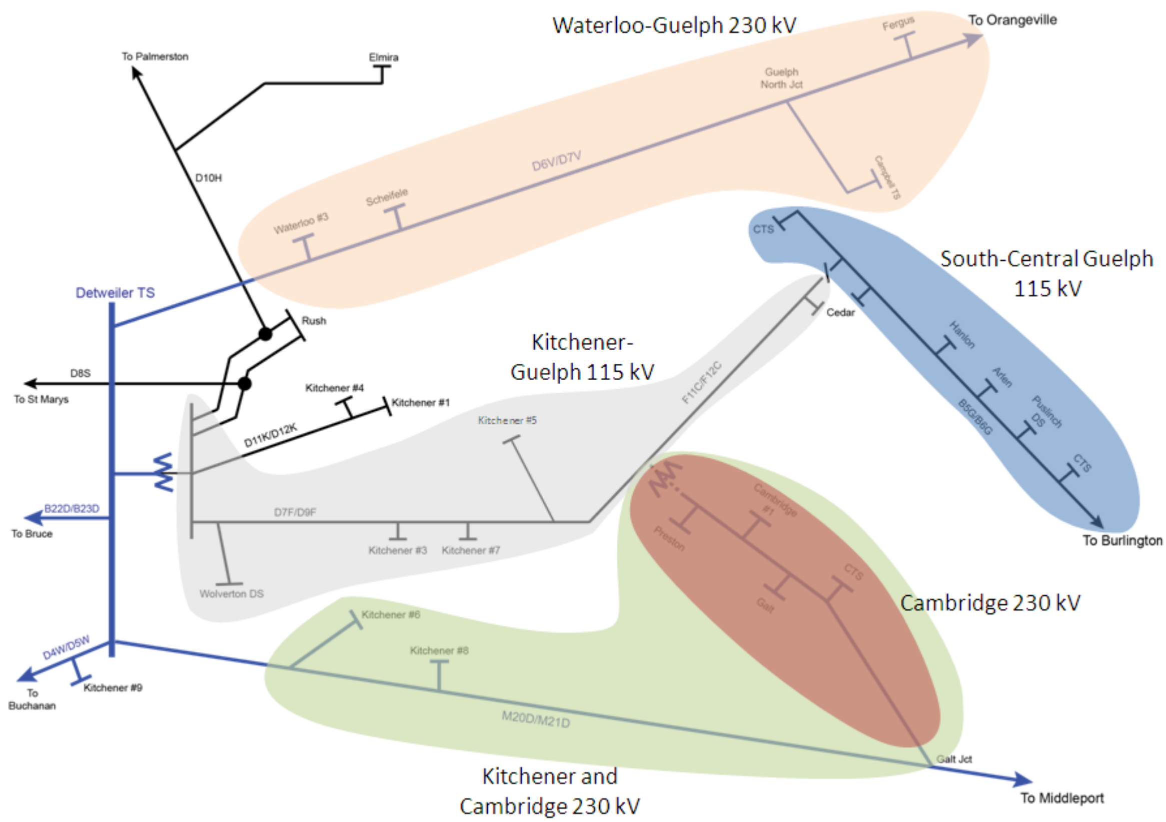
Figure 2: KWCG Area Transmission Subsystems



4 Historical and Forecast Electricity Demand

As previously mentioned, in the summer of 2012 the demand for electricity in the KWCG area peaked at over 1,400 MW. This represented an increase of approximately 10% from the low experienced in 2009 during the economic downturn. Despite the economic downturn, demand in the KWCG area has grown by approximately 1% per year between 2004 and 2012 (prior to the recession, growth was closer to 3%), and based on forecasts provided by the area LDCs, is expected to continue to grow at a pace of nearly 3% per year between 2010 and 2023. Figure 3 provides an overview of the historical and forecast future electricity demand in the KWCG area, inclusive of natural conservation. It also highlights the impacts of expected conservation and distributed generation resources, which are further discussed in Section 6.1 of this exhibit.

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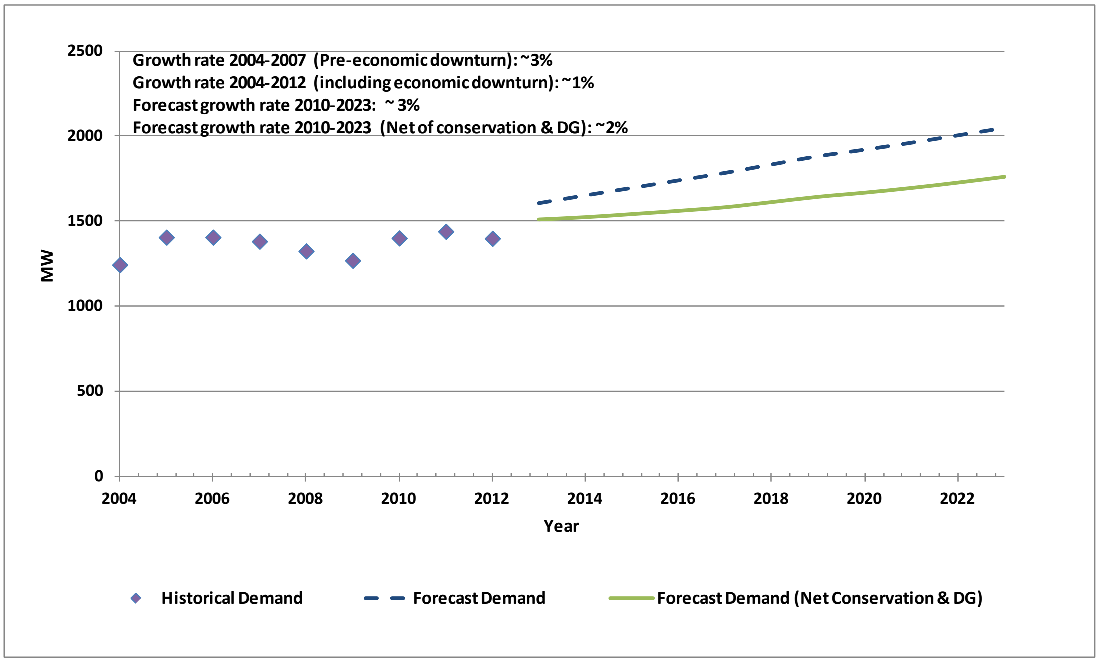
Figure 3: Historical and Forecast Demand in the KWCG Area



The demand for electricity in the KWCG area is influenced by a number of factors such as economic, household and population growth. While these factors do not have a one-to-one correlation with electricity consumption, they do provide an indication of trends in electricity demand growth. Changes in the demand for electricity in the KWCG area that took place between 2004 and 2012 were directionally consistent with changes in these indicators. For example, growth in gross domestic product (GDP), one indication of economic growth, was nearly 2% per year throughout the 2004 to 2011 period in the Kitchener Region (an area defined by Statistics Canada that includes most of the KWCG area).[5] From 2004 to 2007, the period prior to the economic downturn, GDP growth in the area averaged over 3% annually. The direction of this GDP growth trend is consistent with the trend in historical electricity demand in the KWCG area.

Looking forward, GDP growth in the Kitchener Region is forecast to continue at a rate of about 2% annually, amongst the strongest in the province. Again this is in line with the expectation for growth in electricity demand in the KWCG area.

[5] Kitchener Region includes the municipalities of Kitchener, Cambridge, North Dumfries, Waterloo, and Woolwich.

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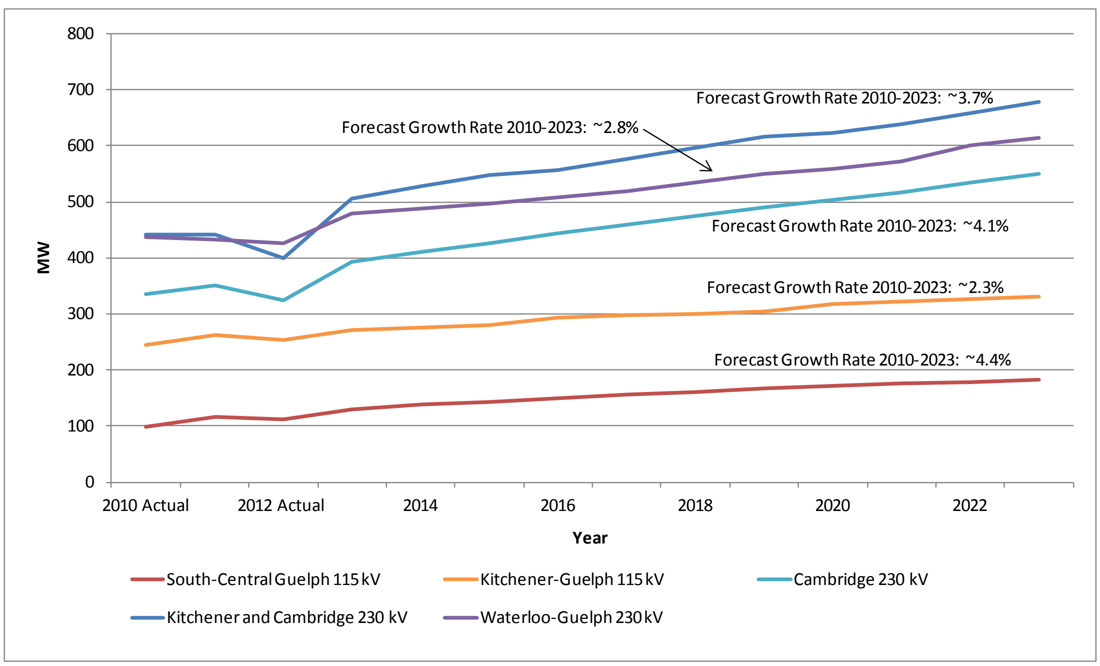
Within the KWCG area, growth in electricity demand amongst the KWCG subsystems is expected to vary due to differences in the types and maturity of the loads they serve. The summer peak demand forecasts of the subsystems, as well as the remaining stations in the KWCG area, are shown in Table 1. Figure 4 provides a graphical representation of the subsystem forecasts.

Table 1: Demand Forecast for the South-Central Guelph, Kitchener-Guelph, Cambridge, and Kitchener and Cambridge Subsystems

(MW)	2010 Actual	2011 Actual	2012 Actual	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
South-Central Guelph 115 kV	99	117	112	131	139	144	150	155	161	167	172	175	179	182
Kitchener-Guelph 115 kV	244	262	254	272	275	281	294	297	301	304	317	321	326	330
Waterloo-Guelph 230 kV	436	433	425	480	489	498	507	518	535	550	560	571	602	615
Cambridge 230 kV	335	351	325	392	410	427	443	459	475	491	504	518	534	549
Kitchener and Cambridge 230 kV	442	442	401	506	528	547	557	577	596	616	622	639	659	678
Other Stations in the KWCG Area	184	190	211	216	221	227	233	237	242	247	251	256	242	247

Figure 4: Demand Forecast for the South-Central Guelph, Kitchener-Guelph, Cambridge, and, Kitchener and Cambridge Subsystems



As shown in Figure 4, the two subsystems with the highest growth expectations are the Cambridge 230 kV and South-Central Guelph 115 kV subsystems. This demand growth is driven by a number of factors including growth in the Region of Waterloo East Side Lands (a prime industrial area north of the 401 served by Cambridge and North Dumfries Hydro) and in the Hanlon Industrial Park (an area served by Guelph Hydro's newest transformer station Arlen MTS).

5 Needs in the KWCG Area

The IESO's Ontario Resource and Transmission Assessment Criteria (ORTAC), (see Exhibit B, Tab 6, Schedule 3, Appendix A) establishes planning criteria and assumptions to be used for assessing the present and future reliability of Ontario's transmission system. Based on an application of these criteria, there are two near- and medium-term needs in the KWCG area: 1) needs relating to supply capacity to meet demand, and 2) needs relating to minimizing the impact of supply interruptions to customers. Each of these is explained below.

<u>Supply Capacity</u>

In accordance with ORTAC, the transmission system supplying a local area (i.e., subsystem) shall have sufficient capability under peak demand conditions to withstand specific outages prescribed by ORTAC while keeping voltages, line and equipment loading within applicable limits. More specifically, the maximum demand that can be supplied following the outage of a single element, as prescribed by ORTAC, is the "supply capacity" or the "load meeting capability" of the line or subsystem.[6] Due to the configuration of the transmission network serving an area, the load meeting capability may vary depending on growth in the surrounding region.

<u>Minimizing the Impact of Supply Interruptions</u>

In accordance with ORTAC, in the event of a major outage (for example a contingency on a double-circuit tower line resulting in the outage of both circuits), the transmission system shall be planned to minimize the impact of supply interruptions to customers both by reducing the number of customers affected by the outage and by restoring power to those affected within a reasonable timeframe. ORTAC therefore prescribes service interruption standards for certain sized load centres following such major transmission outages. Specifically, it provides that following a major outage no more than 600 MW of load will be interrupted, and that for load pockets less than 600 MW, load be restored within the following timeframes:

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[6] ORTAC

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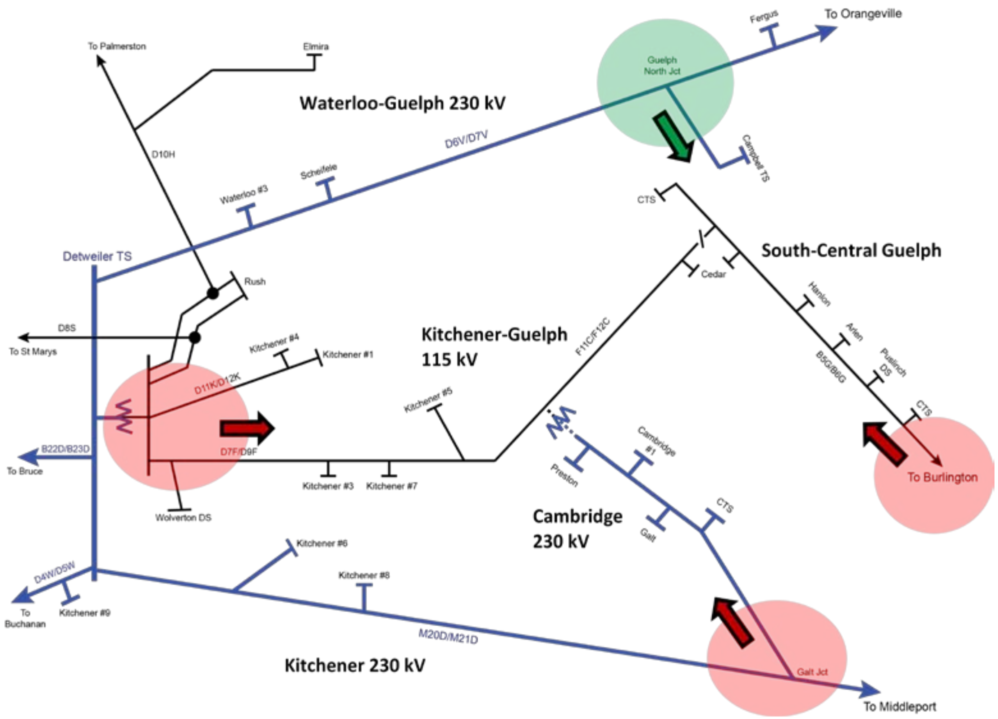
- all load lost in excess of 250 MW must be restored within half an hour;
- all load lost in excess of 150 MW must be restored within four hours; and finally
- all load lost in the area must be restored within eight hours.[7]

<u>Application of ORTAC Criteria</u>

Based on the application of the ORTAC criteria, three of the four sources of supply to the KWCG area (shown by the red circles in Figure 5) have reached, or are close to reaching, their load meeting capability. Additionally, a number of the subsystems are not meeting the service interruption criteria.

The following sections provide an overview of the capability of the existing KWCG transmission system and the need to increase supply capacity and to minimize the impact of supply interruptions to customers in the area.

Figure 5: Sources of Supply to the KWCG Area



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[7] ORTAC

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5.1 Need for Additional Supply Capacity

Over the next ten years, demand for electricity is expected to exceed the existing system's load meeting capability in the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems. Details of the needs in each of these three subsystems are explained below.

<u>South-Central Guelph 115 kV Subsystem</u>

Today, the double-circuit 115 kV transmission line (B5G/B6G) supplying South-Central Guelph from Burlington TS has a load meeting capability of approximately 100 MW. This limit is based on the voltage limitations of either the B5G or B6G circuit following the loss of the companion circuit. Based on the summer peak demand in the South-Central Guelph area, this supply capacity was exceeded in 2012 and is expected to remain beyond capacity over the next decade. Additional capacity is therefore required to meet current and growing electricity demand in the area. Until additional capacity is provided, operating measures (such as opening bus-tie breakers) will be required, resulting in a degradation of the level of supply security to the area.

<u>Kitchener-Guelph 115 kV Subsystem</u>

Today, the Kitchener-Guelph area is supplied by one double-circuit 115 kV transmission line (D7F/D9F and F11C/F12C) from Detweiler TS and supported by the existing 230/115 kV autotransformer at Preston TS. Following the loss of the D9F circuit, the remaining transmission supply to the area has a load meeting capability of approximately 260 MW depending on electricity demand in the surrounding area. This limit is based on thermal overloading of the D7F circuit from Detweiler TS. Based on the forecast electricity demand for the area, peak demand is expected to reach the 260 MW supply capacity limit in the summer of 2013. Additional capacity is therefore required to meet growing electricity demand in the area.

<u>Cambridge 230 kV Subsystem</u>

Today, the Cambridge area is supplied by one double-circuit 230 kV transmission line (the Preston Tap) tapped off of the main 230 kV transmission line (M20D/M21D) between Detweiler TS and Middleport TS. Following the loss of the M20D circuit, the companion circuit on the Preston Tap has a load meeting capability of approximately 375 MW. This limit is based on the thermal overloading of the M21D circuit between Galt Junction and Preston Junction in

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Cambridge. Based on the forecast electricity demand for the area, peak demand is expected to reach the 375 MW supply capacity limit in the summer of 2013. Additional capacity is therefore required to meet growing electricity demand in the area.

5.2 Need to Minimize the Impact of Supply Interruptions to Customers

In addition to the above capacity needs, based on current and forecast demand, two subsystems within the KWCG area, namely the Waterloo-Guelph and Kitchener and Cambridge subsystems, currently fail to comply with the ORTAC service interruption criteria. Additionally, over the medium-term, supply to both of these areas is expected to exceed the maximum 600 MW load interruption level for a major outage as prescribed by ORTAC.

Waterloo-Guelph 230 kV Subsystem

Today, the Waterloo-Guelph subsystem is supplied by an approximately 77 km double-circuit 230 kV transmission line (D6V/D7V) between Detweiler TS and Orangeville TS. In the event of the loss of both the D6V and D7V circuits, all load supplied by this transmission line (which exceeded 400 MW in 2012) will be interrupted. The existing system lacks the capability to restore power to these customers in accordance with the ORTAC criteria which specifies that all load interrupted over 250 MW must be restored within 30 minutes. A major outage of this type took place on February 29th, 2012 when a forced outage on one of the D6V/D7V circuits, coupled with scheduled maintenance on the companion circuit, resulted in the interruption of electricity supply for roughly three hours to approximately 350 MW of customers in parts of the cities of Waterloo, Kitchener and Guelph.

Additionally, over the medium-term (by 2022), demand supplied by the D6V/D7V circuits is expected to exceed 600 MW. Reinforcement will be required to ensure that following a major outage to the D6V/D7V circuits, supply to this large load pocket will, as required by ORTAC, remain uninterrupted.

Kitchener and Cambridge 230 kV Subsystem

Today, the Kitchener and Cambridge subsystem is supplied by an approximately 82 km double-circuit 230 kV transmission line (M20D/M21D) between Detweiler TS and Middleport TS, including the Preston Tap. In the event of the loss of both the M20D and M21D circuits, all load supplied by this transmission line (which was approximately 400 MW in 2012) will be interrupted. The existing 230/115 kV autotransformer and 230 kV disconnect switches at Preston TS allow power to be restored to only approximately 65 MW of demand within half an hour following a major outage. This is insufficient to meet the ORTAC criteria, which specifies that all load interrupted over 250 MW must be restored within 30 minutes. Prior to the installation of the autotransformer and disconnect switches at Preston TS, power could not be restored to any customers in the area in a timely manner. Such was the case in 2003 when the supply of power to parts of the City of Cambridge, the Township of North Dumfries and the City of Kitchener, totaling over 250 MW, was interrupted for nearly four hours.

Additionally, over the medium- term (by 2019), demand supplied by the M20D/M21D circuits is expected to exceed 600 MW. Reinforcement will be required to ensure that following a major outage to the M20D/M21D circuits, supply to this large load pocket will, as required by ORTAC, remain uninterrupted.

5.3 Summary of the Needs

The needs in the KWCG area identified above based on the application of the ORTAC are summarized in Table 2.

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Table 2: Summary of the Needs in the KWCG Area

Need Type	Subsystem	Need Description	Need Date
Capacity to Meet Demand	South-Central Guelph 115 kV	Loading on B5G/B6G exceeds load meeting capability	Now
	Kitchener-Guelph 115 kV	Loading on F11C/F12C exceeds load meeting capability	Now
	Cambridge 230 kV	Loading on M20D/M21D exceeds load meeting capability	Now
Minimize the Impact of Interruptions	Kitchener & Cambridge 230 kV	M20D/M21D does not comply with the ORTAC service interruption criteria	Restoration of load > 250 MW: Now Exceeds Max Allowable Load Loss of 600 MW: 2019
	Waterloo-Guelph 230 kV	D6V/D7V does not comply with the ORTAC service interruption criteria	Restoration of load > 250 MW: Now Exceeds Max Allowable Load Loss of 600 MW: 2022

6 Integrated Solutions to Address the Needs in the KWCG Area

In considering potential solutions for addressing the needs of the KWCG area, the OPA first considered conservation and distributed generation. These options reduce electricity demand and have the potential to negate or defer the need for investment in large-scale generation or transmission infrastructure. The OPA then considered large-scale generation or transmission infrastructure to meet any remaining needs in the area.

6.1 Conservation and Distributed Generation Options

6.1.1 Conservation

Conservation means reducing or shifting the consumption of and/or the demand for electricity. Such reductions or shifting help support the ability of the existing electricity system to meet growing electricity demand.

In February 2011, the Minister of Energy established conservation targets for Ontario over the next 20 years: 4,550 MW of peak demand reduction by 2015, increasing to 7,100 MW by 2030. Included in these targets is a peak demand reduction of 1,330 MW to be achieved by 2014 by Ontario's LDCs. These goals are aggressive, and large load centres, such as the KWCG area, are expected to be key contributors to ensuring Ontario's peak demand reduction targets can be met.

Based on an allocation of the provincial targets, nearly 270 MW in peak demand reduction is expected from conservation achievement within the KWCG area by 2023. Within the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems specifically, the planned peak demand reduction from conservation efforts by 2023 is over 130 MW. This planned conservation is expected to be achieved through a combination of peak demand savings resulting from province-wide conservation and demand management programs, improved building codes and equipment standards, and customer response to time-of-use pricing. These savings have an estimated delivery cost of $65 million, based on an allocation of forecast expenditures for provincial conservation programs. This planned conservation reduction is expected to off-set nearly 35% of the forecast load growth in these subsystems (on aggregate) between 2010 and 2023, and will contribute to meeting the KWCG area's capacity needs as shown in Table 4 below.

While conservation can be an effective means of addressing capacity needs, conservation cannot aid in the restoration of power to customers following a major transmission outage, and therefore cannot resolve the KWCG area's restoration needs.

Planned conservation efforts are important contributors to the reliable supply of electricity to the KWCG area, however further solutions will be needed to fully address the area's electricity needs; a capacity gap of nearly 70 MW remains in 2016, growing to nearly 200 MW by 2023, in

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the South-Central Guelph, Kitchener-Guelph, and Cambridge subsystems. Based on the OPA's experience with conservation programs, the amount of planned conservation forecasted for the region, and the immediate nature of the needs, it is the OPA's view that additional conservation is not a feasible means of addressing the KWCG area's near- and medium-term needs as shown in Table 4. The OPA will continue to monitor conservation program uptake and success in the KWCG area, and look for opportunities for further cost effective conservation to maintain a reliable supply of electricity to the area over the longer-term.

6.1.2 Distributed Generation

Distributed generation is small-scale generation sited close to load centres; as such, it helps supply local energy needs while at the same time contributing to meeting provincial demand. Along with other OPA procurement processes, the introduction of the Green Energy and Green Economy Act, and the associated development of the Feed-In Tariff (FIT) program, has encouraged the development of distributed generation resources in Ontario. These procurements take into consideration the system need for generation as well as cost.

Within the KWCG area, nearly 150 MW of distribution and transmission connected renewable generation has been contracted through the FIT program and previous procurements (such as the Renewable Standard Offer Program), and is expected to come into service by the summer of 2016. This generation is spread throughout the KWCG area, with the majority located in the area north of Elmira and around Fergus TS. Additionally, some small-scale generation, such as Combined Heat and Power, totaling nearly 10 MW of installed capacity is in operation in the region.

It should be noted that distributed generation resources are not always available at the time of system peak, in particular, intermittent renewable generation resources such as wind and solar. The full installed capacity of these facilities therefore cannot be relied upon to meet the KWCG area's electricity needs. The OPA estimates that the existing and contracted distributed generation resources in the KWCG area will contribute approximately 35 MW of effective

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capacity to meeting area peak demand.[8] Of this, approximately 1 MW of effective capacity is located within the South-Central Guelph subsystem, 1 MW in the Kitchener-Guelph subsystem, and 2 MW within the Cambridge subsystem, representing an estimated capital investment of approximately $70 million in these areas. This generation will contribute to addressing the KWCG area's capacity needs.

While distributed generation can be an effective means of meeting capacity needs, its ability to help minimize the impact of major outages to customers is limited. For example, the specific connection point of the facility, the technical design specifications of the generator, and safety protocols on the electricity system, can impact the ability of a distribution connected generator to restore power to customers following a major transmission outage.

The existing and contracted distributed generation resources in the KWCG area are important contributors to maintaining a reliable supply of electricity, however further solutions will be needed to fully address the area's electricity needs. It is the OPA's view that additional distributed generation is not a feasible means of addressing the KWCG area's near- and medium-term needs. There is uncertainty associated with the development of further distributed generation facilities. With regards to renewable generation facilities, there is uncertainty related to local development interest and contract awards under the ongoing FIT program, as well as the siting and connection of facilities at the specific location in which they are needed. For non-renewable distributed generation facilities there is risk associated with the availability of future procurements, as well as the siting and connection of facilities at the specific location in which they are needed. Additionally, it is the OPA's view that further distributed generation resources are not a cost effective means for addressing the needs of the KWCG area, due to the robust load growth anticipated in the region combined with the relatively low cost of the recommended transmission reinforcement discussed in section 6.3 below. Distributed generation may be an effective option to meet an area's needs when low load growth is anticipated and/or the cost of the alternative solutions is high in comparison. The OPA will continue to monitor the uptake of

[8] Effective capacity is that portion of installed capacity that contributes at the time of system peak.

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distributed generation in the KWCG area, and look for opportunities for further cost effective distributed generation to maintain a reliable supply of electricity to the area over the longer-term.

6.1.3 KWCG Area Electricity Demand Net of Conservation and Distributed Generation Resources, and Remaining Reliability Needs

Conservation and distributed generation resources are important contributors to the integrated solution for addressing the needs of the KWCG area. The net summer peak demand in the KWCG area, after taking into account the contributions of conservation and distributed generation resources, is shown in Table 3 below. Additionally, the portion of growth in summer peak electricity demand forecast for the KWCG area met by conservation and distributed generation is shown in Figure 6.

Table 3: Demand Forecast for the South-Central Guelph, Kitchener-Guelph, Cambridge, and Kitchener and Cambridge Subsystems Net of Conservation and Distributed Generation

(MW)	2010 Actual	2011 Actual	2012 Actual	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
South-Central Guelph 115 kV	99	117	112	123	129	132	136	140	144	148	153	155	157	159
Kitchener-Guelph 115 kV	244	262	254	257	254	255	264	263	263	263	274	275	277	280
Waterloo-Guelph 230 kV	436	433	425	448	448	450	451	455	466	477	482	489	516	526
Cambridge 230 kV	335	351	325	372	383	393	404	415	426	438	447	458	471	484
Kitchener and Cambridge 230 kV	442	442	401	480	491	504	506	519	532	546	548	561	576	592
Other Stations in the KWCG Area	184	190	211	199	199	199	201	203	205	206	209	212	196	199

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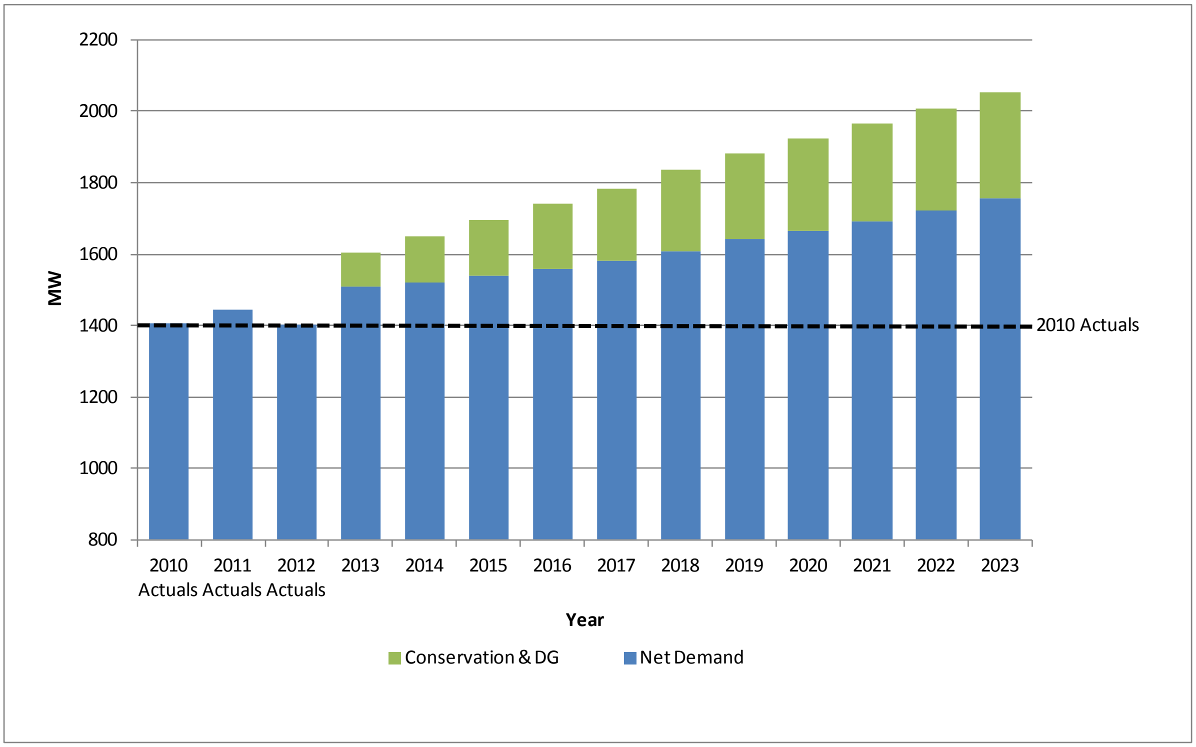
Figure 6: Forecasted Demand Growth in the KWCG Area met by Conservation and Distributed Generation Resources



Conservation and distributed generation resources alone are not sufficient to address the KWCG area's needs and will need to be supplemented by additional solutions. A summary of the remaining reliability needs in the area over the next ten years, after accounting for the contributions of conservation and distributed generation is provided in Table 4. This table also shows the contribution of conservation and distributed generation resources to deferring some of the near-term reliability needs of the KWCG area.

Table 4: Summary of the Needs in the KWCG Area after the Contribution of Conservation and Distributed Generation Resources

Need Type	Subsystem	Need Description	Before Conservation & DG	After Conservation & DG
Capacity to Meet Demand	South-Central Guelph 115 kV	Loading on B5G/B6G exceeds load meeting capability	Now	Now
	Kitchener-Guelph 115 kV	Loading on F11C/F12C exceeds load meeting capability	Now	2019 (deferment of 6 years)
	Cambridge 230 kV	Loading on M20D/M21D exceeds load meeting capability	Now	2014 (deferment of 1 year)
Minimize the Impact of Interruptions	Kitchener & Cambridge 230 kV	M20D/M21D does not comply with the ORTAC service interruption criteria	Restoration of load > 250 MW: Now Exceeds Max Allowable Load Loss of 600 MW: 2019	Restoration of load > 250 MW: Now Exceeds Max Allowable Load Loss of 600 MW: Longer-term
	Waterloo-Guelph 230 kV	D6V/D7V does not comply with the ORTAC service interruption criteria	Restoration of load > 250 MW: Now Exceeds Max Allowable Load Loss of 600 MW: 2022	Restoration of load > 250 MW: Now Exceeds Max Allowable Load Loss of 600 MW: Longer-term

6.2 Generation Options

As noted in Table 4, even after taking into consideration the contribution of conservation and distributed generation, three of the KWCG subsystems (the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems) already exceed or are expected to exceed their supply capacity within the next ten years. Additionally, two subsystems (the Kitchener and Cambridge, and Waterloo-Guelph subsystems), currently do not comply with the ORTAC service

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interruption criteria. The development of large-scale generation can be an effective solution for meeting these needs.

In the KWCG area, a large-scale gas-fired generator (e.g., 200 MW plus) can only be accommodated on the 230 kV transmission system. The optimum location to site such a facility would be in the Cambridge area near Preston TS (a less central location would necessitate added transmission reinforcement costs and/or provide shorter-lasting benefit). This generation facility would meet the capacity and restoration needs of the Cambridge, and Kitchener and Cambridge subsystems, but would not address the capacity needs of the South-Central Guelph and Kitchener-Guelph subsystems, nor the restoration needs of the Waterloo-Guelph subsystem. These remaining reliability needs would necessitate significant transmission upgrades, or the installation of additional large-scale generation facilities. It is the OPA's view that such an option is not cost effective when compared to the recommended transmission reinforcement discussed in section 6.3 below. Additionally, it could be challenging to site a large gas generation plant in the KWCG area within the time necessary to address the area's needs.

The 115 kV transmission system within the KWCG area could accommodate a smaller gas-fired generator, e.g. 100 MW, in size. The optimum location to site such generation would be near Cedar TS. A centralized location near Cedar TS could meet the near and medium-term capacity needs of the South-Central Guelph and Kitchener-Guelph subsystems, however, additional facilities would be required to address the near-term capacity and restoration needs of the Cambridge, and Kitchener and Cambridge, and Waterloo-Guelph subsystems. Given the centralized location of Cedar TS, it would be difficult be difficult to site such a facility. If a site other than Cedar TS was to be selected multiple gas-fired generation facilities would be required to meet the capacity needs of South-Central Guelph and Kitchener-Guelph subsystems. It is the OPA's view that smaller gas-fired generation is not cost effective when compared to the recommended transmission reinforcement discussed in section 6.3 below.

6.3 Transmission Options

Transmission reinforcements are a final option for addressing the remaining reliability needs of the KWCG area. Transmission options are discussed first in terms of their ability to meet the supply capacity needs of the KWCG area, followed by their ability to minimize the impact of

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supply interruptions to customers. It is important to note that given the highly integrated nature of the KWCG area transmission system, transmission options identified as addressing reliability needs in one of the KWCG subsystems may also contribute to addressing reliability needs of the neighbouring subsystems.

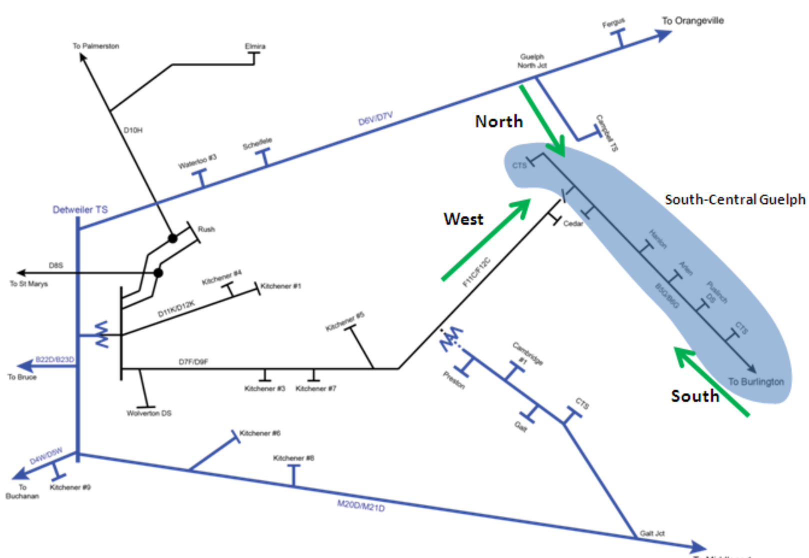
6.3.1 Transmission Options to Address Supply Capacity Needs

As noted in Table 4, three of the KWCG subsystems, namely the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems, already exceed or are expected to exceed their supply capacity. Transmission options for addressing these needs are discussed below.

Transmission Options for the South-Central Guelph Subsystem

The capacity needs of the South-Central Guelph subsystem can be addressed by reinforcing the transmission system from the West, South, or North as shown in Figure 7.

Figure 7: Transmission Reinforcement Options for South-Central Guelph



<u>Reinforcing supply from the South (Burlington TS)</u>

To improve the load meeting capability of the South-Central Guelph area, the existing 115 kV supply from Burlington TS could be reinforced. This could be accomplished by re-conductoring the existing B5G/B6G circuits (approximately 42 km in length) with a higher rated conductor (e.g. 1100 A), or by converting the existing B5G/B6G supply to 230 kV.

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Given the age and design of the existing 115 kV transmission supply to South-Central Guelph, Hydro One has determined that it would not be feasible to reconductor the existing B5G/B6G circuits; instead, a new line would have to be constructed. Rebuilding the existing transmission line at either 115 kV or 230 kV would be complex, requiring bypass facilities to maintain supply to the area during construction. It would also be relatively expensive (over $200 million) given the significant distance between Burlington TS and Guelph and the number of stations that would potentially require conversion. Accordingly, this alternative was not considered further for meeting the capacity needs of South-Central Guelph.

<u>Reinforcing supply from the West (Kitchener-Guelph Subsystem)</u>

Similar to reinforcing supply to South-Central Guelph from the South, the existing 115 kV supply to the Kitchener-Guelph subsystem (the D7F/D9F and F11C/F12C circuits from Detweiler TS) could be reinforced through reconductoring or rebuilding. Due to the age and design of the existing F11C/F12C circuits, however, Hydro One has determined that it would not be feasible to reconductor this transmission line. Therefore, reinforcement from the west would have to be achieved through rebuilding the existing 115 kV transmission line between Detweiler TS and CGE Junction (near Cedar TS) to a higher rated 115 kV or 230 kV facility and installing switching facilities at Cedar TS. Similar to the southern option, rebuilding this line would be complex, would require bypass facilities to maintain supply during construction, and would be expensive (over $130 million) given the significant distance between Detweiler TS and CGE Junction (approximately 33 km) and the number of stations that would potentially require conversion. Accordingly, this alternative was not considered further for meeting the capacity needs of South-Central Guelph.

<u>Reinforcing supply from the North (Waterloo-Guelph Subsystem)</u>

Finally, additional transmission facilities could be constructed to reinforce the transmission supply to South-Central Guelph from the north. Upgrading the existing 115 kV transmission line between Campbell TS and CGE Junction to a double-circuit 230 kV transmission line, installing two new 230/115 kV autotransformers and four new 115 kV circuit breakers at Cedar TS, and transferring an existing directly connected customer in the area to the distribution system, would bring the northern 230 kV supply into the heart of Guelph.

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At a cost of approximately $80 million, this alternative would provide a supply capacity increase sufficient to meet the needs of the South-Central Guelph area until beyond 2030, and could be completed by the end of 2015. While other options for reinforcing the transmission supply to South-Central Guelph from the north were considered (such as alternative switching arrangements, transferring a portion of the Cedar TS load to the 230 kV supply, and locating the two 230/115 kV autotransformers at a new site near Campbell TS), this option provides the greatest increase in supply capacity to South-Central Guelph, reduces the exposure of customers supplied by Cedar TS to supply outages, and provides better flexibility with respect to the end-of-life replacement of station equipment at both Cedar TS and Hanlon TS, which is anticipated to be required over the near- to medium-term. As noted below, it will also address the supply capacity needs of the Kitchener-Guelph subsystem. For these reasons, this is the preferred option for reinforcing the supply to South-Central Guelph.

The proposed system arrangement following the completion of recommended transmission reinforcement is shown in Figure 8.

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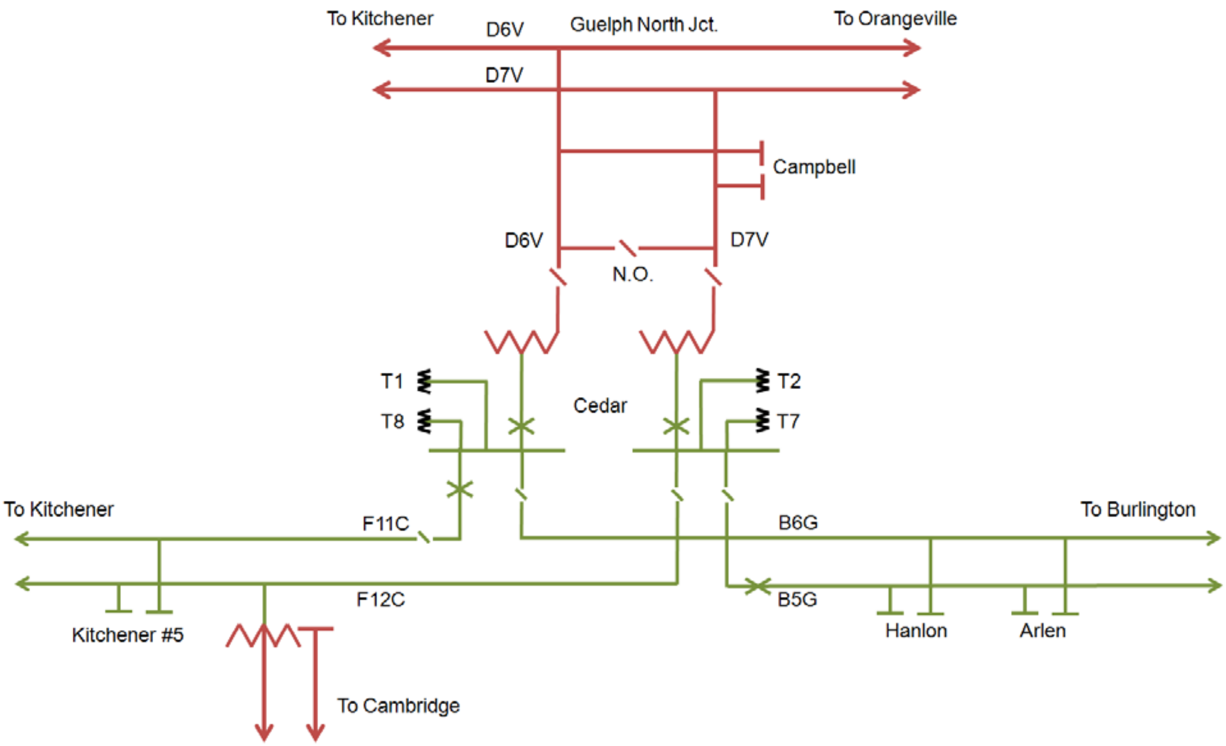
Figure 8: Proposed Arrangement for Reinforcing the Transmission Supply to South-Central Guelph from the North



Transmission Options for the Kitchener-Guelph Subsystem

The preferred solution for South-Central Guelph will make Cedar TS a strong source of supply within the KWCG area. In addition to addressing the capacity needs of South-Central Guelph, this strong source of supply will also be sufficient to satisfy the capacity needs of the Kitchener-Guelph subsystem until beyond 2030. Other alternatives to meet the capacity needs of the Kitchener-Guelph area (e.g. rebuilding of the existing 115 kV supply) would require incremental transmission investments, and are not recommended.

Transmission Options for the Cambridge Subsystem

The installation of a second 230/115 kV autotransformer at Preston TS and associated switching and reactive support, along with the preferred solution for South-Central Guelph, would result in improvements to the supply capacity of the Cambridge and Kitchener-Guelph areas. Following the installation of these facilities, sufficient capacity would exist on the Kitchener-Guelph 115 kV subsystem to accommodate the addition of a future Cambridge & North Dumfries Hydro

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station (approximately 100 MW in size). This would be sufficient to meet the capacity needs of the Cambridge area until the longer-term (2024), providing time to explore opportunities for further cost effective conservation and distributed generation, as well as transmission investments, such as voltage support and/or switching facilities. As further explained below, the addition of this second autotransformer will also partly address the supply restoration needs in the area. This work would be coordinated with the reinforcement of South-Central Guelph and could be completed by the end of 2015 at a cost of approximately $15 million to $25 million.

6.3.2 Preferred Option to Address Supply Capacity Needs

In summary, the preferred transmission options for addressing the near- and medium-term supply capacity needs of the KWCG area are:

- installing two new 230/115 kV autotransformers, four 115 kV breakers, and advancing the relocation of the existing Hydro One Distribution Operating Centre at Cedar TS ($52 million);
- rebuilding approximately 5 km of existing 115 kV transmission line between Campbell TS and CGE junction in Guelph with a double-circuit 230 kV transmission line, and transferring the existing directly connected customer in the area to the distribution system ($27.5 million); and
- installing a second 230/115 kV autotransformer at Preston TS and associated switching and reactive support ($15 million to $25 million).

Together, these improvements will at a total estimated cost of approximately $95 million to $105 million meet the capacity needs of the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems until 2024 or beyond.

6.3.3 Options to Reduce the Impact of Supply Interruptions

As noted in Table 4, two of the KWCG subsystems, namely the Waterloo-Guelph, and Kitchener and Cambridge subsystems, are unable to restore power to customers in the area within half an hour following a major outage as prescribed by the ORTAC service interruption criteria. Additionally, over the longer-term, demand in these two areas is expected to exceed the maximum 600 MW load interruption level prescribed by ORTAC.

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These supply interruption needs can be partly addressed through the foregoing recommended capacity improvements, and the remaining supply interruption need can be satisfied through the following two transmission options 1) the implementation of load transfers following an outage, and/or 2) the installation of switching facilities, such as mid-span openers, motorized disconnect switches or circuit breakers. These potential options are evaluated below.

Options for the Waterloo-Guelph Subsystem

Load Transfers

One method of reducing supply interruptions to customers in the Waterloo-Guelph subsystem is to execute load transfers at the distribution level following a major transmission outage. KWCG area LDCs have identified little to no transfer capability of the loads in the area, and given the length of the D6V/D7V transmission line (about 77 km) and the amount of load served (over 400 MW), a number of load transfers, likely spanning significant distances (e.g. nearly 30 km between Orangeville TS and Fergus TS), would have to be implemented after each major transmission outage. It is the OPA's view that implementation of this option in order to comply with the ORTAC interruption criteria is not technically feasible. Accordingly, this alternative was not considered further as a means of reducing the impact of supply interruptions to customers in the Waterloo-Guelph subsystem.

Mid-Span Openers

Alternatively, installing mid-span openers at Guelph North Junction in the Township of Centre Wellington would facilitate the sectionalization of the D6V/D7V 230 kV circuits. Following a major transmission outage, the mid-span openers could be manually opened to isolate sections of the circuits and thus improve the restoration capability of the Waterloo-Guelph subsystem. However, because the mid-span openers are manually actuated, restoration capability could only be improved within 4 to 8 hours, which is insufficient to meet the 30 minute ORTAC requirement for the Waterloo-Guelph subsystem. For this reason, mid-span openers were not considered further as a means of reducing the impact of supply interruptions to customers in the Waterloo-Guelph area.

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Motorized Disconnect Switches

The installation of motorized disconnect switches at Guelph North Junction could also be used to facilitate the sectionalization of the D6V/D7V 230 kV circuits. These motorized switches could be operated remotely so that following a major transmission outage, load lost in excess of 250 MW in the Waterloo-Guelph area could be restored within 30 minutes. The estimated cost of this alternative is approximately $9 million to $12 million. While these facilities would address the near-term requirement for improved restoration capability, they would not address the longer-term need to prevent the interruption of demand in excess of 600 MW. To address this need, the installation of two 230 kV circuit breakers would be required in the longer-term at a cost of approximately $6 million to $15 million depending on the initial switching facilities installed. For the reasons noted below, this option was not preferred to installing new 230 kV circuit breakers at Guelph North Junction by 2015.

Circuit Breakers

Alternatively, two 230 kV circuit breakers could be installed at a new station (Inverhaugh SS) located at Guelph North Junction to facilitate sectionalization of the D6V/D7V circuits. The estimated cost of installing these breakers is approximately $16 million. This is roughly equivalent to the cost of installing motorized disconnect switches today and breakers in the longer-term. Compared to motorized disconnect switches, circuit breakers would reduce the exposure of customers in the area to supply outages by breaking the D6V/D7V circuits into three shorter sections (ranging from approximately 12 km to 35 km in length, compared to 77 km today). Circuit breakers also have a faster response time than motorized disconnect switches and would reduce the amount of time customers in the area would be without power following a major transmission outage. Finally, these facilities would address the future need to prevent the interruption of supply to customers in the area when demand on the D6V/D7V circuits exceeds 600 MW. For these reasons, the installation of two circuit breakers is the preferred option for reducing the impact of supply interruptions to customers in the Waterloo-Guelph subsystem. The proposed system arrangement after the installation of these breakers is shown in Figure 9.

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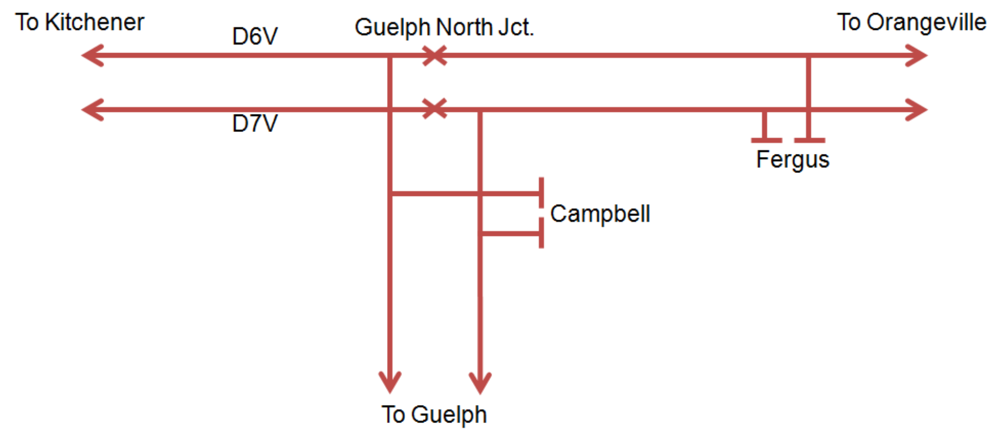
Figure 9: Proposed Transmission System Configuration after the Installation of two 230 kV Circuit Breakers at Guelph North Junction



These facilities, along with the refurbishment of the existing transmission line between Campbell TS and CGE Junction, and the installation of two 230/115 kV autotransformers and four 115 kV in-line breakers at Cedar TS, are referred to as the Guelph Area Transmission Refurbishment project, or GATR project.

Kitchener and Cambridge Subsystem

The preferred transmission reinforcements for meeting the capacity needs of the KWCG area would also increase the capability of the Kitchener and Cambridge subsystem to minimize the impact of major outages to customers in the area. With these reinforcements, the transmission system will have the capability to restore approximately 100 MW of load in the Cambridge area within 30 minutes. Additionally, approximately 100 MW of Cambridge area load will no longer be interrupted following the loss of the M20D/M21D circuits. This represents a significant improvement to the capability of the transmission system to minimize the impact of supply interruptions to customers, and is the preferred solution for contributing to meeting the restoration needs of the Kitchener and Cambridge area. This solution also defers the potential interruption of load in excess of 600 MW in the Kitchener and Cambridge area well into the longer-term.

The potential for further improvements to minimize the impact of major outages to customers in the Kitchener and Cambridge area will be investigated along with longer-term reliability planning for the region. Opportunities for further cost effective conservation and distributed

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generation, as well as other investments, such as voltage support and/or switching facilities, will be investigated.

6.3.4 Preferred Options to Reduce the Impact of Supply Interruptions

In summary, the preferred options to reduce the impact of supply interruptions to customers in the KWCG area are to install two 230 kV circuit breakers at a new station located at Guelph North Junction (at an approximate cost of $16 million) and to install a second 230/115 kV autotransformer at Preston TS and associated switching and reactive support (contingent on the development of the preferred capacity improvements in South-Central Guelph). The estimated cost of a second autotransformer at Preston TS (approximately $15 million to $25 million) is included in the overall estimated costs (approximately $95 million to $105 million) for the recommended capacity improvements. The potential for further improvements to minimize the impact of major outages to customers in the Kitchener and Cambridge area will be investigated along with longer-term reliability planning for the region.

7 Recommended Integrated Solution for the KWCG Area

The recommended solution for the needs of KWCG area is an integrated package composed of 1) conservation, 2) distributed generation resources, and 3) transmission reinforcements in the KWCG area (specifically the GATR project, and the installation of a second 230/115 kV autotransformer at Preston TS and associated switching and reactive support).

Together, conservation and distributed generation resources are expected to off-set more than 35% of the forecast load growth in the South-Central Guelph, Kitchener-Guelph and Cambridge subsystems between 2010 and 2023. These resources help to meet the existing reliability needs of the KWCG area, and also help to defer the need for longer-term investments in the region.

Transmission reinforcements are the final components of the integrated plan for the KWCG area. The total estimated cost of the transmission investments included in the integrated solution is approximately $110 million to $120 million: approximately $95 million for the GATR project, and approximately $15 million to $25 million for the installation of a second 230/115 kV autotransformer at Preston TS and associated switching and reactive support. Project completion

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is expected by the end of 2015, with development of the Preston TS autotransformer facilities being coordinated with completion of the GATR project.

It is the OPA's view that these facilities are a cost-effective and technically-effective solution for improving the supply capacity of the South-Central Guelph, Kitchener-Guelph, and Cambridge subsystems, and for reducing the impact of supply interruptions in Waterloo-Guelph, and Kitchener and Cambridge subsystems. Through longer-term planning for the KWCG area, opportunities for further cost effective conservation and distributed generation, as well as transmission investments will be investigated. Monitoring of growth in electricity demand and the achievement of conservation and distributed generation in the KWCG area, will also be key components of ongoing electricity planning in the region.

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DESCRIPTION OF PROPOSED FACILITIES

1.0 PROPOSED FACILITIES

The Hydro One proposed Guelph Area Transmission Refurbishment (**"GATR"**) project will contribute to meeting the capacity needs of the KWCG area as well as minimize the impact of supply interruptions to customers in the area.

Maps indicating the geographic location and schematic diagrams of the proposed facilities are provided in **Exhibit B, Tab 2, Schedule 2** and **Exhibit B, Tab 2, Schedule 3,** respectively. Illustrations of the transmission towers along this corridor are provided in **Exhibit B, Tab 2, Schedule 4**. The IESO's Draft System Impact Assessment ("**SIA**") is filed in **Exhibit B, Tab 6, Schedule 3**. The Customer Impact Assessment ("**CIA**"), a report outlining the effects of connecting 115 kV circuits B5G/B6G to 230 kV circuits D6V/D7V via two autotransformers T3 and T4 at Cedar TS on neighboring customers, will be filed in late March as **Exhibit B, Tab 6, Schedule 4**.

The proposed upgrade is consistent with the scope identified in the OPA's letter dated October 10, 2012 (see **Exhibit B, Tab 1, Schedule 4, Attachment 2**). The need for the proposed upgrade is described in **Exhibit B, Tab 1, Schedules 4 and 5**.

This application is seeking OEB approval for the following upgrade work on Hydro One's existing transmission line facilities:

- Upgrade approximately 5 km of the existing 115 kV double-circuit transmission line B5G/B6G between CGE Junction and Campbell TS to a 230 kV double-circuit transmission line that is capable of a higher thermal capacity;
- Replace approximately 2 km of Optic Ground Wire ("OPGW") conductor on the existing 230 kV structures between Cedar TS and CGE Junction.

The proposed line facilities are subject to section 92 approval.

In conjunction with the line upgrade work, Hydro One will also complete the following station work:

- Install two new 230/115 kV autotransformers at the existing Cedar Transformer Station (**"TS"**) in the City of Guelph;
- Install four 115 kV circuit breakers at Cedar TS to ensure security of the IESO-controlled grid for a variety of fault and operating scenarios; and
- Upgrade the existing Guelph North Junction in the Township of Centre Wellington to a switching station by installing two 230 kV breakers and associated equipment.

This line upgrade and station work will contribute to addressing the near - and medium-term needs in the KWCG area. Through longer-term planning for the KWCG area, opportunities for further cost effective conservation and distributed generation, as well as transmission investments will be investigated.

2.0 DETAILS OF THE PROPOSED FACILITIES

2.1 Line Work

Approximately 5 km of an existing 115 kV transmission line (B5G/B6G) between CGE Junction and Campbell TS will have to be replaced with a double circuit 230 kV line to address the supply needs in the KWCG area. The transmission line passes through the City of Guelph. A map of the proposed transmission line facilities is provided in **Exhibit B, Tab 2, Schedule 2**.

An existing customer owned station directly connected to the 115 kV B5G/B6G circuits will need to be disconnected from Hydro One's transmission system and reconnected to

Guelph Hydro Electric System's distribution system at Campbell TS in order to maintain supply to the customer.

Cedar TS to CGE Jct

The line section from Cedar TS to CGE Jct can currently operate at 230 kV (with existing 230 kV towers and conductors), therefore, only the grounding conductor (skywire) in this section needs to be replaced with Optic Ground Wire (**"OPGW"**) conductor which will allow for grounding and communication.

CGE Jct to ABB Jct

The line section from CGE Jct to ABB Jct is designed for 115 kV operation and needs to be rebuilt to 230 kV voltage level. This section was built in 1953. The 3.8 km existing double circuit 115 kV line on double wood pole structures from CGE Jct to ABB Jct consists of 35 wood poles and 1 steel tower. 26 out of 35 wood pole structures are 59 years old, exceeding the expected life of 50 years for wood poles. The other 9 wood poles were replaced in 2002. The wood poles in this section will be removed and replaced with double circuit 230 kV steel structures, conductors and accessories.

As per Hydro One's policy on the use of steel pole structures in residential areas it is recommended to install steel *pole* structures (instead of the standard steel *lattice* structures) in residential areas, where it is technically feasible and where such a preference has been indicated. Therefore, as requested by residents in the Deerpath Drive community and by staff from the City of Guelph's Planning, Building, Engineering and Environment group, steel poles are recommended for use in current residential areas on this line section, where possible. This includes approximately 1.9 km of line from the railway just north of the Speed River, to just south of Willow Road. A map indicating the geographic location of the proposed steel poles is provided in **Exhibit B, Tab 2, Schedule 1, Attachment 1.** Steel lattice structures are recommended for use on the remainder of the line section to be refurbished and in locations where steel poles are not technically feasible (e.g. locations where there is an angle in the line, such as structures on either side of the line crossing over the Hanlon Parkway).

ABB Jct to Campbell TS

The line section from ABB Jct to Campbell TS is designed for 115 kV operation and needs to be rebuilt to 230 kV voltage level. This section was built in 1964 and is presently idle. The line section from ABB Jct to Campbell TS consists of 4 steel towers. This section will also be removed and replaced with double circuit 230 kV steel structures, conductors and accessories. One OPGW conductor will be installed from CGE Jct to Campbell TS.

2.2 Station Work

The GATR project requires work to be completed at Cedar TS and the planned Guelph North Junction Switching Station.

Cedar TS

Cedar TS in the City of Guelph is currently supplied from Burlington TS via the double circuit 115 kV line B5G/B6G (T7 and T6 step-down transformers) and from Detweiler TS (T1 and T2 step-down transformers) via the double circuit 115 kV line F11C/F12C. At Cedar TS, Hydro One plans to:

- Install two new 230/115 kV autotransformers and associated electrical equipment allowing for supply at 230 kV from circuits D6V/D7V via the Campbell tap;
- Install four 115 kV circuit breakers to connect the existing 115 kV circuits, F11C, F12C, B5G and B6G, existing stop-down transformers, T1, T2, T7 and T8, and the two new 230/115 kV autotransformers, T3 and T4, and ensure that adequate transmission supply capability is maintained following the loss of any one of the existing transmission lines without interrupting customers.

The installation of the new breakers would close the normally open point between the circuits, thus the D6V/D7V 230 kV system would be connected to the B5G/B6G 115 kV and F11C/F12C 115 kV systems reinforcing the supply to both South-Central Guelph and Kitchener- Guelph.

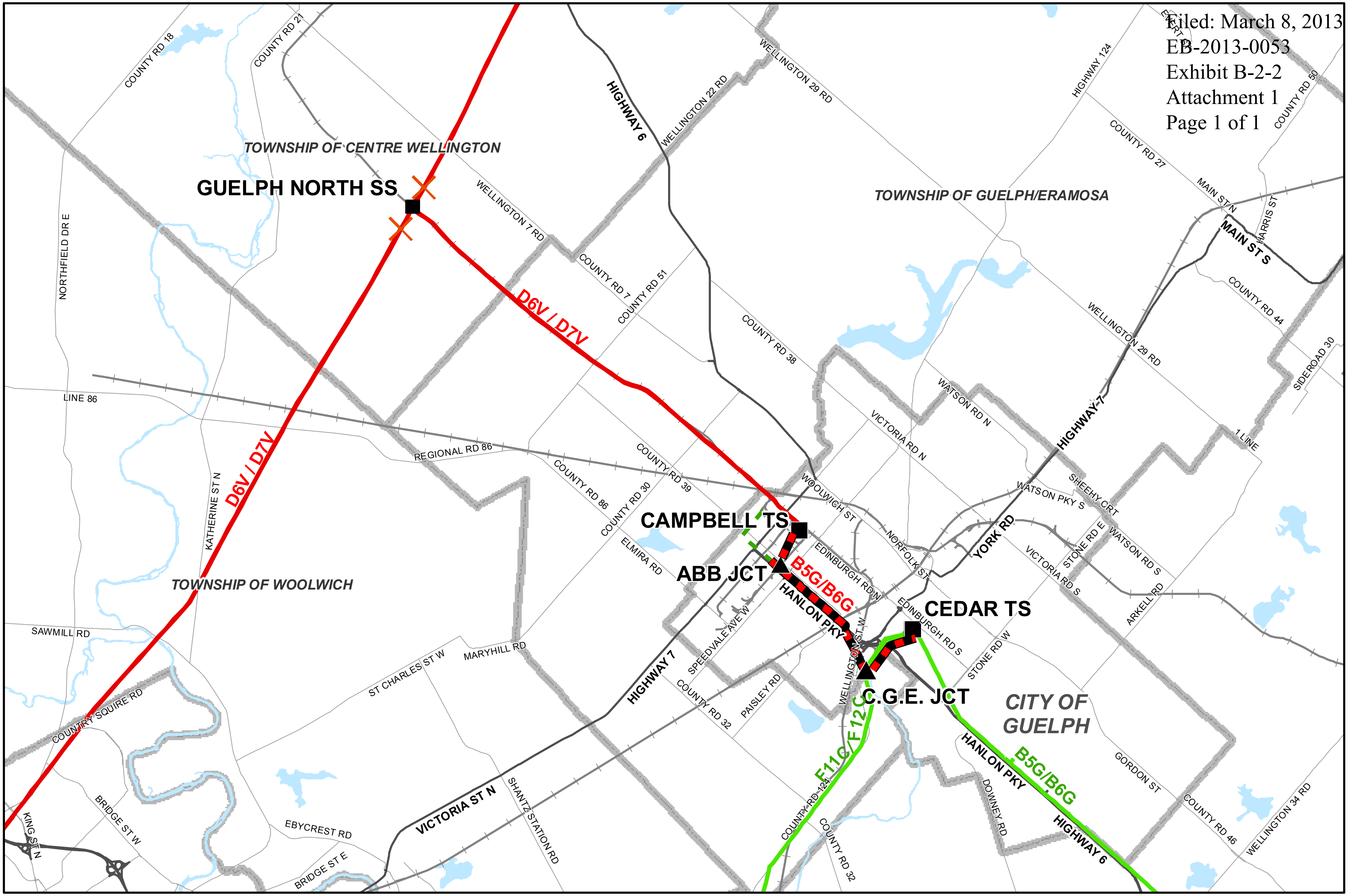
Upon completion, Cedar TS will become a strong source of supply within the KWCG area. By augmenting the existing Burlington TS 115 kV supply to Cedar TS, Hanlon TS and Arlen MTS through the installation of autotransformers connecting the existing 115 kV circuits B5G/B6G to the 230 kV D 6V/D7V circuit from Orangeville TS and Detweiler TS, the GATR project will provide sufficient incremental supply capacity to meet the needs of South-Central Guelph.

Guelph North Junction SS

The existing Guelph North Jct is located in the County of Wellington, in the Township of Centre Wellington, just north of Sideroad 10 a nd west of 2nd Line East. The double circuit 230 kV transmission line (D6V/D7V) between Detweiler TS in Kitchener and Orangeville TS is tapped to Campbell TS. With the proposed 230 kV line upgrade and autotransformers at Cedar TS the B5G/B6G 115 kV and F11C/F12C 115 kV systems will be connected to D6V/D7V, hence reinforcing the supply to both South-Central Guelph and Kitchener-Guelph.

In order to reduce the impact of supply interruptions to customers in the KWCG area, Guelph North Jct is proposed to be upgraded by building a Switching Station (SS) and installing two 230 kV circuit breakers and associated station facilities. The existing tap to Campbell TS will connect to the upgraded transmission line section from Campbell TS to Cedar TS to provide supply to Cedar TS, Hanlon TS and Arlen MTS from D6V/D7V. Adding the current and future load on D6V/D7V requires upgrading the junction to a SS to meet customer supply reliability requirements. Access to the new SS would be from Sideroad 10. Guelph North Junction SS was recently renamed to Inverhaugh SS.

Map of Proposed Facilities



Date: Oct 12, 2012
Produced By: Inergi LP, GIS Services
Map08-46_GATR_ExistingFacilities_v3

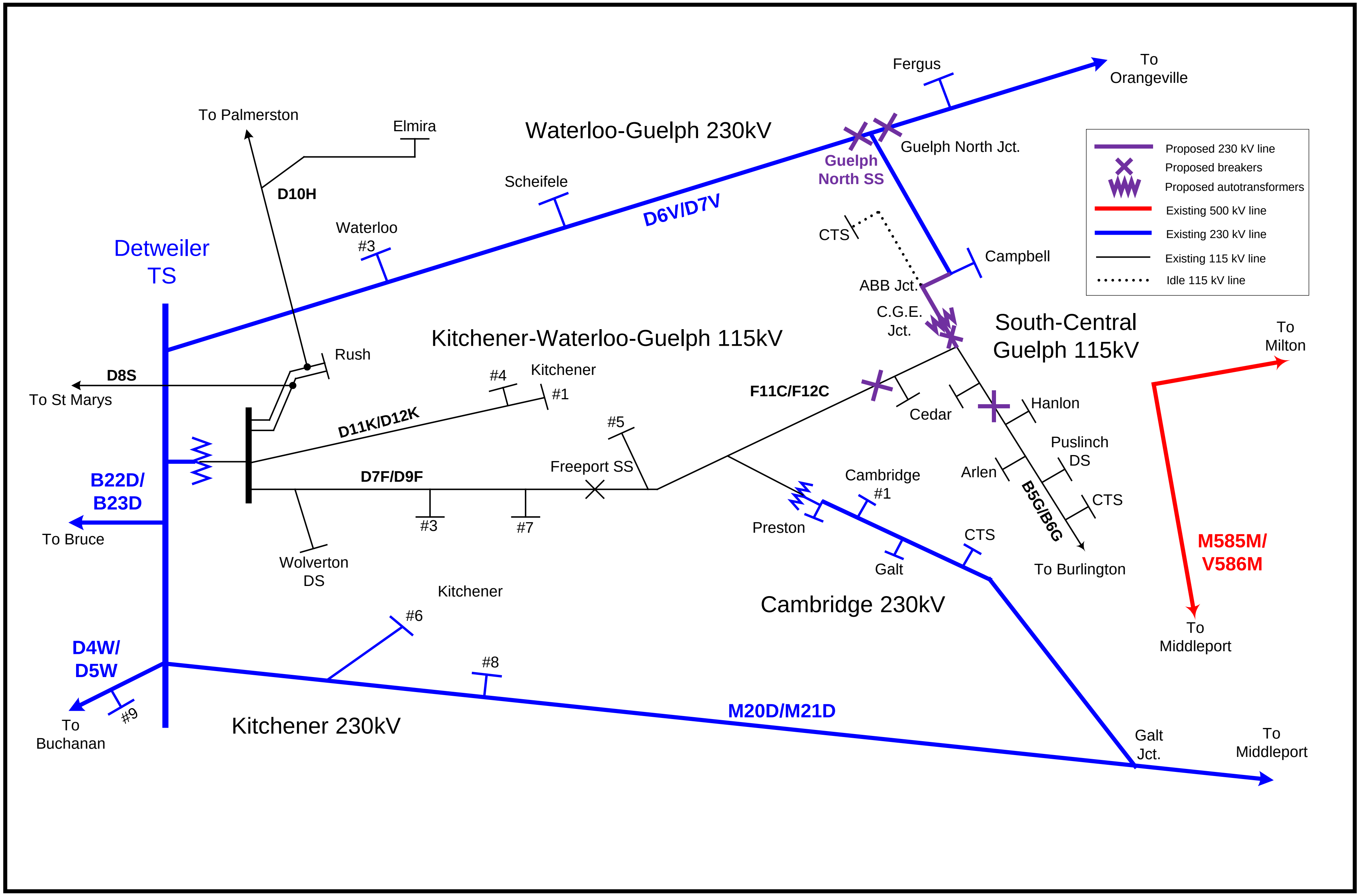
- Transformer and Switching Stations
- Junctions
- 230 kV Breakers
- Municipal Boundary
- 230kV Upgraded Transmission Line
- 230 kV Existing Transmission Line
- Decommissioned 115 kV Transmission Line
- 115 kV Existing Transmission Line
- Major Highways
- Roads
- Railway
- Water

Guelph Area Transmission Refurbishment - Proposed Facilities

1:125,000

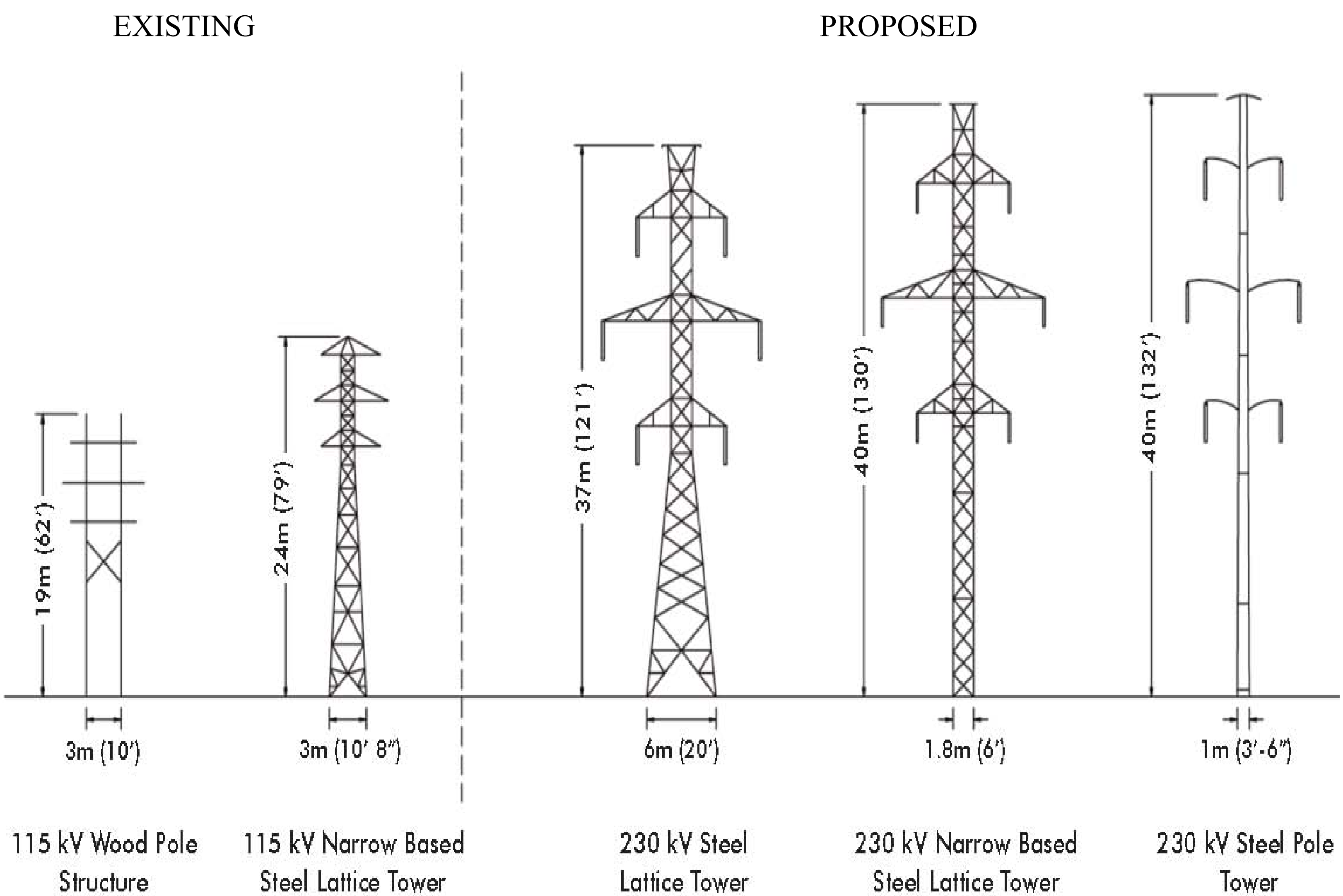
0 2.5 5 km

SCHEMATIC DIAGRAM OF PROPOSED FACILITIES


To Orangeville
Fergus
To Palmerston
Elmira
Waterloo-Guelph 230kV
Guelph North SS
Guelph North Jct.
Proposed 230 kV line
Proposed breakers
Proposed autotransformers
Existing 500 kV line
Existing 230 kV line
Existing 115 kV line
Idle 115 kV line
Scheifele
D10H
D6V/D7V
Waterloo #3
Detweiler TS
CTS
Campbell
ABB Jct.
C.G.E. Jct.
South-Central Guelph 115kV
To Milton
Kitchener-Waterloo-Guelph 115kV
Rush
D8S
To St Marys
#4
Kitchener
#1
F11C/F12C
Hanlon
Cedar
D11K/D12K
#5
Puslinch DS
B22D/ B23D
Freeport SS
Arlen
D7F/D9F
Cambridge #1
CTS
B5G/B6G
To Bruce
#3
#7
Preston
CTS
M585M/ V586M
Wolverton DS
Galt
To Burlington
Kitchener
Cambridge 230kV
#6
To Middleport
D4W/ D5W
#8
M20D/M21D
#9
To Buchanan
Kitchener 230kV
Galt Jct.
To Middleport

CROSS SECTION OF THE TOWER TYPES EXISTING AND PROPOSED

CROSS SECTION OF TOWER TYPES



ALTERNATIVES CONSIDERED

For information on Alternatives Considered, please see OPA's evidence filed as **Exhibit B, Tab 1, Schedule 5**.

PROJECT COSTS, ECONOMICS, AND OTHER PUBLIC INTEREST CONSIDERATIONS

This set of exhibits describes the costs of the proposed facilities and the economics of the project including the economic feasibility, rate impacts, and benefits to Ontario electricity consumers. Other public interest considerations are also discussed.

Under the *OEB Act, 1998,* "public interest" is defined to mean the interest of consumers with respect to price and the reliability and quality of electricity service, and where applicable in a manner consistent with the policies of the Government of Ontario, the promotion of the use of renewable energy sources. C onsumers, as defined by the Transmission System Code, are persons using, for their own consumption, electricity that they did not generate and whose facilities are connected to a transmission system.

PROJECT COSTS

The estimated capital cost of the GATR project, including overheads and capitalized interest is shown below:

Table 1
Cost of Upgrade Line Work

	Estimated Cost ($000's)
Planning & Estimating	$1,900
Line Protection Facilities	450
Property [1]	6,600
Project Management	663
Engineering	361
Procurement	5,720
Construction	4,424
Removals	1,167
Contingencies[2]	2,600
Costs before Overhead and AFUDC	**$23,885**
Overhead [3]	2,456
Capitalized Interest [4]	1,196
Total Line Work	**$27,537**

[1] Property includes costs for temporary rights along the ROW.

[2] Contingencies also include contingency on removal costs of $270K

[3] Overhead costs allocated to the project are for asset management and corporate services costs. These costs are charged to capital projects through a standard overhead capitalization rate. As such they are considered "Indirect Overheads". Hydro One does not allocate any project activity to "Direct Overheads" but rather charges all other costs directly to the project.

[4] Capitalized interest is calculated using Hydro One's embedded cost of debt used to finance capital expenditures. The capitalized interest rate used represents the effective rate of Hydro One's forecast average debt portfolio during the year.

The cost of the upgrade line work provided above allows for the schedule of approval, design and construction activities provided in **Exhibit B, Tab 5, Schedule 2**.

The estimated cost of associated station work at Cedar TS and the estimated cost to upgrade Guelph North Junction to a switching station and associated station work is $60.5 million (see **Exhibit B, Tab 2, Schedule 1** for a description of work). In addition to the above costs, there is an additional $7.4 million that has been attributed to the project for advancement costs related to the relocation of the existing Hydro One Distribution Operating Centre at Cedar TS. This relocation, which was not scheduled to occur until approximately 10 years in the future, is required to allow the station to be reconfigured in order to accommodate the new equipment. As the costs to relocate will be incurred by Hydro One Distribution, they have not been included in the transmission-related costs for the Project. However, in recognition of the fact that the GATR project triggers the need for the relocation, the advancement costs have been included in the project's economic evaluation (**Exhibit B, Tab 4, Schedule 3**), and considered in the analysis of alternatives carried out by the OPA (**Exhibit B, Tab 1, Schedule 5**).

1.0 RISKS AND CONTINGENCIES

As with most projects, there is some risk associated with estimating costs. Hydro One's cost estimate includes an allowance for contingencies in recognition of these risks.

Based on past experience, the estimate for this project work includes allowances in the contingencies to cover the following potential risks:

- Cancellation or delays in obtaining required power and telecommunications system outages (needed for the line upgrade work and commissioning activities);
- Construction equipment failures;
- Material delivery delay due to procurement or vendor issues;

- Activities or materials of a minor nature, not included in the estimate preparation;
- Labour hours deviating from the estimate.

Cost contingencies that have not been included, due to the unlikelihood or uncertainty of occurrence, include:

- Need for a temporary bypass circuit, as Hydro One plans to have the existing B5G/B6G customer's load transferred prior to the start of construction;
- Labour disputes;
- Delays in obtaining regulatory approvals, permits and licences;
- Delays in property rights acquisitions;
- Safety or environmental incidents;
- Unexpected First Nations/Metis interests;
- Significant changes in costs of materials since the estimate preparation;
- Changes to the project plan arising from unforeseen EA conditions of approval.

2.0 COSTS OF COMPARABLE PROJECTS

The OEB Filing Requirements for Electricity Transmission and Distribution Applications (EB-2006-0170), Chapter 4, r equires the applicant to provide a cost comparable project constructed by the applicant. Table 2 be low shows the cost, construction and technical comparison of the GATR project to the Southern Georgian Bay Transmission Reinforcement project (EB-2006-0242).

The GATR project is composed of upgrades to transmission line sections in the area of the City of Guelph. The upgraded line would extend the existing 230 kV D6V/D7V line tap from Guelph Campbell TS to Guelph Cedar TS.

Between these two stations the upgraded line passes through two junctions. The section between Campbell TS and ABB Junction is approximately 1 km in length, and is currently idle. Originally this was a line tap of the B5G/B6G circuits to supply Campbell TS. The line section utilizes narrow-based steel lattice towers, typically 90 feet tall, along the road allowance and wood pole structures along a commercial property. The towers, which date back to the mid-1950's, will be replaced with similar narrow-based 230 kV steel lattice towers, typically 120 to 140 feet tall.

The ABB Junction to CGE Junction is a section of the B5G/B6G transmission line which now only supplies a single customer at 115 kV and is approximately 4 km in length. The existing line will be replaced with steel lattice towers and solid steel pole structures, typically 120 to 140 feet tall. A permanent replacement supply to the customer will be provided from the local distribution utility prior to dismantling the existing line. The costs applicable to Hydro One are included in the project costs.

The existing section of the B5G/B6G line from CGE Junction to Cedar TS, approximately 2 km, is already built for 230 kV operation.

For the purpose of context, Hydro One recently placed in-service a 230 kV transmission line replacement of a 115 kV wood pole line between Essa TS and Stayner TS, the Southern Georgian Bay Transmission Reinforcement Project (EB-2006-0242). Key project information on the two projects is provided in Table 2.

The total cost per km is based on the comparable costs of the two projects. The main drivers of the variance in compable costs are:

- the CGE Jct to Campbell TS is only 5 km in length versus the 27 km length of the Southern Georgian Bay Project. This results in higher construction and project management costs on a per km. basis as the fixed costs are recovered over a shorter distance;

- the Southern Georgian Bay Project only included costs for an update to an Environmental Study Report conducted in 1991, whereas the GATR project required a more in-depth Class EA study including extensive public consultation;
- Southern Georgain Bay project costs were incurred over the 2006 to 2008 period as compared to GATR project costs which reflect costs for the period 2012 to 2015. Significant increases in material and equipment prices occurred over the intervening period.

Table 2
Costs of Comparable Projects

Project	**CGE Jct to Campbell TS (estimate)**	**Southern Georgian Bay TX Reinforcement Project (actual)**
Technical	230 kV double circuits on single structures Generally replace wood poles with steel poles, and lattice tower structures	230 kV double circuits on single structures Generally replace single circuit 115 kV wood pole line with steel pole and lattice tower structures
Length (km)	5 km	27 km
Project Surroundings	Mostly urban residential & commercial	Mostly rural & urban residential
Environmental Issues		Poor soil conditions required a few tower foundations to be changed to pad and pier or piled type foundations
In-Service Date	2015-12-31	2008-10-30
Total Project Cost	$27,537k	$42,960K
Less: Non-Comparable Costs		
Property[1,2]	$8,646k	$600k
Line Protections[1, 3]	$590k	$0
Planning & Estimating[1]	$1,900k	$0
Total Comparable Project Costs	$16,401k	$42,360k
Total Cost/km	$3.3M/km	$1.6M/km

[1] Associated Contingency, Overhead & capitalized interest are included

[2] GATR requires acquisition of approximately eleven property rights whereas only two properties were purchased for EB-2006-0242

[3] Protection costs for EB-2006-0242 included in stations costs

PROJECT ECONOMICS

1.0 ECONOMIC FEASIBILITY

The proposed transmission upgrade work for the Guelph Area Transmission Refurbishment ("**GATR**") Project comprises line assets and related station assets, both of which are proposed to be included in the Network pool for cost classification purposes, with no capital contribution required. See **Exhibit B, Tab 2, Schedule 1**, for information on the proposed work.

A 25-year illustrative discounted cash flow analysis, which includes both the line and station work, is provided in Table 1 below. The results show that based on the estimated initial cost of $88.1[1] million (line upgrade and the associated station facilities), plus assumed ongoing operating and maintenance costs and net of incremental revenue, the transmission refurbishment project will have a negative net present value of $68.5 million with a profitability index ("**PI**") of 0.2. An additional cost of $7.4 million is attributable to the Hydro One Distribution advancement costs described in **Exhibit B, Tab 4, Schedule 2** that are triggered by the GATR project. Hence total project NPV is negative $74.8 million.

2.0 COST RESPONSIBILITY

<u>Network Pool</u>

The existing 115 kV line facilities and associated stations that are being refurbished under the GATR project are currently classified as Line Connection assets. The new 230 kV facilities resulting from the GATR project will provide enhanced interconnection

[1] Initial costs of $88.1 million include $86.8 million of up front capital costs plus $1.3 million cost of removals

capability and reliability among the KWCG sub-systems (as described in **Exhibit B, Tab 1, Schedule 1**). As such, the GATR facilities will perform a network function and for that reason they are proposed to be classified as Network assets. Classifying the new assets as Network pool is also consistent with the concept of "local loops", as determined in a previous decision of the Board (EB-2006-0501). It also follows the general direction in the Board's *"Renewed Regional Planning Framework for Electricity Distributors: A Performance-Based Approach"* ("**RRFE**") report, released on October 18, 2012.

In the RRFE report, the Board concluded that "the redefinition of certain line connection assets in a manner that better reflects the function that each asset performs will facilitate the implementation of regional infrastructure planning[2]". The GATR Project changes the function that the existing line connection assets perform to a network function that provides network benefits.

As noted above, the GATR project establishes a new independent network path and local loop between three Network stations, Burlington TS, Detweiler TS and Orangeville TS. This 'loop' will facilitate the flow of electricity in a more efficient manner by allowing for an optimal sharing of electricity flow over all of the available facilities;

With respect to network classification, the proposed station work associated with the GATR project is to install 115/230 kV autotransformers and associated equipment at Cedar TS. The RRFE report identifies that "all 115/230 kV auto-transformers and the associated switchgear should consistently be defined as network assets…[as the] use of autotransformers is seen as a means to optimize use of the transmission system as a whole in accommodating new loads safely and reliably and, most of all, in a timely manner[3]".

---

[2] Report of the Board - Renewed Regulatory Framework for Electricity Distributors: A Performance-Based Approach, issued October 18, 2012, page 44
[3] IBID, page 45

As noted in the OPA's evidence (**Exhibit B, Tab 1, Schedule 5**, page 24), "given the highly integrated nature of the KWCG area transmission subsystem, transmission options identified as addressing reliability needs in one of the KWCG subsystems may also contribute to addressing reliability needs of the neighbouring systems." The broader sharing of benefits among the KWCG area is consistent with the definition of network assets under consideration in the RRFE position.

In addition to the above, the cost responsibility proposed in the GATR project is consistent with the approach approved by the Board in a recent similar project, EB-2009-0079 (Woodstock East) involving connection pool assets, where reliability was a key driver. It is also consistent with the findings in EB-2004-0436 (John x Esplanade), where the Board approved the project as part of network facilities for cost responsibility purposes, in recognition of the project's network-like benefits.

For all of the above reasons, the project costs have been Network-pooled with no capital contribution required.

3.0 RATE IMPACT ASSESSMENT

The analysis of the network pool rate impacts has been carried out on the basis of Hydro One's transmission revenue requirement for the year 2013, and the most recently approved Ontario Transmission Rate Schedules. The line connection pool and transformation connection pool revenue requirements would be unaffected by the new reinforcement facilities, as there are no project costs allocated to these pools.

Network Pool

Based on the project's initial cost of $88.1 million and the associated network pool incremental cash flows, there will be a change in the network pool revenue requirement once the project's impacts are reflected in the transmission rate base at the projected in-service date, December 2015. Over a 25-year time horizon, the network pool rate will rise by 2 to 3 cents/kw/month, from the current rate of $3.63/kW/month to $3.65/kW/month and $3.66/kW/month. The maximum revenue shortfall related to the proposed network facilities will be $6.6 million in the year 2021. This will result in a maximum rate impact of 0.83% in that year. The detailed analysis illustrating the calculation of the incremental network revenue shortfall and rate impact is provided in Table 2 below.

Impact on Typical Residential Customer

Adding the costs of the new facilities to the network pool will cause a slight increase in a typical residential customer's rates. The table below shows this result for a typical residential customer who is under the Regulated Price Plan (RPP).

A. Typical monthly bill (Residential R1 in a high density zone at 1,000 kWh per month with winter commodity prices.)	$166.23 per month
B. Transmission component of monthly bill	$13.19 per month
C. Network Pool share of Transmission component	$7.67 per month
D. Impact on Network Pool Provincial Uniform Rates (Table 2)	0.83%
E. Increase in Transmission costs for typical monthly bill (C x D)	$0.06 per month or $0.76 per year
F. Net increase on typical residential customer bill (E / A)	0.04%

Note: Values rounded to two significant digits.

Table 1 – DCF Analysis, Network Pool, page 1

Date:	28-Feb-13
Project #	

SUMMARY OF CONTRIBUTION CALCULATIONS
Network Pool - Estimated Cost

hydro one

Facility Name: Guelph Area Transmission Reinforcement

Scope:

			In-Service Date	<——	Project year ended - annualized from In-Service Date				——>							
		Month	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	
		Year	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	
				1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	
Revenue & Expense Forecast																
Load Forecast (MW)				18.0	21.2	24.4	28.2	32.2	33.8	35.7	37.7	39.9	42.1	47.0	51.7	
Tariff Applied ($/kW/Month)				3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	
Incremental Revenue - $M				0.8	0.9	1.1	1.2	1.4	1.5	1.6	1.6	1.7	1.8	2.0	2.3	
OM&A Costs (Removals & On-going Incremental) - $M			(1.3)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	
Municipal Tax - $M			0.0	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	
Net Revenue/(Costs) before taxes - $M			(1.3)	(0.1)	0.0	0.1	0.3	0.5	0.1	0.1	0.2	0.3	0.4	0.6	0.8	
Income Taxes			0.3	1.0	1.8	1.6	1.4	1.2	1.2	1.1	1.0	0.9	0.8	0.7	0.5	
Operating Cash Flow (after taxes) - $M			(0.9)	0.8	1.8	1.7	1.7	1.7	1.3	1.3	1.2	1.2	1.2	1.3	1.4	
		Cumulative PV @ 5.70%														
PV Operating Cash Flow (after taxes) - $M	(A)	20.0	**(0.9)**	**0.8**	**1.6**	**1.5**	**1.4**	**1.3**	**1.0**	**0.9**	**0.8**	**0.8**	**0.7**	**0.7**	**0.7**	
Capital Expenditures - $M																
Upfront - capital cost before overheads & AFUDC			(74.3)													
- Overheads			(7.7)													
- AFUDC			(4.8)													
Total upfront capital expenditures			**(86.8)**													
On-going capital expenditures				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
PV On-going capital expenditures			0.0													
Total capital expenditures - $M			**(86.8)**													
PV Proceeds on disposal of assets - $M			**0.0**													
PV CCA Residual Tax Shield - $M			**0.4**													
PV Working Capital - $M			**(0.0)**													
PV Capital (after taxes) - $M	(B)	**(86.4)**	**(86.4)**													
Cumulative PV Cash Flow (after taxes) - $M	(A) + (B)	**(66.4)**	**(87.3)**	**(86.5)**	**(84.9)**	**(83.4)**	**(82.0)**	**(80.6)**	**(79.7)**	**(78.8)**	**(78.0)**	**(77.2)**	**(76.5)**	**(75.7)**	**(75.0)**	

Discounted Cash Flow Summary
(Based on Economic Study Horizon - Years): **25**

Discount Rate - % **5.70%**

		Before Contribution $M
PV Incremental Revenue		25.9
PV OM&A Costs		(13.3)
PV Municipal Tax		(5.8)
PV Income Taxes		(1.8)
PV CCA Tax Shield		13.4
PV Capital - Upfront	(86.8)	
Add: PV Capital Contribution	**0.0**	(86.8)
PV Capital - On-going		0.0
PV Proceeds on disposal of assets		0.0
PV Working Capital		(0.0)
PV Surplus / (Shortfall)		**(68.5)**

Profitability Index* **0.2**

*PV of total cash flow, excluding net capital expenditure & on-going capital & proceeds on disposal / PV of net capital expenditure & on-going capital & proceeds on disposal

Start Date: 1-Jan-12

In-Service Date: 31-Dec-15

Table 1 – DCF Analysis, Network Pool, page 2

Date:	28-Feb-13
Project #	

SUMMARY OF CONTRIBUTION CALCULATIONS
Network Pool - Estimated Cost

Facility Name: Guelph Area Transmission Reinforcement

Scope:

Month		Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31	Dec-31
Year		**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
		13	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
Revenue & Expense Forecast														
Load Forecast (MW)		56.4	61.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5
Tariff Applied ($/kW/Month)		3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63	3.63
Incremental Revenue - $M		2.5	2.7	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
OM&A Costs (Removals & On-going Incremental) - $M		(1.0)	(1.0)	(1.0)	(1.3)	(1.3)	(1.3)	(1.3)	(1.3)	(1.3)	(1.3)	(1.3)	(1.3)	(1.3)
Municipal Tax - $M		(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)
Net Revenue/(Costs) before taxes - $M		1.5	1.7	1.9	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Income Taxes		0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	(0.0)	(0.0)	(0.1)
Operating Cash Flow (after taxes) - $M		1.9	2.0	2.1	1.9	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.6
PV Operating Cash Flow (after taxes) - $M	(A)	1.0	1.0	1.0	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4
Capital Expenditures - $M														
Upfront - capital cost before overheads & AFUDC														
- Overheads														
- AFUDC														
Total upfront capital expenditures														
On-going capital expenditures		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PV On-going capital expenditures														
Total capital expenditures - $M														
PV Proceeds on disposal of assets - $M														
PV CCA Residual Tax Shield - $M														
PV Working Capital - $M														
PV Capital (after taxes) - $M	(B)													
Cumulative PV Cash Flow (after taxes) - $M	(A) + (B)	(74.1)	(73.1)	(72.1)	(71.4)	(70.6)	(70.0)	(69.3)	(68.8)	(68.2)	(67.7)	(67.2)	(66.8)	(66.4)

Table 2 – Revenue Requirement and Network Pool Rate Impact, page 1

Guelph Area Transmission Reinforcement		Base Year	Project YE 31-Dec 2016	Project YE 31-Dec 2017	Project YE 31-Dec 2018	Project YE 31-Dec 2019	Project YE 31-Dec 2020	Project YE 31-Dec 2021	Project YE 31-Dec 2022	Project YE 31-Dec 2023	Project YE 31-Dec 2024	Project YE 31-Dec 2025	Project YE 31-Dec 2026	Project YE 31-Dec 2027
Calculation of Incremental Revenue Requirement ($ millions)			1	2	3	4	5	6	7	8	9	10	11	12
In-service date	31-Dec-15													
Capital Cost	86.8													
Removal Cost	1.3													
Less: Capital Contribution Required	-													
Net Project Cost	88.1													
Average Rate Base			42.5	84.2	82.5	80.7	79.0	77.3	75.5	73.8	72.1	70.3	68.6	66.8
Incremental OM&A Costs			0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Grants in Lieu of Municipal tax			0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Depreciation			1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Interest and Return on Rate Base			2.7	5.4	5.3	5.2	5.1	5.0	4.9	4.8	4.7	4.5	4.4	4.3
Income Tax Provision			-0.1	-0.7	-0.5	-0.4	-0.2	-0.1	0.0	0.1	0.2	0.3	0.4	0.4
REVENUE REQUIREMENT PRE-TAX			**5.3**	**7.4**	**7.5**	**7.5**	**7.5**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**7.9**
Incremental Revenue			0.8	0.9	1.1	1.2	1.4	1.5	1.6	1.6	1.7	1.8	2.0	2.3
SUFFICIENCY/(DEFICIENCY)			**-4.5**	**-6.5**	**-6.4**	**-6.3**	**-6.1**	**-6.6**	**-6.5**	**-6.4**	**-6.3**	**-6.2**	**-5.9**	**-5.7**
Network Pool Revenue Requirement including sufficiency/(deficiency)		887	893	895	895	895	895	895	895	895	895	895	895	895
Network GW		244	245	245	245	245	245	245	245	245	245	245	245	245
Network Pool Rate ($/kw/month)		3.63	3.65	3.66	3.66	3.65	3.65	3.66	3.66	3.66	3.65	3.65	3.65	3.65
Increase/(Decrease) in Network Pool Rate ($/kw/month), relative to base year			0.02	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02
RATE IMPACT relative to base year			**0.55%**	**0.83%**	**0.83%**	**0.55%**	**0.55%**	**0.83%**	**0.83%**	**0.83%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**

Assumptions		
Grants in Lieu of Municipal tax	0.50%	Transmission system average
Depreciation	2.00%	Reflects 50 year average service life for towers, conductors and station equipment, excluding land
Interest and Return on Rate Base	6.46%	Includes OEB-approved ROE of 8.93%, 2.08% on ST debt, and 5.01% on LT debt. 40/4/56 equity/ST debt/ LT debt split
Income Tax Provision	26.50%	2013 federal and provincial corporate income tax rate
Capital Cost Allowance	8.00%	100% Class 47 assets

Table 2 – Revenue Requirement and Network Pool Rate Impact, page 2

Guelph Area Transmission Reinforcement		Base Year	Project YE 31-Dec 2028	Project YE 31-Dec 2029	Project YE 31-Dec 2030	Project YE 31-Dec 2031	Project YE 31-Dec 2032	Project YE 31-Dec 2033	Project YE 31-Dec 2034	Project YE 31-Dec 2035	Project YE 31-Dec 2036	Project YE 31-Dec 2037	Project YE 31-Dec 2038	Project YE 31-Dec 2039	Project YE 31-Dec 2040
Calculation of Incremental Revenue Requirement ($ millions)			13	14	15	16	17	18	19	20	21	22	23	24	25
In-service date	31-Dec-15														
Capital Cost	86.8														
Removal Cost	1.3														
Less: Capital Contribution Required	-														
Net Project Cost	88.1														
Average Rate Base			65.1	63.4	61.6	59.9	58.2	56.4	54.7	53.0	51.2	49.5	47.7	46.0	44.3
Incremental OM&A Costs			1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Grants in Lieu of Municipal tax			0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Depreciation	2.00%		1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Interest and Return on Rate Base	6.46%		4.2	4.1	4.0	3.9	3.8	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9
Income Tax Provision	26.50%		0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
REVENUE REQUIREMENT PRE-TAX			**7.9**	**7.8**	**7.7**	**8.0**	**7.9**	**7.8**	**7.7**	**7.6**	**7.5**	**7.4**	**7.3**	**7.2**	**7.1**
Incremental Revenue			2.5	2.7	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
SUFFICIENCY/(DEFICIENCY)			**-5.4**	**-5.1**	**-4.8**	**-5.1**	**-5.0**	**-4.9**	**-4.8**	**-4.7**	**-4.6**	**-4.5**	**-4.4**	**-4.3**	**-4.2**
Network Pool Revenue Requirement including sufficiency/(deficiency)		887	895	895	895	895	895	895	895	895	895	895	895	895	894
Network GW		244	245	245	245	245	245	245	245	245	245	245	245	245	245
Network Pool Rate ($/kw/month)		3.63	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65
Increase/(Decrease) in Network Pool Rate ($/kw/month), relative to base year			0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RATE IMPACT relative to base year			**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**	**0.55%**

Table 3 – Derivation of Load used in DCF, page 1

Annual Peak Load Forecast for Guelph Area Transmission Reinforcement

		0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Relevant B5G/B6G Loads		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Cedar TS T7/T8 Net Demand	MW	29.2	28.9	28.6	28.4	28.3	28.2	28.2	28.3	28.5	28.6	28.8	29.1	29.4	29.7
Hanlon TS Net Demand	MW	28.7	28.8	28.9	29.1	29.3	29.7	29.6	29.5	29.5	29.6	29.6	29.5	29.3	29.2
Arlen MTS Net Demand	MW	35.1	39.1	42.7	46.2	50.1	54.0	55.6	57.3	59.0	60.8	62.6	67.0	71.6	76.3
Puslinch DS Net Demand	MW	32.1	32.3	32.6	33.0	33.4	33.8	34.3	34.8	35.4	35.9	36.5	37.7	38.4	39.2
Guelph CTS	MW	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
B5G/B6G Load Subtotal	MW	130.1	134.2	137.9	141.7	146.1	150.9	152.8	155.0	157.4	159.9	162.6	168.3	173.8	179.4
Line Capacity	MW	113	113	113	113	113	113	113	113	113	113	113	113	113	113
Load in excess of capacity, calendar-year basis	MW	17.1	21.2	24.9	28.7	33.1	37.9	39.8	42.0	44.4	46.9	49.6	55.3	60.8	66.4
PLI-adjustment		85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%
PLI-adjustment load in excess of capacity	**MW**	**14.5**	**18.0**	**21.2**	**24.4**	**28.2**	**32.2**	**33.8**	**35.7**	**37.7**	**39.9**	**42.1**	**47.0**	**51.7**	**56.4**

Note - Load forecast above is based on KWCG Regional Study information provided by the OPA on 2012-11-22 (from 2013 -2030)

Table 3 – Derivation of Load used in DCF, page 2

Annual Peak Load Forecast for Guelph Area Transmission Reinforcement

		14	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
Relevant B5G/B6G Loads		**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Cedar TS T7/T8 Net Demand	MW	30.1	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5	30.5
Hanlon TS Net Demand	MW	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
Arlen MTS Net Demand	MW	81.1	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
Puslinch DS Net Demand	MW	40.0	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8
Guelph CTS	MW	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
B5G/B6G Load Subtotal	MW	185.3	191.3	191.3	191.3	191.3	191.3	191.3	191.3	191.3	191.3	191.3	191.3
Line Capacity	MW	113	113	113	113	113	113	113	113	113	113	113	113
Load in excess of capacity, calendar-year basis	MW	72.3	78.3	78.3	78.3	78.3	78.3	78.3	78.3	78.3	78.3	78.3	78.3
PLI-adjustment		85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%
PLI-adjustment load in excess of capacity	**MW**	**61.5**	**66.5**	**66.5**	**66.5**	**66.5**	**66.5**	**66.5**	**66.5**	**66.5**	**66.5**	**66.5**	**66.5**

Table 4 – DCF Assumptions

Hydro One Networks -- Transmission Connection Economic Evaluation Model
2013 Parameters and Assumptions

Transmission rates are based on current OEB-approved uniform provincial transmission rates.

Monthly Rate ($ per kW)	
Network	3.63

Grants in lieu of Municipal tax (% of up-front capital expenditure, a proxy for property value): 0.50% — Based on Transmission system average

Income taxes:

Basic Federal Tax Rate - % of taxable income:	2013	15.00%	Current rate
Ontario corporation income tax - % of taxable income:	2013	11.50%	Current rate

Capital Cost Allowance Rate:

Class 47	2013	8.0%	Current rate

After-tax Discount rate: 5.70% — Based on OEB-approved ROE of 8.93% on common equity and 2.08% on short-term debt, 5.01% forecast cost of long-term debt and 40/ 60 equity/ debt split, and current enacted income tax rate of 26.5%

Other Assumptions:

Estimated Incremental OM&A: ~~Project specific ($ k):~~

Overhead Line	$1.5	per new km of line each year
Network Station	1.0%	of up-front capital expenditure each year for years 1 - 5
	2.0%	of up-front capital expenditure each year for years 6 - 15
	2.6%	of up-front capital expenditure each year for years 16 - 25
Network Switching Station	0.27%	of up-front capital expenditure each year for years 1 - 5
	0.53%	of up-front capital expenditure each year for years 6 - 15
	0.67%	of up-front capital expenditure each year for years 16 - 25

OTHER PUBLIC INTEREST CONSIDERATIONS

1.0 AVAILABILITY, RELIABILITY, AND QUALITY IMPACTS

The Kitchener-Waterloo-Cambridge-Guelph **("KWCG")** area is one of the major load centers in Ontario. With the lack of local generation, the area relies entirely on the transmission system to deliver electricity from external generation sources to the area.

The transmission system supplying the KWCG area is highly integrated. It includes the 230 kV circuits M20D/M21D between Detweiler TS (in Kitchener) and Middleport TS (in Hamilton); D6V/D7V between Orangeville TS (in Orangeville) and Detweiler TS, as well as eight 115 kV circuits: B5G/B6G, F11C/F12C, D7F/D9F, D11K/D12K emanating from Detweiler TS, Cedar TS (in Guelph) and Burlington TS (in Burlington). High voltage autotransformers tie the 115 kV and 230 kV systems together at Detweiler TS, Burlington TS and Preston TS (in Cambridge).

Hydro One intends to undertake the work with in-house construction resources, augmented by outsourcing as required. Request for proposals for any required equipment, materials and services will be tendered for public bids and posted on Hydro One's website.

Based on all of the above, Hydro One submits that availability, reliability and quality of electricity service will be maintained or improved.

CONSTRUCTION AND PROJECT ADMINISTRATION

Hydro One can achieve a December 2015 in-service date for the proposed upgrade work assuming that the Board grants leave to construct approval for the proposed facilities by July 2013.

To complete the project, Hydro One will:

- Upgrade approximately 4 kilometers of existing 115 kV double-circuit wood pole transmission line between CGE Jct and ABB Jct, and replace approximately 1 kilometer of idle steel lattice tower transmission line between ABB Jct and Campbell TS to provide additional load supply capacity at Cedar TS. OPGW will also be added to the existing 230 kV line between CGE Jct and Cedar TS, so that by the end the existing line will be completely replaced with a double circuit 230 kV line utilizing steel lattice towers and steel pole structures extending the D6V/D7V circuits from Campbell TS to Cedar TS. The number and locations of the new structures will be optimized;
- Ensure prudent measures are taken to reduce EMF at ground levels, which is achieved via circuit phasing optimization;
- Review and update easement documents and road authority occupation agreements to meet current and future requirements;
- Obtain additional property rights where required;
- Determine the environmental approvals and/or permits required for the proposed undertaking;
- Carry out line construction activities that includes setting up construction yards, construction crew mobilization at sites, building access roads and stringing pads on the existing right-of-way ("**ROW**"), installing gates and fences, clearing trees and brush from the ROW (if required), removing the existing structures and conductors,

installing new reinforced concrete foundations, erecting new steel towers and poles, stringing new conductors, removal of access road and stringing pads, restoration of the lands, and demobilization of construction crews;

- Carry out protection works at Cedar TS and Guelph North Switching Station (SS) by adding new line protection relays and associated devices.

In addition to the above line work, significant work will also be undertaken at Guelph Cedar TS and at Guelph North Jct. For compatibility, a pair of autotransformers will be installed to connect the 230 kV supply from the D6G/D7G circuits to the 115 kV high voltage equipment at Cedar TS and four new circuit breakers will also be installed. Guelph North Jct will be upgraded to a switching station by adding a circuit breaker to each of the D7G/D6G circuits to improve supply reliability of the line tap to the Campbell and Cedar TS's.

A project schedule showing the tasks leading up to the in-service date is provided in **Exhibit B, Tab 5, Schedule 2**.

The existing wood pole line supplies 115 kV power to a single industrial customer, as discussed in **Exhibit B, Tab 2, Schedule 1**. The proposed work requires a new supply from Guelph Hydro be in place to serve the customer before commencement of removal of the wood pole line. Connection of the upgraded 230 kV line to the power grid will require the proposed upgrades to both Cedar TS and Guelph North Jct be in place before the customer transfer. The connection and commissioning of the new line requires certain components of the power system be temporarily removed from service. Only single circuit outages will be required to connect and commission the line. These outage constraints have been considered in developing the schedule and cost estimate.

The transmission ROW between CGE Jct and Campbell TS will generally remain the same. However, some additional permanent easement rights will be obtained to extend the existing ROW (at Campbell TS) and to widen the existing ROW in limited locations in order to provide additional clearance or minor line alignment changes from the existing arrangement. Some permanent easements will also be required to reconcile and formalize outstanding rights along some sections of the existing ROW. In addition, temporary easement rights will be required during construction for approximately eight temporary roads to gain access to the ROW. The exact location and extent of the additional permanent and temporary rights will be determined after the completion of the legal and engineering survey and the layout plan.

LINE CONSTRUCTION AND IN-SERVICE SCHEDULE

TASK	**START**	**FINISH**
Submit Section 92		March 8, 2013
Projected Section 92 Approval		July 2013
Detailed Engineering	August 2013	December 2014
Property Rights Acquisition	October 2013	July 2014
Tender & Award Major Long Lead Materials	December 2013	February 2014
Receive Major Long Lead Materials	June 2014	December 2014
Construction	June 2014	December 2015
Commissioning	October 2015	December 2015
In Service		**December 2015**

OTHER MATTERS / AGREEMENTS / APPROVALS

1.0 SYSTEM IMPACT ASSESSMENT ("SIA")

Under the Market Rules, any party planning to construct a new or modified connection to the IESO-controlled grid must request an IESO SIA of these facilities. The IESO has completed a draft SIA for the GATR project considering 2016 load conditions. The assessment concludes that the proposed connection of the project is expected to have no material adverse impact on the reliability of the integrated power system. The draft SIA is filed as **Exhibit B, Tab 6, Schedule 3**.

The IESO assessment addresses the impact of the proposed facilities on system operating voltage, system operating flexibility, and on the ability of other connections to deliver or withdraw power supply from the IESO-controlled grid.

2.0 CUSTOMER IMPACT ASSESSMENT ("CIA")

Hydro One will file a CIA, in accordance with its customer connection procedures, in late-March 2013. The CIA document will be filed as **Exhibit B, Tab 6, Schedule 4**.

3.0 STAKEHOLDER AND COMMUNITY CONSULTATION

Hydro One conducted stakeholder and community consultation to provide information about the project and give people opportunities to ask questions and provide feedback. The government ministries, agencies, municipal staff and elected officials, and residents in a defined study area were consulted through personal contact, e-mail or direct mailing, newspaper notices, the establishment of a project website (www.HydroOne.com/Projects/Guelph) and Public Information Centres ("**PICs**"). The feedback received through the consultation process regarding potential construction effects on the natural environment, agriculture, and the neighbouring property owners was considered and incorporated as appropriate. The details of Hydro One's stakeholder consultation process are described in **Exhibit B, Tab 6, Schedule 5**.

Hydro One carried out a parallel engagement process with neighbouring First Nations communities as described in **Exhibit B, Tab 6, Schedule 6**.

4.0 ENVIRONMENTAL ASSESSMENT

The proposed Guelph Area Transmission Refurbishment (**"GATR"**) Project falls within the definition of the projects covered under the Hydro One (1992) "Class Environmental Assessment for Minor Transmission Facilities" (**"Class EA"**) process, which is approved under the *Environmental Assessment Act* ***("EA Act")*** by the Ministry of Environment (**"MOE"**).

The Class EA process that was completed for this Project included:

- Collection of environmental and socio-economic features within the study area;
- Identification of any environmental effects of the proposed transmission facilities and the corresponding mitigation measures;
- Consultation with the public and stakeholders (e.g. federal and provincial ministries, municipal officials and property owners) to further identify issues and concerns with the project and to address those concerns through mitigation; and
- Engagement with neighbouring First Nations and Métis communities.

Since June 2009, Hydro One has conducted comprehensive public and government agency consultation to inform stakeholders about the GATR Project as well as identify and resolve potential concerns. Engagement with neighbouring First Nations communities to respond to and consider their issues and concerns has also been undertaken.

PICs were held for the Project in June 2009, November 2009 and June 2012. Local residents, businesses, interest groups, neighbouring First Nations communities and government agencies were notified about the Project and the PICs through newspaper advertisements and Canada Post Unaddressed Ad mail or direct mailings. A project webpage was also created on Hydro One's website to keep the public and stakeholders informed about the status of the GATR Project, at: http://www.hydroone.com/Projects/Guelph.

A draft Environmental Study Report (**"ESR"**) was made available for public review and comment for approximately 60 calendar days starting August 9, 2012 and ending October 9, 2012.

Agency and public comment letters received during this period were addressed and documented in the final ESR as required by the Class EA process. There were no Part II Order requests received for a higher level of assessment, i.e. Individual Environmental Assessment.

Comments and issues raised during the review period were documented in the final ESR which was filed with the MOE on October 30, 2012. Through filing the final ESR, Hydro One has complied with the *EA Act* for the Class EA for the GATR Project. Prior to construction, Hydro One will seek all regulatory approvals, licences and permits as required.

5.0 COMPLIANCE WITH INDUSTRY STANDARDS AND CODES

The proposed facilities will be constructed, owned and operated by Hydro One. The design and maintenance of these facilities will be in accordance with good utility practice, as established in the *Transmission System Code*.

6.0 LAND MATTERS

The proposed facilities upgrades will be located on the existing corridor from Campbell TS to CGE Junction. Details on land requirements, existing and required land rights, and the process for acquiring the required land rights is provided in **Exhibit B, Tab 6, Schedule 7.**

7.0 OTHER APPROVAL REQUIREMENTS

Hydro One will address all federal, provincial and municipal requirements of the construction process, including:

- Environmental Compliance Approval for noise from the Ministry of Environment under the *Environmental Protection Act;*
- Environmental Compliance Approval for drainage from the Ministry of Environment under the *Environmental Protection Act;*
- Agreements for crossings from rail and pipeline companies;
- Approval for Speed River crossing from Transport Canada under the *Navigable Waters Protection Act;*
- Building permits from the City of Guelph and the Township of Centre Wellington;
- Stage 2 Archaeological Assessment for the Guelph North Junction SS site; and
- Encroachment and land use permits from the Ministry of Transportation, etc.

Hydro One will also voluntarily comply with Municipal Site Development Plan requirements and municipal noise bylaws.

LETTERS OF ENDORSEMENT FOR THE PROJECT

Attachment 1	Guelph Hydro	Barry Chuddy	July 16, 2012
Attachment 2	Guelph Hydro	Kazi Marouf	July 16, 2012
Attachment 3	City of Guelph	Ann Pappert	July 27, 2012
Attachment 4	Kitchener-Wilmot Hydro	J. Van Ooteghem	October 19, 2012
Attachment 5	Cambridge and North Dumfries Hydro Inc.	Ian Miles	October 22, 2012
Attachment 6	Waterloo North Hydro Inc.	Rene W. Gatien	November 1, 2012

Guelph Hydro Inc.

Barry Chuddy
Chief Executive Officer

395 Southgate Drive
Guelph, ON N1G 4Y1
519.837.4727 Fax 519.836.1055
bchuddy@guelphhydro.com
www.guelphhydro.com

July 16, 2012

Mr. Mike Penstone
Vice President of Transmission Projects Development, Hydro One
Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

Dear Sir,

Re: Hydro One's Guelph Area Transmission Refurbishment Project ("GATR")

Guelph Hydro and other local utilities, including Hydro One, participated in a joint planning study sponsored by the Ontario Power Authority (OPA) called the "Guelph Area Transmission Refurbishment Project ("GATR")". This study identified various system constraints and reliability concerns, and looked at the future need for expansion of transmission facilities to allow growth in the region and an acceptable level of system reliability compared to other areas of the Province.

As a result of the inputs to the Study, Hydro One completed a thorough analysis of all options and the information provided was endorsed by all participating LDCs. Further, this project will address the urgent need for additional supply to the City of Guelph while still maintaining a high reliability of supply. To that end, Guelph Hydro fully supports this project as proposed by Hydro One and recommends that the project proceed as soon as possible.

Sincerely,

Barry Chuddy
Chief Executive Officer
Guelph Hydro Inc.

:km

cc: K.Marouf

Guelph Hydro
Electric Systems Inc.

Kazi Marouf
Chief Operations Officer

395 Southgate Drive
Guelph, ON N1G 4Y1
519.837.4702 Fax 519.836.1055
kmarouf@guelphhydro.com
www.guelphhydro.com

July 16, 2012

Mr. Mike Penstone
Vice President of Transmission Projects Development, Hydro One
Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

Dear Sir,

Re: Hydro One's Guelph Area Transmission Refurbishment Project ("GATR")

Guelph Hydro and other local utilities, including Hydro One, participated in a joint planning study sponsored by the Ontario Power Authority (OPA) called the "Guelph Area Transmission Refurbishment Project ("GATR")". This study identified various system constraints and reliability concerns, and looked at the future need for expansion of transmission facilities to allow growth in the region and an acceptable level of system reliability compared to other areas of the Province.

As a result of the inputs to the Study, Hydro One completed a thorough analysis of all options and the information provided was endorsed by all participating LDCs. Further, this project will address the urgent need for additional supply to the City of Guelph while still maintaining a high reliability of supply. To that end, Guelph Hydro fully supports this project as proposed by Hydro One and recommends that the project proceed as soon as possible.

Sincerely,

Kazi Marouf, P. Eng.
Chief Operations Officer
Guelph Hydro Electric Systems Inc.

:km

cc: B. Chuddy

CITY OF Guelph
Making a Difference

July 27, 2012

RECEIVED
AUG 1 4 2012

Mr. Mike Penstone
Vice President of Transmission Projects Development, Hydro One
Hydro One Networks Inc.
483 Bay Street
Toronto, ON M5G 2P5

Dear Sir:

Re: Hydro One's Guelph Area Transmission Refurbishment Project ("GATR")

I have been advised that Guelph Hydro and other local utilities, including Hydro One, participated in a joint planning study sponsored by the Ontario Power Authority (OPA) called the "Guelph Area Transmission Refurbishment Project ("GATR")". This study identified various system constraints and reliability concerns, and looked at the future need for expansion of transmission facilities to allow growth in the region and an acceptable level of system reliability compared to other areas of the Province.

This project will address the urgent need for additional supply to the City of Guelph while still maintaining a high reliability of supply. We share these fundamental goals through the substantial progress we have already made toward the local generation targets in Guelph's Community Energy Initiative.

To that end, the City of Guelph fully supports this project as proposed by Hydro One and recommends that the project proceed as soon as possible.

Yours truly,

Ann Pappert
Chief Administrative Officer

T 519-837-5602
F 519-822-8277
E administration@guelph.ca

cc: B. Chuddy, Chief Executive Officer, Guelph Hydro Inc.
K. Marouf, Chief Operations Officer, Guelph Hydro Electric Systems Inc.
J. Urisk, Board Chair, Guelph Hydro Inc.

AP/sp

KITCHENER WILMOT HYDRO INC.
P.O. BOX 9010
301 VICTORIA STREET SOUTH
KITCHENER, ONTARIO
N2G 4L2

Jerry Van Ooteghem
President & C.E.O
Tel: (519) 745-4771
Fax: (519) 571-9338

October 19, 2012

Mr. Mike Penstone
Vice President of Transmission Projects Development, Hydro One
Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

Subject: Hydro One's Guelph Area Transmission Refurbishment Project ("GATR")

Dear Mr. Penstone:

Kitchener-Wilmot Hydro participated in a joint regional supply planning study along with the Ontario Power Authority, Hydro One and the other Local Distribution Companies. The study examined the adequacy of the transmission grid in Waterloo Region and Wellington County. This study identified various transmission system constraints and reliability concerns, and looked at the future need for expansion of Hydro One's facilities to accommodate growth and improve reliability at the affected utilities.

The study thoroughly analysed all options and identified that the Guelph Area Transmission Refurbishment (GATR) Project is urgently required to address some of the bulk supply issues in the study area and to maintain reliability of supply. To that end, Kitchener-Wilmot Hydro fully supports this project as proposed by Hydro One and recommends that the project proceed as soon as possible.

Yours truly,

J. Van Ooteghem

J. Van Ooteghem, P. Eng.
President & CEO

Energy+
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.
1500 Bishop Street, P.O. Box 1060, Cambridge, Ontario N1R 5X6 • Telephone 519-621-3530 • Facsimile 519-740-3095
Website www.camhydro.com

RECEIVED OCT 25 2012

October 22, 2012

Mike Penstone
Vice President of Transmission Projects Development, Hydro One
Hydro One Networks Inc.
483 Bay Street
Toronto, ON M5G 2P5

Dear Mr. Penstone:

RE: HYDRO ONE'S GUELPH AREA TRANSMISSION REFURBISHMENT PROJECT ("GATR")

Cambridge and North Dumfries Hydro Inc. fully supports the Guelph Area Transmission Refurbishment Project. The GATR work will address some of the bulk supply issues in the region including improvement in both the supply capacity and restoration capability in the City of Cambridge and the Township of North Dumfries.

We recommend that Hydro One proceed as soon as possible.

Yours truly

CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.

Ian Miles
President & CEO

Rene W. Gatien, P. Eng.
President & CEO

WATERLOO NORTH HYDRO INC.

PO Box 640
526 Country Squire Road
Waterloo ON N2J 4A3
Telephone 519-888-5544
Fax 519-886-8592
E-mail rgatien@wnhydro.com
www.wnhydro.com

November 1, 2012

Mr. Mike Penstone
Vice President of Transmission Projects Development, Hydro One
Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

Dear Mr. Penstone;

Re: Hydro One's Guelph Area Transmission Refurbishment Project ("GATR")

Waterloo North Hydro Inc. participated in a joint planning study called the "Guelph Area Transmission Refurbishment Project ("GATR")" with Hydro One and other local utilities.

This study identified various system constraints and reliability concerns, and looked at the future need for expansion of Hydro One's facilities to allow growth to the affected utilities.

Hydro One completed a thorough analysis of all options and the information provided was endorsed by all. Further, the project will address the bulk supply issues in the Guelph area and maintain reliability of supply.

To that end, Waterloo North Hydro Inc. fully supports this project as proposed by Hydro One and recommends that the project proceed as soon as possible.

Please do not hesitate to contact me if you have any questions or concerns.

Yours truly,

Rene W. Gatien

Rene W. Gatien P.Eng. MBA
President & CEO

IESO's System Impact Assessment

REPORT

Power to Ontario.
On Demand.

System Impact Assessment Report

CONNECTION ASSESSMENT & APPROVAL PROCESS

Draft Report

CAA ID: **2012-478**

Project: **Guelph Area Transmission Refurbishment**

Applicant: **Hydro One Inc.**

Market Facilitation Department
Independent Electricity System Operator

Date: Feb. 28, 2013

issue 1.0, revision 12-08

Document Name	System Impact Assessment Report
Issue	0.3
Reason for Issue	Draft Issue
Effective Date	February 28, 2013

System Impact Assessment Report

Acknowledgement

The IESO wishes to acknowledge the assistance of Hydro One in completing this assessment.

Disclaimers

IESO

This report has been prepared solely for the purpose of assessing whether the connection applicant's proposed connection with the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system and whether the IESO should issue a notice of conditional approval or disapproval of the proposed connection under Chapter 4, section 6 of the Market Rules.

Conditional approval of the proposed connection is based on information provided to the IESO by Hydro One at the time the assessment was carried out. The IESO assumes no responsibility for the accuracy or completeness of such information, including the results of studies carried out by Hydro One at the request of the IESO. Furthermore, the conditional approval is subject to further consideration due to changes to this information, or to additional information that may become available after the conditional approval has been granted.

If the connection applicant has engaged a consultant to perform connection assessment studies, the connection applicant acknowledges that the IESO will be relying on such studies in conducting its assessment and that the IESO assumes no responsibility for the accuracy or completeness of such studies including, without limitation, any changes to IESO base case models made by the consultant. The IESO reserves the right to repeat any or all connection studies performed by the consultant if necessary to meet IESO requirements.

Conditional approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed project to the IESO-controlled grid. However, the conditional approval does not ensure that a project will meet all connection requirements. In addition, further issues or concerns may be identified by the transmitter(s) during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with physical or equipment limitations, or with the Transmission System Code, before connection can be made.

This report has not been prepared for any other purpose and should not be used or relied upon by any person for another purpose. This report has been prepared solely for use by the connection applicant and the IESO in accordance with Chapter 4, section 6 of the Market Rules. The IESO assumes no responsibility to any third party for any use, which it makes of this report. Any liability which the IESO may have to the connection applicant in respect of this report is governed by Chapter 1, section 13 of the Market Rules. In the event that the IESO provides a draft of this report to the connection applicant, the connection applicant must be aware that the IESO may revise drafts of this report at any time in its sole discretion without notice to the connection applicant. Although the IESO will use its best efforts to advise you of any such changes, it is the responsibility of the connection applicant to ensure that the most recent version of this report is being used.

Hydro One

The results reported in this report are based on the information available to Hydro One, at the time of the study, suitable for a System Impact Assessment of this connection proposal.

The short circuit and thermal loading levels have been computed based on the information available at the time of the study. These levels may be higher or lower if the connection information changes as a result of, but not limited to, subsequent design modifications or when more accurate test measurement data is available.

This study does not assess the short circuit or thermal loading impact of the proposed facilities on load and generation customers.

In this report, short circuit adequacy is assessed only for Hydro One circuit breakers. The short circuit results are only for the purpose of assessing the capabilities of existing Hydro One circuit breakers and identifying upgrades required to incorporate the proposed facilities. These results should not be used in the design and engineering of any new or existing facilities. The necessary data will be provided by Hydro One and discussed with any connection applicant upon request.

The ampacity ratings of Hydro One facilities are established based on assumptions used in Hydro One for power system planning studies. The actual ampacity ratings during operations may be determined in real-time and are based on actual system conditions, including ambient temperature, wind speed and project loading, and may be higher or lower than those stated in this study.

The additional facilities or upgrades which are required to incorporate the proposed facilities have been identified to the extent permitted by a System Impact Assessment under the current IESO Connection Assessment and Approval process. Additional project studies may be necessary to confirm constructability and the time required for construction. Further studies at more advanced stages of the project development may identify additional facilities that need to be provided or that require upgrading.

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Executive Summary

Conditional Approval for Connection

Hydro One (the "connection applicant") is planning to reinforce the transmission system in the Guelph Area by providing a new supply from the 230 kV system into the 115 kV system with an expansion at the 115 kV Cedar TS and a new 230 kV switching station at Guelph North JCT on D6V and D7V. The new station will be called Inverhaugh SS*. This proposal is known as the Guelph Area Transmission Refurbishment (GATR) project (the "project").

Cedar TS will be rebuilt to facilitate the connection of the lines B5G/B6G (115 kV circuits), F11C/F12C (115 kV circuits) and D6V/D7V (230 kV circuits) as presented in **Figure 4** in Appendix A of this report. The connection of the 230 kV circuits D6V/D7V to Cedar TS will involve the installation of two new 230/115 kV autotransformers at Cedar along with the revitalization of the existing idle 5km 115 kV line B5G/B6G between Cedar TS and Campbell TS to a 230 kV line. The incorporation of Inverhaugh SS will sectionalize D6V and D7V into four circuits as presented in **Figure 3** in Appendix A of this report.

This project is the first step of a staged reinforcement plan for the Kitchener-Waterloo-Cambridge-Guelph area. The scope of an SIA study of this type normally includes an analysis for up to 10 years from the in-service date. However, since the project is the first stage of a longer term plan, the scope of this SIA considered 2016, the year following the planned in-service date.

This SIA report acknowledges that while the GATR project does provide significant improvement to the current situation in the area, it does not completely resolve all concerns. We expect that the residual issues that will remain after the completion of the project will be addressed by future projects in subsequent stages and look forward to receiving those SIA applications.

This assessment concludes that the proposed connection of the project, subject to the requirements specified in this report, is expected to have no material adverse impact on the reliability of the integrated power system. Therefore, the IESO recommends that a *Notification of Conditional Approval for Connection* be issued for the project subject to the implementation of the requirements outlined in this report.

IESO Requirements for Connection

Applicant Requirements

Project Specific Requirements: The following *specific* requirements are applicable for the incorporation of the project. Specific requirements pertain to the level of reactive compensation needed, operation restrictions, special protections system, upgrading of equipment and any project specific items not covered in the *general* requirements.

1. Hydro One is required to review the relay settings of any circuits affected by the project, as per solutions identified in the PIA.

   Finalized protection settings must be confirmed and submitted to the IESO at least six (6) months before implementation. At that time, a relay margin analysis will be performed by the IESO, if required. Should the analysis determine adverse reliability impacts, an addendum to this SIA will be performed.

2. The load restoration requirements for various contingencies are documented in **Table 24** in this report. Hydro One and the affected Local Distribution Companies (LDCs) are required to work together to ensure that load can be restored within the specified time frame.

* Also referred to as Guelph North Junction SS

General Requirements:

The connection applicant shall satisfy all applicable requirements and standards specified in the Market Rules and the Transmission System Code. The following requirements summarize some of the general requirements that are applicable to the proposed project, and presented in detail in section 2 of this report.

(1) The connection applicant shall ensure that the 230 kV equipment is capable of continuously operating between 220 kV and 250 kV, and 115 kV equipment is capable of continuously operating between 113 kV and 127 kV, as specified in Appendix 4.1 of the Market Rules. Protective relaying must be set to ensure that transmission equipment remains in-service for voltages up to 5% above the maximum continuous value.

(2) The connection applicant shall ensure that the connection equipment is designed to be fully operational in all reasonably foreseeable ambient temperature conditions. The connection equipment must also be designed so that the adverse effects of its failure on the IESO-controlled grid are mitigated. This includes ensuring that all circuit breakers fail in the open position.

(3) The connection applicant shall ensure that the new equipment at the project be designed to withstand the fault levels in the area. If any future system changes result in an increased fault level higher than the equipment's capability, the connection applicant is required to replace the equipment with higher rated equipment capable of withstanding the increased fault level, up to maximum fault level specified in Appendix 2 of the Transmission System Code.

Appendix 2 of the Transmission System Code states that the maximum rated interrupting time must be ≤ 3 cycles for the 230 kV breakers and ≤ 5 cycles for the 115 kV breakers. Thus, the connection applicant shall ensure that the installed breakers meet the required interrupting time specified in the Transmission System Code. Fault interrupting devices must be able to interrupt fault currents at the maximum continuous voltage of 250 kV for 230 kV equipment, and 127 kV for 115 kV equipment.

(4) The connection applicant shall ensure that the new protection systems at the facility are designed to satisfy all the requirements of the Transmission System Code and any additional requirements identified by the transmitter.

As currently assessed by the IESO, Inverhaugh SS and Cedar TS are not part of the NPCC-defined Bulk Power System (BPS) and, therefore are not designated as essential to the power system.

The connection applicant shall have adequate provision in the design of protections and controls at the facilities to allow for future installation of Special Protection Scheme (SPS) equipment.

Any modifications made to protection relays by the transmitter after this SIA is finalized must be submitted to the IESO as soon as possible or at least six (6) months before any modifications are to be implemented on the existing protection systems.

(5) The connection applicant shall ensure that the telemetry requirements are satisfied as per the applicable Market Rules requirements. The finalization of telemetry quantities and telemetry testing will be conducted during the IESO Facility Registration/Market Entry process.

(6) The proposed project must be compliant with applicable reliability standards set by the North American Electric Reliability Corporation (NERC) and the North East Power Coordinating Council (NPCC) that are in effect in Ontario as mapped in the following link: http://www.ieso.ca/imoweb/ircp/orcp.asp

(7) The connection applicant is currently a restoration participant. The connection applicant is required to update its restoration participant attachment to include details regarding its proposed project. For more details please refer to the Market Manual 7.8. Details regarding restoration participant requirements will be finalized at the Facility Registration/Market Entry Stage.

(8) The connection applicant must complete the IESO Facility Registration/Market Entry process in a timely manner before IESO final approval for connection is granted.

Models and data, including any controls that would be operational, must be provided to the IESO at least seven months before energization to the IESO-controlled grid. This includes both PSS/E and DSA software compatible mathematical models.

The connection applicant must also provide evidence to the IESO confirming that the equipment installed meets the Market Rules requirements and matches or exceeds the performance predicted in this assessment. This evidence shall be either type tests done in a controlled environment or commissioning tests done on-site. The evidence must be supplied to the IESO within 30 days after completion of commissioning tests. If the submitted models and data differ materially from the ones used in this assessment, then further analysis of the project will need to be done by the IESO.

Rationale for Conditional Approval for Connection

We have analyzed the impact of the project on the system reliability of the IESO-controlled grid, and based on our study results, we have identified that:

1. The proposed connection arrangement and equipment for the project are acceptable to the IESO.

   The new Inverhaugh SS presented in **Figure 3** in Appendix A sectionalizes circuits D6V and D7V between Detweiler and Orangeville reducing the amount of load interrupted for 230 kV tower contingencies along these circuits.

   The proposed configuration at Cedar TS presented in **Figure 4** in Appendix A provides more flexibility to supply and restore the 115 kV load between Detweiler and Burlington than the current configuration. The proposed configuration also ensures that load at Cedar TS remains uninterrupted for any two circuits out of service at Cedar TS.

2. The proposed project is not expected to materially change the fault levels in the area.

3. As part of the proposed project, the normally open disconnect switches at Cedar TS will be closed creating a connection path on the 115 kV circuits between Detweiler TS and Burlington TS. As a result, part of the Burlington 115 kV load will be supplied through the B5G/B6G 115 kV circuits from the Guelph area. The incorporation of GATR will help to significantly relieve the loading on the Burlington autotransformers, though existing overload concerns on these autotransformers may still persist.

4. With the flow through the newly created 115 kV path between Guelph area and Burlington, the 115 kV circuit sections B5G and B6G between Cedar and Hanlon may become overloaded beyond their STE rating with two transmission elements out of service under peak load conditions. Overloading can be prevented by transferring load at Brant and Gage out of Burlington as soon as one element is out of service. If load transfer at Brant and Gage is not sufficient, the 115 kV path could also be opened at Freeport SS.

5. Under 2016 peak load conditions, the 115 kV circuit section D9F between Detweiler and Detweiler JCT could be loaded beyond its LTE when D7F and F12C are on outage. Overloading can be managed by opening low voltage tie breakers at the load stations between Detweiler and Cedar as soon as one element is out of service, or manually interrupting load within 15 minutes after a second element is forced out of service.

6. Under 2016 peak load conditions, the 230 kV circuit section M21D between Galt and Courtice could be loaded beyond its LTE for either the outage of M20D+F12C or for a Detweiler breaker failure resulting in the loss of M20D+Detweiler T3+D7I. Overloading can be managed by manually interrupting load within 15 minutes.

7. The project results in improved voltages within the area. Under study conditions, the 115 kV voltages at Cedar could increase by 7 kV.
8. Under 2016 conditions, there are no post-contingency voltage performance criteria violations. It should be noted, however, that post-contingency voltages at Kitchener MTS #5 can be as low as 108 kV for the outage of D9F+B6G, and post-contingency voltages at Hanlon can be as low as 109 kV for the outage of F12C+B6G. It should also be noted that the loss of M20D+M21D circuits would result in voltages at Middleport to be as high as 250 kV. This high voltage is due to the fact that over 500 MW would be lost by configuration.

Other Findings

As mentioned above, the GATR project provides significant supply reliability improvements, but it does not completely resolve all concerns in the area. This section of the SIA identifies some of the remaining problems to be addressed in the future, and suggests mitigating solutions that have to be included in subsequent reinforcement stages.

1. As forecasted by Hydro One, the load on the 230 kV circuits M20D and M21D is expected to exceed 600 MW in 2024. This will exceed the load security requirement specified in the Ontario Resource and Transmission Assessment Criteria (ORTAC). As part of the next stages of the area reinforcement, Hydro One should include a plan to address this concern.
2. The short circuit levels at Waterloo North #3 230 kV will increase to 98% of its circuit switchers' capabilities. It is recommended that Hydro One and Waterloo North Hydro monitor short circuit levels and, if required, develop a plan for mitigation.
3. Under high wind generation output conditions at Orangeville, it was assumed that that the ratings calculated using 15 km/h winds are acceptable on the I6V and I7V 230 kV circuit sections between Orangeville and Inverhaugh SS. If the use of wind ratings are not acceptable to Hydro One, then there are thermal concerns that need to be addressed after the Orangeville area generation comes in service.
4. To address loading concerns on Burlington autotransformers, and future loading concerns on Detweiler transformers under outage conditions in view of future load growth, it is recommended that Hydro One examines one or more of the following: (i) additional load transfer measures, (ii) implementation of a load rejection scheme to respond to contingencies and interrupt load within 15 minutes of a contingency, and (iii) replacement of limiting Burlington autotransformers, or other measures that may be equally effective.
5. To address future loading concerns on B5G and B6G in view of future load growth, Hydro One should consider one or more of the following: (i) implementation of a load rejection scheme to respond to contingencies and interrupt load within 15 minutes of a contingency and (ii) upgrade circuit sections between Cedar x Hanlon, or other measures that may be equally effective.
6. To address future loading concerns due to load growth on the circuit section between Detweiler and Detweiler JCT on D9F (and possibly on its companion circuit D7F), Hydro One should consider one or more of the following: (i) implementation of a load rejection scheme to respond to contingencies and interrupt load within 15 minutes of a contingency and (ii) upgrade circuit sections between Detweiler and Siebert JCT, or other measures that may be equally effective.
7. To address future loading concerns due to load growth on the circuit section between Galt and Courtice on M21D (and possibly on its companion circuit M20D) Hydro One should consider one or more of the following: (i) implementation of additional load rejection that will respond to contingencies and interrupt load within 15 minutes of a contingency and (ii) upgrade these circuit sections to have higher LTE ratings, or other measures that may be equally effective.

8. To address future post-contingency voltage concerns at Kitchener #5 and Hanlon TS in view of future load growth for two element outages, it is recommended that Hydro One examines one or more of the following: (i) implementation of a load rejection scheme to respond to contingencies within 15 minutes of contingency, (ii) open low voltage tie breakers on loads between Detweiler and Burlington for the loss of B6G/D9F, or (ii) consider future expansion of the Cedar station such that the loss of B6G or F12C does not result in the loss of a Cedar transformer as well. This can be achieved with an eventual expansion of Cedar TS into a 6 breaker ring bus, or other measures that may be equally effective.
9. To address future high voltage concerns at Middleport 230 kV for the loss of M20D+M21D circuits in view of the future load growth, it is recommended that Hydro One examines one or more of the following: (i) review of existing equipment at Middleport TS to determine if voltages in excess of 250 kV can be maintained before manual intervention or (ii) reinforce the 230 kV system between Middleport x Detweiler to ensure that less load is lost for a tower contingency, or other measures that may be equally effective.
10. The current station configuration at Detweiler 230 kV results in multiple critical elements lost for breaker failure conditions. In particular, if Preston T2 is connected to M20D, the breaker failure of Detweiler L7L20 results in the loss of three 230/115 kV autotransformers supplying the area. In view of future load growth in the area, it is recommended that Hydro One consider reconfiguration of the Detweiler 230 kV station to mitigate the effects of breaker failure contingencies, or other measures that may be equally effective.

– End of Section –

1. Project Description

Hydro One is planning to reinforce the transmission system in the Guelph Area by providing a new supply from the 230 kV system into the 115 kV system with an expansion at the 115 kV Cedar TS and a new 230 kV switching station at Guelph North JCT on D6V and D7V. The new station will be called Inverhaugh SS. This proposal is known as the Guelph Area Transmission Refurbishment (GATR) project.

Cedar TS will be rebuilt to facilitate the connection of the lines B5G/B6G (115 kV circuits) F11C/F12C (115 kV circuits) and D6V/D7V (230 kV circuits) as presented in **Figure 4** in Appendix A of this report. The connection of the 230 kV circuits D6V/D7V to Cedar TS will involve the installation of two new 239/121/13.9 kV autotransformers at Cedar along with the revitalization of the existing idle 5km 115 kV line B5G/B6G between Cedar TS and Campbell TS to a 230 kV line. The autotransformers will be equipped with under load tap changers (ULTC) having ± 10 steps to provide voltage control within ± 27.5 kV, and could be isolated with a 230 kV motorized disconnect switch and 115 kV breaker in series with a 115 kV motorized disconnect switch. Two additional 115 kV breakers will be installed at Cedar TS to terminate F11C and B5G on the P bus and K bus respectively.

The incorporation of Inverhaugh SS will sectionalize D6V and D7V into four circuits. The switching station will consist of two in-line breakers and six motorized disconnect switches as presented in **Figure 3** in Appendix A of this report. The names for the circuits resulting from the sectionalization have been assumed to be D6I and I6V (for D6V) and D7I and I7V (for D7V) for the purposes of this report. The I6V and D7I circuits will each have a 230 kV motorized disconnect switch installed at Cedar TS and a normally open 230 kV motorized disconnect switch will also be installed between I6V and D7I at Cedar TS. In the event that one of these circuits is out of service, the normally open switch can be closed to facilitate the supply of the entire Cedar load on the remaining companion circuit.

The planned in-service date of the Guelph Area Transmission Reinforcement project is Q4 2015.

The existing system is depicted in **Figure 1** in Appendix A of this report and the system after the incorporation of GATR is depicted in **Figure 2** in Appendix A of this report.

– End of Section –

2. General Requirements

The connection applicant shall satisfy all applicable requirements and standards specified in the Market Rules and the Transmission System Code. The following sections highlight some of the general requirements that are applicable to the proposed project.

2.1 Voltage

Appendix 4.1 of the Market Rules states that under normal operating conditions, the voltages are maintained within the range of 220 kV to 250 kV in the 230 kV system, and within the range of 113 kV to 127 kV in the 115 kV system in southern Ontario. Thus, the IESO requires that 230 kV equipment in Ontario must have a maximum continuous voltage rating of at least 250 kV and 115 kV equipment in southern Ontario must have a maximum continuous voltage rating of at least 127 kV.

Protective relaying must be set to ensure that transmission equipment remains in-service for voltages between 94% of the minimum continuous value and 105% of the maximum continuous value specified in Appendix 4.1of the Market Rules.

2.2 Connection Equipment Design

The connection applicant shall ensure that the connection equipment is designed to be fully operational in all reasonably foreseeable ambient temperature conditions. The connection equipment must also be designed so that the adverse effects of its failure on the IESO-controlled grid are mitigated. This includes ensuring that all circuit breakers fail in the open position.

2.3 Fault Level

The Transmission System Code requires the new equipment to be designed to withstand the fault levels in the area where the equipment is installed. Thus, the connection applicant shall ensure that the new equipment at the facility is designed to withstand the fault levels in the area. If any future system changes result in an increased fault level higher than the equipment’s capability, the connection applicant is required to replace the equipment with higher rated equipment capable of withstanding the increased fault level, up to maximum fault level specified in the Transmission System Code. Appendix 2 of the Transmission System Code establishes the maximum fault levels for the transmission system. For the 230 kV system, the maximum 3 phase symmetrical fault level is 63 kA and the maximum single line to ground symmetrical fault level is 80 kA (usually limited to 63 kA). For the 115 kV system, the maximum 3 phase and single line to ground symmetrical fault levels are 50 kA.

Appendix 2 of the Transmission System Code states that the maximum rated interrupting time must be ≤ 3 cycles for the 230 kV breakers and ≤ 5 cycles for the 115 kV breakers. Thus, the connection applicant shall ensure that the installed breakers meet the required interrupting time specified in the Transmission System Code. Fault interrupting devices must be able to interrupt fault currents at the maximum continuous voltage of 250 kV for 230 kV equipment and 127 kV for 115 kV equipment.

2.4 Protection System

The connection applicant shall ensure that the protection systems are designed to satisfy all the requirements of the Transmission System Code as specified in Schedules E, F and G of Appendix 1 and any additional requirements identified by the transmitter. New protection systems must be coordinated with the existing protection systems.

Facilities that are essential to the power system must be protected by two redundant protection systems according to section 8.2.1a of the TSC. These redundant protections systems must satisfy all requirements of the TSC, and in particular, they must not use common components, common battery banks or common secondary CT or PT windings. As currently assessed by the IESO, Inverhaugh SS and Cedar TS are not part of the NPCC-defined Bulk Power System (BPS) and, therefore are not designated as essential to the power system. In the future, as the electrical system evolves, this facility may be placed on the BPS list.

The connection applicant is required to have adequate provision in the design of protections and controls at the facility to allow for future installation of Special Protection Scheme (SPS) equipment. Should a future SPS be installed to improve the transfer capability in the area or to accommodate transmission reinforcement projects, the facility will be required to participate in the SPS system and to install the necessary protection and control facilities to affect the required actions.

Any modifications made to protection relays by the transmitter after this SIA is finalized must be submitted to the IESO as soon as possible or at least six (6) months before any modifications are to be implemented on the existing protection systems. If those modifications result in adverse impacts, the connection applicant and the transmitter must develop mitigation solutions

2.5 Telemetry

In accordance with Section 7.4 of Chapter 4 of the Market Rules, the connection applicant shall provide to the IESO the applicable telemetry data listed in Appendix 4.16 of the Market Rules on a continual basis. The data shall be provided in accordance with the performance standards set forth in Appendix 4.20 and Appendix 4.21, subject to Section 7.6A of Chapter 4 of the Market Rules. The whole telemetry list will be finalized during the IESO Facility Registration/Market Entry process.

The connection applicant must install monitoring equipment that meets the requirements set forth in Appendix 2.2 of Chapter 2 of the Market rules. As part of the IESO Facility Registration/Market Entry process, the connection applicant must also complete end to end testing of all necessary telemetry points with the IESO to ensure that standards are met and that sign conventions are understood. All found anomalies must be corrected before IESO final approval to connect any phase of the project is granted.

2.6 Reliability Standards

Prior to connecting to the IESO controlled grid, the proposed project must be compliant with the applicable reliability standards established by the North American Electric Reliability Corporation (NERC) and reliability criteria established by the Northeast Power Coordinating Council (NPCC) that are in effect in Ontario. A mapping of applicable standards, based on the proponent's/connection applicant's market role/OEB license can be found here: http://www.ieso.ca/imoweb/ircp/orcp.asp

This mapping is updated periodically after new or revised standards become effective in Ontario.

The current versions of these NERC standards and NPCC criteria can be found at the following websites:
http://www.nerc.com/page.php?cid=2|20
http://www.npcc.org/documents/regStandards/Directories.aspx

The IESO monitors and assesses market participant compliance with a selection of applicable reliability standards each year as part of the Ontario Reliability Compliance Program. To find out more about this program, write to orcp@ieso.ca or visit the following webpage: http://www.ieso.ca/imoweb/ircp/orcp.asp

Also, to obtain a better understanding of the applicable reliability compliance obligations and engage in the standards development process, we recommend that the proponent/ connection applicant join the IESO's Reliability Standards Standing Committee (RSSC) or at least subscribe to their mailing list by contacting rssc@ieso.ca. The RSSC webpage is located at:
http://www.ieso.ca/imoweb/consult/consult_rssc.asp.

2.7 Restoration Requirements

The connection applicant is currently a restoration participant. The connection applicant is required to update its restoration participant attachment to include details regarding its proposed project. For more details please refer to the Market Manual 7.8. Details regarding restoration participant requirements will be finalized at the Facility Registration/Market Entry Stage.

As currently assessed by the IESO, Cedar TS and Inverhaugh SS are not classified as Key Facilities that are required to establish a Basic Minimum Power System following a system blackout. Key Facility and Basic Minimum Power System are terms defined in the NPCC Glossary of Terms.

2.8 Facility Registration/Market Entry

The connection applicant must complete the IESO Facility Registration/Market Entry process in a timely manner before IESO final approval for connection is granted.

Models and data, including any controls that would be operational, must be provided to the IESO. This includes both PSS/E and DSA software compatible mathematical models representing the new equipment for further IESO, NPCC and NERC analytical studies. The models and data may be shared with other reliability entities in North America as needed to fulfill the IESO's obligations under the Market Rules, NPCC and NERC rules. The connection applicant may need to contact the software manufacturers directly, in order to have the models included in their packages. This information should be submitted at least seven months before energization to the IESO-controlled grid, to allow the IESO to incorporate this project into IESO work systems and to perform any additional reliability studies.

As part of the IESO Facility Registration/Market Entry process, the connection applicant must provide evidence to the IESO confirming that the equipment installed meets the Market Rules requirements and matches or exceeds the performance predicted in this assessment. This evidence shall be either type tests done in a controlled environment or commissioning tests done on-site. In either case, the testing must be done not only in accordance with widely recognized standards, but also to the satisfaction of the IESO. Until this evidence is provided and found acceptable to the IESO, the Facility Registration/Market Entry process will not be considered complete and the connection applicant must accept any restrictions the IESO may impose upon this project's participation in the IESO-administered markets or connection to the IESO-controlled grid. The evidence must be supplied to the IESO within 30 days after completion of commissioning tests. Failure to provide evidence may result in disconnection from the IESO-controlled grid.

If the submitted models and data differ materially from the ones used in this assessment, then further analysis of the project will need to be done by the IESO.

-End of Section-

3. Data Verification

3.1 Connection Arrangement

The connection arrangement of Inverhaugh SS and Cedar TS is not expected to reduce the level of reliability of the integrated power system and is, therefore, acceptable to the IESO. Load security is improved with the new Inverhaugh SS and proposed configuration at Cedar TS.

The new Inverhaugh SS presented in **Figure 4** in Appendix A sectionalizes circuits D6V and D7V between Detweiler and Orangeville reducing the amount of load being interrupted for 230 kV tower contingencies along these circuits.

The proposed configuration at Cedar TS presented in **Figure 4** in Appendix A provides more flexibility to supply and restore the 115 kV load between Detweiler and Burlington than the current configuration. The proposed configuration also ensures that load at Cedar TS remains uninterrupted for any two circuits out of service at Cedar TS.

3.2 Overhead Circuit Data

The specifications for the new overhead circuit sections between Campbell and Cedar are given below in **Table 1.**

Table 1: Overhead Circuit Data

Ckt	From	To	Length (km)	Max Op (kV)	Summer Ratings (A)			Positive Sequence Impedance (pu) S_B= 100 MVA		
					Cont	LTE	STE	R	X	B
I6V	Campbell	Cedar TS	5	250	1050	1370	1600	0.00075	0.00650	0.01043
D7I	Campbell	Cedar TS	5	250	1050	1370	1600	0.00075	0.00650	0.01043

3.3 Transformers

The specifications for the new 230/115 kV autotransformers at Cedar TS are given below in **Table 2**

Table 2: Cedar T3/T4 Transformer Data

Unit	Transformation	Rating (MVA) (ONWF)	Positive Sequence Impedance (pu) S_B= 63.5 MVA	Configuration			**ULTC Tap Changer**
				HT	**HL**	**LT**	
T3/T4	239/121/13.9 kV	150/200/250	HT: 20.28% HL: 5.91% LT: 12.27%	Yg	Yg	Delta	239 ± 27.5 kV in ± 10 steps

3.4 Circuit Breakers

The specifications for the required 230 kV breakers at Inverhaugh SS and 115 kV breakers at Cedar TS are given below in Table **3**:

Table 3: Specifications of 115 kV and 230 kV circuit breakers

Location	#	Maximum Continuous Voltage Rating (kV)	Interrupting Time (ms)	Continuous Current Rating (A)	Short Circuit Symmetrical Rating (kA)
Cedar TS 115 kV	4	127	50 ms	2000	50
Inverhaugh SS 230 kV	2	250	50 ms	2000	63

3.5 Disconnect Switches

The specifications for 115 kV and 230 kV disconnect switches required for this project are provided below:

Table 4: Specifications of 115 kV and 230 kV Disconnect Switches

Type	Location	#	Maximum Continuous Voltage Rating (kV)	Continuous Current Rating (A)	Short Circuit Symmetrical Rating (kA)
230 kV Autotransformer/Line Disconnect	Between Campbell TS and Cedar TS	5	250	2000	63
230 kV Breaker Disconnect	Inverhaugh SS	6	250	2000	63
115 kV Autotransformer/Line Disconnect	Cedar TS	6	127	1200	50
115 kV DESN Disconnect	Cedar TS	4	127	1200	50

-End of Section-

4. Short Circuit Assessment

Fault level studies were completed by the transmitter to examine the effects of the project on fault levels at existing facilities in the surrounding area. Studies were performed to analyze the fault levels (i) before the incorporation of GATR and (ii) after the incorporation of GATR. A third study was performed to analyze the impact of a second 230/115 kV Preston transformer to be installed after the incorporation of GATR.

The interrupting capabilities of the high voltage short circuit interrupting devices at the monitored stations were found to be adequate for the anticipated fault levels. It should be noted that the connection of GATR will result in the symmetrical short circuit levels at Waterloo North #3 to increase from 94% to 98% of the station’s circuit switcher capability. It is recommended that Hydro One and Waterloo North Hydro monitor short circuit levels and, if required, develop a plan for mitigation.

4.1 Study Assumptions

The short circuit study was carried out with the following primary system assumptions:

(1) Generation Facilities In-service

East

Lennox	G1-G4	Chenaux	G1-G8
Kingston Cogen	G1-G2	Mountain Chute	G1-G2
Wolf Island	300 MW	Stewartville	G1-G5
Arnprior	G1-G2	Brockville	G1
Barrett Chute	G1-G4	Havelock	G1
Chats Falls	G2-G9	Saunders	G1-G16
Cardinal Power	G1, G2		

Toronto

Pickering units	G1, G4-G8	Sithe Goreway	G11-13, G15
Darlington	G1-G4	TransAlta Douglas	G1-G3
Portlands GS	G1-G3	GTAA	G1-G3
Algonquin Power	G1, G2	Brock west	G1
Whitby Cogen	G1		

Niagara

Thorold GS	GTG1, STG2	Beck 2	G11-G26
Beck 1	G3-G10	Beck 2 PGS	G1-G6
Decew	G1, G2, ND1		

South West

Nanticoke	G5-G8	Kingsbridge WGS	39.6 MW
Halton Hills GS	G1-G3	Amaranth WGS	199.5 MW

Bruce

Bruce A	G1-G4	Ripley WGS	76 MW
Bruce B	G5-G8	Underwood WGS	198 MW
Bruce A Standby	SG1		

West

Lambton units	G3-G4	Imperial Oil	G1
Brighton Beach	G1, G1A, G1B	Kruger Port Alma WGS	101.2 MW
Greenfield Energy Centre	G1-G4	Gosfield Wind Project	50.6 MW
St. Clair Energy Centre	CTG3, STG3, CTG4, STG4	Kruger Energy Chatham WF	101 MW
East Windsor Cogen	G1-G2	Raleigh Wind Energy Centre	78 MW
TransAlta Sarnia	G861, G871, G881, G891	Talbot Wind Farm	98.9 MW

Ford Windsor CTS	STG5	Dow Chemicals	G1, G2, G5
TransAlta Windsor	G1, G2	Port Burwell WGS	99 MW
West Windsor Power	G1, G2	Fort Chicago London Cogen	23 MVA
		Great Northern Tri-Gen Cogen	15 MVA

(2) Previously Committed Generation Facilities

- Bruce G1, G2
- Big Eddy GS and Half Mile Rapids GS
- White Pines Wind Farm
- Amherst Island
- York Energy Centre
- Conestogo Wind Energy Centre 1
- Dufferin Wind Farm
- Summerhaven Wind Farm
- Port Dover and Nanticoke
- Grand Renewable Energy
- Green Electron
- Comber East C24Z
- Comber West C23Z
- Pointe-Aux-Roches Wind
- South Kent Wind Farm
- Wolfe Island Shoals

(3) Recently Committed Generation Facilities

- Bluewater Wind Energy Centre
- Jericho Wind Energy Centre
- Bornish Wind Energy Centre
- Goshen Wind Energy Centre
- Cedar Point Wind Power Project Phase II
- Adelaide Wind Energy Centre
- Grand Bend Wind Farms
- Grand Valley Wind Farms (Phase 3)
- Erieau Wind
- East Lake St. Clair Wind
- Adelaide Wind Power Project
- Gunn’s Hill Wind Farm
- Silvercreek Solar Park
- K2 wind
- Armow
- 300 MW wind at Orangeville
- 100 MW wind at S2S

(4) Existing and Committed Embedded Generation

- Essa area: 264 MW
- Ottawa area: 90 MW
- East area: 580 MW
- Toronto area: 168 MW
- Niagara area: 52 MW
- Southwest area: 348 MW
- Bruce area: 26 MW
- West area: 585 MW

(5) Transmission System Upgrades

- Woodstock Area transmission reinforcement (CAA2006-253);
    - Karn TS in-service and connected to M31W & M32W at Ingersol TS
    - W7W/W12W terminated at LFarge CTS
    - Woodstock TS connected to Karn TS
- Rodney (Duart) TS DESN connected to W44LC and W45LS 230 kV circuits (CAA2007-260)

(6) System Operation Conditions

- Lambton TS 230 kV operated *open*
- Claireville TS 230 kV operated *open*
- Leaside TS 230 kV operated *open*
- Leaside TS 115 kV operated *open*
- Middleport TS 230 kV bus operated *open*
- Hearn SS 115 kV bus operated *open*
- Preston T2 connected to M21D
- Cherrywood TS north & south 230kV buses operated ***open***
- Richview TS 230 kV bus operated ***open***
- All tie-lines in-service and phase shifters on neutral taps
- Maximum voltages on the buses

Detailed study results are presented in Appendix C of this report

-End of Section-

5. System Impact Studies

The technical studies focused on identifying the impact of the project on the reliability of the IESO-controlled grid. They include thermal loading assessment of transmission lines and system voltage performance of local buses.

5.1 Existing System

The Kitchener –Waterloo- Cambridge -Guelph area is the region of the power system bounded by 230 kV circuits D6V, D7V, M21D, M22D and the 115 kV circuits D9F, D7F, F11C, F12C, B5G, B6G, D11K, D12K, D10H and D8S. Normally open points exists at Guelph Cedar JCT that separate the 115 kV circuits F11C and F12C from B6G and B5G and also act to separate the load at Cedar. The Cedar load on T2 and T1 is supplied from Detweiler TS, while the Cedar load on T7 and T8 is supplied from Burlington. The existing system is illustrated in **Figure 1** in Appendix A of this report.

Under peak load conditions, if two Detweiler or two Burlington autotransformers are on outage, there can be thermal overloads on the remaining autotransformers. In these cases, the normally open points at Guelph Cedar JCT can be closed after the loss of one autotransformer, to transfer Cedar load away from the location of the overload. Load can also be transferred away from Burlington at Brant TS and Gage TS and transferred away from Detweiler at Elmira TS.

In 2008 the 230 kV/115 kV Preston T2 autotransformer was installed to help supply the Cambridge-Preston area. This autotransformer is normally connected to the circuits F12C (115 kV) and M21D (230 kV). Under peak load conditions, thermal overloads may occur on M20D or M21D for the loss of the companion circuit and can be resolved with the initiation of the Preston Special Protection Scheme, which trips the Preston T2 autotransformer, if armed.

5.2 Study Assumptions

This project is the first step of a staged reinforcement plan for the Kitchener-Waterloo-Cambridge-Guelph area. The scope of an SIA study of this type normally includes an analysis for up to 10 years from the in-service date. However, since the project is the first stage of a longer term plan, the scope of this SIA considered 2016, the year following the planned in-service date.

This SIA report acknowledges that while the GATR project does provide significant improvement to the current situation in the area, it does not completely resolve all concerns. We expect that the residual issues that will remain after the completion of the project will be addressed by future projects in subsequent stages and look forward to receiving those SIA applications.

In this assessment, the 2016 summer base case was used with the following assumptions:

(1) **Transmission facilities**: All existing and committed major transmission facilities with 2016 in-service dates or earlier were assumed in-service.

Other assumptions for transmission facilities include:

- S2S opened at Owen Sound to prevent thermal overloading of the section from Meaford TS to Stayner TS;
- Burlington TS 115 kV switchyard reconfiguration as per CAA ID 2006-EX299;
- Reconfiguration of Orangeville TS as per CAA ID 2010-EX500;
- Preston autotransformer connected to M21D and F12C

(2) **Generation facilities:** All existing and committed major generation facilities with 2016 in-service dates or earlier were assumed in-service. The primary committed generation facilities are outlined in the assumptions for short circuit study **Section 4** of this report.

(3) **Load Facilities:** All major load facilities with 2016 in-service dates or earlier were assumed in-service.

Other assumptions for load facilities include:

- Wolverton load assumed to be connected to 115 kV circuit D9F
- Gerdau Cambridge T3 load is dispatchable and can be re-dispatched within 15 minutes.

(4) **Load Power Factor:** The loads on the transformer stations in the surroundings of the proposed project are modelled to operate with a 0.9 power factor (lagging) at the HV voltage bus.

The shunt capacitors are switched on to provide the necessary reactive power compensation for maintaining at least 0.9 lagging power factor at the high voltage buses.

The HV power factor at Galt TS was assumed to be 0.99 pf. Historical data for year 2012 shows that the power factor at Galt under peak load summer conditions was typically 0.99 pf.

(5) **Load Modelling:** Based on voltage declines observed under preliminary testing, a voltage dependent load model was assumed before tap changer action conditions. A constant load model was assumed after tap changer action conditions. Voltage dependent loads were modelled with P as 50% constant current and 50% constant impedance ($P\alpha\ V^{1.5}$) and Q being modelled as 100% constant impedance ($Q\alpha\ V^{2}$).

(6) **Basecases:** Four basecases with 2016 summer peak load under different generation dispatch were used for the SIA studies. The generation dispatch philosophies of the cases were chosen to stress the local transmission system and represent various system conditions, as follows.

Scenario S1: High FETT

Bruce Zone: 8 Bruce units at full capacity and all other generation at 100% capacity;
West zone: All generation at 100% capacity;
South West zone: Halton Hills out of service. All other generation at 100% capacity;
Toronto zone: 2 Pickering and 4 Darlington units at full capacity. Sithe Goreway at 50% capacity and Portlands out of service;
East zone: 70% of available generation in-service
Flow South Interface flows (From the North): 1250 MW

Scenario S2: High Flows out of Orangeville @ I6V/I7V

Bruce Zone: 8 Bruce units at full capacity and all other generation at 100% capacity;
West zone: No wind generation and 3 Greenfield units placed out of service. All other generation at 100% capacity.
South West zone: Halton Hills out of service and low wind generation southwest of Detweiler. All other generation at 100% capacity.
Toronto zone: 2 Pickering, 4 Portlands and 4 Darlington at full capacity. Sithe Goreway at 100% capacity.
East zone: All generation at 100% capacity.
Flow South Interface flows (from the North): 2050 MW

Scenario S3: High Flows out of Detweiler @ D6I/D7I

Bruce Zone: 8 Bruce units at full capacity and all other generation at 100% capacity;
West zone: All generation at 100% capacity;
South West zone: Halton Hills out of service and low wind generation in the Orangeville area. All other generation at 100% capacity.
Toronto zone: 4 Pickering and 4 units at Darlington at full capacity. Sithe Goreway at 50% capacity and Portlands out of service;
East zone: 85% of available generation in-service.
Flow South Interface flows (From the North): 135 MW

Scenario S4: High Flows out of Middleport @ M20D/M21D

Bruce Zone: 6 Bruce units at full capacity and all other generation at 100% capacity;
West zone: No wind generation and 3 Greenfield units placed out of service. All other generation at 100% capacity.
South West zone: Halton Hills at 100% capacity and low wind generation east of Orangeville and south west of Detweiler. All other generation at 100% capacity.
Toronto zone: 4 Pickering, 4 Portlands and 4 Darlington at full capacity. Sithe Goreway at 100% capacity.
East zone: All generation at 100% capacity.
Flow South Interface flows (From the North): 1250 MW

The various interface flows and circuit flows are shown in Table 5 under the four scenarios with the incorporation of the project.

Table 5: Basecase scenario active power flows (MW)

Scenario	FABC*	BLIP*	FETT*	FS*	QFW*	I6V+I7V @Orangeville	D6I+D7I @Detweiler	M20D+M21D @Middleport
S1 - High FETT Case	6471	-2040	6911	1249	1542	504	212	214
S2 – High Flows out of Orangeville I6V/I7V	6471	-116	3359	2051	288	764	-15	192
S3 – High flows out of Detweiler on D6I/D7I	6471	-2035	6332	135	1577	233	411	352
S4 – High flows out of Middleport on M20D/M21D	4804	-120	3403	1248	1487	407	221	518

(*) This interface is defined in the Ontario Transmission System document. (http://www.ieso.ca/imoweb/pubs/marketReports/OntTxSystem_2012nov.pdf)

5.3 Load Forecast

The following are the load forecasts provided by Hydro One for loads in the Kitchener, Waterloo, Cambridge, Guelph and Burlington areas for the period of 2016-2026. This forecast was assumed for scenarios S1-S4:

Table 6: Load Forecast of Kitchener-Cambridge-Waterloo-Guelph area from 2016 to 2026

Station	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Cambridge #1	90.5	101.5	100.6	101.7	101.7	101.7	101.7	101.7	101.7	101.7	101.7
Galt TS	160.0	160.0	160.0	160.0	160.0	160.1	160.0	160.0	160.0	160.0	160.0
Preston TS	113.3	113.3	113.3	113.3	113.3	113.3	113.3	113.3	113.3	113.3	113.3
Cambridge #2	0.0	0.0	12.3	22.8	31.8	42.6	55.5	68.8	82.6	96.8	101.7
Cambridge #3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
Campbell TS	128.7	127.7	127.0	126.7	126.8	129.3	132.0	135.1	138.4	141.9	144.8
Cedar TS T1/T2	73.3	73.4	73.7	74.1	74.7	76.0	77.4	79.0	80.6	82.3	82.6
Cedar TS T7/T8	28.9	28.6	28.4	28.3	28.2	28.2	28.3	28.5	28.6	28.8	29.1
Hanlon TS	28.8	28.9	29.1	29.3	29.7	29.6	29.5	29.5	29.6	29.6	29.5
Guelph MTS#1	39.1	42.7	46.2	50.1	54.0	55.6	57.3	59.0	60.8	62.6	67.0
Detweiler TS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kitchener #1	29.0	29.3	29.6	30.0	30.4	30.9	31.4	31.9	32.4	32.9	33.5
Kitchener #3	61.5	61.9	62.3	62.8	73.0	73.7	74.5	75.3	76.2	77.1	78.1
Kitchener #4	62.6	62.0	61.6	61.4	61.3	61.2	61.3	61.4	61.6	61.8	62.2
Kitchener #5	66.0	65.1	64.3	63.7	63.3	62.9	62.6	68.7	68.6	68.5	68.6
Kitchener #6	67.1	66.3	65.7	65.2	64.9	64.6	64.4	64.2	64.2	64.2	64.2
Kitchener #7	42.5	42.3	42.1	42.0	42.0	42.1	42.1	35.9	36.0	36.2	36.4
Kitchener #8	35.4	37.9	40.4	43.0	36.1	38.8	41.5	44.3	47.0	49.8	52.7
Kitchener #9	26.6	26.5	26.6	26.7	26.8	27.0	27.2	27.5	27.8	28.1	28.4
Elmira TS	22.6	22.9	23.3	24.1	25.0	26.0	27.1	28.3	29.6	31.0	32.5
Rush MTS	60.8	62.1	63.5	64.4	65.3	66.4	49.5	50.3	58.2	59.3	60.5
Scheifele TS	153.4	156.1	133.8	134.9	136.5	138.2	140.2	142.4	137.9	140.3	143.0
Waterloo #3	68.2	70.3	72.7	76.7	61.9	54.9	73.8	75.1	76.5	77.9	79.5
Snider TS -	0.0	0.0	31.5	36.7	54.2	64.4	67.0	69.6	72.4	75.3	83.3
Bradley TS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fergus TS	100.4	100.6	101.0	101.5	102.1	102.6	103.3	104.0	104.7	105.5	106.8
Puslinch DS	32.3	32.6	33.0	33.4	33.84	34.3	34.8	35.4	35.9	36.5	37.7
Wolverton DS	18.8	18.7	18.7	18.7	18.7	18.8	18.9	19.0	19.1	19.2	19.4
Cambridge CTS	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Guelph CTS1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Guelph CTS2	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Table 7: Load Forecast of Burlington Area from 2016 to 2026

Station	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Brant TS	59.6	59.8	60.0	60.2	60.3	60.5	60.7	60.9	61.1	61.3	61.5
Bronte TS	159.1	161.4	163.7	166.1	168.4	170.7	173.0	175.4	177.7	180.0	182.4
Dundas 2 TS	50.3	50.6	50.8	51.1	51.3	51.6	51.8	52.0	52.3	52.5	52.8
Dundas TS	102.5	102.8	103.1	103.4	103.8	104.1	104.4	104.7	105.0	105.3	105.6
Elgin TS	85.9	86.1	86.4	86.7	87.0	87.3	87.6	87.9	88.2	88.5	88.7
Gage TS	31.3	31.4	31.5	31.6	31.7	31.7	31.8	31.9	32.0	32.0	32.1
McMaster CTS	18.0	18.1	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9
Mohawk TS	86.9	87.3	87.7	88.1	88.5	89.0	89.4	89.8	90.2	90.6	91.0
Newton TS	49.8	50.0	50.2	50.3	50.5	50.7	50.8	51.0	51.2	51.3	51.5
Powerline MTS	66.9	67.4	67.8	68.3	68.8	69.3	69.8	70.2	70.7	71.2	71.7

5.4 Contingencies

All four scenarios were subjected to the same contingencies for the voltage and thermal analysis. The contingencies were applied in accordance to the ORTAC and are as follows:

Table 8: Application of Contingencies for GATR System Impact Assessment

Type	Definition	Category	Application
N-1 Contingencies	Loss of single element	N/A	Respected on both bulk and non-bulk areas of system.
N-2 Contingencies	Loss of two elements simultaneously	Breaker Failures	Respected on bulk areas of system. Breaker failures are respected on the 230 kV system.
		Tower Contingencies	Typically respected on only bulk areas of the system. In the non-bulk areas, these would be similar to N-1-1 contingencies
N-1-1 Contingencies	Loss of one element+ system re-preparation+ loss of second element	N/A	Respected on both bulk and non-bulk areas of the system for load security criteria.

In general, the 500 kV and 230 kV portions of the system near the project are considered to be bulk, while the 115 kV areas of the system are considered non-bulk. This has been confirmed with the connection of the new project.

The following is the list of all contingencies simulated for the thermal and voltage analysis.

Table 9: List of Simulated Contingencies

N-1 Contingencies			
I6V	I7V	D6I	N580M
D7I	M20D	M21D	N581M
E9V	B5V	D5W	N582L
D9F	D7F	F11C	M585M
B5G	F12C	B6G	V586M
Burlington T4			
N-2: Tower Contingencies			
I6V+I7V	D6I+D7I	I6V+D7I	M20D+M21D
B4V+B5V	B22D+B23D	D4V+D5W	E8V+E9V
D7F+D9F	F11C+F12C	B5G+B6G	B3+B4
B560V+B561M	E564L+A565L	M585M+V586M	
N-2: Breaker Failure Contingencies			
B560V+B569B -Bruce L560L569 BF	N580M+V596M - Middleport L80L86 BF	N581M+M585M - Middleport L81L85 BF	D7I+I7V - Inverhaugh SS BF
M20D + Middleport SC21 – Middleport KL20 BF	M20D + Middleport T3 – Middleport T3L20 BF	M21D+Middleport SC23 – Middleport KL21 BF	D6I+I6V - Inverhaugh SS BF
M21D+N6M - Middleport L6L21 BF	D5W+ Detweiler SVC – Detweiler HT1H BF	M21D+Detweiler SVC – Detweiler HT1A BF	M20D+D7I – Detweiler L7L20 BF
M21D+ Detweiler SC21 – Detweiler ASC21 BF	M21D+D7I - Detweiler AL7 BF	M21D+D6I - Detweiler AL6 BF	M20D+D5W – Detweiler HL20 BF
D5W+ B22D - Detweiler HL22 BF	E8V+I7V - Orangeville AL4 BF	B4V+I6V - Orangeville CB2 BF	Burlington T6+T9 - Burlington H1H2 BF
N-1-1: Contingencies			
F12C+D7I	B6G+I6V	M20D+D7F	D9F+Detweiler SC11
D7F+Detweiler T2+ Detweiler SC12	B5G+Burlington T12	B5G+ Burlington SC11	B6G+B4
D7F+F12C	D9F+F11C	M21D+F12C	F11C+B6G
F12C+B5G	M21D+N580M	M21D+N581M	M21D+M585M
M21D+V568M	M21D+I7V	M20D+F12C	M21D+B6G
M21D+D9F	M21D+D7F	M21D+F11C	M21D+B5G
I7V+Orangeville SC21	I6V+Orangeville SC21	D6I+D5W+Detweiler SC22	D7I+D5W+Detweiler SC22
D6I+I7V	Burlington T4+T9	Burlington T4+T6	Detweiler T3+T4
Middleport T6+T3	B5G+Burlington T4	D9F+F12C	D9F+B5G
F11C+B5G	D7F+B5G	D9F+B6G	D7F+B6G
F11C+D7F	F12C+B6G		

5.5 Before and After Comparison of Active Power and Voltage

A comparison of pre-contingency active power flows and voltage conditions were examined under all four scenarios before and after the incorporation of GATR under 2016 conditions. The following observations were made:

- The GATR connection results in a significant increase in flows out of Detweiler on the 230 kV circuits between Detweiler x Orangeville.
- The GATR connection results in a tendency of flows towards Burlington 115 kV on the 115 kV circuits B5G and B6G. This is opposite to the flow pattern under the existing configuration whereby the tendency is out of Burlington 115 kV bus due to the radial connection of these circuits.
- The GATR connection results in a slight increase in easterly flows towards the Toronto zone on the 230kV circuits between Trafalgar and Richview. The GATR connection has created an additional path between the Southwest and Toronto zones. Congestion on these circuits has been identified previously in recent FIT studies under high easterly flows towards Toronto conditions. The incorporation of GATR will increase the level of congestion, but this can be managed through the redispatch of generation.
- The GATR connection result in an overall reduction in flows on Preston, Detweiler and Burlington 230/115 kV transformers.
- The GATR connection results in a significant improvement of voltages at Cedar 115 kV. Without the GATR connection, pre-contingency voltages at Cedar would otherwise be near minimum acceptable 115 kV voltage levels (113 kV).

The following table shows the before and after GATR active flow pattern on various circuits near the project.

Table 10: Before and After GATR Comparison of Active Power Flows

Circuit(s)	S1 – High FETT Case			S2 – High Detweiler x Orangveille Flows out of Orangeville			S3 - High Detweiler x Orangveille Flows out of Detweiler			S4 – High M20D+M21D Flows out of Middleport		
	Before GATR (MW)	After GATR (MW)	% Δ	Before GATR (MW)	After GATR (MW)	% Δ	Before GATR (MW)	After GATR (MW)	% Δ	Before GATR (MW)	After GATR (MW)	% Δ
Kitchener-Waterloo-Cambridge-Guelph & Burlington Area												
D7V+D6V @ Orangeville or I6V+I7V @ Orangeville	413.7	504.5	21.9	670.0	764.4	14.1	165.3	232.9	40.9	354.4	407.4	15.0
D7V+D6V@ Detweiler or D6I+D7I@Detweiler	44.3	212.4	379.5	-205.1	-15.4	-92.5	290.3	411.1	41.6	102.5	221.3	115.9
M20D+M21D@ Middleport	139.5	214.2	53.5	126.5	192.4	52.1	288.4	352.0	22.1	484.8	518.3	6.9
B5G+B6G@ Burlington	137.9	-74.2	-153.8	138.0	-67.3	-148.8	138.1	-31.4	-122.7	138.0	25.6	-81.4
D9F+D7F@Detweiler	243.5	204.1	-16.2	250.2	188.1	-24.8	233.3	211.4	-9.4	216.8	168.3	-22.4
Preston T2 transformer (230 to 115 kV flows)	21.7	15.2	-30.0	15.2	-2.1	-113.8	31.9	34.0	6.6	48.3	35.3	-26.9
Detweiler T2+T3+T4	357.9	318.5	-11.0	363	301.1	-17.1	347.2	325.3	-6.3	333.1	284.8	-14.5
Burlington T4+T6+T9+T12	864.3	651.4	-24.6	864.7	658.5	-23.8	864.7	694.4	-19.7	864.6	751.3	-13.1
Trafalgar Area												
R19T @ Trafalgar	439.6	454.6	3.4	164.5	179.2	8.9	390.6	402.8	3.1	282.9	291.3	3.0
R21T @ Trafalgar	437.7	452.7	3.4	155.8	170.5	9.4	388.8	401.0	3.1	274.1	282.5	3.1
R14T @ Trafalgar	452.0	464.9	2.9	224.6	237.2	5.6	404.5	415.0	2.6	321.3	328.6	2.3
R17T @ Trafalgar	454.0	466.9	2.8	226.7	239.3	5.6	406.5	417.0	2.6	323.4	330.7	2.3
Middleport Area												
Q23BM@ Middleport	197.7	177.1	-10.4	196.9	177.0	-10.1	169.3	152.5	-9.9	39.7	29.4	-25.9
Q25BM@Middleport	198.9	178.1	-10.5	199.5	179.3	-10.1	170.2	153.3	-9.9	38.9	28.4	-27.0
Q24HM@Middelport	167.4	154.2	-7.9	199.3	186.6	-6.4	147.9	137.2	-7.2	62.8	56.2	-10.5
M34H@Middleport	168.0	156.5	-6.8	151.1	139.9	-7.4	154.9	145.7	-5.9	95.2	89.2	-6.3
Q29HM@ Middleport	93.3	82.6	-11.5	157.6	146.9	-6.8	78.8	70.2	-10.9	27.4	21.8	-20.4
M27B@Middleport	291.7	272.2	-6.7	191.4	172.5	-9.9	270.8	255.2	-5.8	162.2	152.0	-6.3
M28B@Middleport	291.6	272.1	-6.7	191.3	172.5	-9.8	270.7	255.2	-5.7	162.1	152.0	-6.2

The following table shows the before and after GATR pre-contingency voltages on various buses near the project.

Table 11: Before and After GATR Comparison of System Voltages

Buses	S1 – High FETT Case		S2 – High Detweiler x Orangveille Flows out of Orangeville		S3 - High Detweiler x Orangeville Flows out of Detweiler		S4 – High M20D+M21D Flows out of Middleport	
	Before (kV)	After (kV)	Before (kV)	After (kV)	Before (kV)	After (kV)	Before (kV)	After (kV)
Detweiler 230 kV	242.0	242.0	244.2	244.2	244.2	244.2	244.2	244.2
Middleport 230 kV	245.6	246.6	242.8	243.9	243.1	244.0	242.8	243.5
Preston 230 kV	236.4	238.3	237.8	239.0	237.1	238.0	237.6	238.7
Orangeville	242.3	241.5	246.4	246.4	243.5	242.7	243.6	242.7
Detweiler 115 kV	122.1	122.4	124.3	124.5	124.4	124.6	124.2	124.5
Cedar B5G/B6G 115 kV	116.4	121.8	115.0	122.3	114.9	122.4	115.5	122.5
Cedar F11C/F12C	119.1	121.8	120.7	122.3	121.0	122.4	120.8	122.5
Preston 115 kV	120.5	121.1	120.2	121.2	120.9	121.7	120.3	121.4
Burlington 115 kV	122.2	123.3	121.0	122.4	120.9	122.3	121.5	122.9

5.6 Thermal Analysis

The transmission thermal loading assessment results show that with the connection of the GATR project, under 2016 peak load conditions, the existing post-contingency loading issues on the Burlington and Detweiler autotransformers are alleviated. Post-contingency overloads may exist on M21D and B6G for two element outages, but can be managed with load curtailment, or control actions initiated as soon as one element is on outage, respectively.

The *Ontario Resource and Transmission Assessment Criteria* requires that all line and equipment loads be within their continuous ratings with all elements in service, and within their long-term emergency ratings (LTE) with any one element out of service. Immediately following contingencies, lines may be loaded up to their short-term emergency ratings (STE) where control actions such as re-dispatch, switching, etc. are available to reduce the loading to the long-term emergency ratings.

The ratings for the conductors were calculated as follows:

- *Ambient conditions*: 35°C temperature, 4 km/h wind speed, daytime;
- *Continuous*: Rating calculated at the lesser of the sag temperature or 93 °C operating temperature;
- *Long Term Emergency*: Rating calculated at the lesser of the sag temperature or 127 °C operating temperature;
- *Short Term Emergency*: Rating calculated at the sag temperature with a pre-contingency loading of 100% of the continuous rating.

As per the Ontario Resource and Transmission Assessment Criteria, for conductors within a 50 km radius of wind generation at 100% active power output, the above can be calculated using 15 km/h wind speed with approval of the transmission owner.

The continuous, long term emergency (LTE) and short term emergency (STE) transformer ratings were provided by Hydro One.

5.6.1 Pre-contingency Conditions

Under 2016 conditions, all monitored elements were found to be within applicable thermal ratings under pre-contingency conditions.

The following table shows the pre-contingency thermal loading on various 230 kV circuits near the project under all four scenarios. Note, for scenarios S1 and S2, the wind farm generation in the Orangeville area was assumed at its maximum output capability. As such, I6V and I7V sections between Orangeville and Inverhaugh SS, which are within a radius of 50 km, were assumed with ratings at 15 km/h wind speed. Hydro One will need to confirm if the use of circuit ratings assumed under 15 km/h wind conditions in this case is acceptable.

Table 12: Pre-contingency Thermal Analysis on 230 kV Circuits

230 kV Circuits									
Circuit	From	To	Rating (A)			% Loading			
			Continuous	LTE	STE	S1	S2	S3	S4
M20D	DETWEILER_TS220	DETWEIL_JM20220	1370	1820	2750	29	29.4	20.1	11
	DETWEIL_JM20220	KITCH_#8JM20220	1370	1820	2750	23.3	23.1	13.8	9
	KITCH_#8JM20220	GALT_J_M20D 220	1370	1820	2750	20.4	19.9	10.5	10.1
	GALT_J_M20D 220	PRESTON_JM20220	920	1130	1240	51.2	50.7	52.4	53.2
	PRESTON_JM20220	C&ND_MTSJM20220	840	860	870	33.4	32.8	34.3	34.7
	C&ND_MTSJM20220	PRESTON_M20D220	840	860	870	18.8	18.3	19.5	19.9
	MIDDLEPT_DK1220	GALT_J_M20D 220	1370	1820	2750	18.5	13.9	24.4	40.5
M21D	DETWEILER_TS220	DETWEIL_JM21220	1370	1820	2750	25.5	27.7	18.8	11
	DETWEIL_JM21220	KITCH_#8JM21220	1370	1820	2750	19.5	21.3	12.4	8.7
	KITCH_#8JM21220	GALT_J_M21D 220	1370	1820	2750	16.5	18	9.3	9.7
	GALT_J_M21D 220	COURT_STL_J 220	920	1130	1240	64.6	59.1	67.4	66
	COURT_STL_J 220	PRESTON_JM21220	920	1130	1240	53.1	47.7	56.1	54.8
	PRESTON_JM21220	C&ND_MTSJM21220	840	860	870	35.1	29	38.4	37.3
	C&ND_MTSJM21220	PRESTON_M21D220	840	860	870	21	15.5	25	24.6
	PRESTON_M21D220	PRESTON_TSH1220	840	860	870	5.3	9	12.1	14.9
	MIDDLEPT_DK2220	GALT_J_M21D 220	1370	1820	2750	28.5	21.2	37.4	49.5
D6I	DETWEILER_TS220	WAT_NORTH3J6220	840	1090	1400	43.7	33	64.6	45.1
	WAT_NORTH3J6220	SCHEIFEL_JD6220	840	1090	1210	33.1	30.1	53.4	34.6
	BRADLEY_TSD6220	SCHEIFEL_JD6220	840	1090	1210	13.9	36.6	29.3	14.6
	SNIDER_TSD6V220	BRADLEY_TSD6220	840	1090	1210	14.1	36.7	29.3	14.7
	GUELPH_N_JD6220	SNIDER_TSD6V220	840	1090	1210	14.5	36.9	29.4	14.8
I6V	GUELPH_N_JD6220	CAMPBELL_D6V220	1060	1390	1610	45.6	47.5	38.2	36.3
	FERGUS_J_D6V220	GUELPH_N_JD6220	840[1]	1090[1]	1210[1]	N/A	N/A	19.1	43.9
			1130[2]	1410[2]	1490[2]	42.9	69.2	N/A	N/A
	ORANGVILLE 220	FERGUS_J_D6V220	1110[1]	1460[1]	2080[1]	N/A	N/A	26	44.1
			1530[2]	1910[2]	2420[2]	39.7	59.0	N/A	N/A
	CAMPBELL_D6V220	CGE_J_D6V 220	1050	1370	1600	30.1	32.3	22.7	20.6
	CGE_J_D6V 220	CEDAR D6V220	1050	1370	1600	30.1	32.3	22.7	20.7
D7I	DETWEILER_TS220	WAT_NORTH3J7220	840	1090	1370	46.9	35.9	66.2	48.4
	WAT_NORTH3J7220	SCHEIFEL_JD7220	840	1090	1210	36.4	32.1	55.1	38
	BRADLEY_TSD7220	SCHEIFEL_JD7220	840	1090	1210	15.4	37.4	28.3	16.9
	SNIDER_TSD7V220	BRADLEY_TSD7220	840	1090	1210	15.7	37.6	28.4	17.2
	GUELPH_N_JD7220	SNIDER_TSD7V220	840	1090	1210	16.3	37.8	28.4	17.9
	GUELPH_N_JD7220	CAMPBELL_D7V220	1060	1390	1610	46.1	48.6	37.2	36.6
	CAMPBELL_D7V220	CGE_J_D7V 220	1050	1370	1600	30.4	33.3	21.4	20.9
	CGE_J_D7V 220	CEDAR D7V220	1050	1370	1600	30.5	33.4	21.5	21
I7V	FERGUS_J_D7V220	GUELPH_N_JD7220	840[1]	1090[1]	1210[1]	N/A	N/A	18.7	43.4
			1130[2]	1410[2]	1490[2]	43.0	69.5	N/A	N/A
	ORANGVILLE 220	FERGUS_J_D7V220	1110[1]	1460[1]	2080[1]	N/A	N/A	25.8	44
			1530[2]	1910[2]	2420[2]	39.8	59.3	N/A	N/A

Notes: (1) Rating under 4 km/h wind speed
(2) Rating under 15 km/h wind speed

The following table shows the pre-contingency thermal loading on various 115 kV circuits near the project under all four scenarios.

Table 13: Pre-contingency Thermal Analysis on 115 kV Circuits

115 kV Circuits									
Circuit	From	To	Rating (A)			% Loading			
			Continuous	LTE	STE	S1	S2	S3	S4
D7F	DETWEILER_TS118	DETWEIL_JD7F118	810	1070	1390	55	58.5	59	50.8
	DETWEIL_JD7F118	KITCH_#6_JD7118	810	1070	1390	55.1	58.5	59	50.8
	KITCH_#6_JD7118	SIEBERT_JD7F118	810	1070	1390	55.1	58.6	59.1	50.8
	SIEBERT_JD7F118	KITCH_#7_D7F118	810	1070	1390	35.1	39.3	39.1	32
	KITCH_#7_D7F118	FREEPORT_SS7118	810	1070	1390	21.5	26	25.2	20.4
D9F	DETWEILER_TS118	DETWEIL_JD9F118	810	1070	1390	70.4	66.9	75.5	65.3
	DETWEIL_JD9F118	KITCH_#6_JD9118	810	1070	1390	58.2	54.7	63.4	53.1
	KITCH_#6_JD9118	SIEBERT_JD9F118	810	1070	1390	58.2	54.7	63.4	53.2
	SIEBERT_JD9F118	KITCH_#7_D9F118	810	1070	1390	38.7	34.5	44	33.5
	KITCH_#7_D9F118	FREEPORT_SS9118	810	1070	1390	25.8	20.6	30.9	20
F11C	FREEPORT_SS9118	SPEEDVIL_J11118	590	770	830	15.6	1.6	16.7	1.9
	SPEEDVIL_J11118	PRESTON_TS 118	1130	1500	1810	0	0	0	0
	SPEEDVIL_J11118	CGE_J_F11C 118	590	770	830	15.3	1.7	16.6	1.3
	CGE_J_F11C 118	CEDAR_TS_F11118	590	770	830	14.8	1.7	16.4	1.2
F12C	FREEPORT_SS7118	SPEEDVIL_J12118	590	770	830	10.9	12.1	7.5	22.1
	PRESTON_TS 118	SPEEDVIL_J12118	1130	1500	1810	7.8	13.3	17.8	22.1
	SPEEDVIL_J12118	CGE_J_F12C 118	590	770	830	23.5	12.9	30.5	20.7
	CGE_J_F12C 118	CEDAR_TS_F12118	590	770	830	23	12.8	30.2	20.2
B5G	CEDAR_TS_B5G118	HANLON_J_B5G118	590	590	590	74.5	70.6	58	37.4
	HANLON_J_B5G118	ARLEN_J_B5G 118	590	590	590	63	58.8	45.5	24.4
	ARLEN_J_B5G 118	PUSLINCH_JB5118	590	590	590	48.7	43.8	29.6	6.6
	PUSLINCH_JB5118	HARPERS_JB5G118	590	590	590	39.2	33	19.3	7.6
	HARPERS_JB5G118	BURLINGTONSP118	590	640	650	36.4	29.9	16.7	11.7
B6G	CEDAR_TS_B6G118	HANLON_J_B6G118	590	590	590	71.7	69.9	54.4	33.4
	HANLON_J_B6G118	ARLEN_J_B6G 118	590	590	590	60.6	58	42.2	20.8
	ARLEN_J_B6G 118	PUSLINCH_JB6118	590	590	590	47	42.9	26.6	3.7
	PUSLINCH_JB6118	HARPERS_JB6G118	590	590	590	38.1	32.4	16.1	10.4
	HARPERS_JB6G118	BURLINGTONSP118	590	640	650	37.6	32	15.6	10.3

The following table shows the pre-contingency thermal loading on various transformers near the project under all four scenarios.

Table 14: Pre-contingency Thermal Analysis on Transformers

Transformers									
Tfx	From	To	Rating (MVA)			% Loading			
			Continuous Rating	LTE	STE	S1	S2	S3	S4
T2	DETWEILER 230 KV	DETWEILER 115	250	283.7	396	43.2	39.6	42.7	37.4
T3	DETWEILER 230 KV	DETWEILER 115	250	383.4	487.2	45.3	41.6	44.8	39.3
T4	DETWEILER 230 KV	DETWEILER 115	225	295.4	403	48.1	44	47.5	41.6
T2	PRESTON 230 KV	PRESTON 115 KV	250	394.6	493.9	7.3	12.5	16.8	20.7
T3	CEDAR 230 KV	CEDAR 115 KV	250	400	500	51.7	56.3	39.3	35.8
T4	CEDAR 230 KV	CEDAR 115 KV	250	400	500	52.2	57.8	37.2	36.2
T4	BURLINGTON 230 KV	BURLINGTON 115 KV	250	389.3	464.5	71.3	71.5	74.9	80.3
T6	BURLINGTON 230 KV	BURLINGTON 115 KV	250	370.4	483.1	66.6	66.8	69.9	75
T9	BURLINGTON 230 KV	BURLINGTON 115 KV	250	388.9	482.7	68.2	68.5	71.6	76.8
T12	BURLINGTON 230 KV	BURLINGTON 115 KV	250	304.7	442.9	68.9	69.2	72.4	77.6

5.6.2 Post-contingency Conditions

Under 2016 conditions, circuit sections on M21D, B6G, D9F and autotransformers at Burlington were found to be potentially overloaded under post-contingency conditions.

The 230 kV circuit section M21D between Galt and Courtice becomes loaded at or beyond its LTE rating for the loss of two elements. Under 2016 peak load conditions, this can be managed by curtailing load such as Gerdau Cambridge T3 which is dispatchable within 15 minutes for the loss of two elements. Over the longer term Hydro One is recommended to consider, in view of the future load growth: (i) implementing additional load rejection that will respond to contingencies and interrupt load within 15 minutes for the loss of two elements and (ii) upgrading the limiting circuit sections on M21D (and possibly its companion circuit M20D) to have higher LTE ratings, or other measures that may be equally effective..

The 115 kV circuit sections D9F between Detweiler and Detweiler JCT, B5G between Cedar and Hanlon and B6G between Cedar and Hanlon were found to be loaded beyond its LTE and or STE ratings for the loss of two elements. Under 2016 peak load conditions, this can be managed by a combination of load transfers at Brant and Gage, opening 115 kV breakers at Freeport or opening low voltage tie breakers at Kitchener #5 and Kitchener #7 with one element out of service. Alternatively, load can be manually interrupted within 15 minutes after a second element is forced out of service. Over the longer term, Hydro One is recommended to consider, in view of the future load growth: (i) implementation of a load rejection scheme to respond to contingencies and interrupt load within 15 minutes for the loss of two elements or (ii) upgrading the limiting circuit sections on D9F (and possibly its companion circuit D7F) and B5G and B6G, or other measures that may be equally effective..

The GATR project will help improve the existing loading conditions on Burlington T12 when two Burlington autotransformers are out of service. As part of the proposed project, the normally open disconnect switches at Cedar TS will be closed creating a connection path on the 115 kV circuits between Detweiler TS and Burlington TS. As a result, part of the Burlington 115 kV load will be supplied through the B5G/B6G 115 kV circuits from the Guelph area. The incorporation of GATR will help to significantly relieve the loading on the Burlington autotransformers, though existing overload concerns on these autotransformers may still persist. Existing operating measures to transfer load at Brant and Gage during Burlington autotransformer outages, may not be sufficient to respect thermal ratings under 2016 peak conditions. It is recommended that Hydro One examines one or more of the following (i) additional load transfers in Burlington area, (ii) implementation of a load rejection scheme to respond to contingencies and interrupt load within 15 minutes of a contingency, or (iii) replacement of limiting Burlington autotransformers, or other measures that may be equally effective.

The following table shows the 230 kV circuit sections which are loaded at 95% or above its LTE under various post-contingency conditions. As shown, there are loading concerns on M21D at Galt x Courtice. Note, for scenarios S1 and S2, the wind farm generation in the Orangeville area was assumed at its maximum output capability. As such, I6V and I7V sections between Orangeville and Inverhaugh SS, which are within a radius of 50 km, were assumed with ratings at 15 km/h wind speed. Hydro One will need to confirm if the circuit ratings assumed under 15 km/h wind conditions in this case is acceptable. If the use of these ratings with 15 km/h winds are not acceptable to Hydro One then under the typical 4km/h wind speed assumption, there are thermal concerns that need to be addressed post-contingency.

Table 15: Post- Contingency Thermal Analysis on 230 kV Circuits (>95% of LTE)

230 kV Circuits												
Transformer	S1			S2			S3			S4		
	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE
D7I- Detweiler x Waterloo North	All Within Criteria			All Within Criteria			D6G+I7V	95.6	76.0	All Within Criteria		
							Det T3+T4	96.4	76.7			
M21D- Galt x Courtice	M20D+D7I	**99.9**	91.0	M20D+D7I	95.2	86.8	M20D+D7I	**100.4**	91.5	M20D+D7I	**99.7**	90.8
	M20D+D7F	96.2	87.7	M20D+F12C	**100.7**	91.7	M20D+D5W	98.0	89.3	M20D+D5W	95.7	87.2
	M20D+F12C	**100.4**	91.5				M20D+D7F	**99.8**	90.9	M20D+D7F	97.1	88.5
							M20D+F12C	**100.9**	91.9	M20D+F12C	**100.9**	91.9

The following table shows the effect of possible control actions that can be taken to ensure that the loading on M21D remains within LTE and STE values. As shown, the tripping of Preston T2 via the existing Preston Special Protection Scheme does not help in these cases to relieve the overload on M21D between Galt and Courtice, but curtailing load such as Gerdau Cambridge T3 which is dispatchable within 15 minutes of the contingency would help.

Table 16: Possible Control Actions to Mitigate 230 kV Thermal Overloads

Issue	Control Action	S1	S2	S3	S4
M21D- Galt x Courtice >LTE for Loss of M20D+D7I	Load Curtailment/Dispatch of 14 MW on circuit M21D	97% of LTE	N/A	97% of LTE	97% of LTE
	Trip Preston T2 via SPS	**101% of LTE**	N/A	**101% of LTE**	**101% of LTE**
M21D- Galt x Courtice>LTE for Loss of M20D+D7F	Load Curtailment/Dispatch of 14 MW on circuit M21D	N/A	N/A	97% of LTE	N/A
	Trip Preston T2 via SPS	N/A	N/A	**101% of LTE**	N/A
M21D- Galt x Courtice > LTE for Loss of M20D+F12C [1]	Load Curtailment/Dispatch of 14 MW on circuit M21D	96% of LTE	97% of LTE	97% of LTE	97% of LTE

Notes: (1) Preston T2 is connected to F12C and is off-loaded for this contingency

The following table shows the 115 kV circuits which are loaded at 95% or above its LTE under various post-contingency conditions. Shown are the corresponding LTE and STE loading. It should be noted that the percentage of LTE and STE loading are the same for B5G between Cedar to Hanlon and B6G between Cedar to Hanlon as there is no difference in rating values.

Table 17: Post-Contingency Thermal Analysis on 115 kV Circuits (>95% of LTE)

115 kV Circuits												
Circuit Section	S1			S2			S3			S4		
	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE
D9F-Detweiler x Detweiler	D7F+F12C	**100.4**	77.3	D7F+F12C	96.8	74.5	D7F+F12C	**103.7**	79.8	All within criteria		
B5G – Cedar x Hanlon	Burl T6+T9	**100.5**	**100.5**	Burl T6+T9	96.9	96.9	All within criteria			All within criteria		
	Burl T4+T9	**105.2**	**105.2**	Burl T4+T9	**100.7**	**100.7**						
	Burl T4+T6	**103.5**	**103.5**	Burl T4+T6	**104.6**	**104.6**						
B6G – Cedar x Hanlon	B5G	97.5	97.5	B5G	96	96	B5G+Burl T4	95.4	95.4	All within criteria		
	Burl T6+T9	96.1	96.1	Burl T6+T9	95	95						
	B5G+Burl T12	**107.2**	**107.2**	B5G+Burl T12	**106**	**106**						
	B5G+Bur SC11	**101.1**	**101.1**	B5G+Burl SC11	**100.3**	**100.3**						
	M21D+B5G	98.4	98.4	M21D+B5G	99.3	99.3						
	Burl T4+T9	**100.6**	**100.6**	Burl T4+T9	98.8	98.8						
	B5G+Burl T4	**111.6**	**111.6**	B5G+Burl T4	**110.1**	**110.1**						
	D7F+B5G	95.1	95.1	Burl T4+T6	**102.5**	**102.5**						
	Burl T4+T6	99.0	99.0									

The following table shows the effect of possible control actions that can be taken to ensure that the loading on D9F, B5G and B6G remain within LTE and STE values. It can be concluded that control actions such as a combination of load transfer and opening up breakers or load curtailment within 15 minutes post-contingency are all viable solutions. The transfer of load at Brant and Gage was not found to be sufficient in respecting the LTE and STE ratings of B6G between Cedar and Hanlon for the loss of B5G+Burlington T4 and may require additional measures such as opening up the 115 kV Freeport breakers L7L12 and L9L11 to sever the link between Burlington and Kitchener-Guelph area.

Table 18: Possible Control Actions to Mitigate 115 kV Thermal Overloads

Overload	Control Action	S1	S2	S3	S4
D9F – Detweiler x Detweiler Jct >LTE	Loss of D7F+F12C				
	If D7F O/S: Open LV breakers at Kitchener #5 on F12C	87% of LTE	N/A	91% of LTE	N/A
	If F12C O/S: Open LV breakers at Kitchener #7 on D7F	92% of LTE	N/A	95% of LTE	N/A
	Load Rejection of 9 MW at Wolverton	96% of LTE	N/A	99% of LTE	N/A
B5G- Cedar x Hanlon >LTE/STE	Loss of Burl T6+T9				
	If Burl T6/T9 O/S: Transfer load at Brant and Gage	91% of LTE	N/A	N/A	N/A
	If Burl T6/T9 O/S: Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	89% of LTE	N/A	N/A	N/A
	Load Rejection of 22 MW at Hanlon	94% of LTE	N/A	N/A	N/A
	Loss of Burl T4+T9				
	If Burl T4/T9 O/S: Transfer load at Brant and Gage	95% of LTE	91% of LTE	N/A	N/A
	If Burl T4/T9 O/S: Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	93% of LTE	88% of LTE	N/A	N/A
	Load Rejection of 22 MW at Hanlon	98% of LTE	94% of LTE	N/A	N/A
	Loss of Burl T4+T6				
	If Burl T4/T6 O/S: Transfer load at Brant and Gage	93% of LTE	95% of LTE	N/A	N/A
	If Burl T4/T6 O/S: Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	91% of LTE	92% of LTE	N/A	N/A
	Load Rejection of 22 MW at Hanlon	96% of LTE	97% of LTE	N/A	N/A
B6G- Cedar x Hanlon >LTE/STE	Loss of B5G+Burl T4				
	If Burl B5G/T4 O/S: Transfer load at Brant and Gage	104% of LTE	103% of LTE	N/A	N/A
	If Burl B5G/T4 O/S: : Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	94% of LTE	94% of LTE	N/A	N/A
	Load Rejection of 22 MW at Hanlon	98% of LTE	96% of LTE	N/A	N/A
	Loss of B5G+Burl T12				
	If Burl B5G/Burl T12 O/S: Transfer load at Brant and Gage	100% of LTE	98% of LTE	N/A	N/A
	If Burl B5G/Burl T12 O/S: Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	90% of LTE	90% of LTE	N/A	N/A
	Load Rejection of 22 MW at Hanlon	94% of LTE	92% of LTE	N/A	N/A
	Loss of B5G+Burl SC11				
	If Burl B5G/Burl SC11 O/S Transfer load at Brant and Gage	95% of LTE	94% of LTE	N/A	N/A
	If Burl B5G/Burl SC11 O/S Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	85% of LTE	86% of LTE	N/A	N/A
	Load Rejection of 22 MW at Hanlon	88% of LTE	86% of LTE	N/A	N/A
	Loss of Burl T4+T9				
	If Burl T4/Burl T9 O/S: Transfer load at Brant and Gage	91% of LTE	N/A	N/A	N/A
	If Burl T4/Burl T9 O/S: Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	81% of LTE	N/A	N/A	N/A
	Load Rejection of 22 MW at Hanlon	94% of LTE	N/A	N/A	N/A
	Loss of Burl T4+T6				
	If Burl T4/Burl T6 O/S: Transfer load at Brant and Gage	N/A	93% of LTE	N/A	N/A
	If Burl T4/Burl T6 O/S: Open breakers L7L12 and L9L11 at Freeport and transfer load at Brant and Gage	N/A	84% of LTE	N/A	N/A
	Load Rejection of 22 MW at Hanlon	N/A	96% of LTE	N/A	N/A

Table 19 shows the autotransformers which are loaded at 95% or above its LTE under various post-contingency conditions with the incorporation of GATR. **Table 20** shows the loading on these autotransformers under the same post-contingency conditions shown in **Table 19** without the incorporation of GATR. As shown, the incorporation of GATR will help to significantly relieve the loading on these transformers, though existing overload concerns on the Burlington autotransformers may still persist.

Table 19: With GATR: Post-Contingency Thermal Analysis on Transformers (>95% of LTE)

Transformers (with GATR)												
Transformer	S1			S2			S3			S4		
	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE
Detweiler T2	Det T3+T4	95	68	Within Criteria			Det T3+T4	98	70	Within Criteria		
Burlington T12	Burl T6+T9	105	72	Burl T6+T9	105	72	Burl T6+T9	109	75	Burl T6+T9	117	80
	Burl T4+T9	114	79	Burl T4+T9	102	70	Burl T4+T9	119	82	Burl T4+T9	121	83
	Burl T4+T6	106	73	Burl T4+T6	105	72	Burl T4+T6	111	76	Burl T4+T6	118	81

Table 20: Without GATR: Post-Contingency Thermal Analysis on Transformers

Transformers (without GATR)												
Transformer	S1			S2			S3			S4		
	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE	Contingency	% LTE	% STE
Detweiler T2	Det T3+T4	116	83	Det T3+T4	112	80	Det T3+T4	108	77	Det T3+T4	101	72
Burlington T12	Burl T6+T9	153	105	Burl T6+T9	154	106	Burl T6+T9	154	106	Burl T6+T9	154	106
	Burl T4+T9	169	116	Burl T4+T9	158	109	Burl T4+T9	169	116	Burl T4+T9	164	113
	Burl T4+T6	158	109	Burl T4+T6	159	109	Burl T4+T6	160	110	Burl T4+T6	160	110

The following table shows the effect of load transfer/load rejection that can be taken to ensure that the loading on Burlington T12 remains within LTE and STE values. As shown the existing load transfer measures at Gage and Brant may not be sufficient to respect the LTE rating of Burlington T12 for the loss of two Burlington autotransformers. Additional transfer of Elgin would help, but note, it is currently not an approved control measure.

Table 21: Possible Control Actions to Mitigate Transformer Thermal Overloads

Issue	Control Action	S1	S2	S3	S4
Burlington T12 > LTE	Burl T6+T9				
	If Burl Transformer O/S: Load Transfer of 90 MW (Brant+Gage)	90% of LTE	90% of LTE	95% of LTE	**102% of LTE**
	If Burl Transformer O/S: Load Transfer of at least 128 MW (Brant+Gage+Elgin)	83 % of LTE	84% of LTE	89% of LTE	96% of LTE
	Burl T4+T9				
	If Burl Transformer O/S: Load Transfer of 90 MW (Brant+Gage)	98% of LTE	86% of LTE	**103% of LTE**	**105% of LTE**
	If Burl Transformer O/S: Load Transfer of at least 128 MW (Brant+Gage+Elgin)	92% of LTE	79% of LTE	97% of LTE	99% of LTE
	Burl T4+T6				
	If Burl Transformer O/S: Load Transfer of 90 MW (Brant+Gage)	91% of LTE	90% of LTE	96% of LTE	**103% of LTE**
	If Burl Transformer O/S: Load Transfer of at least 128 MW (Brant+Gage+Elgin)	85 % of LTE	83% of LTE	90% of LTE	97% of LTE

5.7 Voltage Analysis

The voltage assessment study shows that with the connection of the GATR, voltages at the monitored buses remained within criteria for all recognized contingencies under 2016 conditions.

It should be noted, however that 115 kV post-contingency voltages at Kitchener #5 were found to be as low as 108 kV for the outage of D9F+B6G and post-contingency voltages at Hanlon TS were found to be as low as 109 kV for the outage of F12C+B6G. Low voltages are attributed to the fact that in addition to circuits being lost for these contingencies, one or more Cedar autotransformers are also removed by configuration. It is recommended that Hydro One considers one or more of the following: (i) implementation of load rejection scheme to respond to contingencies and interrupt load within 15 minutes of contingency, (ii) open LV breakers on loads between Detweiler and Burlington for the loss of B6G/D9F, or (ii) future expansion of the Cedar station into a 6 breaker ring bus such that the loss of B6G or F12C does not also result in the loss of a Cedar autotransformer, or other measures that may be equally effective.

Although not summarized in this report, it was found that the loss of M20D+M21D circuits can result in voltages at Middleport 230 kV bus to be as high as 250 kV, the maximum 230 kV acceptable voltage as per the ORTAC, under scenario S1 and S2 conditions. This is attributed to the fact that over 500 MW would be lost by configuration. To address future high voltage concerns at Middleport 230 kV for the loss of M20D+M21D circuits in view of the future load growth, it is recommended that Hydro One examines one or more of the following: (i) review of existing equipment at Middleport TS to determine if voltages in excess of 250 kV can be maintained before manual intervention or (ii) reinforce the 230 kV system between Middleport x Detweiler to ensure that less load is lost for a tower contingency, or other measures that may be equally effective.

The rapid load growth on along the Middleport x Detweiler corridor also poses future low voltage concerns for the loss of either M20D or M21D. Low voltages can be greatly exacerbated with breaker failure contingencies, in which multiple elements can be lost simultaneously. Breaker failures are especially a concern at the Detweiler 230kV in which many critical elements can be lost simultaneously. The Detweiler 230 kV station configuration is shown in **Figure 5**. As shown, several breaker failures are of particular concern:

- **Detweiler L7L20 breaker falure: loss of D7I+M20D+ Detweiler T3** – In addition to M20D being lost, Cedar T4 and Detweiler T3 autotransformers are also lost. Note, if Preston T2 is connected to M21D, this breaker failure contingency would result in the loss of three 230/115 kV autotransformers (Detweiler T3, Cedar T4 and Preston T2)
- **Deweiler AL6 breaker failure: loss of M21D+D6I+T4** – In addition to M21D being lost, Detweiler T4 auto transformer is also lost.
- **Detweiler HT1H breaker failure: loss of D5W+Detweiler SC22+Detweiler SVC** – In addition to D5W being lost, a 245 Mvar capacitor and the SVC at Deweiler are lost.

In view of future load growth in the area, it is recommended that Hydro One consider reconfiguration of the Detweiler 230 kV station to mitigate the effects of breaker failure contingencies, or other measures that may be equally effective.

The *Ontario Resource and Transmission Assessment Criteria (ORTAC)* states that with all facilities in service pre-contingency, or with a critical element out of service after permissible control actions, the following criteria shall be satisfied:

- The pre-contingency voltages on 500 kV buses must not be less than 490 kV and no greater than 550 kV, 230 kV buses must not be less than 220 kV and no greater than 250 kV and 115kV buses must not be less than 113 kV and no greater than 127 kV;
- The post-contingency voltages on 500 kV buses must not be less than 470 kV and no greater than 550 kV, 230 kV buses must not be less than 207 kV and no greater than 250 kV and 115 kV buses must not be less than 108 kV and no greater than 127 kV; and

With all planned facilities in-service pre-contingency, the voltage drop following a contingency must not exceed 10% pre-ULTC and 10% post-ULTC.

The voltage performance of the IESO-controlled grid was evaluated by examining if pre- and post-contingency voltages and post-contingency voltage declines remain within criteria at various facilities. Contingencies as per **Table 9** of this report were simulated under all four base case scenarios. The most impactive contingencies are summarized in the following table:

Table 22: Post- contingency voltage analysis results – Scenarios S1 and S2

Scenario S1																							
Bus Name	Pre-Contingency Condition: All Elements I/S													Pre-Contingency Condition: One Element O/S									
	Pre-Cont kV	M21D+Det SVC				M21D+Det SC21				M21D+D7V_D				M21D O/S, Loss of F12C		D9F O/S, Loss of B6G		D9F O/S, Loss of F12C		F12C O/S, Loss of B6G	
		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc
		kV	%	kV	%	kV	%	kV	%	kV	%	kV	%	kV	kV	kV	kV	kV	kV	kV	kV
Preston 230 kV	238	220	-8	224	-6	224	-6	228	-5	226	-5	228	-4	226	228	238	238	238	238	238	238
Middleport 230 kV	246	243	-1	244	-1	245	-1	245	-1	245	-1	246	0	245	246	247	247	246	246	246	246
Detweiler 115 kV	122	118	-3	119	-3	121	-1	121	-1	122	0	122	0	122	122	122	122	123	123	122	122
Detweiler 230 kV	242	233	-3	235	-3	239	-1	240	-1	242	0	242	0	242	242	242	242	242	242	242	242
Burlington 115 kV	123	122	-1	122	-1	123	0	123	0	123	0	123	0	123	123	123	123	122	123	122	122
Kitchener #5 MTS	120	116	-3	117	-2	119	-1	119	-1	119	-1	119	-1	118	118	108[1]	110[1]	110[1]	111[1]	117	118
Cedar TS 115 kV	122	118	-3	119	-2	121	-1	121	-1	120	-2	120	-2	120	121	120	120	117	118	124	124
Arlen TS 115 kV	121	118	-3	119	-2	120	-1	121	0	119	-2	119	-2	119	119	119	119	118	118	111	111
Hanlon TS 115 kV	121	118	-3	119	-2	121	0	121	0	119	-2	119	-2	119	119	120	120	117	118	111	111
Scenario S2																							
Bus Name	Pre-Contingency Condition: All Elements I/S													Pre-Contingency Condition: One Element O/S									
	Pre-Cont kV	M21D+Det SVC				M21D+Det SC21				M21D+D7V_D				M21D O/S, Loss of F12C		D9F O/S, Loss of B6G		D9F O/S, Loss of F12C		F12C O/S, Loss of B6G	
		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc
		kV	%	kV	%	kV	%	kV	%	kV	%	kV	%	kV	kV	kV	kV	kV	kV	kV	kV
Preston 230 kV	238	221	-7	225	-6	224	-6	227	-5	225	-6	227	-5	225	227	238	238	237	237	237	237
Middleport 230 kV	244	241	-1	242	-1	242	-1	243	-1	242	-1	242	-1	242	242	244	244	243	243	243	243
Detweiler 115 kV	124	122	-2	123	-2	124	0	124	0	124	0	124	0	125	125	125	125	125	125	125	125
Detweiler 230 kV	244	239	-2	240	-2	242	-1	243	0	244	0	244	0	244	244	244	244	244	244	244	244
Burlington 115 kV	122	121	-1	122	0	122	0	122	0	122	0	122	0	121	122	122	122	121	121	121	121
Kitchener #5 MTS	122	120	-1	120	-1	121	0	122	0	121	0	121	0	120	120	110[1]	111[1]	110[1]	111[1]	120	120
Cedar TS 115 kV	122	121	-1	121	-1	122	0	122	0	120	-2	121	-1	121	121	120	120	117	118	124	124
Arlen TS 115 kV	122	120	-2	120	-2	121	-1	121	-1	119	-2	119	-2	118	118	119	119	117	117	110	110
Hanlon TS 115 kV	122	120	-1	121	-1	122	0	122	0	119	-2	120	-2	118	118	119	120	116	117	109	109

Notes: (1) Under outage conditions after the second element is forced out of service, load at Kitchener #5 can be curtailed to restore the voltage above 113 kV

Table 23: Post-contingency voltage analysis results – Scenarios S3 and S4

Scenario S3																					
Bus Name	Pre-Contingency Condition: All Elements I/S													Pre-Contingency Condition: One Element O/S							
	Pre-Cont kV	M21D+Det SVC				M21D+Det SC21				M21D+D7V_D				M21D O/S, Loss of F12C		D9F O/S, Loss of B6G		D9F O/S, Loss of F12C		F12C O/S, Loss of B6G	
		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc
		kV	%	kV	%	kV	%	kV	%	kV	%	kV	%	kV	kV	kV	kV	kV	kV	kV	kV
Preston 230 kV	238	218	-9	223	-6	221	-7	225	-5	225	-5	228	-4	225	228	238	238	237	238	238	238
Middleport 230 kV	244	240	-2	241	-1	241	-1	242	-1	242	-1	243	-1	242	243	244	244	242	242	243	243
Detweiler 115 kV	125	119	-4	121	-3	122	-2	123	-1	124	0	124	0	125	125	125	125	125	125	125	125
Detweiler 230 kV	244	234	-4	236	-3	239	-2	240	-2	244	0	244	0	244	244	244	244	244	244	244	244
Burlington 115 kV	122	120	-2	121	-1	121	-1	122	0	121	-1	122	0	121	122	122	122	121	121	121	121
Kitchener #5 MTS	122	117	-4	118	-3	120	-2	120	-2	119	-2	120	-2	120	120	110[1]	111[1]	110[1]	111[1]	120	120
Cedar TS 115 kV	122	118	-4	119	-2	120	-2	121	-1	120	-2	120	-2	121	121	120	120	117	118	125	125
Arlen TS 115 kV	121	118	-2	119	-2	120	-1	120	-1	119	-2	119	-2	118	118	119	119	116	117	110	110
Hanlon TS 115 kV	122	118	-3	119	-2	120	-1	120	-1	119	-2	119	-2	118	118	119	119	116	116	109	109

Scenario S4																					
Bus Name	Pre-Contingency Condition: All Elements I/S													Pre-Contingency Condition: One Element O/S							
	Pre-Cont kV	M21D+Det SVC				M21D+Det SC21				M21D+D7V_D				M21D O/S, Loss of F12C		D9F O/S, Loss of B6G		D9F O/S, Loss of F12C		F12C O/S, Loss of B6G	
		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc		Post-ultc		Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc	Pre-ultc	Post-ultc
		kV	%	kV	%	kV	%	kV	%	kV	%	kV	%	kV	kV	kV	kV	kV	kV	kV	kV
Preston 230 kV	238	219	-8	224	-6	223	-6	227	-5	225	-6	227	-5	225	227	238	238	237	237	237	237
Middleport 230 kV	243	240	-1	241	-1	241	-1	242	-1	242	-1	242	-1	242	242	243	243	243	243	243	243
Detweiler 115 kV	124	121	-3	122	-2	124	0	124	0	124	0	124	0	125	125	125	125	125	125	125	125
Detweiler 230 kV	244	237	-3	238	-2	242	-1	243	0	244	0	244	0	244	244	244	244	244	244	244	244
Burlington 115 kV	123	121	-1	122	-1	122	-1	123	0	122	-1	122	-1	122	122	123	123	122	122	121	122
Kitchener #5 MTS	122	119	-3	119	-2	121	-1	122	0	121	-1	121	-1	120	120	110[1]	111[1]	110[1]	111[1]	120	120
Cedar TS 115 kV	123	120	-2	120	-2	122	-1	122	-1	120	-3	120	-2	121	121	121	121	118	118	125	125
Arlen TS 115 kV	122	119	-2	120	-2	121	-1	122	0	120	-2	120	-2	118	118	120	120	117	117	110	110
Hanlon TS 115 kV	122	119	-2	120	-2	121	-1	122	0	119	-2	120	-2	118	118	120	120	116	117	110	110

Notes: (1) Under outage conditions after the second element is forced out of service, load at Kitchener #5 can be curtailed to restore the voltage above 113 kV

5.8 Load Restoration and Load Security

The IESO Load Security criteria is not met in the vicinity of the GATR project. As shown in the thermal analysis of this report, with two Burlington transformers out of service, the equipment loading on the Burlington autotransformers were found to exceed applicable short-term emergency ratings, even after the transfer of loads at Brant and Gage TS. This violation of criteria is not due to the incorporation of GATR, but is an existing problem; in fact, the project helps alleviate the overloading. Hydro One is recommended to develop a plan to address the overloads on the Burlington autotransformers under 2016 peak load conditions and beyond. For all other conditions, such as with all transmission facilities in service and one element out of service, the load security criteria are met.

As forecasted by Hydro One, the load on the 230 kV circuits M20D and M21D is expected to exceed 600 MW in 2024. This will exceed the load security requirement specified in the ORTAC. A plan to examine options should be developed by Hydro One.

Load restoration requirements are identified in **Table 24** under various contingencies for the years 2016 to 2026. Hydro One and the affected Local Distribution Companies (LDC) are required to work together to ensure that load can be restored within the specified time frame as required by the ORTAC.

The load security criteria for the IESO-controlled grid are defined in Section 7.1 of the *Ontario Resource and Transmission Assessment Criteria (ORTAC)*. They are as follows:

1. With all the transmission facilities in service, equipment loading must be within continuous ratings.
2. With one element out of service, equipment loading must be within applicable long-term ratings and not more than 150 MW of load may be interrupted by configuration.
3. With two elements out of service, equipment loading must be within applicable short-term emergency ratings and not more than 600 MW of load may be interrupted by configuration.

Affected load shall be restored with the restoration times listed below:

a. All load must be restored within approximately 8 hours;

b. When the amount of load interrupted is greater than 150 MW, the amount of load in excess of 150 MW must be restored within approximately 4 hours;

c. When the amount of load interrupted is greater than 250 MW, the amount of load in excess of 250 MW must be restored within 30 minutes.

Table 24: Load Restoration Schedule from 2016 to 2026

Load to be Restored (MW)											
Time Frame	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
D7F+D9F											
8 hours	122.9	122.9	123.1	123.6	133.8	134.6	135.5	130.2	131.3	132.5	133.9
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
F12C+F11C											
8 hours	66.0	65.1	64.3	63.7	63.3	62.9	62.6	68.7	68.6	68.5	68.6
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
B5G+B6G											
8 hours	105.2	109.3	113.3	117.9	122.6	124.6	126.7	128.9	131.3	133.7	139.2
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
F12C+B6G											
8 hours	102.2	102.1	102.1	102.4	103.0	104.2	105.7	107.4	109.2	111.1	111.7
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
M20D+M21D											
8 hours	506.4	519.0	532.3	546.0	547.7	561.1	576.5	592.4	608.8	625.8	643.1
4 hours	356.4	369.0	382.3	396.0	397.7	411.1	426.5	442.4	N/A	N/A	N/A
30 mins	256.4	269.0	282.3	296.0	297.7	311.1	326.5	342.4	N/A	N/A	N/A
D6I+D7I											
8 hours	221.6	226.5	238.0	248.4	252.6	257.5	280.9	287.2	286.8	293.6	305.9
4 hours	71.6	76.5	88.0	98.4	102.6	107.5	130.9	137.2	136.8	143.6	155.9
30 mins	0.0	0.0	0.0	0.0	2.6	7.5	30.9	37.2	36.8	43.6	55.9
I6V+I7V											
8 hours	100.4	100.6	101.0	101.5	102.1	102.6	103.3	104.0	104.7	105.5	106.8
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
D7I+I6V											
8 hours	130.7	129.7	129.0	128.7	128.8	131.3	134.0	137.1	140.4	143.9	146.8
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
D11K+D12K											
8 hours	91.5	91.3	91.3	91.4	91.7	92.1	92.6	93.3	94.0	94.8	95.7
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
D1W (Loss of Wolverton)											
8 hours	18.8	18.7	18.7	18.7	18.7	18.8	18.9	19.0	19.1	19.2	19.4
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
B5G (Loss of Enbridge Westover + Puslinch)											
8 hours	56.2	56.3	56.5	56.7	56.9	57.2	57.4	57.7	58.0	58.3	58.8
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0
M21D (Loss of Gerdau Cambridge)											
8 hours	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
4 hours	0	0	0	0	0	0	0	0	0	0	0
30 mins	0	0	0	0	0	0	0	0	0	0	0

-End of Section-

Appendix A Figures

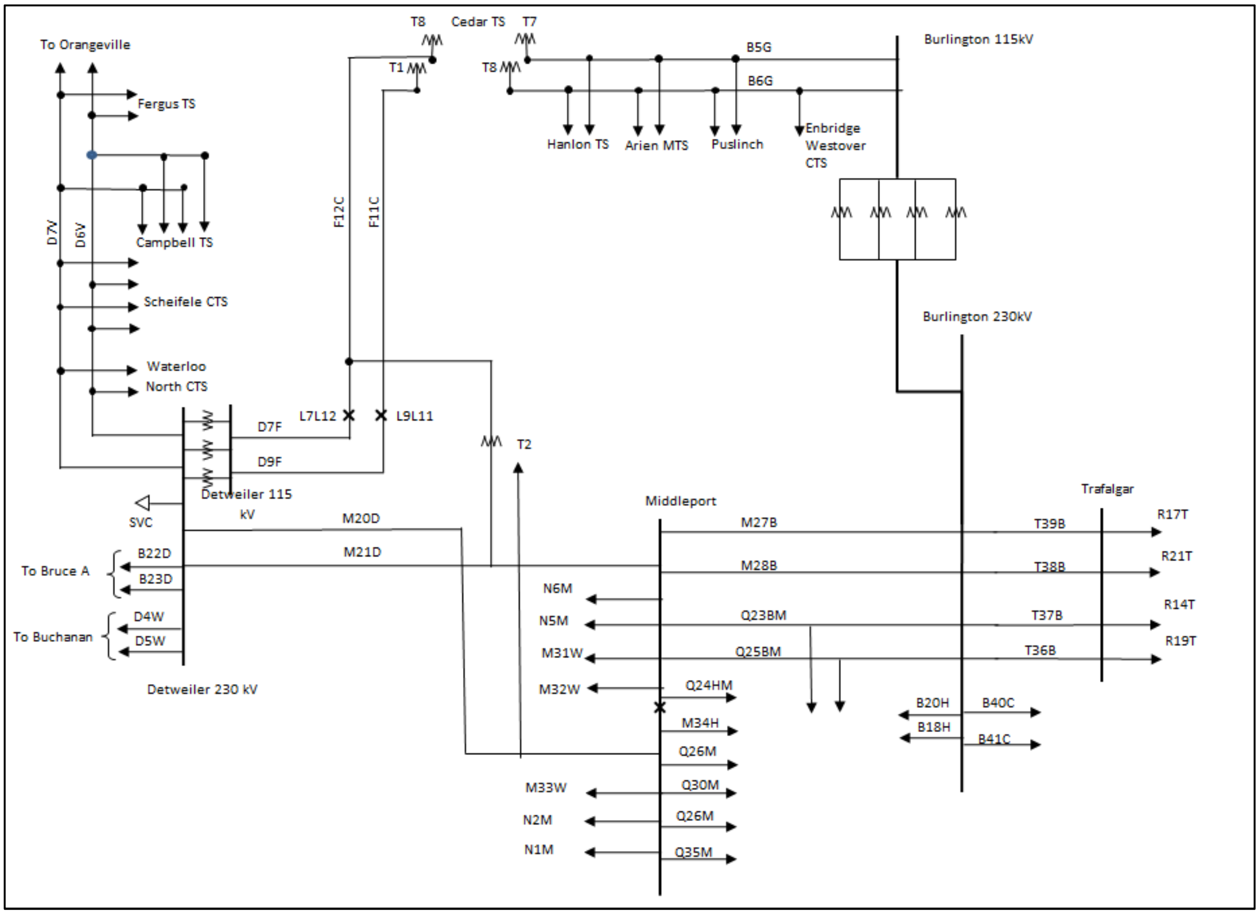

Figure 1 Kitchener-Waterloo-Guelph-Cambridge area before GATR

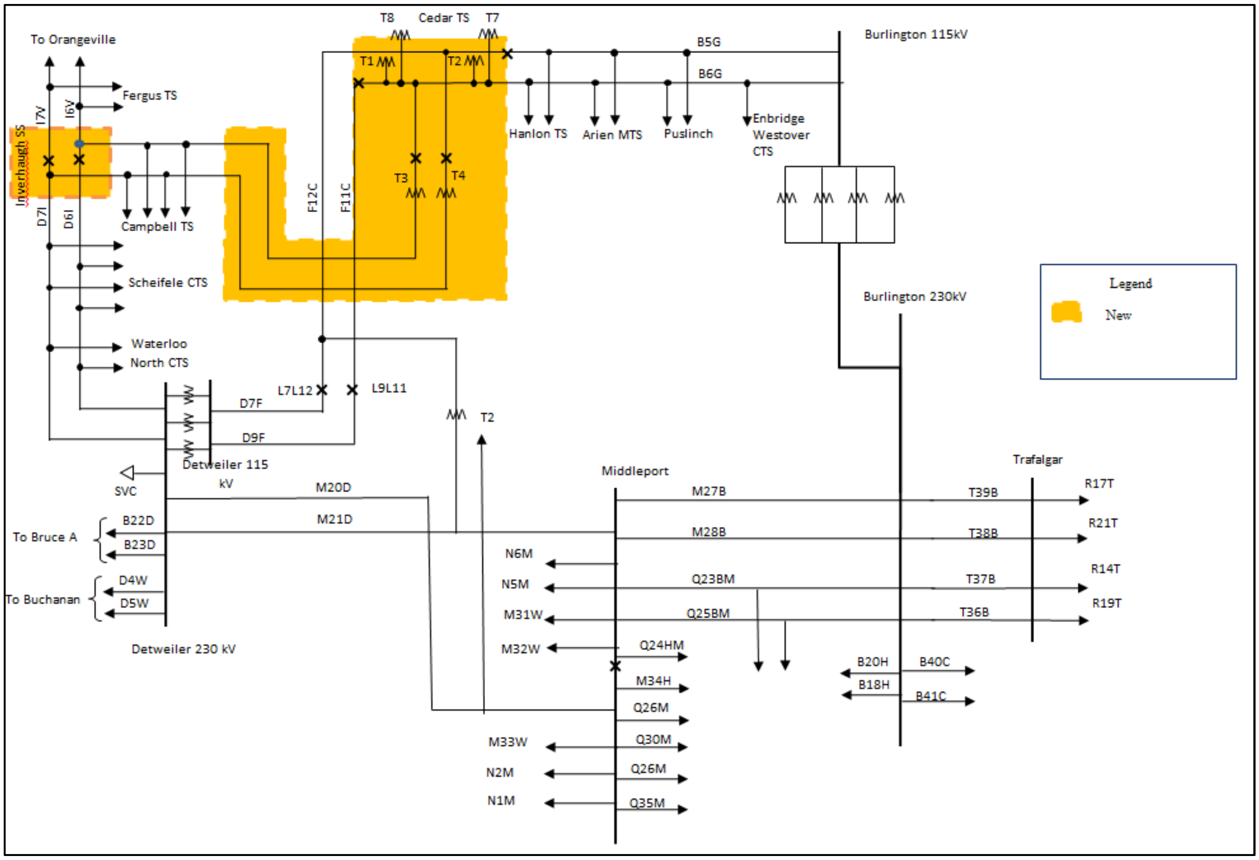

Figure 2: Kitchener-Waterloo-Guelph-Cambridge area after GATR

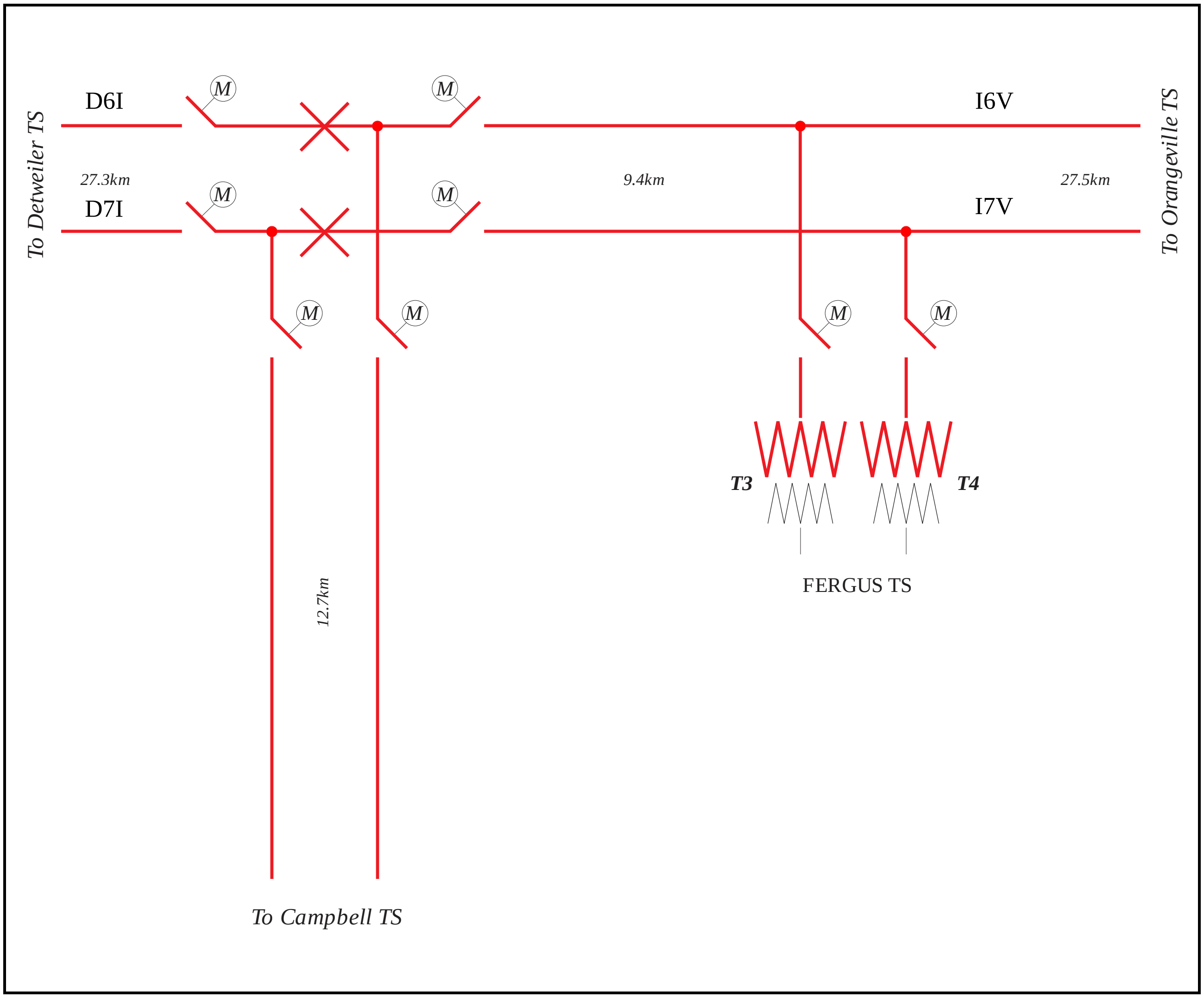

Figure 3: Hydro One Proposed Inverhaugh SS Station Configuration

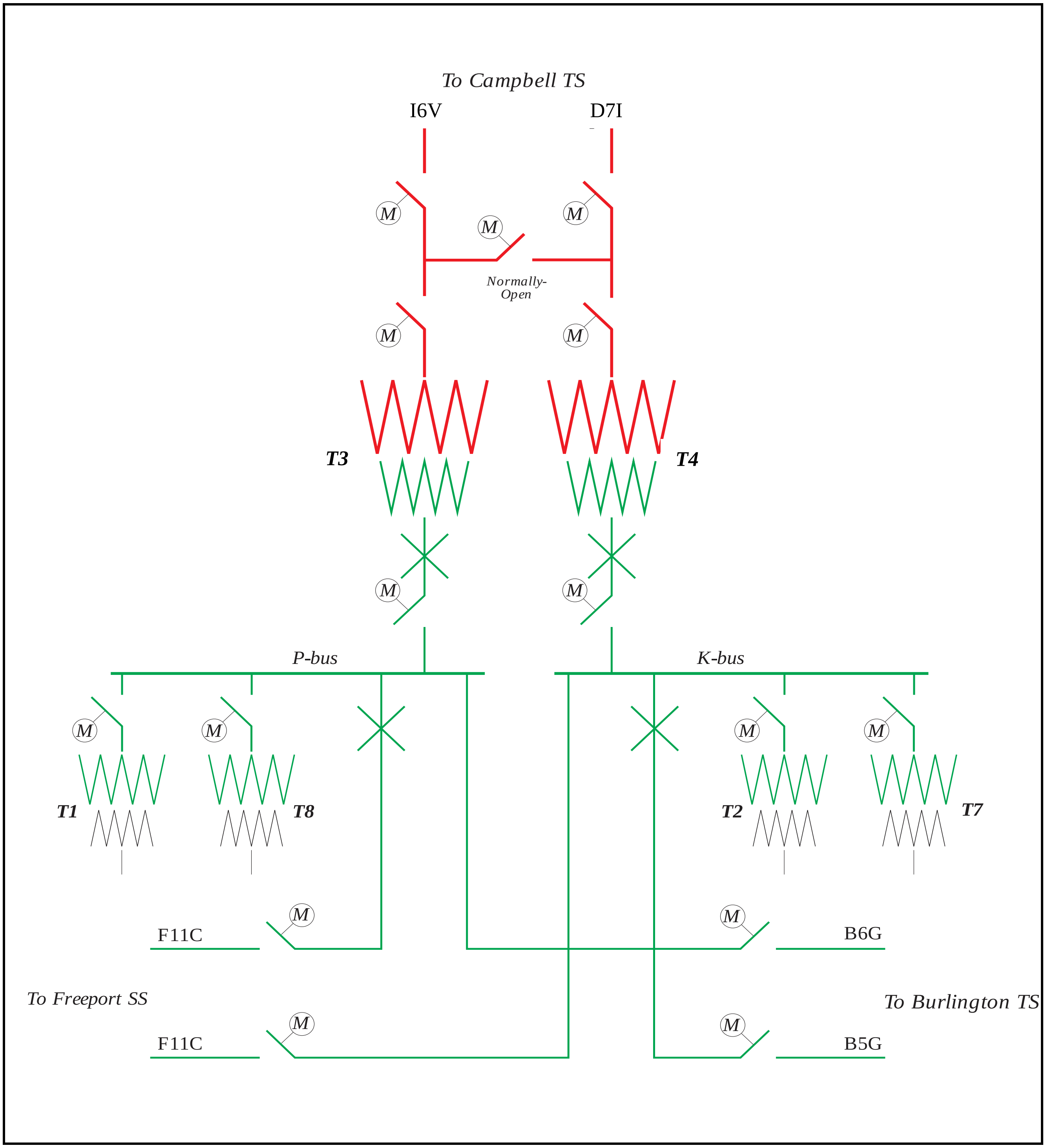

Figure 4: Hydro One Proposed Cedar TS Configuration

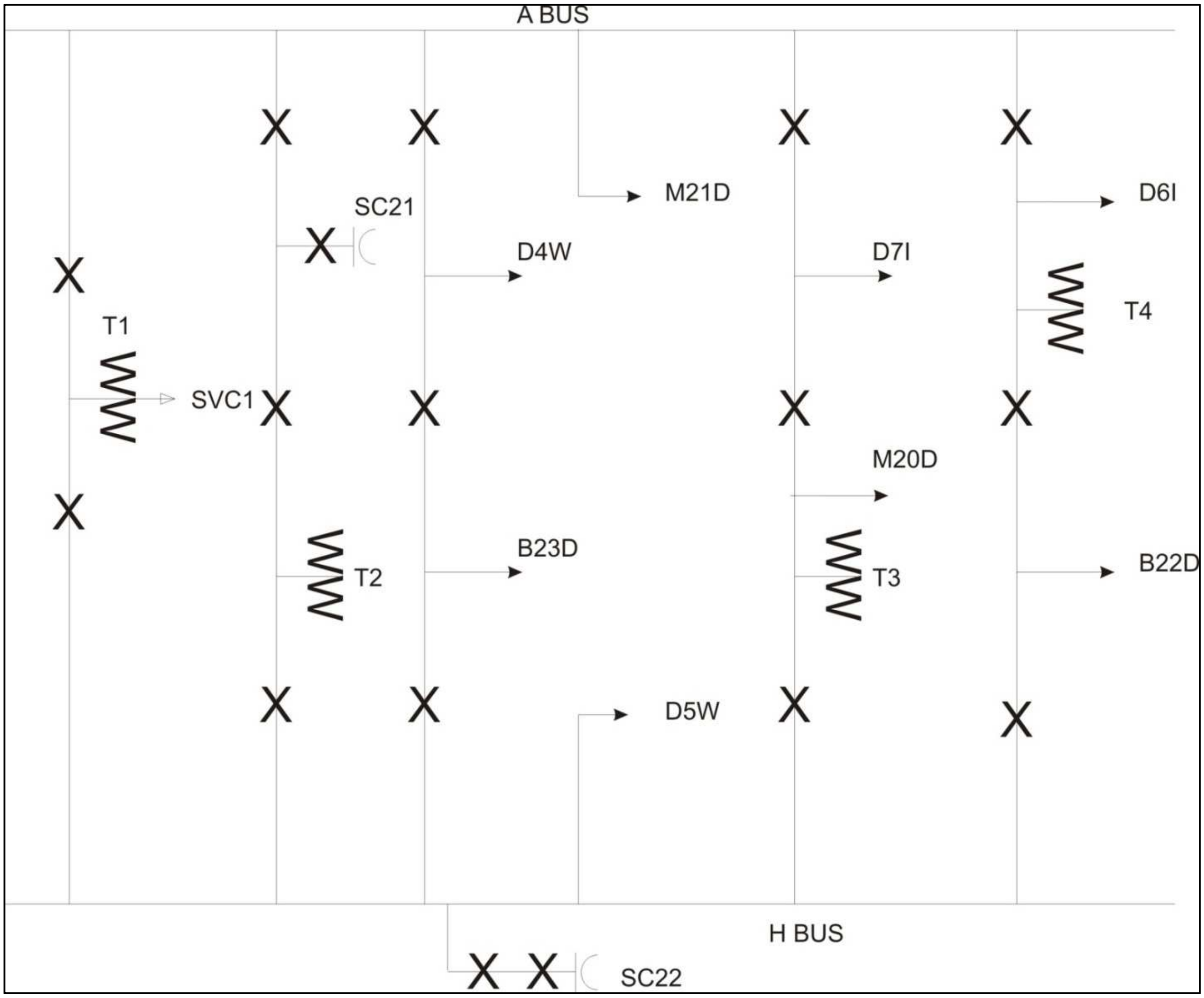

Figure 5: Detweiler 230 kV Station Configuration

Appendix B Short Circuit Results

The following tables summarize the fault levels at facilities near the project under the three different scenarios at transmission stations (Table 25) and at DESN stations (Table 26).

Table 25: Fault levels at transmission stations near the project

Transmission Stations	Lowest Rated HV Interrupter (kA)		Scenario 1 Before Project				Scenario 2 After Project				Scenario 3 After Project + 2nd Preston 230/115 kV Transformer			
			Symmetrical (kA)		Asymmetrical (kA)		Symmetrical (kA)		Asymmetrical (kA)		Symmetrical (kA)		Asymmetrical (kA)	
	Sym	Asym	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault
Middleport V586M 500 kV	63	78	23.0	20.1	29.3	25.9	23.0	20.1	29.3	25.9	23.0	20.1	29.3	25.9
Middleport M585M 500 kV	50	62.4	24.5	21.7	31.4	29.0	24.6	21.7	31.4	29.1	24.6	21.7	31.4	29.1
Middleport M20D 230 kV	60	70.4	47.1	44.1	59.3	57.7	47.2	44.2	59.4	57.8	47.4	44.4	59.6	58.1
Middleport M21D 230 kV	60	70.4	42.9	40.1	55.0	54.5	43.0	40.2	55.1	54.5	43.0	40.2	55.1	54.5
Detweiler 230 kV	40	42.1	23.6	23.1	27.7	29.5	24.7	24.0	28.9	30.5	24.9	24.2	29.0	30.7
Detweiler 115 kV	39.3	45.5	24.6	28.5	28.6	35.3	27.5	31.1	31.4	37.9	28.5	32.2	32.5	39.1
Orangeville 230 kV	46.2	54.2	19.4	20.9	22.2	25.0	20.2	21.6	23.1	25.7	20.2	21.6	23.1	25.8
Preston F12C 115 kV	40	40.2	13.7	14.0	15.4	16.7	17.4	17.2	19.1	20.0	17.5	17.6	19.3	20.4
Preston F11C 115 kV	40[1]	40.2[1]	-	-	-	-	-	-		-	18.6	18.4	20.3	21.0
Freeport D7F 115 kV	40	64	14.4	12.4	15.6	13.3	17.6	14.4	18.9	15.3	18.0	14.8	19.2	15.7
Freeport D9F 115 kV	40	64	10.6	8.1	11.5	8.4	14.4	10.1	15.3	10.3	18.1	15.1	19.3	16.1
Inverhaugh D6I 230 kV	63	63	-	-	-	-	13.7	11.7	15.6	13.3	13.9	11.9	15.8	13.5
Inverhaugh D7I 230 kV	63	63	-	-	-	-	13.8	11.9	15.7	13.5	13.9	11.9	15.8	13.5
Cedar F12C 115 kV	50	50	6.6	4.2	6.8	4.4	16.5	16.8	17.8	19.0	16.7	17.1	18.0	19.3
Cedar F11C 115 kV	50	50	5.4	3.3	5.7	3.3	15.5	7.5	16.7	7.6	16.7	17.2	18.0	19.4
Cedar T4H 230 kV	50	50	-	-	-	-	9.5	8.5	10.8	10.3	9.5	8.5	10.9	10.4
Cedar T3H 230 kV	50	50	-	-	-	-	9.3	8.0	10.6	9.8	9.5	8.5	10.9	10.4

Notes: (1) Assumed to be the same as the existing T2K breaker

Table 26: Fault Levels at load stations near the project

DESN Stations	Lowest Rated HV Interrupter (kA)		Scenario 1 Before Project				Scenario 2 After Project				Scenario 3 After Project + additional Preston 230/115 kV transformer			
			Symmetrical (kA)		Asymmetrical (kA)		Symmetrical (kA)		Asymmetrical (kA)		Symmetrical (kA)		Asymmetrical (kA)	
	Sym	Asym	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault	3ph Fault	LG Fault
Arlen B5G 115 kV	63	63	5.0	2.6	5.1	2.6	13.1	9.7	13.6	9.9	13.2	9.8	13.6	10.0
Arlen B6G 115 kV	63	63	5.0	2.6	5.1	2.6	12.6	6.4	13.1	6.5	13.2	9.8	13.7	10.0
Enbridge Westover S 115 kV	6	9	5.0	3.2	5.0	3.2	5.7	3.7	5.7	3.7	5.7	3.7	5.7	3.7
Enbridge Westover N 115 kV	25	40	5.2	3.3	5.2	3.3	6.0	3.8	6.0	3.8	6.0	3.8	6.0	3.8
Hanlon B6G 115 kV	25	40	4.8	2.5	4.9	2.5	13.3	6.7	13.9	6.7	14.0	10.9	14.6	11.3
Hanlon B5G 115 kV	25	40	4.8	2.5	4.9	2.5	13.9	10.8	14.4	11.2	14.0	10.9	14.6	11.3
Waterloo N D6I 220 kV	20	32	18.8	16.8	21.5	19.3	19.6	17.5	22.3	20.0	19.7	17.6	22.5	20.1
Waterloo N D7I 220 kV	20	32	18.7	16.8	21.5	19.4	19.6	17.5	22.3	20.0	19.7	17.6	22.5	20.1
KIT#5 F11C 115 kV	20	32	8.3	5.7	8.8	5.9	10.3	6.6	10.8	6.8	12.0	8.5	12.5	8.8
KIT#5 F12C 115 kV	20	32	10.2	7.5	10.7	7.9	11.8	8.2	12.2	8.5	11.9	8.4	12.4	8.7
KIT#6 M20D 230 kV	20	32	17.9	16.1	20.9	18.6	18.5	16.5	21.5	19.0	18.6	16.7	21.6	19.2
KIT#6 M21D 230 kV	20	32	17.9	16.1	20.9	18.6	18.5	16.6	21.5	19.0	18.6	16.7	21.6	19.2
KIT7 D7F 115 kV	20	32	14.4	12.4	15.6	13.3	17.6	14.4	18.8	15.2	18.0	14.8	19.2	15.6
KIT7 D9F 115 kV	20	32	10.7	8.1	11.6	8.4	14.4	10.1	15.3	10.4	18.1	15.1	19.3	16.0
KIT8 M20D 220 kV	20	32	17.7	14.6	21.1	16.8	18.2	14.8	21.5	17.1	18.2	15.0	21.5	17.2
KIT8 M21D 220 kV	20	32	17.6	14.6	20.9	16.9	18.1	14.9	21.4	17.2	18.1	15.0	21.5	17.3
Gerdau Cambridge 220 kV	20	32	11.4	9.7	13.4	11.7	12.0	10.1	14.0	12.1	12.0	10.2	14.0	12.2
Puslinch B5G 115 kV	20	32	5.4	2.9	5.5	2.9	11.6	8.0	11.8	8.2	11.6	8.1	11.9	8.2
Puslinch B6G 115 kV	20	32	5.4	2.9	5.5	2.9	11.3	6.1	11.5	6.1	11.7	8.1	11.9	8.2
Wolverton 115 kV	25	25	5.9	4.0	5.9	4.0	6.1	4.0	6.1	4.0	6.1	4.0	6.1	4.0
KIT9 D4W 230 kV	20	32	14.8	11.5	17.2	12.9	15.1	11.7	17.5	13.1	15.1	11.7	17.5	13.1
KIT9 D5W 230 kV	20	32	14.8	11.5	17.2	12.9	15.1	11.7	17.5	13.1	15.1	11.7	17.5	13.1

Appendix C PIA Report

Hydro One Networks Inc.
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PROTECTION IMPACT ASSESSMENT

GUELPH AREA TRANSMISSION REFURBISHMENT PROJECT

Date: November 07th, 2012
P&C Planning Group Project #: PCT-062-PIA

Prepared by:	Reviewed by:
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Disclaimer

This Protection Impact Assessment has been prepared solely for the IESO for the purpose of assisting the IESO in preparing the System Impact Assessment for the proposed transmission network improvement to the IESO–controlled grid. This report has not been prepared for any other purpose and should not be used or relied upon by any person, including the connection applicant, for any other purpose.

This Protection Impact Assessment was prepared based on information in the application provided to the IESO and Hydro One by the connection applicant to request a connection assessment at the time the assessment was carried out. It is intended to highlight significant impacts, if any, to affected transmission protections early in the project development process. The results of this Protection Impact Assessment are also subject to change to accommodate the requirements of the IESO and other regulatory or legal requirements. In addition, further issues or concerns may be identified by Hydro One during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with the Transmission System Code legal requirements, and any applicable reliability standards, or to accommodate any changes to the IESO-controlled grid that may have occurred in the meantime.

Hydro One shall not be liable to any third party, including the connection applicant, which uses the results of the Protection Impact Assessment under any circumstances, whether any of the said liability, loss or damages arises in contract, tort or otherwise.

Revision History

Revision	Date	Change
R0	October 22nd, 2012	Initial Issue to IESO
R1	October 30th , 2012	Excluded Preston 2nd Transformer from GATR scope
R2	November 7th, 2012	Revised as per Guelph North SS Breaker Relocation

1.0 INTRODUCTION

1.1 Protection Impact Assessment (PIA)

This PIA is prepared for the IESO to assess the potential impact of the proposed connection on the existing transmission protections. The primary focus of this study is the protection of Hydro One system equipment while meeting the IESO System Reliability Criteria.

1.2 Description of Proposed Connections to the Grid

The Guelph area transmission system is being upgraded to increase the capacity of the electricity supply to the cities of Guelph, Kitchener, and the surrounding area, and to minimize the impact of major transmission outages on customers in the area.

Please refer to Figures 1, 2 and 3 for depiction illustration of the new requirements as presented in the Hydro One planning specification AR#17389.

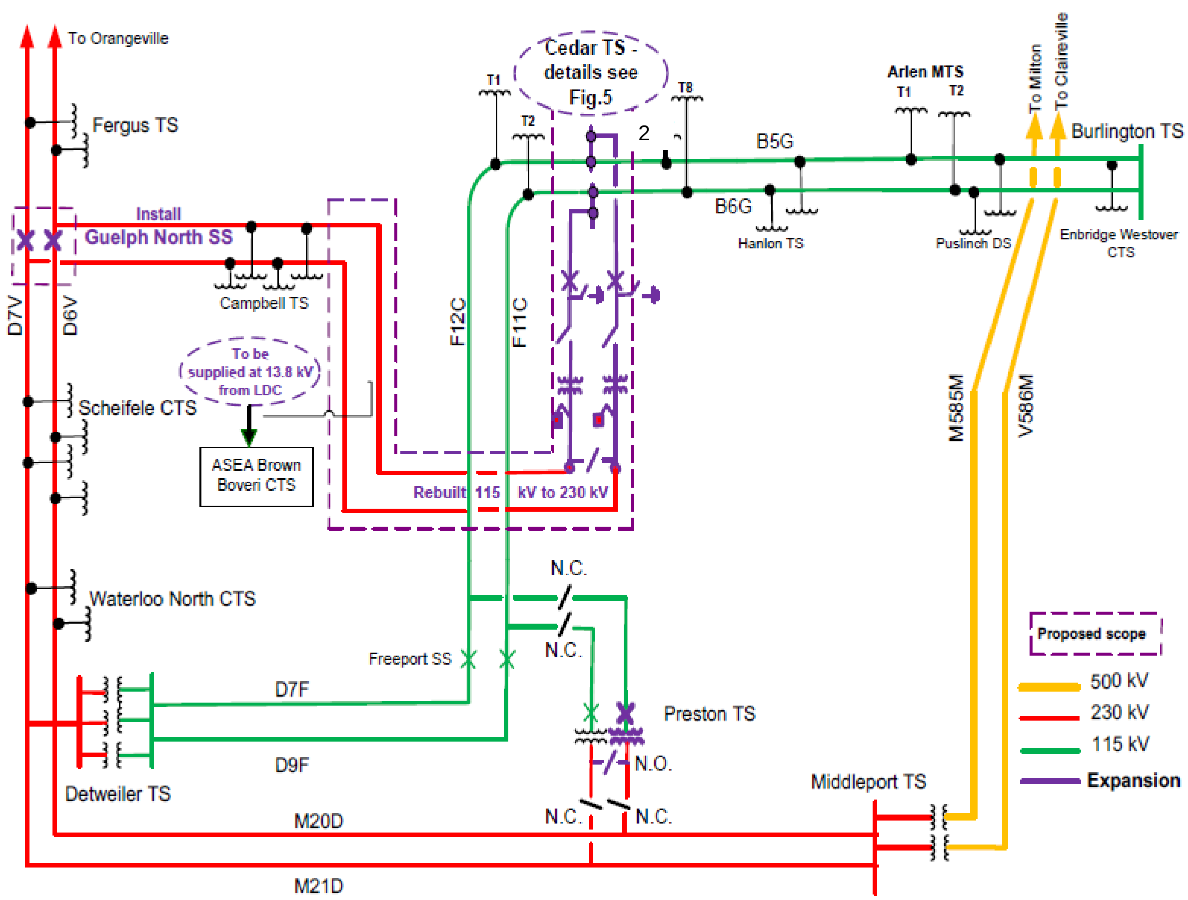

Figure 1 : Install two 230/115 kV autotransformers at Cedar TS, 2 in-line breakers at Guelph North Junction and 2 in-line breakers at Cedar TS

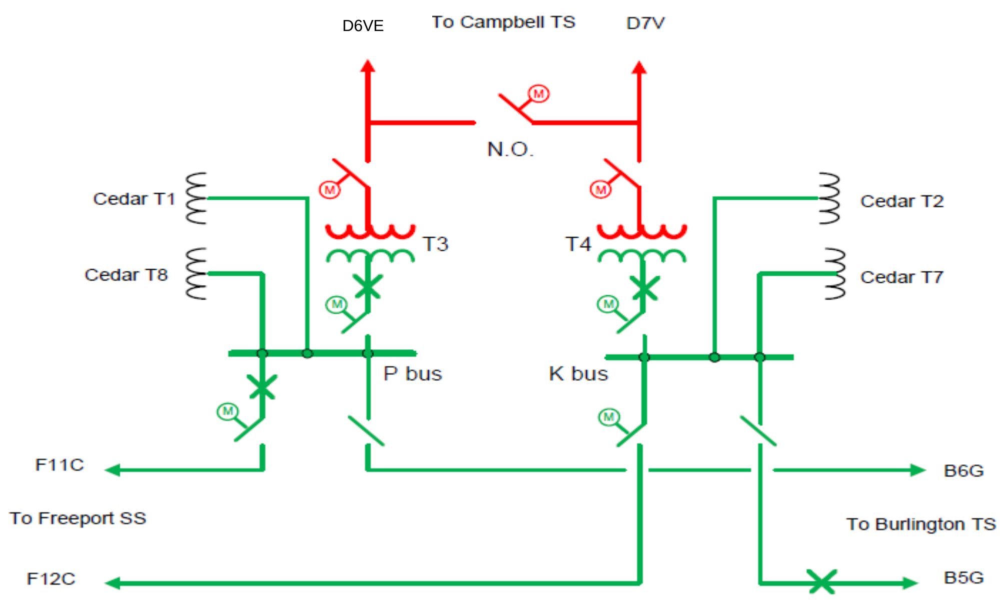

Figure 2 – Configuration of 2 in-line breakers (staggered) at Cedar TS

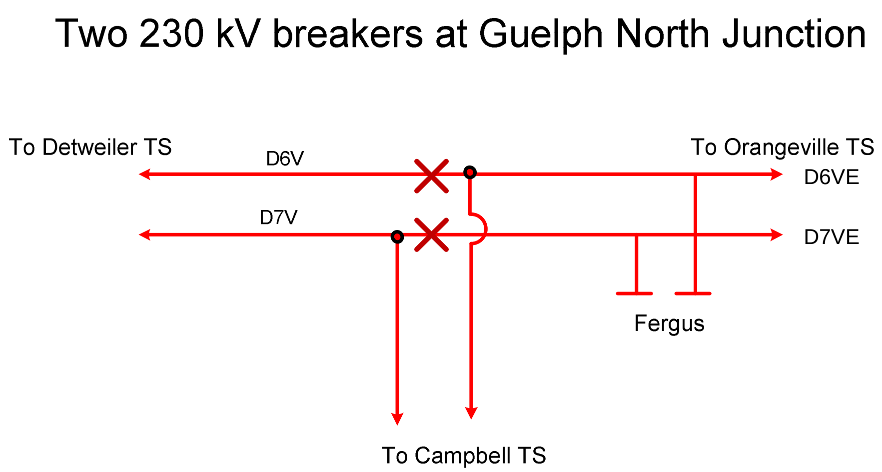

Figure 3 – Configuration of two in-line breakers at Guelph North Junction

The scope of the Guelph Area Transmission Refurbishment (GATR) project specified in this recommendation was comprised of the following;

- Installation of two 230/115kV autotransformers at Cedar TS;
- Re-connection of the existing 115kV F11C/B6G and F12C/B5G circuits at Cedar TS;
- Installation of 230kV in-line breakers at a new "Guelph North SS" to facilitate sectionalisation of the existing D6V/D7V 230kV circuits; and
- Rebuilding the existing 115kV transmission line between Campbell TS and CGE junction near Cedar TS (approx.. 5km) for 230kV operations;

1.3 Assumptions

The study presented in this document is based on the options provided by the OPA and by Hydro One Transmission planning specification AR#17389 – R08 dated October 11, 2012.

2.0 PROTECTION

2.1 General

This document reviews the impact on the Hydro One Protections attributed to the introduction of new 115kV in-line breakers at Cedar TS, 230kV in-line breakers at Guelph North Junction, and auto-transformer additions at Cedar TS and Preston TS etc.

The existing operation practice is as follows: F11C/B6G and F12C/B5G 115kV circuits operate normally open (NO) at the Guelph Cedar TS and only get connected when supplying respective loads on B5G/B6G circuits under emergency conditions with the Burlington TS and Preston TS terminals opened.

The new transmission reinforcement provides operating flexibility by supplying all loads on F11C/B6G and F12C/B5G circuits with the Burlington and Preston terminals closed.

The project requires new protection and tele-protection at Cedar, Guelph North SS and Preston TS, plus settings and scheme changes at Detweiler TS, Orangeville TS, and Middleport TS etc.

2.2 Specific Protection Requirements

This project requires significant protection and tele-protection equipment additions/upgrades in multiple locations. The detail protection work to be performed is described as follows:

2.2.1 115kV Burlington TS

B5G & B6G 115kV Circuits (Burlington TS-Cedar TS)

The existing protection comprises GE D60 protection relay in the A group and SEL 421 relay in the "B" Group and will remain as is.

The new B5G & B6G protection schemes shall operate as a permissive over reach (POTT) scheme between Burlington TS and Cedar TS. The settings will be revised for new application.

The existing transfer trip signals from Burlington TS to the associated tapped stations (Hanlon TS, Pushlinch TS, Arlen MTS, Enbridge CTS, etc) will remain unchanged. New TT signals from Cedar TS to the associated tapped stations must be established. (Direct or cascaded via Burlington TS).

2.2.2 Cedar TS

B5G & B6G 115kV Circuits (Cedar TS- Burlington TS)

New 'A' and 'B' distance protections shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The 115kV B5G & B6G protection schemes shall operate as a permissive over reach (POTT) scheme between Cedar TS and Burlington TS. The B6G Protection zone shall exclude all the in-feeds at Cedar TS as feasible. (I.e. Zone off T3, T1, T8 at Cedar TS).

Establish Transfer Trip send/receive (direct or cascaded) from Cedar TS to the associated tapped stations (Hanlon TS, Puslinch TS, Arlen MTS, Enbridge CTS, etc).

F11C & F12C 115kV Circuits (Cedar TS- Preston TS - Freeport TS)

New 'A' and 'B' protections for 115kV lines F11C /F12C shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The new protection scheme shall operate as a three terminal directional comparison blocking (DCB) scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between three terminals; Cedar TS, Preston TS and Freeport SS.

The F12C Protection zone shall exclude all the in-feeds at Cedar TS as feasible. (ie. Zone off T4, T2, T7 at Cedar TS).

T3 & T4 230/115kV Autotransformers

New 'A' and 'B' protections for 230/115kV auto-transformers T3 and T4 are to be provided with standard IEDs meeting the requirements of NPCC Directory D4 where feasible. The transformer differential protective zone shall encompass the 115kV breaker BCT and 230kV auto-transformer bushing CTs.

230kV Lines D6VE (Guelph North SS – Cedar TS- Orangeville TS)

New 'A' and 'B' line protections shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The protection scheme shall operate as a three terminal DCB scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Orangeville TS.

Establish new dual channel Transfer Trip send/receive from Cedar TS to the associated tapped stations (Campbell TS, Fergus TS), directly or cascaded via remote terminal stations.

230kV Line D7V (Guelph North SS – Cedar TS- Detweiler TS)

New 'A' and 'B' line protections shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Detweiler TS.

Establish new dual channel Transfer Trip send/receive from Cedar TS to the associated tapped stations (Campbell TS, WNH MTS#3, Scheifele MTS etc), direct or cascaded via remote terminal stations.

2.2.3 Freeport SS

F11C & F12C 115kV Circuits (Cedar TS- Preston TS - Freeport TS)

The existing protection comprises GE D60 protection in the A group and SEL 421 in the “B” Group and will continue to remain as is.

The existing F11C and F12C protection settings comprise two setting groups. The Group 1 setting reach covers up to the line switches near Guelph Cedar TS when it is open. The second setting group is for the scenario with the Guelph line switch closed while Preston TS and the Burlington TS terminals are open.

With the new configuration, two setting groups will no longer be required. Revise the settings for new application.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between three terminals; Cedar TS, Preston TS and Freeport SS.

2.2.4 Preston TS

F11C & F12C 115kV Circuits (Cedar TS- Preston TS - Freeport TS)

Currently, both F11C and F12C 115kV circuits are protected with a common protection arrangement comprising distance relays GE D60 in the ‘A’ and SEL-421 in the ‘B’ group.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between three terminals; Cedar TS, Preston TS and Freeport SS.

At Preston TS, only one circuit will be connected at a given time and therefore existing common protection (Group A and Group B) will remain as is. However, a new dual channel Main and Alt channels shall be provided for each circuit. A special logic shall be provided to route BLK and TT signals to associated F11C or F12C remote ends (Freeport SS and Cedar TS) according to the disconnect (DS-F11C or DS-F12C) position at Preston TS.

M20D and M21D 230kV Circuits (Preston TS- Detweiler TS – Middleport TS)

Currently, both M20D/M21D 230kV circuits are protected with one common protection arrangement comprising distance relays GE D60 in the ‘A’ and SEL-421 in the ‘B’ group.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Preston TS, Detweiler and Middleport TS.

At Preston TS, only one circuit will be connected at a given time and therefore existing common protection (Group A and Group B) will remain as is. However, a new dual channel Main and Alt channels shall be provided for each circuit. A special logic shall be provided to route BLK and TT signals to associated M20D or M21D remote ends (Detweiler TS and Middleport TS) according to the disconnect (DS-M20D or DS-M21D) position at Preston TS.

Establish new dual channel Transfer Trip send/receive from Preston TS to the associated tapped stations (Kitchener MTS#6, Kitchener MTS#8, Galt TS, Cambridge NDum MTS#1 etc), directly or cascaded via remote end terminal stations.

2.2.5 Detweiler TS

M20D and M21D 230kV Circuits (Preston TS- Detweiler TS – Middleport TS)

The existing protection consists of distance relays GE D60 in the ‘A’ and SEL-421 in the ‘B’ group protection and will remain as is. New settings will be applied to accommodate the new apparent impedances.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Preston TS, Detweiler and Middleport TS.

Existing TT send/receive to the associated tapped stations (Kitchener MTS#6, Kitchener MTS#8, Galt TS, Cambridge NDum MTS#1 etc) will remain unchanged. The necessary modifications will be made to cascade Preston TS transfer trip send/receive to respective tapped stations via Detweiler TS.

D6V 230kV Circuit (Detweiler TS-Guelph North SS)

The existing D6V protection consists of distance relays ABB REL-521 in the ‘A’ and SEL-321 in the ‘B’ group and will remain as is. New settings will be applied to provide coverage for new configuration.

The D6V protection scheme shall operate as a permissive over reach (POTT) scheme between Detweiler TS and Guelph North SS. A new dual channel Main and Alt schemes shall be established for both POTT and TT signals between Detweiler TS and GuelphNorth SS. The existing link to Orangeville will be discontinued.

Existing TT send/receive to the associated tapped stations (WNH MTS#3, Scheifele MTS, etc) will remain unchanged. The necessary modifications shall be made to cascade Guelph North SS transfer trip send/receive to the associated tapped stations via Detweiler TS.

D7V 230kV Circuit (Detweiler TS-Guelph North SS-Cedar TS)

The existing D7V protection consists of distance relays ABB REL-521 in the ‘A’ and SEL-321 in the ‘B’ group and will remain as is. New settings will be applied to provide coverage for new configuration.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Detweiler TS. The existing link to Orangeville will be discontinued.

Existing transfer trip signals to the associated tapped stations (WNH MTS#3, Scheifele MTS etc) will remain unchanged. Establish new dual channel Transfer Trip signals to Campbell TS, directly or via Cedar TS. The necessary modifications will be made to cascade Guelph North SS and Cedar TS transfer trip send/receive to the associated tapped stations via Detweiler TS.

2.2.6 Guelph North SS

D6V 230kV Circuit (Guelph North SS- Detweiler TS)

New ‘A’ and ‘B’ protection shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The D6V protection scheme shall operate as a permissive over reach (POTT) scheme. New dual channel Main and Alt schemes shall be provided for both POTT and TT signals between Guelph North SS and Detweiler TS.

Establish dual channel Transfer Trip signal send/receive to the associated tapped stations (WNH MTS#3, WNH Scheifele MTS, etc), directly or cascaded via Detweiler TS.

D7V 230kV Circuit (Detweiler TS-Guelph North SS-Cedar TS)

New ‘A’ and ‘B’ protection shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Detweiler TS.

Establish dual channel Transfer Trip signal send/receive to the associated tapped stations (WNH MTS#3, Scheifele MTS, Campbell TS etc), directly or cascaded via remote end terminal stations.

D6VE 230kV Circuit (Guelph North SS- Cedar TS- Orangeville TS)

New ‘A’ and ‘B’ protection shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Orangeville TS.

Establish dual channel Transfer Trip send/receive from Guelph North SS to the associated tapped stations (Campbell TS, Fergus TS), directly or cascaded via remote end terminal stations.

D7VE 230kV Circuit (Guelph North SS- Orangeville TS)

New ‘A’ and ‘B’ protection shall be installed with standard IEDs meeting the requirements of NPCC Directory D4 where feasible.

The D7VE protection scheme shall operate as a permissive over reach (POTT) scheme. New dual channel Main and Alt schemes shall be provided for both POTT and TT signals between Guelph North SS and Orangeville TS.

Establish dual channel Transfer Trip signal send/receive to the associated tapped stations (Fergus MTS etc) directly or cascaded via Orangeville TS.

2.2.7 Orangeville TS

D6VE 230kV Circuit (Guelph North SS- Cedar TS- Orangeville TS)

The existing D6VE (formally D6V) protection consists of distance relays GE D60 in the ‘A’ and SEL-421 in the ‘B’ group and will remain as is. New settings will be applied to provide coverage for new configuration.

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Orangeville TS. The link to Detweiler TS will be discontinued.

Existing transfer trip signals to the associated tapped stations (Fergus TS, Campbell TS etc) will remain unchanged. The necessary modifications will be made to cascade Guelph North SS and Cedar TS transfer trip send/receive to the associated tapped stations (Fergus TS, Campbell TS etc) via Orangeville TS.

D7VE 230kV Circuit (Guelph North SS- Orangeville TS)

The existing D7VE (formally D7V) protection consists of distance relays GE D60 in the ‘A’ and SEL-421 in the ‘B’ group and will remain as is. New settings will be applied to provide coverage for new configuration.

The D7VE protection scheme shall operate as a permissive over reach (POTT) scheme. New dual channel Main and Alt schemes shall be provided for both POTT and TT signals between Guelph North SS and Orangeville TS. The link to Detweiler TS will be discontinued.

Existing transfer trip signals to the associated tapped stations (Fergus TS etc) will remain unchanged. The existing transfer trip send/receive to Campbell TS is no longer required. The necessary modifications will be made to cascade Guelph North SS transfer trip send/receive to respective tapped stations (Fergus TS etc) via Orangeville TS.

2.2.8 Middleport TS

M20D and M21D 230kV Circuits (Preston TS- Detweiler TS – Middleport TS)

The existing protection consists of distance relays L-PRO 2000E in the ‘A’ and SEL-321 in the ‘B’ group protection and will remain as is.

The new protection scheme shall operate as a three terminal directional comparison blocking scheme (DCB). Therefore, a new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between Preston TS, Detweiler and Middleport TS.

Existing TT send/receive (direct and cascaded) to the associated tapped stations (Kitchener MTS#6, Kitchener MTS#8, Galt TS, Cambridge NDum MTS#1 etc) will remain unchanged.

2.3 <u>Tele-Protection</u>

Tele-protection arrangement shall comply with the reliability requirements listed in Transmission System Code (TSC). Hydro one telecom shall assess the most economical and reliable solution for

Guelph North SS, Cedar TS, Burlington TS and Preston TS. The remaining stations (Detweiler TS, Orangeville TS and Middleport TS) already comprise SONET nodes.

2.3.1 B5G & B6G 115kV Circuits (POTT/TT Scheme; Burlington TS-Cedar TS)

The existing tele-protection comprises single Main/Alt analog circuits between Burlington and the associated tapped stations (Cedar TS, Hanlon TS, Arlen MTS etc.) will remain unchanged.

New dual channel Main and Alt communication schemes shall be established for both POTT and TT signals between Burlington TS and Cedar TS. Therefore, a new tele-protection equipment is required at both Cedar TS and Burlington TS.

Establish new dual channel transfer trip signals from Cedar TS to the associated tapped stations (Hanlon TS, Puslinch TS, Arlen MTS, Enbridge CTS, etc), directly or cascaded via Burlington TS. Where required, Implement necessary modifications to the t tapped stations' tele-communication arrangement.

2.3.2 F11C & F12C 115kV Circuits (Three Terminal DCB/TT Scheme: Cedar TS- Preston TS - Freeport TS)

The new protection scheme shall operate as a three terminal DCB scheme. Therefore, a Main and Alt communication channels are needed for both blocking (BLK) and transfer trip (TT) signals between three terminals. Therefore, new tele-protection equipment is to be installed at all three locations; Freeport SS, Preston TS and Cedar TS.

At Preston TS, only one circuit will be connected at a given time and therefore existing common protection (Group A and Group B) will remain as is. However, a Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between Freeport SS, Preston TS and Cedar TS. A special logic shall be created to route BLK/TT signals to associated F11C or F12C remote ends (Freeport SS and Cedar TS) according to the disconnect (DS-F11C or DS-F12C) positions at Preston TS.

The existing transfer trip signals from Freeport to the associated tapped stations (Kitchener MTS#5, etc) will remain unchanged.

Establish the required new transfer trip send/receive signals from all three stations to the associated tapped stations. (Direct or cascaded). Where required, Implement necessary modifications to the tapped stations' tele-communication arrangement.

2.3.3 D6VE 230kV Circuit (Three Terminal DCB/TT Scheme): Guelph North SS – Cedar TS-Orangeville TS

The existing D6V 230kV circuit at Orangeville TS comprises SONET Double circuit connection to Detweiler TS. The existing direct tele-protection links to detweiler TS are no longer needed and they will be discontinued.

A new Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Orangeville TS. Therefore, a new dual channel tele-protection node shall be established at both Guelph North SS and Cedar TS.

The existing transfer trip channels between Orangeville TS to Fergus TS (SONET-single) and Orangeville TS to Campbell TS (Analog- Single) will remain unchanged.

Establish new dual communication channels to send/receive transfer trip signals from Guelph North SS and Cedar TS to the associated tapped stations (Fergus TS, Campbell TS, etc), directly or cascaded via remote terminal stations.

2.3.4 D7VE 230kV Circuit (POTT/TT Scheme) - Guelph North SS- Orangeville TS

Existing D7V 230kV circuit at Orangeville TS comprises SONET Double circuit connection to Detweiler TS. The direct tele-protection links to detweiler TS are no longer needed and they will be discontinued.

New Dual channel Main and Alt communication scheme shall be established for both permissive and transfer trip (TT) signals between Guelph North SS and Orangeville TS. Therefore, a new dual channel tele-protection node shall be established at Guelph North SS.

The existing transfer trip channel between Orangeville TS and Fergus TS (SONET-single) will remain unchanged. The channel between Orangeville TS and Campbell TS (Analog- Single) will no longer be required.

Establish new dual communication channels to send/receive transfer trip signals from Guelph North SS to the associated tapped stations (Fergus TS, etc), directly or cascaded via Orangeville TS.

2.3.5 D6V 230kV Circuit (POTT/TT Scheme): Detweiler TS - Guelph North SS

Existing D6V 230kV circuit at Detweiler TS comprises SONET (Double) communication link to Orangeville TS. The direct tele-protection links to Orangeville TS are no longer needed and they will be discontinued.

New Dual channel Main and Alt communication scheme shall be established for both permissive and transfer trip (TT) signals between Guelph North SS and Detweiler TS. Therefore, a new dual channel tele-protection node will be required at Guelph North SS.

The existing transfer trip channels between Detweiler TS and WNH MTS#3 (Analog-single), Scheifele MTS (MET-Double), will remain unchanged.

Establish new dual communication channels to send/receive transfer trip signals from Guelph North SS to the associated tapped stations, directly or cascaded via Detweiler TS.

2.3.6 D7V 230kV Circuit (Three Terminal DCB/TT Scheme): Guelph North SS – Cedar TS-Detweiler TS

Existing D7V 230kV circuit at Detweiler TS comprises SONET Double circuit connection to Orangeville TS. The direct tele-protection links to Orangeville TS are no longer needed and they will be discontinued.

New Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between; Cedar TS, Guelph North SS and Detweiler TS. Therefore, new dual channel tele-protection nodes shall be established at both Guelph North SS and Cedar TS.

The existing transfer trip channels between Detweiler TS and WNH MTS#3 (Analog-single), Scheifele MTS (MET-Double), will remain unchanged.

Establish new dual communication channels to send/receive transfer trip signals from Guelph North SS and Cedar TS to the associated tapped stations (WNH MTS#3, Scheifele MTS, Campbell TS etc), directly or cascaded via remote terminal stations.

2.3.7 M20D and M21D 230kV Circuits (Three Terminal DCB/TT Scheme): Detweiler TS-Preston TS- Middleport TS

Existing M20D/M21D 230kV circuit at Detweiler TS and Middleport TS comprise SONET Double circuit connection and will remain as is.

At Preston TS, only one circuit will be connected at a given time and therefore existing common protection (Group A and Group B) will remain as is. However, a Dual channel Main and Alt communication scheme shall be established for both blocking (BLK) and transfer trip (TT) signals between Detweiler TS, Preston TS and Middleport TS. A special logic shall be created to route BLK/TT signals to the associated M20D or M21D remote ends (Detweiler TS and Middleport TS) according to the disconnect positions (DS-M20D or DS-M21D) at Preston TS.

The existing transfer trip channels between Detweiler TS and Galt TS (SONET-single), Cambridge NDum MTS#1 (Analog-Double), Preston TS (Analog Double), Kitchener MTS#6 (MET-Single), Kitchener MTS#8 (Analog-Double) will remain unchanged. Similarly, the existing transfer trip channels between Middleport TS and Galt TS (SONET-single) will also remain unchanged.

Establish new dual communication channels to send/receive transfer trip signals from Preston TS to the associated tapped stations, directly or cascaded via remote terminal stations.

2.4 Protection Settings and Fault Clearing Times

Abbreviations:

DOR-Directional Over Reach; **DUR-** Directional Under Reach; **TT-**Transfer Trip; NBR-No Blocking Receive; **DRB-** Directional Reverse Blocking; **P-**Permissive.

The following tables provide the rationale for the settings. The final settings will be done after a detail fault study prior to implementation.

2.4.1 B5G & B6G 115kV Circuits (Burlington TS-Cedar TS)

Existing Settings

Burlington TS—B5G/B6G 115kV Circuits

The existing settings accommodate a B5G/B6G supply from Burlington TS to Cedar radially. The new length of Burlington TS to Cedar TS will be 44km.

Station	Zone	Reach (km)	**Protection Rationale**
Burlington TS A – GE D60 B – SEL 421	1	67.2	Z1P set to 125% ZMA (3PH) to ABB CTS, Z1MG set to 125% ZMA (SLG) to ABB CTS
	2	67.2	Z2P set same as Z1P;Z2MG set same as Z1MG

New Settings

Burlington TS—B5G/B6G 115kV Circuits (POTT/TT)

The new line length between Burlington TS and Cedar TS will be ~44km.

Station	Zone	Reach (km)	Protection Rationale
Burlington TS A – GE D60 B – SEL 421	1	35	Z1P set to 80% of ZL1 to Cedar TS, Z1G set to 75% ZL1 to Cedar TS, Instantaneous; (DUR/TT)
	2	56	Z2P set to 125% of ZMA for 3PH fault at Cedar TS, Z2G set to 125% of ZMA for SLG fault at Cedar TS, 400ms timed; (DOR/TT/P), Z2 Fast Trip

Cedar TS-B5G/B6G 115kV Circuits (POTT/TT)

The new line length between Burlington TS and Cedar TS will be ~44km.

Station	Zone	Reach (km)	Protection Rationale
Burlington TS A – GE D60 B – SEL 421	1	35	Z1P set to 80% of ZL1 to Burlington TS, Z1G set to 75% ZL1 to Burlington TS, Instantaneous; (DUR/TT)
	2	53	Z2P set to 125% of ZMA for TPH at Cedar TS, Z2G set to 125% of ZMA for SLG at Cedar TS, 400ms timed; (DOR/TT/P), Z2 Fast Trip

The longest fault clearing time for a N-1-1 contingency will be for the case of a fault in Zone 2 reach of the Burlington TS (or Cedar TS) and followed by a breaker failure at Burlington TS (or Cedar TS). The time required for this corresponds to the zone 2 time delay (400ms), plus breaker failure time delay(150ms), Transfer Trip delay (50ms) plus time for breaker operation (50ms) – about 650 ms in total.

2.4.2 F11C & F12C 115kV Circuits (Freeport SS-Preston TS-Cedar TS)

Existing Settings

Freeport SS – F11C/B6G and F12C/B5G

The existing Settings comprise two setting groups. Group 1 setting reach covers the normal operation mode when the Cedar TS in-line disconnect switch is open. The Group 2 setting reach covers F11C + B6G by both Freeport and Preston with line-end-open at Burlington.

Free Port SS	Zone	Reach (km)	Protection Rationale
A – GE D60 B – SEL 421	1	3.6	Z1P set to 80% of ZL1 to Preston TS, Z1G set to 75% ZL1 to Preston TS, Instantaneous; (DUR/TT)
	2	22.5	Z2P set to 125% of ZMA for TPH at Cedar TS, Z2G set to 125% of ZMA for SLG at Cedar TS, 400ms timed; (DOR/TT/NBR); 50ms.
	3	50	Z3 (reverse) is set to 125% of Preston Z2 reach-ZL; DRB SEND

Preston TS	Zone	Reach (km)	Protection Rationale
A – GE D60 B – SEL 421	1	3.6	Z1P set to 80% of ZL1 to Preston TS, Z1G set to 75% ZL1 to Preston TS, Instantaneous; (DUR/TT)
	2	37.5	Z2P set to 125% of ZMA for 3PH at Cedar TS, Z2G set to 125% of ZMA for SLG at Cedar TS, 400ms timed; (DOR/TT/NBR); 50ms.
	3	60	Z3 (reverse) is set to 125% of Freeport Z2 reach-ZL; DRB SEND

New Settings

F11C & F12C 115kV Circuits (Cedar TS- Preston TS - Freeport TS) -Three Terminal DCB/TT Scheme:

F11C and F12C protection shall operate as a Three Terminal Directional Comparison Blocking Scheme (DCB). Each terminal sends a blocking signal from its reverse zone to other two terminals.

The line length between Freeport TS and Cedar TS will be 17km.

Free Port SS	Zone	Reach (km)	Protection Rationale
A – GE D60 B – SEL 421	1	3.6	Z1P set to 80% of ZL1 to Preston TS, Z1G set to 75% ZL1 to Preston TS, Instantaneous; (DUR/TT)
	2	55.5	Z2P set to 125% of ZMA for 3PH at Cedar TS, Z2G set to 125% of ZMA for SLG fault at Cedar TS, 400ms timed; (DOR/TT/NBR) 50ms.
	3	42	Phase and Ground Z3 (Rev) is set to 125% of Preston Z2 reach –ZL ; DRB SEND

Preston TS	Zone	Reach (km)	Protection Rationale
A – GE D60 B – SEL 421	1	3.6	Z1P set to 80% of ZL1 to Freeport SS, Z1G set to 75% ZL1 to Free port SS, Instantaneous; (DUR/TT)
	2	37	Z2P set to 125% of ZMA for 3PH at Cedar TS, Z2G set to 125% of ZMA for SLG fault at Cedar TS, 400ms timed; (DOR/TT/NBR) 50ms.
	3	65	Phase and Ground Z3 (Rev) is set to 125% of Freeport Z2 reach –ZL ; DRB SEND

Cedar TS	Zone	Reach (km)	Protection Rationale
A – GE D60 B – SEL 421	1	11.6	Z1P set to 80% of ZL1 to Preston TS, Z1G set to 75% ZL1 to Preston TS, Instantaneous; (DUR/TT)
	2	42.5	Z2P set to 125% of ZMA for 3PH at Freeport SS, Z2G set to 125% of ZMA for SLG fault at Freeport SS, 400ms timed; (DOR/TT/NBR) 50ms.
	3	52.5	Phase and Ground Z3 (Rev) is set to 125% of Freeport Z2 reach –ZL ; DRB SEND

The longest fault clearing time for N-1-1 contingency will be for the case of a fault in Zone 2 reach of the Freeport SS (or any other) and followed by a breaker failure at Freeport SS (or any other) . The time required for this corresponds to the zone 2 time delay (400ms), plus breaker failure time delay(150ms), Transfer Trip delay (50ms) plus time for breaker operation (50ms) – about 650 ms in total.

2.4.3 D6V and D7V 230kV Circuits (Detweiler- Orangeville TS)

The existing Detweiler TS-Orangeville TS circuits will be sectionalized at Guelph North SS (Approx. 27km from Detweiler and 37km from Orangeville TS. The existing total line length is approximately 64km between Detweiler TS to Orangeville TS.

Existing Settings

Detweiler TS	Zone	Reach (~km)	Protection Rationale
A – REL 521 B – SEL 321	1	52	Z1P set to 80% of ZL1 to Orangeville TS, Z1G set to 75% ZL1 to Orangeville TS, Instantaneous; (DUR/TT)
	2	90	Z2P set to 125% ZMA(3PH), Z2G set to 125% ZMA (SLG), 400ms timed; (DOR/TT/P)

Orangeville TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	51	Z1P set to 80% of ZL1 to Detweiler TS, Z1G set to 75% ZL1 to Orangeville TS, Instantaneous; (DUR/TT)
	2	93	Z2P set to 125% ZMA(3PH), Z2G set to 125% ZMA (SLG), 400ms timed; (DOR/TT/P)

New Settings

2.4.3.1 D6V 230kV Circuit (Detweiler TS- Guelph North SS) – POTT/TT Scheme

The new line length will be ~27km between Detweiler TS and Guelph North SS.

Detweiler TS	Zone	Reach (~km)	Protection Rationale
A – REL 521 B – SEL 321	1	22	Z1P set to 80% of ZL1 to Guelph North SS, Z1G set to 75% ZL1 to Guelph North SS, Instantaneous; (DUR/TT)
	2	35	Z2P set to 125% ZMA for Guelph North SS 3PH fault, Z2G set to 125% ZMA for Guelph North SS SLG fault, 400ms timed; (DOR/TT/P), Z2 Fast Trip

Guelph North SS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	22	Z1P set to 80% of ZL1 to Detweiler TS, Z1G set to 75% ZL1 to Detweiler TS, Instantaneous; (DUR/TT)
	2	35	Z2P set to 125% ZMA for Detweiler 3PH fault, Z2G set to 125% ZMA for Detweiler SLG fault, 400ms timed;(DOR/TT/P), Z2 Fast Trip

The longest fault clearing time for N-1-1 contingency will be for the case of a fault in Zone 2 reach of the Detweiler TS (or Guelph North SS) and followed by a breaker failure at Detweiler TS (or Guelph North SS) .The time required for this corresponds to the zone 2 time delay (400ms), plus breaker failure time delay(150ms), Transfer Trip delay (50ms) plus time for breaker operation (50ms) – about 650 ms in total.

2.4.3.2 D7V 230kV Circuit (Detweiler TS- Guelph North SS-Cedar TS) – Three Terminal DCB Scheme DOR/TT/NBR

The new line length will be ~27km from Detweiler TS to Guelph North SS + 17km tap off to Cedar TS.

New Settings

Detweiler TS	Zone	Reach (~km)	Protection Rationale
A – REL 521 B – SEL 321	1	22	Z1P set to 80% of ZL1 to Guelph North SS, Z1G set to 75% ZL1 to Guelph North SS, Instantaneous; (DUR/TT)
	2	76	Z2P set to 125% ZL1, Z2G set to 125% ZL1, 400ms timed;(DOR/TT/NBR) , 50ms
	3	25	Phase and Ground Z3 (Rev) is set to 125% of Cedar TS Z2 reach –ZL ; DRB SEND

Guelph North SS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	10	Z1P set to 80% of ZL1 to Campbell TS, Z1G set to 75% ZL1 to Campbell TS, Instantaneous; (DUR/TT)
	2	35	Z2P set to 125% ZMA(3PH) for Detweiler TS fault, Z2G set to 125% ZMA (SLG) for Detweiler TS fault, 400ms timed;(DOR/TT/NBR), 50ms
	3	68	Phase and Ground Z3 (Rev) is set to 125% of Cedar TS Z2 reach –ZL ; DRB SEND

Cedar TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	4	Z1P set to 80% of ZL1 to Guelph North SS, Z1G set to 75% ZL1 to Campbell TS, Instantaneous; (DUR/TT)
	2	55	Z2P set to 125% ZL1, Z2G set to 125% ZL1, 400ms timed;(DOR/TT/NBR) ,(Set sequential Z2 coverage due to high apparent impedance), 50ms
	3	51	Phase and Ground Z3 (Rev) is set to 125% of Detweiler Z2 reach –ZL ; DRB SEND

The longest fault clearing time for N-1-1 contingency will be for the case of a fault in Zone 2 reach of the Guelph North SS (or any other) and followed by a breaker failure at Guelph North SS (or any other) .The time required for this corresponds to the zone 2 time delay (400ms), plus breaker failure time delay(150ms), Transfer Trip delay (50ms) plus time for breaker operation (50ms) – about 650 ms in total.

2.4.3.3 D6VE 230kV Circuit (Guelph North SS-Cedar TS-Orangeville TS) - Three Terminal DCB Scheme DOR/TT/NBR

The new line length will be ~37km from Guelph North SS to Orangeville TS + 17km tap off to Cedar TS.

New Settings

Guelph North SS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	10	Z1P set to 80% of ZL1 to Cedar TS, Z1G set to 75% ZL1 to Campbell TS, Instantaneous; (DUR/TT)
	2	49	Z2P set to 125% ZMA for Orangeville TS 3PH fault, Z2G set to 125% ZMA for Orangeville TS SLG fault, 400ms timed; (DOR/TT/NBR).
	3	68	Z3 (reverse) is set to 125% of (Cedar TS Z2 reach-ZL); DRB SEND

Orangeville TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	30	Z1P set to 80% of ZL1 to Guelph North SS, Z1G set to 75% ZL1 to Guelph North SS, Instantaneous; (DUR/TT)
	2	68	Z2P set to 125% ZL to Campbell TS, Z2G set to 125% ZL to Campbell TS, 400ms timed;(DOR/TT/NBR); ,(Set Sequential Z2 coverage due to high apparent impedance), 50ms
	3	31	Z3 (reverse) is set to 125% of (Cedar TS Z2 reach-ZL); DRB SEND

Cedar TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	4	Z1P set to 80% of ZL1 to Campbell TS, Z1G set to 75% ZL1 to Guelph North SS, Instantaneous; (DUR/TT)
	2	68	Z2P set to 125% ZL1, Z2G set to 125% ZL1, 400ms timed;(DOR/TT/NBR) ,(Set sequential Z2 coverage due to high apparent impedance), 50ms
	3	31	Z3 (reverse) is set to 125% of (Orangeville TS Z2 reach-ZL); DRB SEND

The longest fault clearing time for N-1-1 contingency will be for the case of a fault in Zone 2 reach of the Guelph North SS (or any other) and followed by a breaker failure at Guelph North SS (or any other) .The time required for this corresponds to the zone 2 time delay (400ms), plus breaker failure time delay(150ms), Transfer Trip delay (50ms) plus time for breaker operation (50ms) – about 650 ms in total.

2.4.3.4 D7VE 230kV Circuit (Guelph North SS-Orangeville TS) – POTT/TT Scheme

The new line length will be ~37km from Guelph North SS to Orangeville TS.

Guelph North SS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	30	Z1P set to 80% of ZL1 to Orangeville TS, Z1G set to 75% ZL1 to Orangeville TS, Instantaneous ; (DUR/TT)
	2	49	Z2P set to 125% ZMA(3PH) for Orangeville TS fault, Z2G set to 125% ZMA (SLG) for Orangeville TS fault, 400ms timed ; (DOR/TT/P)

Orangeville TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	30	Z1P set to 80% of ZL1 to Guelph North SS, Z1G set to 75% ZL1 to Guelph North SS, Instantaneous; (DUR/TT)
	2	46	Z2P set to 125% ZMA(3PH) for Guelph North SS fault, Z2G set to 125% ZMA (SLG) for Guelph North SS fault, 400ms timed; (DOR/TT/P)

The longest fault clearing time for N-1-1 contingency will be for the case of a fault in Zone 2 reach of the Guelph North SS (or Orangeville TS) and followed by a breaker failure at Guelph North SS (or Orangeville TS) .The time required for this corresponds to the zone 2 time delay (400ms), plus breaker failure time delay(150ms), Transfer Trip delay (50ms) plus time for breaker operation (50ms) – about 650 ms in total.

2.4.4 M20D and M21D 230kV Circuits (Detweiler- MiddleportSS TS)

The line length between Detweiler TS and Middleport TS is 57.8km. For Preston Settings, the line length will be 53.5km.

Existing Settings

Detweiler TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	46	Z1P set to 80% of ZL1 to Middleport TS, Z1G set to 75% ZL1 to Middleport TS, Instantaneous; (DUR/TT)
	2	175	Z2P set to 125% ZMA for Middleport 3PH fault, Z2G set to 125% ZMA (SLG), 400ms timed; (DOR/TT/P) & NBR from Preston TS

Middleport TS	Zone	Reach (~km)	Protection Rationale
A – LPRO 2100E B – SEL 321-1	1	46	Z1P set to 80% of ZL1 to Detweiler TS, Z1G set to 75% ZL1 to Orangeville TS, Instantaneous; (DUR/TT)
	2	88	Z2P set to 125% ZMA for Detweiler 3PH fault, Z2G set to 125% ZMA (SLG), 400ms timed; (DOR/TT/P)

Preston TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	36.5	Z1P set to 80% of ZL1 to Middleport TS, Z1G set to 75% ZL1 to Middleport TS, Instantaneous; (DUR/TT)
	2	120	Z2P set to 125% ZMA for Detweiler 3PH fault, Z2G set to 125% ZMA (SLG), 400ms timed; (DOR/TT/P) & NBR from Preston TS
	3	165	Z3 (reverse) is set to 125% of (Detweiler Z2 reach-ZL); DRB SEND

New Settings

M20D and M21D 230kV Circuits (Detweiler TS- Preston TS- Middleport TS) - Three Terminal DCB Scheme (DOR/TT/NBR)

Detweiler TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	43	Z1P set to 80% of ZL1 to Middleport TS, Z1G set to 75% ZL1 to Preston TS, Instantaneous; (DUR/TT)
	2	80	Z2P set to 125% ZMA for Middleport 3PH fault, Z2G set to 125% ZMA for Middleport SLG fault, 400ms timed; (DOR/TT/NBR) ; 50ms
	3	30	Z3 (reverse) is set to 125% of (Middleport TS Z2 reach-ZL); DRB SEND

Middleport TS	Zone	Reach (~km)	Protection Rationale
A – LPRO 2100E B – SEL 321-1	1	46	Z1P set to 80% of ZL1 to Detweiler TS, Z1G set to 75% ZL1 to Orangeville TS, Instantaneous; (DUR/TT)
	2	70	Z2P set to 125% ZMA for Detweiler 3PH fault, Z2G set to 125% ZMA (SLG), 400ms timed; (DOR/TT/NBR), 50ms
	3	42	Z3 (reverse) is set to 125% of (Detweiler Z2 reach-ZL); DRB SEND

Preston TS	Zone	Reach (~km)	Protection Rationale
A – GE D60 B – SEL 421	1	36.5	Z1P set to 80% of ZL1 to Middleport TS, Z1G set to 75% ZL1 to Middleport TS, Instantaneous; (DUR/TT)
	2	67	Z2P set to 125% ZL1, Z2G set to 125% ZL1 to Detweiler TS, 400ms timed;(DOR/TT/NBR) ,(Set sequential Z2 coverage due to high apparent impedance), 50ms
	3	28	Z3 (reverse) is set to 125% of (Detweiler Z2 reach-ZL); DRB SEND

The longest fault clearing time for N-1-1 contingency will be for the case of a fault in Zone 2 reach of the Detweiler (or any other) and followed by a breaker failure at Detweiler TS (or any other) .The time required for this corresponds to the zone 2 time delay (400ms), plus breaker failure time delay(150ms), Transfer Trip delay (50ms) plus time for breaker operation (50ms) – about 650 ms in total.

3.0 SCADA/RTU

4.0 POWER SYSTEM MONITORING

5.0 REVENUE METERING

6.0 CYBER SECURITY

NERC’s standards CIP-002 through CIP-009 may apply.

7.0 STATION REQUIREMENTS

8.0 UPDATE DATABASES AND DOCUMENTATION

IMO_REQ_0041
Filed: March 8, 2013
EB-2013-0053
Exhibit B-6-3
Appendix A
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REQUIREMENTS

Power to Ontario.
On Demand.

Ontario Resource and Transmission Assessment Criteria

Issue 5.0

This document is to be used to evaluate long-term system *adequacy* and *connection assessments*

Disclaimer

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Document ID	IMO_REQ_0041
Document Name	Ontario Resource and Transmission Assessment Criteria
Issue	Issue 5.0
Reason for Issue	Released for Baseline 17.1
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Document Change History

Issue	Reason for Issue	Date
1.0	First release	June 4, 2003
2.0	Issue released for Baseline 10.0	September 10, 2003
3.0	Name and logo changed to IESO	September 14, 2005
4.0	Released for Baseline 15.0	March 8, 2006
5.0	Revised for Baseline 17.1	August 22, 2007

Related Documents

Document ID	Document Title

Table of Contents

Table of Changes

Reference (Section and Paragraph)	Description of Change
Entire document	Name changed to Ontario Resource and Transmission Assessment Criteria. Defined terms were italicized. Document titles were reformatted as per section 1.4. Quotations were removed from words that are not documents.
Section 1	Clarified the purpose, scope and users of the document. Added conventions section.
Section 2	Clarified load modelling (sec 2.4) and contingency criteria (sec 2.7.1). Aligned section 2.7.1 with the criteria with NPCC document A-02 (section 5.0). Clarified study time periods, load forecasts and modelling, local area requirements, bulk power system and local area contingency studies.
Section 3	Clarified special protection systems (sec 3.4.1). Clarified how system conditions were to be modelled including generation dispatch, stability conditions, permissible control actions and special control systems. Changed to section 3.1.1 to 3.1 and corrected references to 3.1.1.
Section 4	Clarified P-V curves (sec 4.5.1). Clarified power transfer capability, pre-contingency voltage limits and voltage change limits, steady state voltage stability, lines and equipment loading and short circuit levels.
Section 5	Updated section heading and all references to be "Transmission Connection Criteria".
Section 6	Updated section heading and all references to be "Generation Connection Criteria". Clarified how transmission line ratings are calculated in the vicinity of wind farms.
Section 7	Created a new section titled " 7. Load Security and Restoration Criteria ". Clarified the effect of local generation when one element is out of service and when two elements are out of service. References to E-2 were deleted in section 7.2. Clarified control action criteria and application of restoration criteria.
Section 8	Created a new section titled "Resource Adequacy Assessment Criterion". Changed title of document to "Ontario Resource and Transmission Assessment Criteria"
Appendix E	Deleted
References	Added documents referred to within this document

1. Introduction

1.1 Purpose

The purpose of this document is to identify the technical criteria for use in the assessments of the *adequacy* and *security* of the *IESO-controlled grid* and to clarify how the *IESO* will apply the relevant *NPCC* and *NERC* standards and implement them within Ontario.

1.2 Scope

This document is to be used for assessing the current and future *adequacy* of the *IESO-controlled grid*, for conducting the *IESO's* 18-month outlooks, for identifying the need for system enhancements and for evaluating the effectiveness of planned generation and transmission enhancements. It does not identify operating or safety criteria.

1.3 Who Should Use This Document

This document is used by the *IESO* and may also be referred to by stakeholders and *market participants* to help them understand *IESO* criteria and further their *connection assessment* work.

1.4 Conventions

The standard conventions followed for market manuals are as follows:

- The word 'shall' denotes a mandatory requirement;
- Terms and acronyms used in this market manual including all Parts thereto that are italicized have the meanings ascribed thereto in Chapter 11 of the "Market Rules";
- Double quotation marks are used to indicate titles of legislation, publications, forms and other documents.

Any procedure-specific convention(s) shall be identified within the procedure document itself.

– End of Section –

2. Study Parameters and Contingency Criteria

This section is intended to provide guidance in carrying out the technical studies to assess the *adequacy* of the *IESO-controlled grid* in order to meet general load growth and *connection assessment* requirements, and to ensure that *reliability* is within standards. It also includes contingency criteria consistent with *NERC* and *NPCC* standards.

These study parameters must be applied on the basis of good utility practice and judgment, taking into account the particular circumstances and characteristics of the part of the *IESO-controlled grid* that is being studied.

This section includes study guidelines for: study period, base case, load levels, power transfer capability, area flow requirements, contingency based assessment and study conditions.

2.1 Study Purpose

The purpose of conducting studies is to identify system deficiencies and to establish the requirements for a connection proposal to ensure it satisfies *reliability standards*.

A comparison of the results of power flow studies under normal and *outage* conditions (with normal and *outage* power flows) will determine:

- the need date for new transmission investment in the *IESO-controlled grid* to maintain the *reliability* of supply within standards; or,
- the acceptability of a connection proposal for a *connection assessment*.

The sensitivity of the need date to load growth rate, resource variations (e.g. approved *connection assessments*) and related system developments should be investigated. The results of this investigation should normally be given in terms of a range of dates within which there is a high confidence level that the connection proposal is acceptable or that additional *facilities* or enhancements will be required.

2.2 Study Period

The study period depends on the purpose of the assessment. When checking the reliability of long term projects and plans the study period must go out beyond the in-service date and include various years between the start and end dates of the study.

- For *connection assessments* for proposed load developments, the study period shall run from the planned in service date of the proposed *facility* up to 10 years into the future depending on the availability of load forecasts. Where the evaluation depends on factors or system developments beyond the 10 year study period, the study period may need to be extended farther into the future.

- For *connection assessments* for generators, the study period shall run from the planned in service date of the proposed *facility* up to 10 years into the future depending on the availability of demand forecasts. Where the evaluation depends on factors or system developments beyond the 10 year study period, the study period may need to be extended farther into the future.

- For *connection assessments* for proposed *transmission* developments, the study period shall run from the planned in service date of the proposed *facility* up to 10 years into the future depending on the availability of load forecasts. Where the evaluation depends on factors or system developments beyond the 10 year study period, the study period may need to be extended farther into the future.

- For *NPCC* transmission reviews, the study period covers a 4 to 6 year look ahead period from the report date. These reviews are of three types: a comprehensive or full review, an intermediate or partial review and an interim review. Refer to *NPCC* document B-04, "Guidelines for *NPCC* AREA Transmission Reviews" for details.

- For *NPCC* resource adequacy reviews, the study period covers a 5 year look ahead period. These reviews are of two types: a comprehensive resource review and an annual interim review. Refer to *NPCC* document B-08, "Guidelines for Area Review of Resource Adequacy" for details.

Note that it is unnecessary to consider every year in the study period. The first and last years of the study period plus sufficient intermediate years to zero in on and bracket the critical year(s) is generally adequate.

2.3 Base Case

Master base cases are used as the starting point for all studies. The master base cases include all *connection assessment* projects that are approved, including those that did not require a formal *connection assessment* study. *Local area* details are added as appropriate. Information regarding base cases can be found on the *IESO's* Forecasts webpage.

The *IESO* Web site also provides firm and planned resource scenarios as described in each 18-Month Outlook.

Connection assessment studies are conducted using the master base cases. Long term assessment studies start with the master base cases and exclude less firm generation *connection assessment* projects per the planned resource scenario. The impact of adding approved *connection assessment* projects should be reviewed to identify if approved *connection assessments* improve or worsen any identified deficiency.

2.4 Load Forecasts and Load Modelling

The load levels used in the study shall be based on the latest forecast[1] consistent with the IESO's and the OPA's latest long-term forecast. Load forecast uncertainty should be taken into account by investigating the sensitivity of the need date to various items (e.g. higher and lower loads).

The summer or winter median growth forecast (based on normal weather) should be used depending on the peak loading conditions of the area being studied.

The sensitivity study should be done with high-growth extreme weather forecasts and low-growth normal weather forecasts, and with light load scenarios as required in order to stress the system. Under light load conditions, worst case ambient conditions should be assumed.

If a *connection assessment applicant* provides a detailed local forecast, that forecast should be used.

For *local area* assessments, the 18 month master base case should be modified to ensure the forecast is representative of the most recent peak load and power factors based on billing data. Local load should be modeled as accurately as possible and any local *embedded generator(s)* or large motor(s) should be included.

For assessment purposes the power factor is assumed to be 0.90 at the *defined meter point*. If an *embedded generator* is connected to a load bus, the 0.90 power factor is assumed with the generator out-of-service. In certain circumstances detailed load models may be required if they are expected to impact the *local area* performance.

Dispatchable load will be assumed to be consuming as required in order to stress the system.

Studies should be done with a load model representative of the actual load. For powerflow planning studies assessing the voltage stability of the bulk system, loads normally should be modelled as constant megavolt-amperes (MVA). In assessing voltage change limits and transient performance, a voltage dependent load model should be used. If specific information is not available, the load model in Ontario should be as indicated in the following table:

Static Load Models for Simulation

REAL POWER		REACTIVE POWER	
Constant Current	**Constant Impedance**	**Constant Current**	**Constant Impedance**
(%)	**(%)**	**(%)**	**(%)**
50	50	0	100

Thus, in Ontario, a load model of P=50, 50, Q=0, 100 (e.g. $P \propto V^{1.5}$, and $Q \propto V^2$) should be used. The load models for neighboring areas should be consistent with load models used in Reliability First Corporation (RFC), Midwest Regional Organization (MRO), and *NPCC* studies.

[1] The IESO continues to produce 10-year demand forecasts using an econometric model. These forecasts are coordinated with OPA's multi-year end use forecasts and adjusted for Conservation and Demand Management (CDM).

2.5 Power Transfer Capability

A power transfer capability analysis should be performed throughout the study period taking into account the effects of planned *facilities*, the growth in loads, and the effects (if any), of various system generation patterns. The transfer limits should be determined for one or both directions of flow (as necessary).

With all transmission *facilities* in service, the power transfer capability is determined for the worst applicable contingency. Also, it will generally be necessary to determine the effects of seasonal variations (e.g., summer and winter line ratings) on the limits.

Generally, the transmission interface limits will be determined by one or more of the following post-contingency considerations:

- line and equipment loading must not exceed ratings,
- voltage declines must not exceed certain limits,
- machine and voltage angles must remain in synchronism, and
- voltages are stable (V-Q sensitivity is positive).

2.6 Local Area Requirements

Inter-area transmission is any circuit or group of transmission circuits interconnecting two areas of the *IESO-controlled grid*. Flows across the interface may either always be in one direction or in different directions at different times, in which case it may be necessary to consider each of the areas as the receiving area. The impact of *local area facilities* on inter-area transmission must be evaluated.

The magnitude and direction of future power flow requirements on the area studied should be determined for normal and contingency conditions. Peak, off-peak, and light load flow requirements should be considered.

With all transmission *facilities* in service (normal conditions), the schedule for generation in the receiving area should be based on the historically typical conditions. That is, for pre-contingency conditions, nuclear and run of river hydro-electric generation should be assumed at a level that is available 98% of the time. For example, on-peak conditions should be assessed with peaking hydro-electric generation plants, fossil plants and wind farms running at maximum output. Where *reliability* depends on local generation, sensitivity studies should be done to assess the impact of *outages* of local generation.

Load diversity and transmission losses should be given due consideration to ensure *facility* requirements are not overestimated.

2.7 Contingency-Based Assessment

The principal purpose of a system *adequacy/connection assessment* is to identify any areas where supply *reliability* may be at unacceptable risk. This could be due to a combination of factors such as load growth, load reduction, generation, or non-deliverability within a certain area.

The *IESO-controlled grid* must be planned with sufficient capability to withstand the loss of specified, representative and reasonably foreseeable contingencies at projected customer *demand* and anticipated transfer levels. Application of these contingencies should not result in any criteria violations, or the loss of a major portion of the system, or unintentional separation of a major portion of the system. The *IESO-controlled grid* shall be designed with sufficient capability to keep voltages, line and equipment loading within applicable limits for these contingencies

The *IESO*, as a member of *NPCC*, uses a contingency-based assessment to evaluate the *adequacy* and *security* of the bulk power system. The contingencies considered are identified in *NPCC* criteria A-02, "Basic Criteria for Design and Operation of Interconnected Power Systems". The *IESO* conducts studies with these contingencies applied throughout the *IESO-controlled grid*, assuming that *facilities* have not been designed to bulk power system standards, to test for the consequences. The *IESO* evaluates the study results to determine if a *facility* should be designated a bulk power system *facility*. If the consequence of the contingency has a significant adverse impact outside the *local area*, the *facilities* are deemed to be bulk power system *facilities* and must comply with *NPCC* criteria A-02, A-04, "Maintenance Criteria for Bulk Power System Protection" and A-05, "Bulk Power System Protection Criteria". *NPCC* Criteria are not applied in *local areas* where the consequence of faults or disturbances is well understood and restricted to a clearly defined set of *facilities* on the *IESO-controlled grid*.

NPCC extreme contingencies shall be assessed periodically in accordance with *Reliability* Coordinating Council criteria A-02, and guideline B-04, "Guideline for *NPCC* AREA transmission Reviews".

NPCC is in the process of developing the classification methodology for identifying the elements that constitute the bulk power system (reference *NPCC* A-10, "Classification of Bulk Power System Elements". The *IESO's* definition of the bulk power system will be consistent with *NPCC's* definition.

When conducting *connection assessments* or assessing system *adequacy*, various contingencies are applied to the *IESO-controlled grid* and their impact is evaluated. Different contingencies are evaluated for the bulk power system and *local areas*. For those parts of the *IESO-controlled grid* that are designated as bulk power system *facilities*, *NPCC* design criteria contingencies are applied, per Section 2.7.1. For those parts of the *IESO-controlled grid* that are designated as *local areas*, *local area* contingencies are applied, per Section 2.7.2.

In *local areas*, where the contingency propagates to a higher voltage level or causes a net load loss in excess of 1000MW, the *IESO* will apply the bulk power system contingencies described in section 2.7.1.

2.7.1 The Bulk Power System Contingency Criteria

In accordance with *NPCC* criteria A-02, the bulk power system portion of the *IESO-controlled grid* shall be designed with sufficient transmission capability to serve forecasted loads under the conditions noted in this section. These criteria will also apply after any critical generator, transmission circuit, transformer, series or shunt compensating device or HVdc pole has already been lost, assuming that generation and power flows are adjusted between ***outages*** by the use of ***ten-minute operating reserve*** and where available, phase angle regulator control and HVdc control.

Stability of the bulk power system shall be maintained during and following the most severe of the contingencies stated below, with due regard to reclosing. The following contingencies are evaluated for the bulk power system portion of the *IESO-controlled grid*:

a. A permanent three-phase fault on any generator, transmission circuit, transformer or bus section with normal fault clearing.

b. Simultaneous permanent phase-to-ground faults on different phases of each of two adjacent circuits of a multiple circuit tower, with normal fault clearing. If multiple circuit towers are used only for station entrance and exit purposes, and if they do not exceed five towers at each station, this condition is an acceptable risk and therefore can be excluded.

c. A permanent phase-to-ground fault on any transmission circuit, transformer or bus section with delayed fault clearing (This contingency covers a breaker failure).

d. Loss of any element without a fault.

e. A permanent phase-to-ground fault on a circuit breaker with normal fault clearing. (Normal fault clearing time for this condition may not always be high speed.) Note that this condition covers the blind spot on a breaker or on a bus section between a free standing current transformer (CT) and a breaker. It is included for completeness and is not intended to be more onerous than c) above (e.g. neither a stuck breaker nor a protection system failure need be considered for this type of contingency on account of the low probability of such an occurrence, therefore, there would normally be no reason to actually test for this condition).

f. Simultaneous permanent loss of both poles of a direct current bipolar *facility* without an ac fault.

g. The failure of a circuit breaker to operate when initiated by an *SPS* following: the loss of any element without a fault; or a permanent phase-to-ground fault, with normal fault clearing on any transmission circuit, transformer or bus section.

The bulk power system portion of the *IESO-controlled grid* shall be designed in accordance with these criteria and the ***IESO's*** local voltage control procedures and criteria, which shall be coordinated with adjacent *control areas*[2]. Adequate reactive power resources and appropriate controls shall be installed in the *IESO-controlled grid* to maintain voltages within normal limits for predisturbance conditions, and within applicable *emergency* limits for the system conditions that exist following the contingencies specified above.

Line and equipment loadings shall be within normal limits for predisturbance conditions and within applicable *emergency* limits for the system conditions that exist following the contingencies specified above.

The *IESO-controlled grid* shall be designed to ensure that equipment capabilities are adequate for fault current levels with all transmission and *generation facilities* in service for all potential operating conditions. Procedures established to manage fault levels shall be coordinated with adjacent areas and regions[2].

[2] Language and accountabilities used in NPCC A-2 is evolving. Terms such as control areas, areas, and regions should be interpreted broadly to include the meaning originally intended in A-2, until it is revised.

2.7.2 Local Area Contingencies

For *local areas* the *IESO-controlled grid* must exhibit acceptable performance following:

a. the loss of an element without a fault, and

b. a phase-to-phase-to-ground fault on any generator, transmission circuit, transformer, or bus section with normal fault clearing.

In the non bulk power system, the contingencies studied and the acceptability of involuntary load interruptions are dependent on the amount of load impacted. Typically only single-element contingencies are evaluated. The *IESO* defines a single-element as a single zone of protection. Double element contingencies are evaluated as per section 2.7.1.

2.7.3 Extreme Contingencies

NPCC criteria A-02 recognizes that the bulk power system can be subjected to extreme contingencies. Even though the probability of these situations is low, *NPCC* criteria states that analytical studies shall be conducted to determine the effect of certain extreme contingencies. In the case where an extreme contingency assessment concludes there are serious consequences, an evaluation of implementing a change to design or operating practices to address such contingencies must be conducted, and measures may be utilized where appropriate to reduce the likelihood of such contingencies or to mitigate the consequences indicated in the assessment of such contingencies.

2.7.4 Extreme System Conditions

The bulk power system can be subjected to abnormal system conditions with a low probability of occurring such as peak load conditions resulting from extreme weather conditions with applicable ratings of electrical elements or fuel shortages. An assessment to determine the impact of these conditions on expected steady-state and dynamic system performance shall be done in order to obtain an indication of system robustness or to determine the extent of a widespread adverse system response. After due assessment of extreme system conditions, measures may be utilized, where appropriate, to mitigate the consequences that are indicated as a result of testing for such system conditions.

2.8 Study Conditions

The system load and generation conditions under which the contingencies are assumed to occur are chosen on a deterministic basis to represent the reasonable worst case scenario. For loadflow and transient stability studies, the system should be studied with various pre-contingency conditions that stress the system. Various contingencies should then be evaluated to identify the most limiting contingencies and conditions. Typical sets of system conditions to evaluate in the study of the bulk power system and *local areas* are shown below. Not all conditions need to be evaluated. Studies should start with the one or two most stressful system conditions. If no deficiency is identified then no additional study is required. If a deficiency is identified, sensitivity studies should be done to further define the timing and magnitude of the deficiency. These additional conditions for long term assessments may include modifying the master base case to include approved connection approvals.

Various interface transfer levels should be considered to stress the system as required to uncover deficiencies.

<u>Sample System Conditions to Evaluate in Studies for the Bulk Power System</u>

Weather/Load	Generation	Transmission	Contingencies per Section 2.7.1
Median growth extreme weather	All in service	All in service	All
Median growth normal weather	2 units out of service	All in service	All
Median growth normal weather	All in service	1 element out of service	All
Low growth normal weather	All in service	All in service	All
Light load normal weather	Reduced *dispatch* as required	All in service	All

The purpose of the analysis is to identify the consequence of various scenarios up to two single contingencies, but not necessarily the worse possible contingencies under the worst load and ambient conditions.

<u>Sample System Conditions to Evaluate in Studies for Local Areas</u>

Weather/Load	Local Generation	Local Transmission	Contingencies per Section 2.7.2
Median growth extreme weather	Up to 2 local units out of service	All in service	All
Median growth extreme weather	All in service	Any one element out of service	All
Light load normal weather	Various scenarios	Various scenarios	All
Low growth normal weather	All in service	All in service	All

– End of Section –

3. System Conditions

The specific load and generation conditions and assumptions, applicable stability conditions, and permissible use of control actions for the area being studied are identified in the following sections.

3.1 Generation Dispatch

Generation is to be *dispatched* as required in order to stress the system so as to identify limitations of the *transmission* transfer capability.

3.2 Exports and Imports

All exports and imports should be taken into account to achieve the conditions of section 3.1. The pre-contingency level of the transfer selected should be based on the existing and projected *interconnection* capability. Combinations of maximum transactions coincident with high internal power flows should be considered in order to stress the import interface and to ensure studies evaluate the full range of power flow scenarios. In addition, the effect of bilateral *interconnection* assistance up to the tie-tine capability should be studied with all transmission *facilities* in service. Post-contingency tie flows that are different from the scheduled flows on phase-shifted ties or greater than the pre-contingency interface flow on unregulated ties may be permitted before adjustment provided they are within applicable limits (generally the 15 minute rating).

3.3 Stability Conditions

3.3.1 Contingencies

The system shall remain stable during and after the most severe of the contingencies listed in 2.7.1 and 2.7.2, with due regard to reclosing as per *NPCC* criteria A-02.

3.3.2 General Guidelines

The *NPCC* A-02 criteria do not stipulate the use of margin on transient stability limits. However, the *IESO* criteria require that all stability limits should be shown to be stable if the most critical parameter is increased by 10%. This is to account for modeling errors, metering errors and variations in *dispatch*.

The 10% increase can be simulated by generation or load changes even beyond the forecast load or generation capabilities provided it does not lead to invalid results. Negative values of local load is preferable to increasing local generation beyond its maximum capability.

3.4 Permissible Control Actions

Following the occurrence of a contingency, the following control actions may be used to respect the loading, voltage decline, and stability limits referenced in this document:

- Generation Redispatch
- Automatic tripping of generation (generation rejection)
- Trip circuits open to change flow distributions
- Trip or redispatch *dispatchable loads*
- Switch reactors and/or capacitors out (switching in of capacitors in locations that are especially sensitive to voltage changes is to be done only in such a manner as to ensure minimal impact on customers, e.g., using independent pole operation (IPO) breakers)
- Operate phase shifters

In addition to the above control actions, automatic or manual tripping of *non-dispatchable load* may be considered for certain contingencies with one or more transmission elements out-of-service. Generally, *facilities* for the automatic tripping of load will only be acceptable as a stop gap measure to increase the power transfer capability across a bulk transmission interface to cope with temporary deficiencies.

The control actions that are permissible are shown below:

Permissible Control Actions Following Contingency

System Condition Prior to Contingency	Permissible Control Actions Following Contingency
All elements in service	• Generation Redispatch • Load Redispatch • Generation Rejection • Capacitor Switching • Reactor Switching • Open circuits to change flow distributions
One or more transmission elements out of service	• Generation redispatch including transactions • Generation Rejection • Capacitor Switching • Reactor Switching • Open circuits to change flow distributions • Load Rejection

3.4.1 Special Protection System

A *special protection system* (*SPS*) is defined as a protection system designed to detect abnormal system conditions and take corrective action(s) other than the isolation of faulted elements. Such action(s) may include changes in load, generation, or system configuration to maintain system stability, acceptable voltages or power flows. The *NPCC* A-02 criteria provide for the use of a *SPS* under normal and *emergency* conditions.

A *SPS* shall be used judiciously and when employed, shall be installed consistent with good system design and operating policy. A *SPS* associated with the bulk power system may be planned to provide protection for infrequent contingencies, for temporary conditions such as project delays, for unusual combinations of system demand and outages, or to preserve system integrity in the event of severe outages or extreme contingencies. The reliance upon a *NPCC* type I *SPS* for *NPCC* A-2 design criteria contingencies with all transmission elements in service must be reserved only for transition periods while new transmission reinforcements are being brought into service. A *SPS* associated with the non-bulk portion of the power system may be planned to provide protection for a wider range of circumstances than a *SPS* associated with the bulk system.

The decision to employ a *SPS* shall take into account the complexity of the scheme and the consequences of correct or incorrect operation as well as its benefits. The requirements of *SPSs* are defined in *NPCC* criteria A-05, and in NPCC criteria A-11, "Special Protection System Criteria". With all transmission elements in service, continued reliance on a *SPS* is a trigger for considering additional transmission.

A *SPS* proposed in a *connection assessment* must have full redundancy and separation of the communication channels, and must satisfy the requirements of the *NPCC* Type I *SPS* criteria to be considered by the *IESO*.

Automatic Tripping of Generation (Generation Rejection)

Automatic tripping of generation via Generation Rejection Schemes (G/R) is an acceptable post-contingency response in limited circumstances as specified below in section 7.3, Control Action Criteria. Arming of G/R may be acceptable for selected contingencies provided the G/R corrects a *security* violation and results in an acceptable operating state.

– End of Section –

4. Pre and Post Contingency System Conditions

This section identifies the acceptable pre-and post-contingency response on the *IESO-controlled grid*. Criteria include:

- Power Transfer Capability
- Pre Contingency Voltage Limits
- Voltage Change Limits
- Transient Voltage Criteria
- Steady State Voltage Stability
- Congestion
- Line and Equipment Loading
- Short Circuit Levels

If studies indicate that any criterion in this section is not met, the *IESO* will either notify the *IESO-administered market* of a system inadequacy or inform the *connection assessment* proponent that the submitted proposal is not acceptable (i.e. that the proposal must be re-designed).

4.1 Power Transfer Capability

To evaluate the impact of a *connection assessment* on power flow across an interface, it is important to consider:

- The impact on the power flow caused by the introduction of a new limiting contingency (new elements introduce new contingencies); and
- The impact on power flow distribution over the interface (transfer capability) caused by the introduction of new *facilities* which change power flow distribution.

New or modified connections to the *IESO-controlled grid,* for example a new generator, may increase congestion on transmission *facilities* but will not be permitted to lower power transfer capability or operating *security limits* by 5% or more. This will be assessed on a case by case basis. The following are examples of changes that could affect the transfer capability or operating *security* limits:

- an increase in load or generation greater than or equal to 20 MVA;
- where the connectivity of the transmission system is changed and a new contingency is created;

- where the electrical characteristics of generation facilities are changed by greater than or equal to 5%, or exceed accepted design standards and tolerances, or are not in conformance with Appendix 4.2 of the Market Rules;
- where the electrical characteristics of a transmission facility change by greater than or equal to 10%;
- where the transfer capability is reduced by more than 5%; or
- where a new or modified SPS is proposed

4.2 Pre-Contingency Voltage Limits

Under pre-contingency conditions with all *facilities* in service, or with a critical element(s) out of service after permissible control actions and with loads modeled as constant MVA, the *IESO-controlled grid* is to be capable of achieving acceptable system voltages. The table below indicates the maximum and minimum voltages generally applicable. These values are obtained from Chapter 4 of the "Market Rules", and CSA standards for distribution voltages below 50 kV.

Nominal Bus Voltages

Nominal Bus Voltage (kV)	**500**	**230**	**115**	**Transformer Stations, e.g. 44, 27.6, 13.8 kV**
Maximum Continuous (kV)	550	250	127*	106%
Minimum Continuous (kV)	490	220	113	98%

* Certain buses can be assigned specific maximum and minimum voltages as required for operations. In northern Ontario, the maximum continuous voltage for the 115kV system can be as high as 132kV.

- Transmission equipment must be able to interrupt fault current for voltages up to the *maximum continuous rating*.
- Transmission equipment must remain in service, and not automatically trip, for voltages up to 5% above the maximum continuous rating, for up to 30 minutes, to allow the system to be re-*dispatched* to return voltages within their normal range.

Transformer stations must have adequate under-load tap-changer or other voltage regulating *facilities* to operate continuously within normal variations on the *transmission system* and to operate in *emergencies* in accordance with transmission voltage ranges as listed in the table in section 4.3.

In general, system pre-contingency voltages used in planning studies should approximate existing system voltage profiles under similar load and generation conditions.

Voltages below 50kV shall be maintained in accordance with CSA 235 by the *transmitter* and/or *distributor*.

4.3 Voltage Change Limits

With all planned *facilities* in service pre-contingency, system voltage changes in the period immediately following a contingency are to be limited as follows:

Nominal Bus Voltage (kV)	**500**	**230**	**115**	**Transformer Station Voltages**		
				44	**27.6**	**13.8**
% voltage change **before** tap changer action	10%	10%	10%	10%	10%	10%
% voltage change **after** tap changer action	10%	10%	10%	5%	5%	5%
AND within the range						
Maximum* (kV)	550	250	127	112% of nominal		
Minimum* (kV)	470	207	108	88% of nominal		

*The maximum and minimum voltage ranges are applicable following a contingency. After the system is redispatched and generation and power flows are adjusted the system must return to within the maximum and minimum continuous voltages identified in section 4.2.

Before tap-changer action (immediate post-contingency period) a constant MVA load model can be used. If the voltage change exceeds the limits identified above, a voltage dependent load model should be used (e.g. $P \alpha V^{1.5}$, and $Q \alpha V^2$). After tap-charger action a constant power load model should be assumed (e.g. the load will return to its pre-contingency level). In areas of the system where it is known that post-contingency voltages will remain depressed after tap-changer and other automatic corrective actions, or in situations where special control actions are proposed (e.g., blocking of under-load tap-changers), the use of variable loads in the longer term post-contingency period may be acceptable.

In cases where voltage rises are a possibility (e.g., islanded generators), transient stability tests should be carried out as a check to ensure that realistic reactive additions are appropriate and that customer equipment will not be exposed to excessive voltages after the transient post-contingency period. The occurrence of a voltage rise for loss of a system element is rare but voltage rises after reclosure operations, especially where capacitor or reactor switching are involved, are relatively common and should be checked. Voltage rises should not result in bus voltages higher than the maximum values indicated in the above table. Not only is equipment damage a concern at such high voltages but, in addition, it may not be safe to carry out breaker switching operations to reduce the voltages to acceptable levels. Capacitor breakers at locations where excessive voltages are possible should be designed for appropriately higher operating voltages.

4.3.1 Reactive Element Switching Change

Reactive devices should be sized to ensure that voltage declines or rises at *delivery point* buses on switching operations will not to exceed 4% of steady state rms voltage before tap changer action using a voltage dependent load model (e.g. $P \alpha V^{1.5}$, and $Q \alpha V^2$).

4.3.2 Capacitive Element Switching Change

Capacitive devices include HV capacitors, LV capacitors, SVCs, series capacitors, and synchronous condensers.

Capacitive devices should be sized to ensure that voltage declines or rises at ***delivery point*** buses on switching operations will not exceed 4% of steady state rms voltage for line switching operations per Chapter 4 of the "Market Rules". This 4% is based on load flows before tap changer action using a voltage dependent load model (e.g. $P \alpha V^{1.5}$, and $Q \alpha V^2$).

4.4 Transient Voltage Criteria

In cases where protection or control coordination may be an issue, or where significant induction motor load is present, time domain simulations should be conducted to assess the dynamic voltage performance. These simulations should cover a time frame in which ULTCs operate (<30 seconds) and should include modeling of devices which affect voltage stability (such as induction motors, ULTCs, switched shunts, generator field current limiters, etc). Per section 3.3.1, due regard should be given to reclosure operations in the simulation.

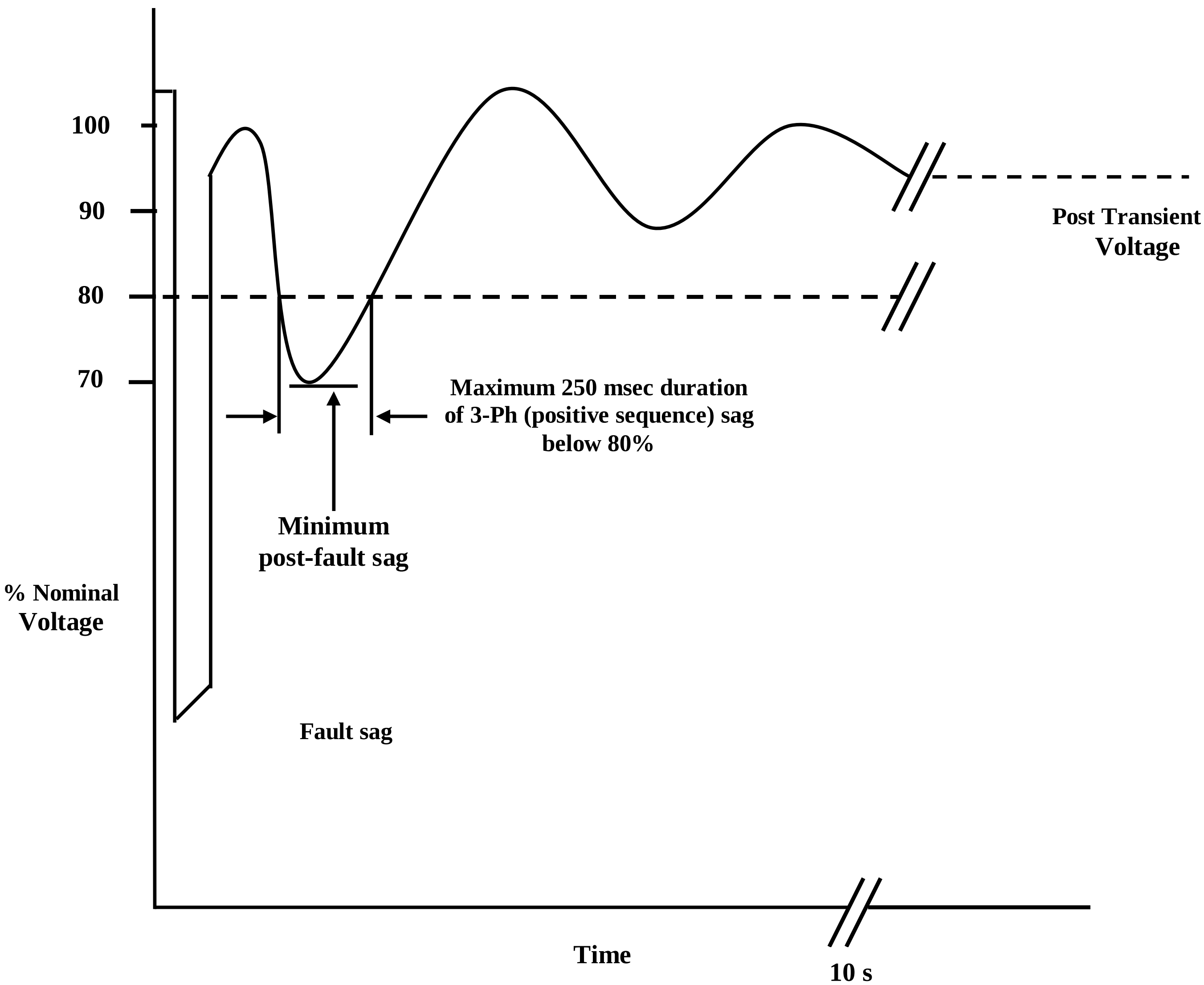
For transient voltage performance, studies should be done with a load model representative of the actual load. If that information is not available, the standard voltage dependent load model of P=50, 50, Q=0, 100 is to be used (see section 2.4 Load Forecasts and Load Modelling).

This criterion is not intended to be used as a standard of utility supply to individual customers, nor used for transmission and distribution protection design. Rather it is intended to avoid uncontrolled, significant load interruption that may lead to unintended *transmission system* performance. The starting voltage, sag and duration of post-fault transient undervoltages are a measure of the system strength, and its ability to recover promptly.

The following transient voltage criteria are to be used to evaluate system performance. The *IESO* will conduct periodic review of the IEEE standards and relevant literature to monitor the need to revise this section.

The minimum post-fault positive sequence voltage sag must remain above 70% of nominal voltage and must not remain below 80% of nominal voltage for more than 250 milliseconds within 10 seconds following a fault. Specific locations or grandfathered agreements may stipulate minimum post-fault positive sequence voltage sag criteria higher than 80%. IEEE standard 1346-1998 supports these limits.

Transient Voltage Sag Criteria



Mitigation options include high-speed fault clearing, *special protection systems*, field forcing, transmission reinforcements and transmission interface transfer limits.

While the determination of whether a transient stability test is stable or unstable is generally straightforward, issues such as transient load shakeoff, high voltage tripping of capacitors, and undamped oscillatory behaviour in the post-transient period should be considered using the following guidelines:

- occasional tests should be run out to about thirty seconds - first swing stability does not guarantee transient stability;
- high voltage swings will generally be considered acceptable unless the magnitude or duration of the high voltage swing could be sufficient to cause capacitor tripping. Typical maximum voltage and duration of swing to avoid damage to and tripping of high voltage capacitors are identified

below. The magnitude of the high voltage swing must be less than the capacitor breaker rating multiplied by the factor in the following table for the duration indicated.

Duration	Maximum Permissible Voltage (Multiplying Factor To Be Applied to Rated RMS Voltage)
½ cycle	3.00
1 cycle	2.70
6 cycles	2.20
15 cycles	2.00
1 second	1.70
15 seconds	1.40

4.5 Steady State Voltage Stability

Adequate voltage performance under 4.4 above does not guarantee system voltage stability. Steady state stability is the ability of the *IESO-controlled grid* to remain in synchronism during relatively slow or normal load or generation changes and to damp out oscillations caused by such changes.

The following checks are carried out to ensure system voltage stability for both the pre-contingency period and the steady state post-contingency period:

- Properly converged pre- and post-contingency powerflows are to be obtained with the critical parameter increased up to 10% with typical generation as applicable;
- All of the properly converged cases obtained must represent stable operating points. This is to be determined for each case by carrying out P-V analysis at all critical buses to verify that for each bus the operating point demonstrates acceptable margin on the power transfer as shown in the following section; and
- The damping factor must be acceptable (the real part of the eigenvalues of the reduced Jacobian matrix are positive).

The following sections provide more information on damping factor, use of P-V curves to identify stability limits, and dynamic voltage performance simulations.

4.5.1 Power – Voltage (P-V) Curves

To generate the P-V curve, loads should be modeled as constant MVA. In specific situations, if good data is available, voltage dependent loads and tap-changer action may be modeled in detail to assess the system voltage performance following the contingency and automatic equipment actions but before manual operator intervention.

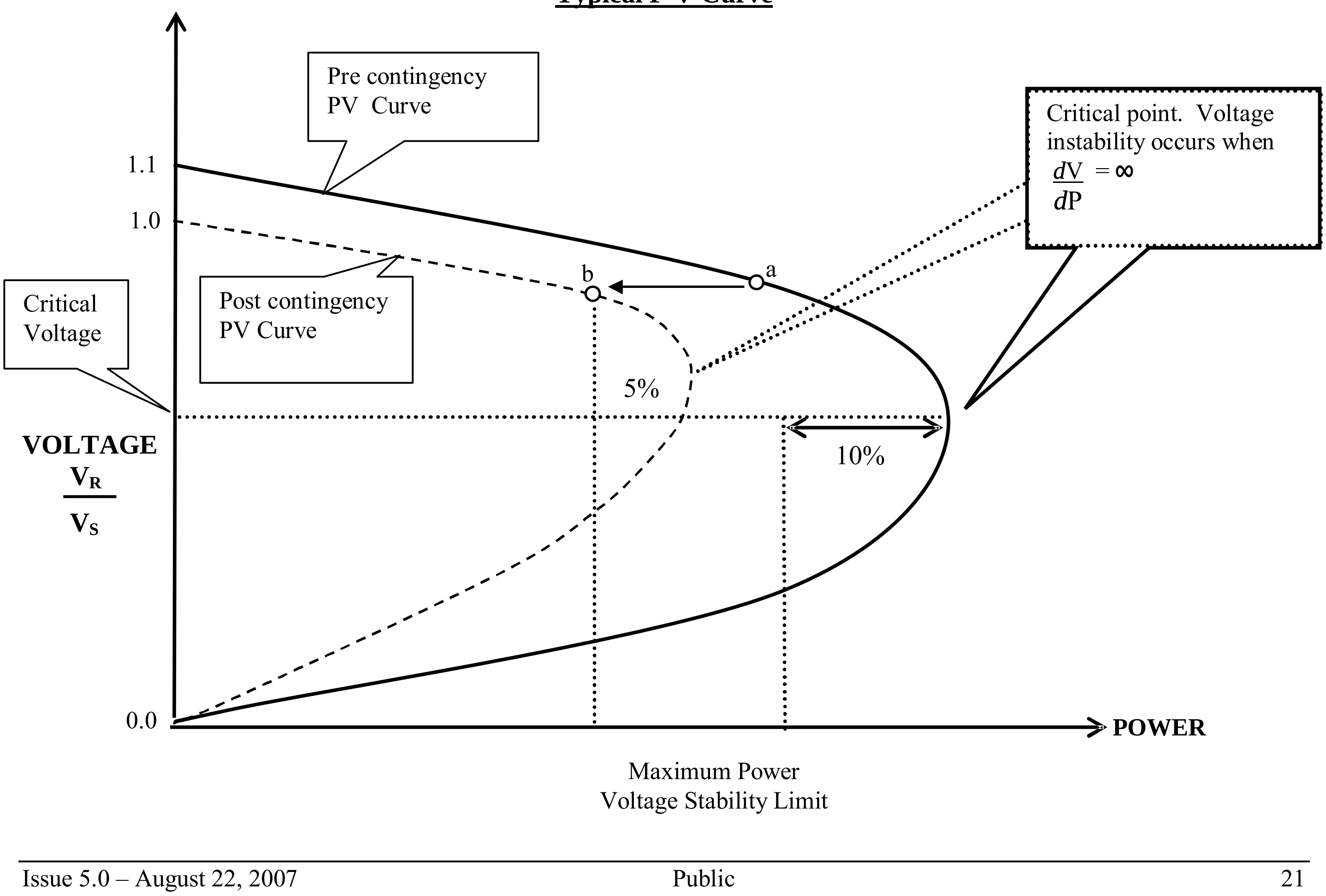
Power flow programs can be used to generate a P-V curve. In certain situations it may be desirable to manually generate a P-V curve to take into account specific remedies available.

A sample P-V curve is shown below. The critical point of the curve, or voltage instability point, is the point where the slope of the P-V curve is vertical. As illustrated, the maximum acceptable pre-contingency power transfer must be the lesser of:

- a pre-contingency power transfer (point a) that is 10% lower than the voltage instability point of the pre-contingency P-V curve, and
- a pre-contingency transfer that results in a post-contingency power flow (point b) that is 5% lower than the voltage instability point of the post-contingency curve

The P-V curve is dependent on the power factor. Care must be taken that the worst case P-V curve is used to identify the stability limit.

Typical P-V Curve



4.5.2 Damping Factor

The damping factor provides a measure of the steady-state stability margin of a power system. The damping factor can be derived from an eigenvalue state-space model of the power system. The damping factor (x) is:

$$\xi = \frac{-\delta}{\sqrt{\delta^2 + \omega^2}}$$

where δ and ω are the real and imaginary parts of the critical eigenvalue. If δ is negative, the oscillations will decay. Where the eigenvalues are not available δ and ω may be measured from time domain simulations by assuming that the oscillations are exponentially damped sinusoids in a second order system.

The damping factor determines the rate of decay of the amplitude of the oscillation. The following table provides pre and post contingency damping factor requirements.

Acceptable Damping Factors

System Condition	Damping Factor
Pre-Contingency	> 0.03
Post-contingency[1]	> 0.00
Post-Contingency[2]	> 0.01
Following Repreparation of the system[3]	> 0.03

1. Before automatic intervention
2. Following automatic intervention. Studies should assume **NO** manual intervention
3. Following all permissible control actions identified in section 3.4

For critical cases, there should be evidence of strong damping of system oscillations within about 10 seconds, otherwise, simulations should be run out to about 20 seconds and all modes of oscillations should show adequate damping behaviour. For swings characterized by a single dominant mode of oscillation, the damping can be calculated directly from the oscillation envelope; a 15% decrement between cycles is required to meet the damping factor criteria.

4.6 Congestion

Congestion is the condition under which the trades that *market participants* wish to implement exceed the capability of the *IESO-controlled grid*. It usually requires the system operator to adjust the output of generators, decreasing it in one area to relieve the constraint and to increase it in another to continue to meet customer *demand*.

For long term *adequacy* assessments, congestion should be flagged where observed. Congestion is flagged as the amount of time that interface flows exceed 100% of their limit where the limit has been increased by the use of applicable *SPSs*. Locational pricing data, where available, may be used to assess historical congestion costs.

4.7 Line and Equipment Loading

4.7.1 General Guidelines

All line and equipment loading limits, the limited time associated emergency ratings and the ambient conditions assumed in determining the ratings are defined by the equipment owner. Long-term emergency ratings are generally a 10-day limited time rating for transformers, and a continuous or 50 hour /year rating for transmission circuits. Short-term emergency ratings are generally 15-minute or 30-minute limited time ratings for transformers and transmission circuits. For each assessment, the applicable ratings will be confirmed with the equipment owner.

4.7.2 Loading Criteria

All line and equipment loads shall be within their continuous ratings with all elements in service and within their long-term emergency ratings with any one element out of service. Immediately following contingencies, lines may be loaded up to their short-term emergency ratings where control actions such as re-dispatch, switching, etc. are available to reduce the loading to the long-term emergency ratings.

It is assumed that for the bulk power system, loading conditions and control actions are available to reduce the loading to the long-term emergency rating or less within 15 minutes.

Circuit breakers, current transformers, disconnect switches, buses and all other system elements must not be restrictive.

The ratings of tie lines are governed by agreements between the *facility* owners. The criteria to direct operation of the lines are governed by agreements between the system or market operators.

4.8 Short Circuit Levels

Short circuit studies are to be carried out with all existing *generation facilities* in service and with all *connection assessments* that have been approved, including those that did not require a formal *connection assessment* study. System voltages are to be assumed to be at the maximum acceptable system voltage identified in Section 4.2. The latest information from neighbouring systems that may have an impact on short circuit studies (including *NPCC* SS-38 and *NERC* MMWG representation) is to be used to define relevant *interconnection* assumptions. Short circuit levels must be within the maximum short circuit levels and duration specified in the Ontario Energy Board's (OEB's) "Transmission System Code".

No margin is used when comparing the short circuit value to *facility* ratings.

The *IESO* will accept make before break switching operations that temporarily increase fault levels beyond breaker interrupting capability as long as affected equipment owners are willing to accept the risk and its consequences.

4.9 Station Layout

Guidance on transformer and switching station layout is provided in Appendix B. The guidelines provide an acceptable way towards meeting the contingency criteria of section 2.7. However, other configurations and station layouts that meet those criteria are also acceptable.

– End of Section –

5. Transmission Connection Criteria

The term “transmission connection” is applied to any *facility* that establishes or modifies a connection to the *IESO-controlled grid* such that a *connection assessment* is required.

5.1 New or Modified Facilities

New or modified *facilities* must satisfy all *NERC* standards, Regional *Reliability* Council Criteria, and the requirements of the OEB's "Transmission System Code", the "Market Rules" and associated standards, policies, and procedures.

New or modified *facilities* must not materially reduce the level of *reliability* of existing *facilities*. Specifically:

- *facilities* within a common zone of protection, such as line taps or bus sections, must be built to meet or exceed the affected *transmitter's* standards prevailing at the time of construction;
- the *security* and dependability of protection equipment that forms a common zone of protection, or of protections that are required to operate in a coordinated fashion, must be of a standard of *reliability* that is equal to or higher than the *reliability standards* specified in the OEB's "Transmission System Code" prevailing at the relevant time;
- *facilities*, such as line taps, that significantly increase the line length and thereby its exposure to faults, may be required to use circuit breakers and separate zones of protection to limit the additional exposure to existing connections; and
- new or modified connections must not materially reduce the existing transfer capability of the *IESO-controlled grid*, and must not impose additional restrictions on the deployment of existing *connection facilities*.

5.2 Effect on Existing Facilities

New or modified connections must not materially reduce the load-meeting capability of existing *facilities*.

New or modified connections must not restrict the capability of existing *generation facilities* or loads to deliver to or receive power from the *IESO-controlled grid*.

Where there would be insufficient transmission capability to deliver the maximum registered capacity to the *IESO-controlled grid* while recognizing applicable contingency criteria:

- the proposal must be re-designed, e.g. the maximum registered capacity must be reduced to a level that can be delivered;
- the transmission *facilities* must be refurbished or replaced; or
- *special protection systems (SPS),* in limited circumstances, may be utilized to mitigate the effects of contingencies on the transmission *facilities*.

– End of Section –

6. Generation Connection Criteria

Transmission to incorporate new generation is defined as those new circuits that connect the generator to the *IESO-controlled grid*, plus any reinforcements to the *IESO-controlled grid* required as a direct and sole result of the new generation. With the new generation at its maximum output, all load levels should be considered.

6.1 Voltage Change

The loss of a generating *facility* due to a single-element contingency involving any element upstream of the generator bus (e.g. line or step-up transformer) should respect the voltage change criteria in section 4.3.

6.2 Wind Power

- For the purposes of *transmission system adequacy* and *connection assessments*, wind powered generators are to be treated as *non-dispatchable* (intermittent) units which are operating up to their maximum output.

- For *connection assessments*, transmission line ratings will be calculated using 15km/h winds, instead of the typical 4km/h, within the vicinity of the wind farm and, with the approval of the *transmission* asset owner, out to a 50 km radius.

Guidance on technical requirements related to wind turbine performance and wind farm station layout is provided in Appendix C. The guidelines provide a design that satisfies the contingency criteria of section 2.7. However, other configurations and station layouts that meet those criteria are also acceptable.

As the *IESO* gains more experience with the operating characteristics of wind powered generators, the above criteria may be revised.

6.3 Synchronous Generation

Transmission *facilities* for incorporating new generation must meet the requirements of section 5. Guidance on technical requirements related to synchronous generator performance, station layout, and connection to the *IESO-controlled grid* is provided in Appendix D. The guidelines provide a design that satisfies the contingency criteria of section 2.7. However, other configurations and station layouts that meet those criteria are also acceptable.

6.4 Station Layout

Guidance on transformer and switching station layout is provided in Appendix B. The guidelines provide an acceptable way towards meeting the contingency criteria of section 2.7. However, other configurations and station layouts that meet those criteria are also acceptable.

– End of Section –

7. Load Security and Restoration Criteria

The long-term *transmission system* planning criteria below establish default levels of load *security* and load restoration. The application of a lower level of load *security* may be acceptable in the non bulk portions of the *IESO-controlled grid* provided the bulk power system adheres to *NERC* and *NPCC* standards. Different criteria may be used for the facilities beyond the load side of the *connection point* to the *transmission system* (notionally the defined point of sale).

7.1 Load Security Criteria

The *transmission system* must be planned to satisfy *demand* levels up to the extreme weather, median-economic forecast for an extended period with any one transmission element out of service. The *transmission system* must exhibit acceptable performance, as described below, following the design criteria contingencies defined in sections 2.7.1 and 2.7.2. For the purposes of this section, an element is comprised of a single zone of protection.

With all transmission *facilities* in service, equipment loading must be within continuous ratings, voltages must be within normal ranges and transfers must be within applicable normal condition stability limits. This must be satisfied coincident with an outage to the largest local generation unit.

With any one element out of service[3], equipment loading must be within applicable long-term *emergency* ratings, voltages must be within applicable *emergency* ranges, and transfers must be within applicable normal condition stability limits. Planned load *curtailment* or load rejection, excluding voluntary *demand* management, is permissible only to account for local generation outages. Not more than 150MW of load may be interrupted by configuration and by planned load *curtailment* or load rejection, excluding voluntary *demand* management. The 150MW load interruption limit reflects past planning practices in Ontario.

With any two elements out of service[4], voltages must be within applicable *emergency* ranges, equipment loading must be within applicable short-term *emergency* ratings and transfers must be within applicable *emergency* condition stability limits. Equipment loading must be reduced to the applicable long-term *emergency* ratings in the time afforded by the short-time ratings. Planned load *curtailment* or load rejection exceeding 150MW is permissible only to account for local generation outages. Not more than 600MW of load may be interrupted by configuration and by planned load *curtailment* or load rejection, excluding voluntary *demand* management. The 600MW load interruption limit reflects the established practice of incorporating up to three typical modern day distribution stations on a double-circuit line in Ontario.

[3] For example, after a single-element contingency with all transmission elements in service pre-contingency.
[4] For example, after a double-element contingency will all transmission elements in service pre-contingency or after a single-element contingency with one transmission element out of service pre-contingency.

7.2 Load Restoration Criteria

The *IESO* has established load restoration criteria for high voltage supply to a *transmission customer*. The load restoration criteria below are established so that satisfying the restoration times below will lead to an acceptable set of *facilities* consistent with the amount of load affected.

The *transmission system* must be planned such that, following design criteria contingencies on the *transmission system*, affected loads can be restored within the restoration times listed below:

a. All load must be restored within approximately 8 hours.

b. When the amount of load interrupted is greater than 150MW, the amount of load in excess of 150MW must be restored within approximately 4 hours.

c. When the amount of load interrupted is greater than 250MW, the amount of load in excess of 250MW must be restored within 30 minutes.

These approximate restoration times are intended for locations that are near staffed centres. In more remote locations, restoration times should be commensurate with travel times and accessibility.

7.3 Control Action Criteria

The deployment of control actions and *special protection systems* must not result in material adverse effects on the bulk system.

The *transmission system* may be planned such that control actions such as generation re-dispatch, reactor and capacitor switching, adjustments to phase-shifter and HVdc pole flow, and changes to inter-Area transactions may be judiciously employed following contingencies to restore the power system to a secure state.

The reliance upon a *special protection system* must be reserved only for exceptional circumstances, such as to provide protection for infrequent contingencies, temporary conditions such as project delays, unusual combinations of system *demand* and *outages*, or to preserve system integrity in the event of severe *outages* or extreme contingencies.

Transmission expansion plans for areas that may have a material adverse effect on the interconnected bulk power system must not rely on *NPCC* Type I *special protection systems* with all planned transmission *facilities* in service.

7.4 Application of Restoration Criteria

Where a need is identified, for example via the *IESO's* outlooks or via the OPA's IPSP, *market participants* and the applicable *transmitter* will be notified of the need for a deliverability study.

Transmission customers and *transmitters* can consider each case separately taking into account the probability of the contingency, frequency of occurrence, length of repair time, the extent of hardship caused and cost. The *transmission customer* and *transmitter* may agree on higher or lower levels of *reliability* for technical, economic, safety and environmental reasons provided the bulk power system adheres to *NERC* and *NPCC* standards.

7.5 Exemptions to the Restoration Criteria

Where the *transmission customer(s)* and *transmitter(s)* agree that satisfying the security and restoration criteria on *facilities* not designated as part of the bulk system is not cost justified, they may jointly apply for an *exemption* to the *IESO*. In applying for this *exemption*, *transmission customer(s)* and *transmitter(s)* will identify the conditions (generally the timing and load level) under which they plan to satisfy the criteria. *IESO* will assess these on a case-by-case basis and grant the *exemption*, allowing a lower level of *reliability*, unless there is a material adverse effect on the *reliability* of the bulk power system.

End of Section

8. Resource Adequacy Assessment Criterion

8.1 Statement of Resource Adequacy Criterion

To assess the *adequacy* of resources in Ontario, the *IESO* uses the *NPCC* resource adequacy design criterion from *NPCC* A-02:

> "Each Area's probability (or risk) of *disconnecting* any firm load due to resource deficiencies shall be, on average, not more than once in ten years. Compliance with this criterion shall be evaluated probabilistically, such that the loss of load expectation [LOLE] of *disconnecting* firm load due to resource deficiencies shall be, on average, no more than 0.1 day per year. This evaluation shall make due allowance for *demand* uncertainty, scheduled *outages* and deratings, *forced outages* and deratings, assistance over *interconnections* with neighboring Areas and Regions, *transmission transfer capabilities*, and capacity and/or load relief from available operating procedures."

8.2 Application of the Resource Adequacy Criterion

The *IESO* uses the General Electric Multi-Area Simulation (MARS) computer program to determine the reserve margin required to meet the *NPCC* resource adequacy criterion. A detailed load, generation, and transmission representation for 10 zones in Ontario is modeled in MARS. Simple representations are used for the five external *control areas*[2] to which Ontario *connects*.

The reserve margin is expressed as a percent of *demand* at the time of the annual peak where the LOLE is at or just below 0.1 days per year. A reserve margin calculated on this basis represents the minimum acceptable reserve level needed to meet the *NPCC* resource adequacy criterion. At least once per year, *IESO* will calculate the required reserve margin at the time of annual peak for the next five years and will *publish* this value.

For operational planning purposes, just meeting the *NPCC* criterion is considered sufficient since frequent forecast updates combined with significant *outage* flexibility, external economic supply potential and the availability of *emergency* operating procedures have historically provided sufficient "insurance" against residual supply risk.

For capacity planning purposes, where longer term decisions must be made, additional reserves to cover residual uncertainties and project delays may be appropriate. Also, the *IESO* does not consider *emergency* operating procedures for longer term capacity planning because the relief provided by these measures is intended for dealing with *emergencies* rather than being used as a surrogate resource. Regular triggering of *emergency* operating procedures rather than developing appropriate resources could lead to the erosion of these options through overuse. The extent to which all uncertainty is covered becomes an economic decision which should be guided by the *NPCC* criterion.

8.3 Resource Assumptions

The Ontario system has a resource mix comprised of a variety of fuel types. Assumptions about resource availability vary by fuel type. Generally, resource availability forecasts are based on median assumptions. A complete description of the resource assumptions used in the *IESO's adequacy* assessments can be found in the methodology document entitled, "Methodology to Perform Long Term Assessments". This document is *published* quarterly with the release of the 18-Month Outlook Resource Adequacy Assessments.

End of Section

Appendix A: IESO/NPCC/NERC Reliability Rule cross-reference

IESO/NPCC/NERC Reliability Rule Cross-Reference

Section	Ontario Criteria	NPCC Criteria	NERC Standard
Resource *Adequacy*	Available *Capacity Reserve* Margin Requirement	A-2	TPL-005, 006; MOD-016 to MOD-021, 024, 025
Transmission Capability Planning **Bulk Power System**	Thermal Assessment	A-2	TPL-003; FAC-001, 002
	Voltage Assessment	A-2	
	Stability Assessment	A-2	
	Extreme Contingency Assessment	A-2	TPL-004
Transmission Capability Planning **Non Bulk *Local Areas***	Thermal Assessment		TPL-003; FAC-001, 002
	Voltage Assessment		
	Stability Assessment		
	Supply Deliverability Level		TPL-004

– End of Section –

Appendix B: Guidelines for Station Layout

This Appendix provides a guide to desirable configurations. Variations from this guide are permissible provided that such variations comply with the criteria of sections 2.7 and 4.

The specification of station layout requires consideration of the number of breakers required to trip all infeeds to a fault. Increasing the number of breakers to clear a fault results in the relaying systems becoming more complex and increases the chance of failure to clear all infeeds to the fault.

It is not practical to calculate mathematically the optimum balance of complexity, *reliability* and cost in specifying station layout. Therefore, a review of existing practices has been made and compiled as a guide to show the maximum complexity that should normally be permitted in design of station layout or switching connections for transformers or circuits.

In general, the specification of station layout and the number of breakers needed to trip to clear faults should take into account the following:

- probability of failure
- *reliability* studies of the layout
- effect on the *IESO-controlled grid*
- nature and size of the load affected
- typical duration of a failure
- operating efficiency

B.1 OEB's Transmission System Code

Any new connection or modification of an existing station layout must meet the requirements of the "Market Rules" and the OEB's "Transmission System Code".

The OEB's "Transmission System Code" specifies that all customers must provide an isolating *disconnect* switch or device at the point or junction between the *transmitter* and the customer. This device is to physically and visually open the main current-carrying path and isolate the Customer's *facility* from the *transmission system*. Details are provided in Schedule F of the OEB's "Transmission System Code".

Schedule G of the OEB's "Transmission System Code" specifies that a high-voltage interrupting device (HVI) shall provide a point of isolation for the generator's station from the *transmission system*. The HVI shall be a circuit breaker unless the *transmitter* authorizes another device.

B.2 Analysis of System Connections

The key factors that must be considered when evaluating a switching or transformer station include:

- *Security* and quality of supply
  Relevant criteria are presented in section 4.
- Extendibility
  The design should allow for forecast need for future extensions if practical.
- Maintainability
  The design must take into account the practicalities of maintaining the substation and associated circuits. It should allow for elements to be taken out of service for maintenance without negatively impacting *security* and quality of supply.
- Operational Flexibility
  The physical layout of individual circuits and groups of circuits must permit the required operation of the *IESO-controlled grid*.
- Protection Arrangements
  The design must allow for adequate protection of each system element
- Short Circuit Limitations
  In order to limit short circuit currents to acceptable levels, bus arrangements with sectioning *facilities* may be required to allow the system to be split or re-connected through a fault current limiting reactor.

The contingencies evaluated in assessing proposed station layout *adequacy* will be those outlined in section 2.7. The *IESO* will analyze the effect of various contingencies on the *adequacy* and *security* of the *IESO-controlled grid*. The *IESO* will also ensure that the proposed configuration allows for routine maintenance *outages* with minimal exposure to load interruption from subsequent contingencies. For example, for *facilities* classed as bulk power system, the *IESO* will examine the following contingencies for the proposed station layout:

- Fault on any element with delayed clearing because of a stuck breaker
- Maintenance *outage* on a breaker or bus followed by a single-element contingency

The resulting *IESO-controlled grid* performance must meet the criteria in section 4. As the *IESO-controlled grid* develops, the criteria under which a particular station layout is assessed may change (e.g. a *local area* station may become a bulk power system station).

The *IESO* will then evaluate the amount of load interrupted by single-element contingencies (or double circuit contingencies depending on the load level) with the proposed station layout". For example a *local area* switching station layout would be reviewed to ensure that a single-element or double circuit contingency would not result in an interruption that exceeds the criteria in section 7.1.

Evaluations of modifications to existing *facilities* will take into account the lower level of flexibility and layouts will be evaluated on the extent they meet the assessment criteria.

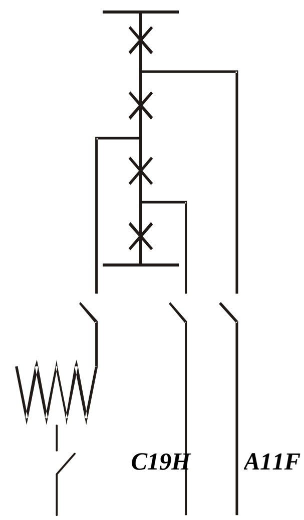
B.3 General Requirement's For Station Layouts

This section identifies general requirements for all station layouts based on *good utility practice* and operational efficiency. Acceptable system performance will dictate the acceptability of any proposed layout. This section provides the electrical single line diagram and does not reflect physical layouts. See section B.4 for information on physical layout.

B.3.1 "Breaker-And-A-Third" Layouts

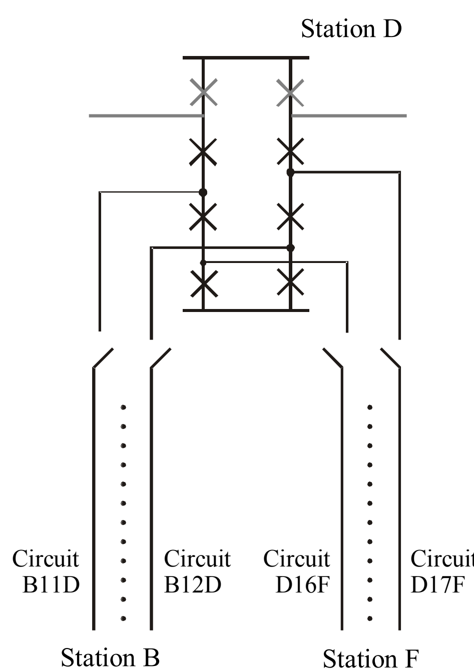
In "breaker-and-a-third" layouts the ideal location for autotransformers and generators is in the middle of the diameter as shown.

It is desirable to have one element (one autotransformer or one line) per position.



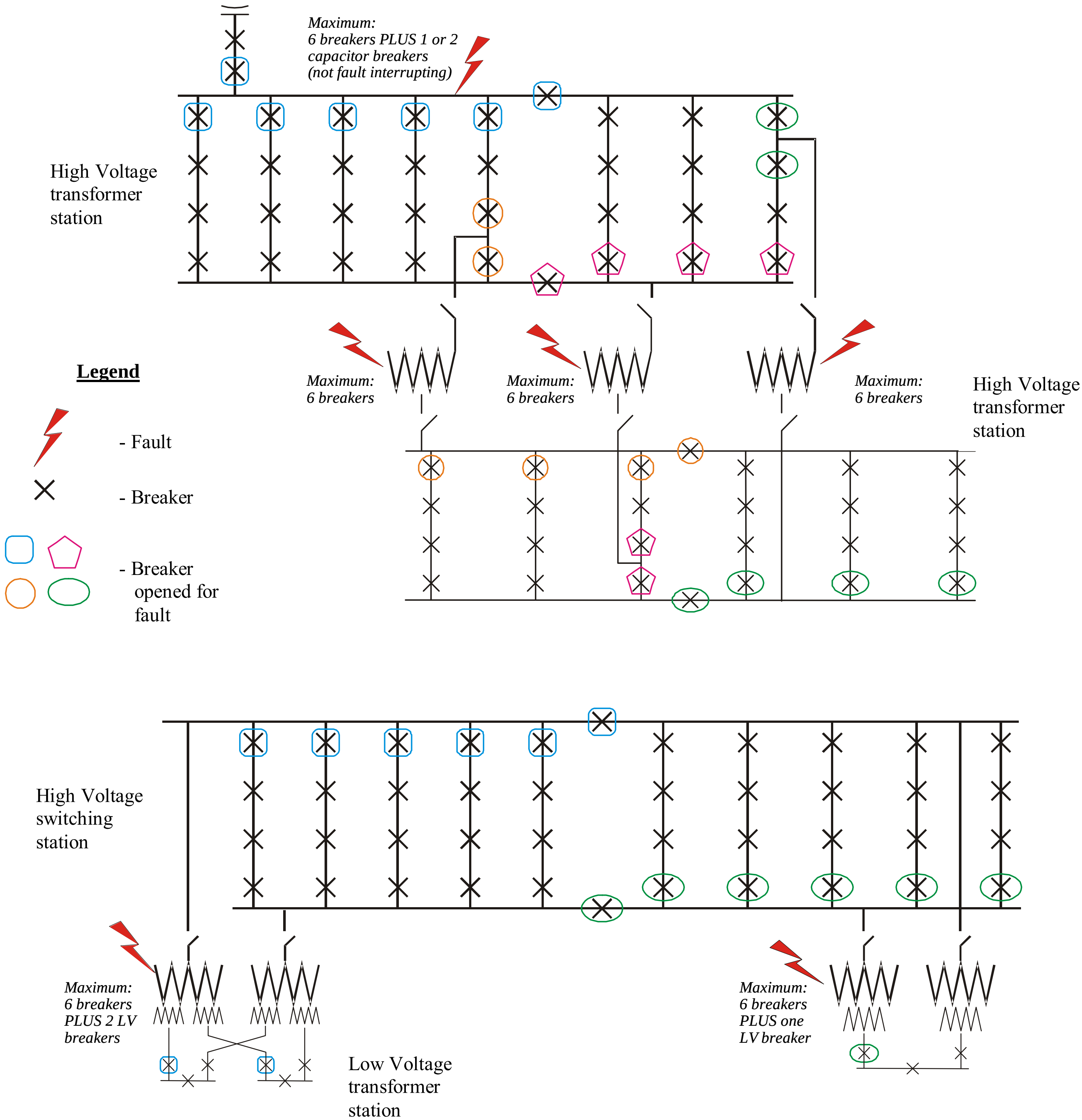
B.3.2 Bus Balance

The ideal arrangement for a double circuit line is to terminate each circuit on different diameters positioned so that there is maximum flexibility and *security* for a variety of fault and operating scenarios.

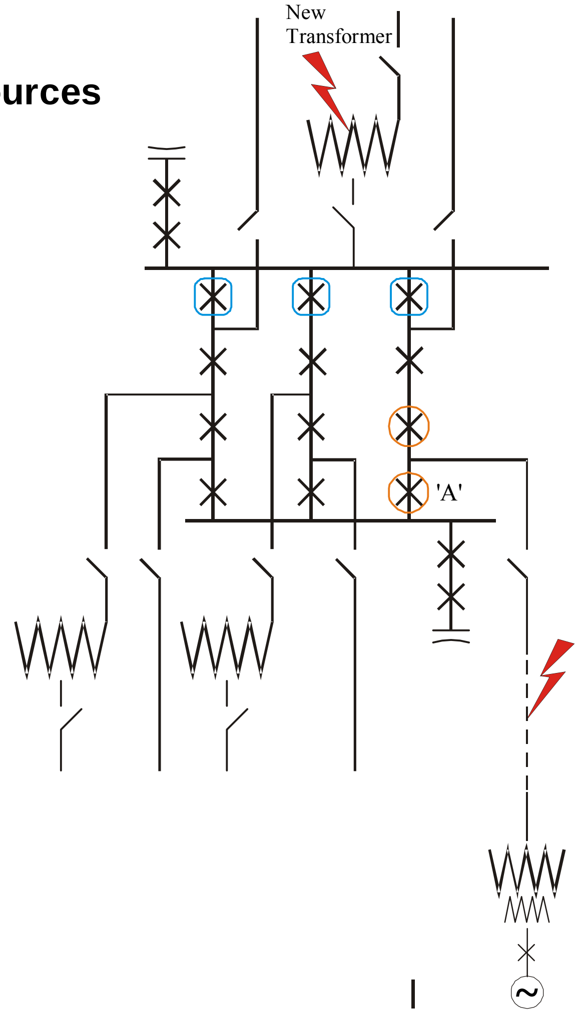


B.3.3 Maximum Breakers

Station layout should be such that a maximum of 6 High Voltage (500kV, 230kV and 115kV) and up to 2 capacitor or 2 Low Voltage breakers are needed to trip following any fault (operation of the capacitor breaker does not involve interruption of fault current). The following layouts illustrate these rules.



B.3.4 Separation of Reactive Power Sources



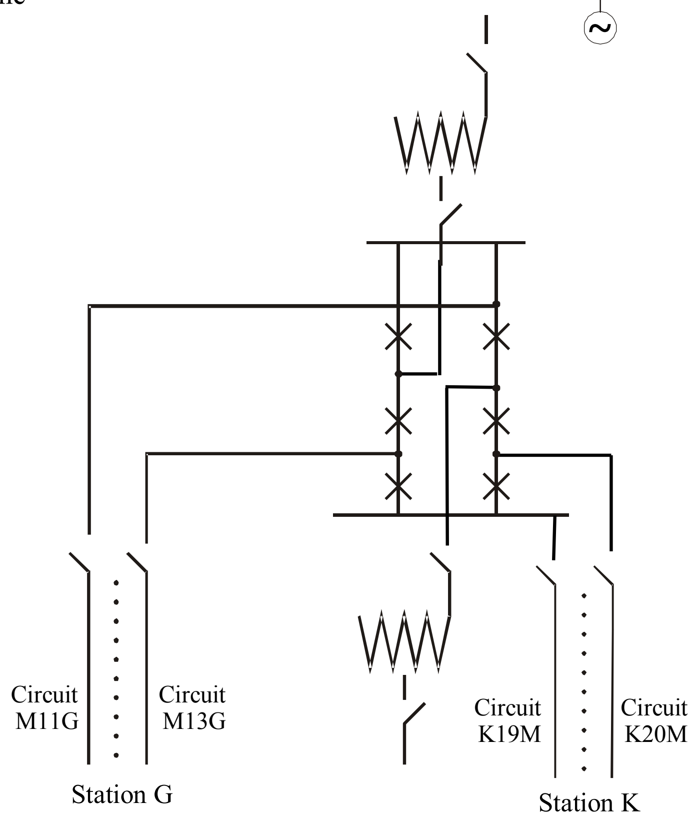
The goal of a good station layout is to minimize the effect of a contingency. Thus a contingency should result in the fewest possible number of elements removed from service.

In this vein, only one supply element should be connected directly to a bus. The intent is that a single contingency not result in the loss of two VAR sources.

For example, when terminating a new autotransformer, generator, circuit, or capacitor bank onto a bus, a single element contingency should not result in the loss of the autotransformer or line and the simultaneous loss of the capacitor bank or generator. (It would be acceptable to connect a step-down transformer and capacitor bank to the same bus.)

Per B.3.1, the ideal location of a generator is in the centre of a diameter (where the autotransformers are connected on the layout shown). The generator termination at the location shown is not ideal. A single-element contingency with breaker failure would result in the simultaneous loss of the generator and capacitor bank. To determine the acceptability of the layout shown it would be necessary to conduct a transmission assessment to class the *facility* as either bulk power system or local and then to evaluate the performance of the *IESO-controlled grid* for the appropriate contingencies.

B.3.5 Ring Bus

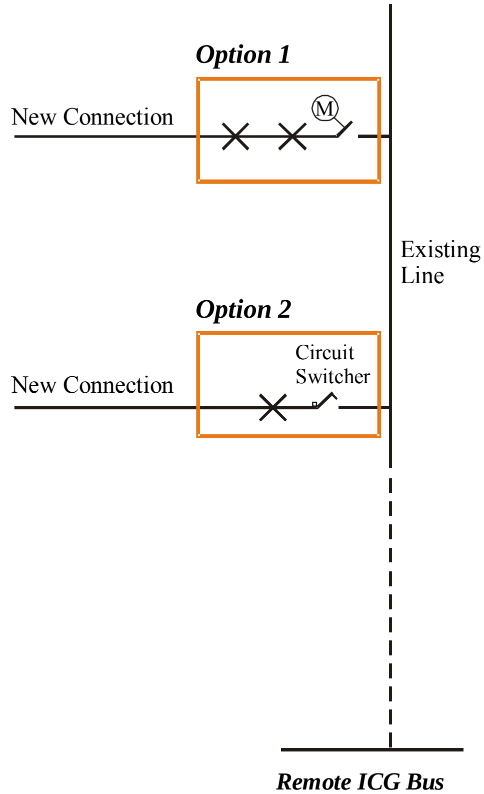


A minimum of three diameters is desired. Alternatively if a ring bus is temporarily unavoidable, the station should be laid out for the future addition of another diameter.

During periods when breakers are out-of-service for maintenance, ring buses can impose significant operational constraints. The layout shown provides one way to optimize the layout of a ring bus and minimize the adverse effect of maintenance.

B.3.6 Connections Without Transfer Trip

Where the *connection point* to the *IESO-controlled grid* is sufficiently remote that transfer trip is impractical, either of the two options shown would be acceptable.

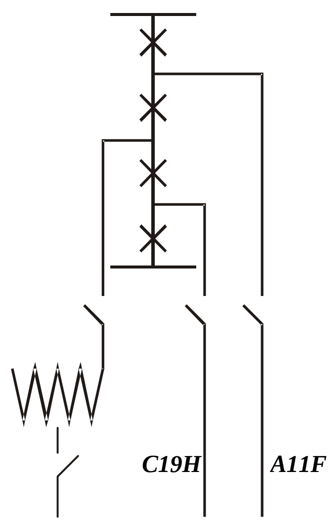


In Option 1, a line fault would initiate tripping of both breakers simultaneously, thereby addressing concerns about possible breaker failure if only a single breaker were used. This arrangement must include a motorized *disconnect* to provide 'physical' isolation of the new line from the *IESO-controlled grid*.

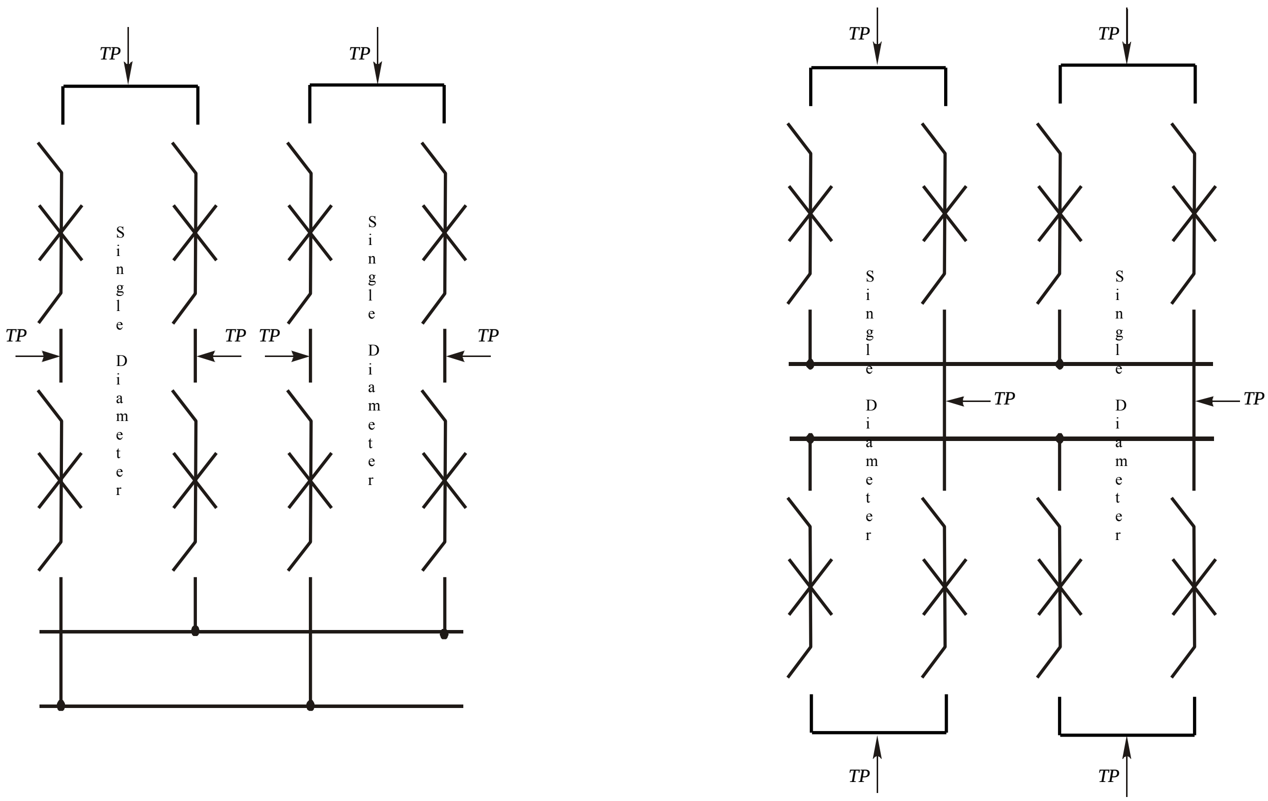
In Option 2, a line fault would initiate simultaneous operation of the single breaker and the circuit switcher. The integral *disconnect* switch of the circuit switcher would provide the required 'physical' isolation of the new line from the *IESO-controlled grid*.

B.4 Physical Station Layouts

The electrical single line diagram of a "breaker-and-a-third" arrangement is shown. Typical physical layouts for "breaker-and-a-third" follow.



Typical Physical Arrangement for a Breaker-and-a-Third Layouts



TP = Termination Point for a transmission element such as a circuit, transformer, etc.

Overhead connections omitted for clarity

– End of Section –

Appendix C: Wind Farms Connection Requirements

The following is intended to clarify the requirements for connection to the *IESO-controlled grid* of wind-generation proposals which are aimed at ensuring that the *reliability* of the system is preserved. This short list does not relieve proponents from any *market rule* obligation. *Transmitter* and *distributor* requirements are separate and are not addressed herein.

The key factors that must be evaluated when performing a *connection assessment* of a wind farm are:

1. Equipment must be suitable for continuous operation in the applicable transmission voltage range specified in Appendix 4.1 of the "Market Rules". Equipment must also be able to withstand over-voltage conditions during the short period of time (not more than 30 minutes) it takes to return the power system to a secure state. Plant auxiliaries must not restrict *transmission system* operation.

2. Generating units do not trip for contingencies except those that remove generation by configuration. This requires adequate low and high voltage ride through capability. If generating units trip unnecessarily, they will require enhanced ride-through capability to prevent such tripping or the *IESO* may restrict operation to avoid these trips.

3. Recognized contingencies within the wind-*generation facility*, except for transmission breaker failures, must not trip the connecting transmission circuit(s).

4. Induction generators are required to have the reactive power capabilities described in Appendix 4.2 Reference 1 of the "Market Rules". Induction generating units injecting power into the *transmission system* are required to have the same reactive capabilities as synchronous units that have similar apparent power ratings. They are required to have the capability to inject at the *connection point* to the *IESO-controlled grid* approximately 43.6 MVAr for every 90 MW of active power (0.9 power factor at the low voltage terminals of the *connection point*). The requirement to provide the entire range of reactive power for at least one constant transmission voltage limits the impedance of the connection between the generating units and the *transmission system* to about 13% impedance on the generator's rated output base. Generating units not injecting power into the *transmission systems* must be able to reduce reactive flow to zero at the point of connection and must have similar reactive capabilities as units connected to the *transmission system*. The *IESO* may require any reactive power deficiencies of *facilities* injecting into the *transmission system* to be corrected by reactive compensation devices.

   - For wind turbine technologies that have dynamic reactive power capabilities described in 4.2 Reference 1 of the "Market Rules", additional shunt capacitors may be required to offset the reactive power losses over the wind farm collection system that are in excess of those allowed by the "Market Rules".

   - For wind turbine technologies that do not have dynamic reactive power capabilities described in 4.2 Reference 1 of the "Market Rules", dynamic reactive compensation (static var compensator) equivalent to the "Market Rules" requirement must be installed. In addition, shunt capacitors may be required to offset the reactive power losses that are in excess of those allowed by the "Market Rules", over the wind farm collection system.

5. *Facilities* shall have the capability to regulate voltage as specified by the *IESO*. Operation in any other mode of *regulation* (e.g. power factor or reactive power control) shall be subject to *IESO* approval.

6. *Facilities* shall be installed to participate in any *special protection system* identified by the *IESO* during the CAA process. In most cases, this will be generation rejection and the associated telecommunication *facilities*.

7. Generating units will meet the voltage variation and frequency variation requirements described in Appendix 4.2 Reference 2 and Reference 3 of the "Market Rules".

8. Real-time monitoring must be provided to satisfy the requirements described in Appendix 4.15 and Appendix 4.19 of the "Market Rules".

9. *Revenue metering* must be provided to satisfy the Market Rule requirements. No commissioning power will be provided until the *revenue metering* installation is complete.

10. The *facility* does not increase the duty cycle of equipment such as load tap changing transformers or shunt capacitors beyond a level acceptable to the associated *transmitter* or *distributor*.

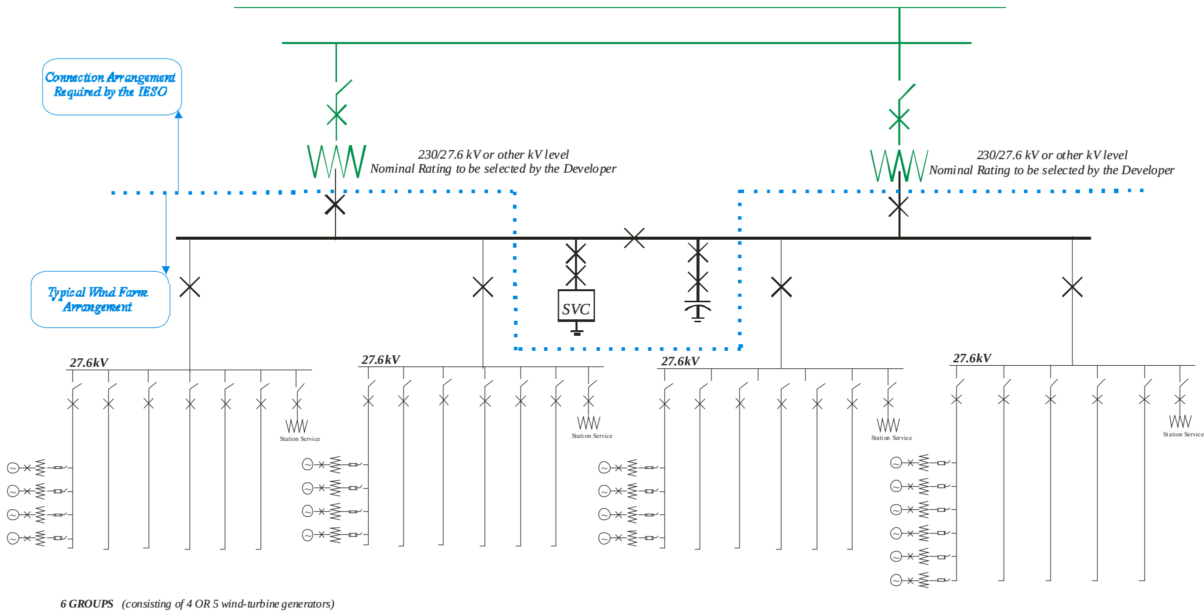
11. Line taps and step-up transformers connect to both circuits of a double-circuit-line (figure attached). The *facility* must be designed to balance the loading on both circuits of a double-circuit line.

12. Equipment must be designed so the adverse effects of failure on the *transmission system* are mitigated. This includes ensuring all transmission breakers fail in the open position.

13. Equipment must be designed so it will be fully operational in all reasonably foreseeable ambient conditions. This includes ensuring that certain types of breakers are equipped with heaters to prevent freezing.

14. The equipment must be designed to meet the applicable requirements of the OEB's "Transmission System Code" or the OEB's "Distribution System Code" in order to maintain the *reliability* of the grid. They include requirements identified by the *transmitter* for protection and telecommunication *facilities* and coordination with the exiting schemes. The protection systems for equipment connected to the *IESO-controlled grid* must be duplicated and supplied from separate batteries.

15. Disturbance monitoring equipment capable of recording the post-contingency performance of the *facility* must be installed. The quantities recorded, the sampling rate, the triggering method, and clock synchronization must be acceptable to the *IESO*.



Typical Configuration

Appendix D: Synchronous Generation Connection Requirements

The following summarizes the requirements for connection to the *IESO-controlled grid* of single-cycle or combined-cycle generation proposals of medium to large size which are aimed at ensuring that the *reliability* of the system is preserved. This short list does not relieve proponents from any m*arket rule* obligation. This document may be used by *market participants* to help them understand *IESO* criteria and further their *connection assessment* work.

Transmitter and d*istributor* requirements are separate and are not addressed herein. The Proponent is expected to follow other approvals processes to ensure the other aspects of *reliability* such as detailed equipment design, environmental considerations, power quality, and safety are properly addressed.

Generating Unit Performance

Excitation System

The requirements for exciters on *generation unit* rated at 10 MVA or higher are listed in Reference 12 of Appendix 4.2 in the "Market Rules" as follows:

- A voltage response time not longer than 50 ms for a voltage reference step change not to exceed 5%;
- A positive ceiling voltage of at least 200% of the rated field voltage, and
- A negative ceiling voltage of at least 140% of the rated field voltage.

In addition, the requirements for power system stabilizers (PSS) are described in Reference 15 of Appendix 4.2:

- Each synchronous generating unit that is equipped with an excitation system that meets the performance requirements described above shall also be equipped with a power system stabilizer. The power system stabilizer shall, to the extent practicable, be tuned to increase damping torque without reducing synchronizing torque.

Governor

Reference #16 of Appendix 4.2 of the "Market Rules" requires that every synchronous generator unit with a name plate rating greater than 10 MVA or larger be operated with a speed governor, which shall have a permanent speed droop that can be set between 3% and 7% and the intentional dead band shall not be wider than ± 36 mHz.

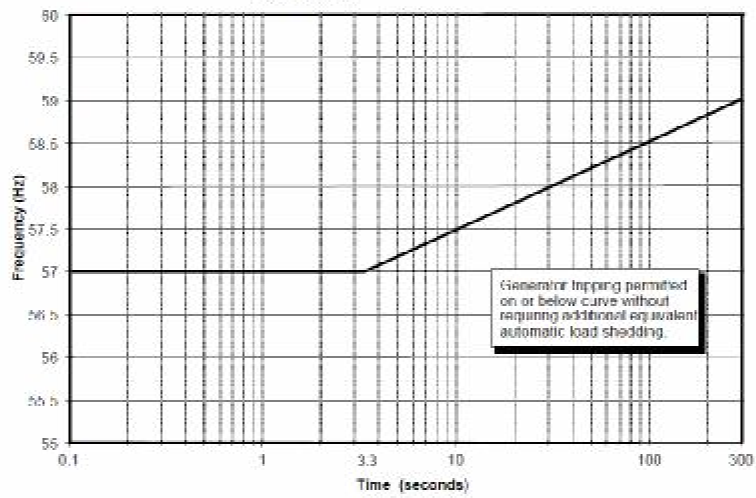
Automatic Voltage Regulator

Reference #13 of Appendix 4.2 of the "Market Rules" requires each synchronous generating unit to be equipped with a continuously acting *automatic voltage regulator* (*AVR*) that can maintain the terminal voltage under steady state conditions within ±0.5% of any voltage set point. Each synchronous *generation unit* shall regulate voltage except where permitted by the *IESO*.

Generator Underfrequency Performance

Reference #3 of Appendix 4.2 of the "Market Rules" requires that generating *facilities* be capable of operating continuously at full power for a system frequency range between 59.4 to 60.6 Hz. In accordance with *NPCC* criteria A-03, "Emergency Operation Criteria", generators shall not trip for under-frequency system conditions for frequency variations that are above the curve shown below. However, if this cannot be achieved, and if approved by the *IESO*, then automatic load shedding equivalent to the amount of generation to be tripped must be provided in the area. This criterion is required to ensure the stability of an island, if formed, and to avoid major under-frequency load shedding in the area.

Figure 1 - Standards for setting underfrequency trip protection for generators



Generation Facility Connection Options

The *IESO*, in its review of the various generation projects that propose to connect to the *IESO-controlled grid*, has developed typical connection arrangements for generation developments. Variations to the typical connection arrangements may be accepted by the *IESO* provided that *reliability* criteria are met and that the *connection assessment* studies prove that the system is not adversely affected. Connection of *generation facilities* larger than 500 MW that propose to use arrangements that are typical for the developments under 500 MW may be accepted subject to *IESO* approval.

Generation Facilities Rated between 250 MW and 500 MW

All projects rated between 250 MW and 500 MW are required to connect to two circuits (where available) and as a minimum provide one of the connectivity arrangements shown in Figure 1, 2 or 3. Station arrangements that connect two like elements next to each other separated by only one breaker should be avoided.

The configurations shown in Figure 1 and Figure 2 are suitable for coupled gas and steam turbines pairs.

- A contingency associated with one of the transmission lines will be cleared at the terminal stations and by the breaker on the corresponding generator line tap. If the post-contingency rating of the remaining line permits, the *facility* can remain connected to one circuit.

- A bus-tie breaker failure condition will send transfer trip to the line tap breakers and the entire *facility* will be tripped off. If the *IESO's* assessment indicates that tripping the entire generating *facility* will have a negative impact on the system then the *IESO* will recommend alternative connection arrangements.
- For the configuration in Figure 1, a contingency associated with one of the step-up transformers or a generator unit will be cleared by opening the bus-tie breaker and the HV synchronizing breaker.
- The configuration in Figure 2 is more economical because it allows the connection of two units via one step-up transformer but is less reliable since a contingency associated with one step-up transformer results in the loss of two generating units.
- For an *outage* associated with one of the HV breakers the entire *generation facility* could remain connected unless limited by equipment ratings, voltage, or stability.

For the connectivity shown in Figure 3:

- A contingency associated with one of the transmission lines will be cleared at the terminal stations and the corresponding breakers in the ring bus. If the post-contingency rating of the remaining line permits, the *facility* can remain connected to one circuit.
- An HV breaker failure contingency could trip two generating units or a line and a generating unit. If *IESO's* assessment indicates that tripping two generating units will have a negative impact on the system then the *IESO* will require either additional breakers to be installed or the size of the development to be reduced to an acceptable level.
- For an *outage* associated with one of the HV breakers the entire *generation facility* could remain operational unless limited by equipment ratings, voltage, or stability.

In addition the *generation facilities* will have to comply with the OEB's "Transmission System Code" requirements and other protection system requirements established by the *transmitter*.

<u>Generation Facilities Rated Above 500 MW</u>

All projects rated above 500 MW are required to connect to at least two circuits and provide one of the connectivity arrangements shown in Figure 4 or Figure 5. Station arrangements that connect two like elements next to each other separated by only one breaker should be avoided.

The full switchyard arrangement shown in Figure 4 is required when large generating *facilities* propose to connect to a main transmission corridor of considerable length that *connects* two transmission stations.

The ring bus arrangement shown in Figure 5 is acceptable when the development is connecting to a radial double circuit line.

Typical Connection Arrangements for Generation Facilities Rated between 250MW and 500 MW

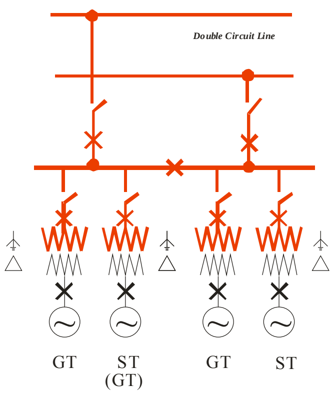


Figure 1 (Low Voltage Breakers are Optional)

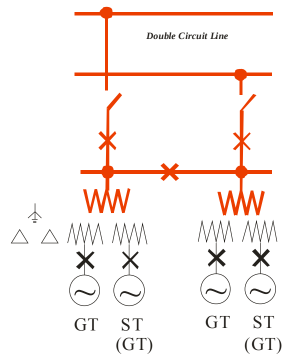


Figure 2

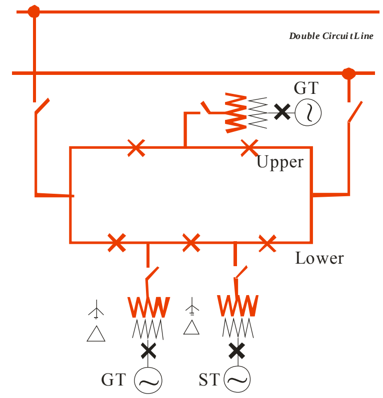


Figure 3

Typical Connection Arrangements for Generation Facilities Rated Higher than 500 MW

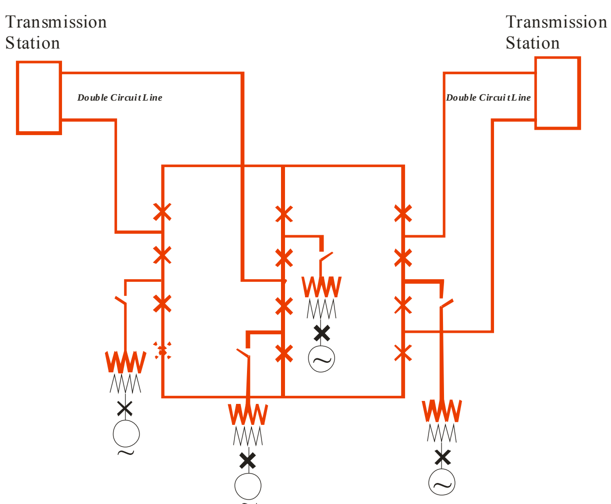


Figure 4

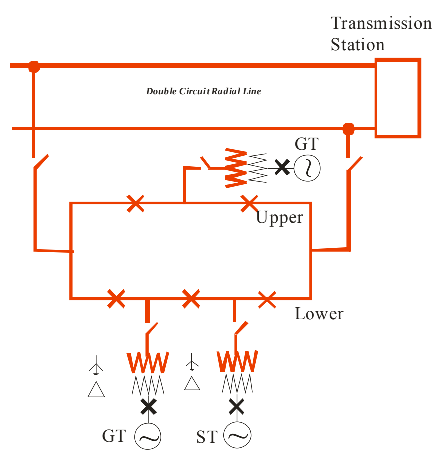


Figure 5

End of Section

References

Document ID	Document Name
NPCC A-01	Criteria for Review and Approval of Documents
NPCC A-02	Basic Criteria for Design and Operation of Interconnected Power Systems
NPCC A-04	Maintenance Criteria for Bulk Power System Protection
NPCC A-05	Bulk Power System Protection Criteria
NPCC A-11	Special Protection System Criteria
NPCC B-04	Guideline for NPCC AREA transmission Review
NPCC Criteria, Guides and Procedures can be found at http://www.npcc.org/document/abc.cfm	

– End of Document –

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CUSTOMER IMPACT ASSESSMENT

Guelph Area Transmission Refurbishment Project

AR: 17389

Revision: **Final**

Date: May 28, 2013

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Disclaimer

This Customer Impact Assessment was prepared based on information available about the Guelph Area Transmission Project. It is intended to highlight significant impacts to affected transmission customers listed in Table 1 of this document early in the project development process and thus allow an opportunity for these parties to bring forward any concerns that they may have. Subsequent changes and the required modifications or the implementation plan may affect the impacts of the proposed connection identified in Customer Impact Assessment. The results of this Customer Impact Assessment are also subject to change to accommodate the requirements of the IESO and other regulatory or municipal authority requirements. Hydro One shall not be liable to any third party which uses the results of the Customer Impact Assessment under any circumstances whatsoever for any indirect or consequential damages, loss of profit or revenues, business interruption losses, loss of contract or loss of goodwill, special damages, punitive or exemplary damages, whether any of the said liability, loss or damages arises in contract, tort or otherwise

CUSTOMER IMPACT ASSESSMENT

GUELPH AREA TRANSMISSION REFURBISHMENT

1.0 INTRODUCTION

1.1 Scope of the Study

This Customer Impact Assessment (CIA) study assesses the potential impacts of the proposed Guelph Area Transmission Project on the load customers and generators in the local vicinity.
This study is intended to supplement the System Impact Assessment "CAA ID 2012- 478" issued by the IESO.
This study covers the impact of the Guelph Area Transmission (GATR) Project on the Hydro One Networks Inc. (Hydro One) system in the Kitchener-Waterloo-Cambridge-Guelph Area (KWCG). The primary focus of this study is to identify the fault levels and capacity changes on the transmission customer connected facilities.

This study does not evaluate the overall impact of the GATR project on the bulk system. The impact of the GATR project on the bulk system is the subject of the System Impact Assessment (SIA) which is issued by the Independent Electricity System Operator (IESO).

Transmission connected customers potentially impacted by the incorporation of the GATR project were requested to provide comments to a draft report of this study. The 30-day review period ended on May 2, 2013. All comments received on the draft report were incorporated.

1.2. 0 Background

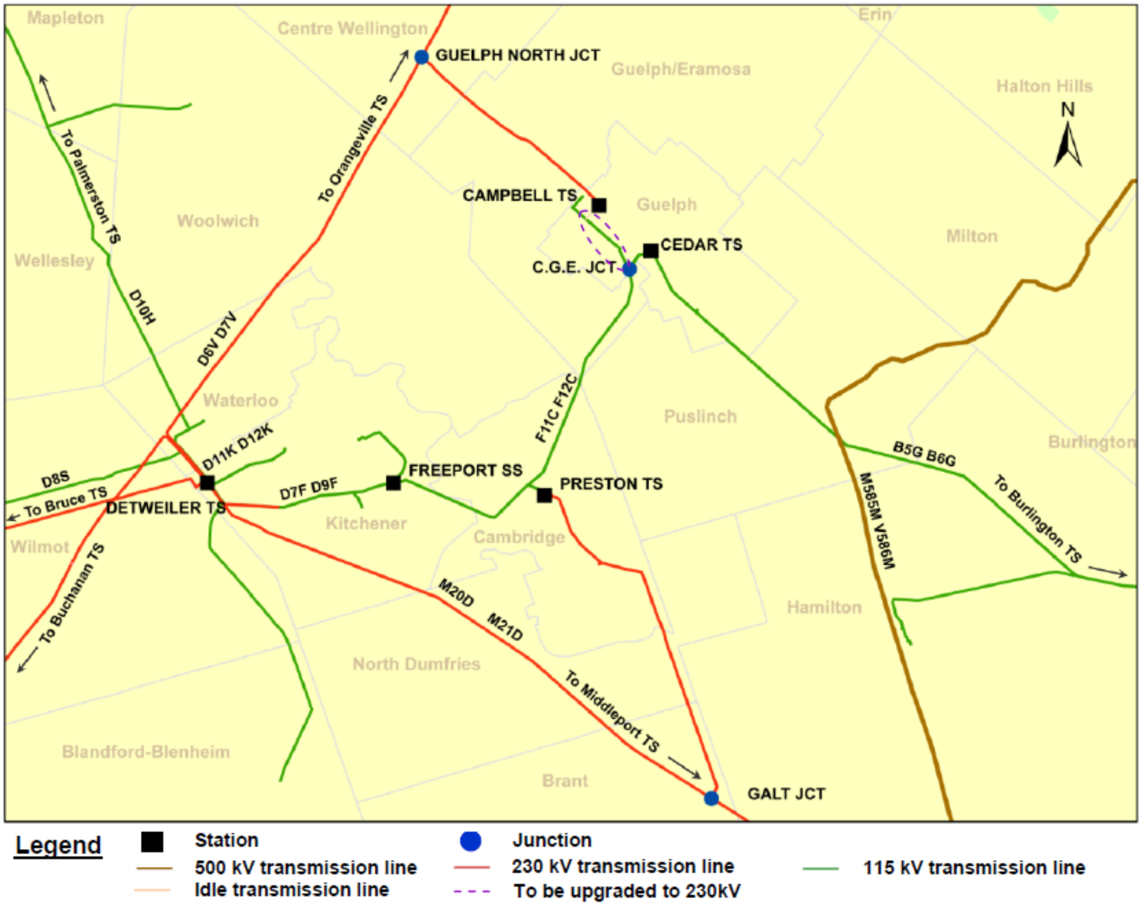
The Guelph Area Transmission Refurbishment project will contribute to meeting the supply needs of the South-Central Guelph, Kitchener-Guelph and the Cambridge area as well as improve the adequacy and reliability of electricity supply in the KWCG area.
The GATR project proposes the following transmission facilities:

- Upgrade approximately 5 km of the existing 115 kV double-circuit transmission line B5G and B6G between CGE Junction and Campbell TS to a 230 kV double-circuit transmission line that is capable of a higher thermal capacity.

- Install two new 230 / 115 kilovolt (kV) autotransformers at the existing Cedar Transformer Station (TS) in the City of Guelph;
- Install 115 kV switchgear facilities at Cedar TS to ensure security of the IESO-controlled grid for a variety of fault and operating scenarios, and
- Upgrade the existing Guelph North Junction in the Township of Centre Wellington to a switching station, Inverhaugh SS, by installing two 230 kV breakers and associated equipment.

This work will address the near- and medium-term needs in the KWCG area. Additional solutions to address longer-term reliability in the area will be identified as part of the continuing KWCG regional planning process.

The Guelph Area Transmission Project is located in southwestern Ontario. The transmission elements of this project extend from Guelph Cedar TS located in city of Guelph to Guelph North Jct. located in County of Centre Wellington. The 115 kV transmission corridor, comprises B5G/B6G, F11C/F12C and D9F/D7F lines that connect Burlington TS (in Burlington) to Detweiler TS (in Kitchener) (see Figure 1 below). Approximately five kilometers of 115 kV line B5G/B6G in this corridor, between Guelph Central (C.G.E. Jct) and Guelph North (Campbell TS), will be upgraded to 230 kV.



Source: Hydro One TLGIS

Figure 1 – The KWCG area

1.2.1 Existing Transmission Facilities in Southwestern Ontario

The generation capacity in southwestern Ontario is mainly a mix of nuclear, gas-fired, coal-fired and renewable sources. Some of the larger generating stations in the region are Bruce GS, Nanticoke GS, Lambton GS and Beck GS. The area also includes major load centers such as Hamilton, London, Windsor and Kitchener-Waterloo-Cambridge-Guelph ("**KWCG**").

The transmission assets in southwestern Ontario connect the major generation and load centers in the region to the interconnected grid. Almost half of the generating capacity in the region supplies the energy needs of other parts of the Province. The transmission system in this area is designed and placed to support this concentration of generation capacity, respecting physical constraints such as voltage stability and thermal limits. This is a tightly interconnected system, where the availability and performance of each major element (especially the 230 kV facilities) can affect the integrity of the entire network and neighboring jurisdictions.

1.2.2. Transmission Resources in the KWCG Area

KWCG area is located in southwestern Ontario and consists of cities of Kitchener, Waterloo, Cambridge, and Guelph, townships of Wellesley, Woolwich, Wilmot, and North Dumfries, as well as County of Centre Wellington. Much of this area is within the Regional Municipality of Waterloo. Population growth in the four KWCG cities is among the highest in the province, and in the summer of 2005 the demand for electricity in the area peaked at roughly 1,400 MW. While the recent economic recession has impacted growth in the region, the demand for electricity had almost recovered to pre-recession levels in the summer of 2010, and is expected to grow at roughly 2% between now and 2030; more than four times the forecast growth in peak demand for province over the same period. Within the KWCG area, the strongest growth in demand is expected in the Cambridge and North Dumfries and South-Central Guelph areas. As mentioned above, the KWCG area is one of the major load centers in Ontario. With the lack of local generation, the area relies entirely on the transmission system to deliver electricity from external generation sources to the area.

The transmission system supplying the KWCG area is highly integrated and interactive. It includes the 230 kV circuits between Detweiler TS (in Kitchener), Orangeville TS (in Orangeville) and Middleport TS (in Hamilton), as well as eight 115 kV circuits emanating from Detweiler TS and Burlington TS (in Burlington). High voltage autotransformers tie the 115 kV and 230 kV systems together at Detweiler TS, Burlington TS and Preston TS (in Cambridge). The 230 kV and 115 kV transmission lines in the KWCG area are as follows:

- The 230 kV Detweiler TS x Orangeville TS double-circuit tower line, D6V and D7V;

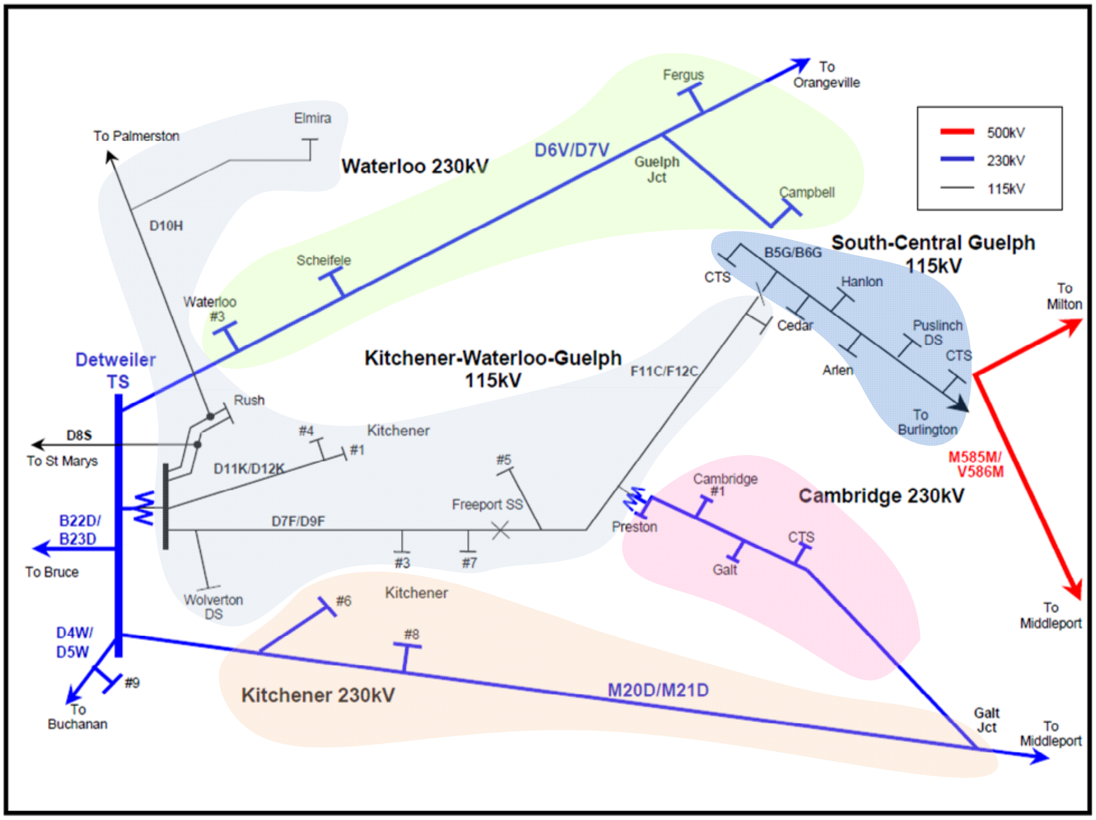
- The 230 kV Middleport TS x Detweiler TS and Preston TS double-circuit tower line, M20D and M21D;
- The 115 kV Burlington TS x Cedar TS double-circuit tower line, B5G and B6G;
- The 115 kV Detweiler TS x Freeport SS double-circuit tower line, D7F and D9F;
- The 115 kV Detweiler TS x St. Mary's TS single-circuit tower line, D8S;
- The 115 kV Detweiler TS x Palmerston TS single-circuit pole line, D10H;
- The 115 kV Detweiler TS x Kitchener TS double-circuit tower line, D11K and D12K;
- The 115 kV Freeport SS x Cedar TS double-circuit tower line, F11C and F12C.

Other major 230 kV facilities connected the KWCG area include transformer and switching stations at Detweiler TS, Burlington TS, Orangeville TS, Middleport TS, Freeport SS and Preston TS.

The transmission system in the KWCG area can be separated into five subsystems as follows:

- The South-Central Guelph 115 kV Subsystem: customers supplied from Burlington TS via B5G/B6G;
- The Kitchener-Waterloo-Guelph 115 kV Subsystem: customers supplied from Detweiler TS via D7F/D9F, F11C/F12C, D11K/D12K and D8S/D10H;
- The Cambridge 230 kV Subsystem - customers supplied from M20D/M21D via the "Preston Tap";
- The Kitchener 230 kV Subsystem - customers supplied directly from Detweiler TS via M20D/M21D;
- The Waterloo 230 kV Subsystem - customers supplied directly from Detweiler TS via D6V/D7V.

Figure 2 provides a graphical representation of these subsystems.



Source: Hydro One

Figure 2 – Five Existing Subsystems of the KWCG Area Network

The Hydro One proposed Guelph Area Transmission Refurbishment project will contribute to meeting the supply needs of the South-Central Guelph, Kitchener-Guelph and the Cambridge area as well as improve the adequacy and reliability of electricity supply in the KWCG area.

2.0 DETAILS OF THE PROPOSED FACILITIES

<u>Line Work</u>

Approximately 5 km of an existing 115 kV transmission line (B5G/B6G) between CGE Junction and Campbell TS will have to be replaced with a double circuit 230 kV line to address the supply needs in the KWCG area. The transmission line passes through the city of Guelph. An existing customer owned station directly connected to the 115 kV B5G/B6G circuits will need to be disconnected from Hydro One's Transmission system and reconnected to Guelph Hydro Electric System's distribution system at Campbell TS in order to maintain supply to the customer.

Cedar TS to CGE Jct

The line section from Cedar TS to CGE Jct can currently operate at 230 kV (with existing 230 kV towers and conductors), therefore, only the grounding conductor (skywire) in this section needs to be replaced with Optic Ground Wire (OPGW) conductor which will allow for grounding and communication.

CGE Jct to ABB Jct

The line section from CGE Jct to ABB Jct is designed for 115 kV operation and needs to be rebuilt to 230 kV voltage level. This section was built in 1953. The 3.8 km existing double circuit 115 kV line on double wood pole structures from CGE Jct to ABB Jct consists of 35 wood poles and 1 steel tower. 26 out of 35 wood poles are 59 years old, exceeding the expected life of 50 years for wood poles. The other 9 wood poles were replaced in 2002. The wood poles in this section will be removed and replaced with double circuit 230 kV steel structures, conductors and accessories.

As per Hydro One’s policy on the use of steel pole structures in residential areas it is recommended to install steel *pole* structures (instead of the standard steel *lattice* structures) in residential areas, where it is technically feasible and where such a preference has been indicated. Therefore, as requested by residents in the Deerpath Drive Community and by staff from the City of Guelph’s Planning, Building, Engineering and Environment group, steel poles are recommended for use in current residential areas on this line section, where possible. This includes approximately 1.9 km of line from the railway just north of the Speed River, to just south of Willow Road. Steel lattice structures are recommended for use on the remainder of the line section to be refurbished and in locations where steel poles are not technically feasible (i.e. locations where there is an angle in the line, such as structures on either side of the line crossing over the Hanlon Parkway).

ABB Jct to Campbell TS

The line section from ABB Jct to Campbell TS is designed for 115 kV operation and needs to be rebuilt to 230 kV voltage level. This section was built in 1964 and is presently idle. The line section from ABB Jct to Campbell TS consists of 4 steel towers. This section will also be removed and replaced with double circuit 230 kV steel structures, conductors and accessories. One OPGW will be installed from CGE Jct. to Campbell TS.

Station Work

The GATR project requires work to be completed at Cedar TS and the planned Guelph North Junction Switching Station.

Cedar TS

Cedar TS in the City of Guelph is currently supplied from Burlington TS via the double circuit 115 kV line B5G/B6G (T7 and T6 step-down transformers) and from Detweiler TS (T1 and T2 step-down transformers) via the double circuit 115 kV line F11C/F12C. At Cedar TS, Hydro One plans to:

- Install two new 230/115 kV autotransformers and associated electrical equipment allowing for supply at 230 kV from circuits D6V/D7V via the Campbell tap
- Install new 115 kV switchgear facilities to connect the existing 115 kV circuits: F11C, F12C, B5G and B6G, existing step-down transformers: T1, T2, T7 and T8 , and two new 230/115 kV autotransformers: T3 and T4, and ensure that adequate transmission supply capability is maintained following the loss of any one of the existing transmission lines without interrupting customers.
- The installation of the facilities listed above at Cedar TS would close the normally open point between the 115 kV circuits: B5G/B6G and F11C/F12C, and thus the D6V/D7V 230 kV system would be connected to the B5G/B6G 115 kV and F11C/F12C 115 kV systems, reinforcing the supply to both South-Central Guelph and Kitchener- Guelph.

Upon completion, Cedar TS will become a strong source of supply within KWCG area. By augmenting the existing Burlington TS 115 kV supply to Cedar TS, Hanlon TS and Arlen MTS through the installation of autotransformers connecting the existing 115 kV circuits B5G/B6G to the 230 kV D6V/D7V circuit from Orangeville TS and Detweiler TS, the GATR project will provide sufficient incremental supply capacity to meet the needs of South-Central Guelph.

Inverhaugh Switching Station at Guelph North Junction

The existing Guelph North Jct. is located in the County of Wellington, in the Township of Centre Wellington, just north of Sideroad 10 and west of 2nd Line East. The double circuit 230 kV transmission line (D6V/D7V) between Detweiler TS in Kitchener and Orangeville TS is tapped to Campbell TS. With the proposed 230 kV line upgrade and autotransformers at Cedar TS the B5G/B6G 115 kV and F11C/F12C 115 kV systems will be connected to D6V/D7V, hence reinforcing the supply to both South-Central Guelph and Kitchener-Waterloo-Guelph.

In order to improve the reliability of electrical supply to South Central Guelph stations on B5G/B6G, Guelph North Jct is proposed to be upgraded by building a Switching Station (SS) and installing two 230 kV circuit breakers and associated station facilities. The existing tap to Campbell TS will connect to the upgraded transmission line section from Campbell TS to Cedar TS to provide supply to Cedar TS, Hanlon TS and Arlen MTS from D6V/D7V. Adding the current and future load on D6V/D7V requires upgrading the junction to a switching station to meet customer supply reliability requirements. Access to the new SS would be from Sideroad 10.

2.1 Single Line Diagrams

Cedar TS

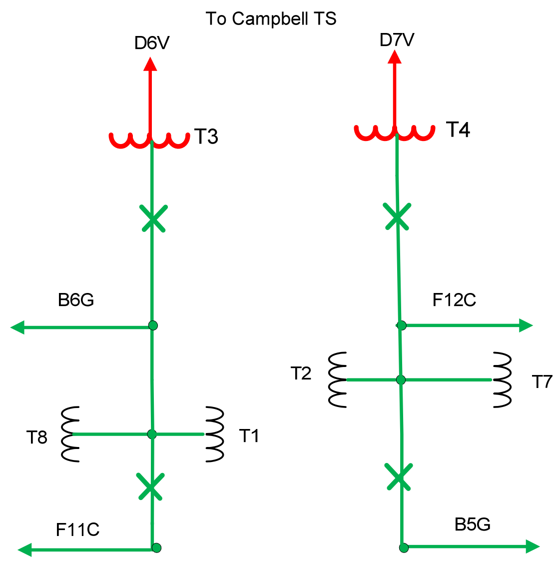


Figure 3: STAGE 1 - Schematic Single Line Diagram of CEDAR TS with Implementation of GATR

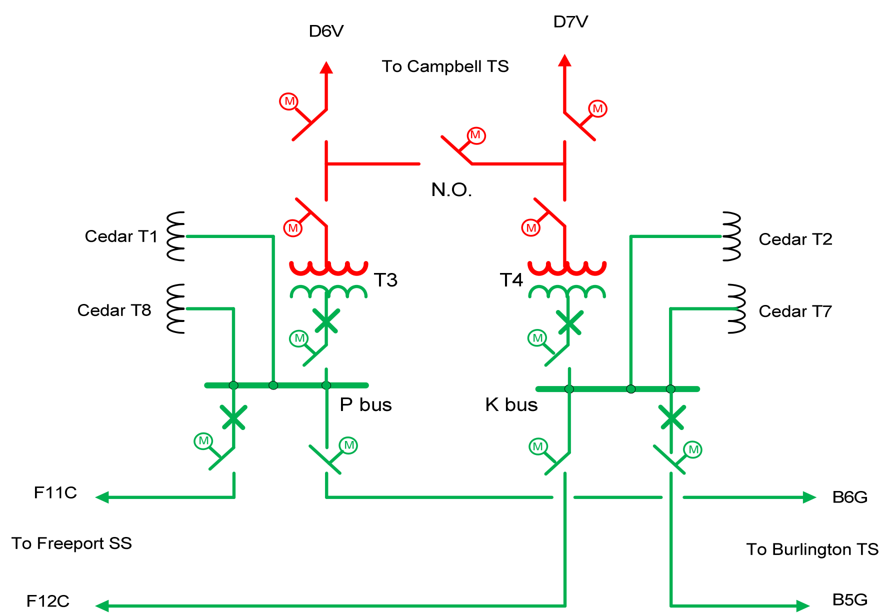


Figure 4: STAGE 1 - Detailed Single Line Diagram of CEDAR TS with Implementation of GATR (CEDAR bus split – 4 in-line breakers)

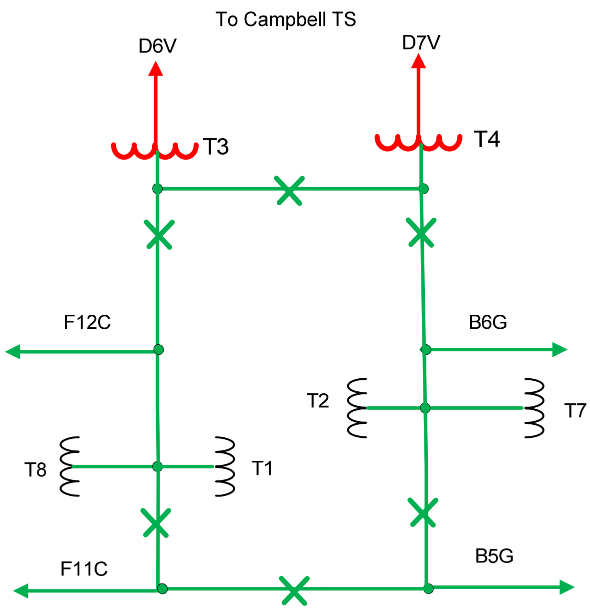


Figure 5: STAGE 2 - Schematic Single Line Diagram CEDAR TS ring bus configuration with six 115 kV breakers (future configuration - ultimate design)

Inverhaugh SS

Two 230 kV breakers at Guelph North Junction

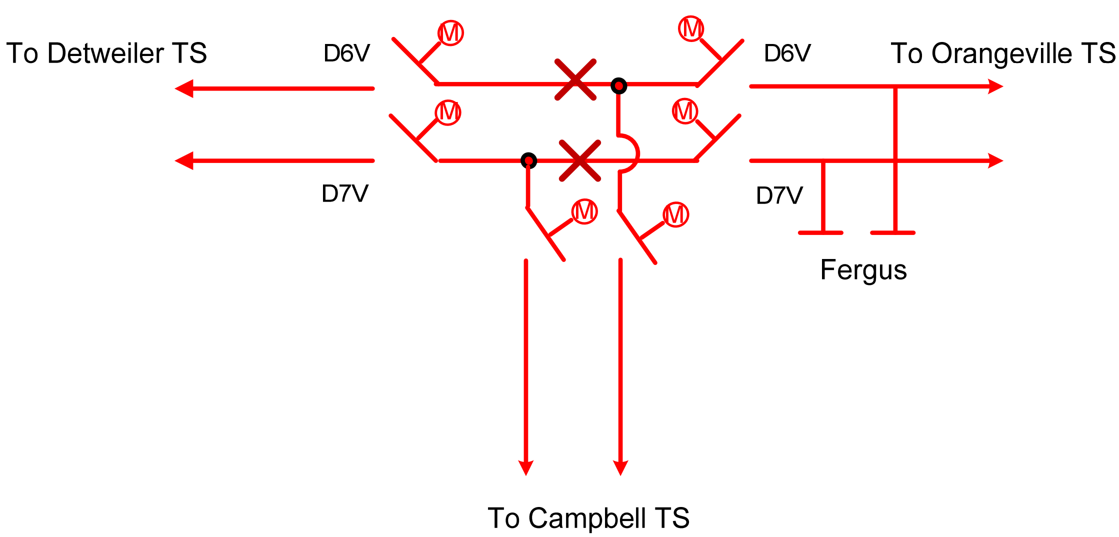


Figure 6 : Two 230 kV circuit breakers at Guelph North Junction

3.0 CUSTOMER IMPACT ASSESSMENT

This Customer Impact Assessment (CIA) is a requirement of the Transmission System Code (TSC) to assess the potential impacts on the existing transmission connected customer(s). The primary focus of this study is to communicate the Guelph Area Transmission Project to customers supplied directly in the KWCG area and in the vicinity of the mentioned geographical area (Figure 2). Table 1 summarizes the customers connected at each station:

Table 1: Transmission Customers in the KWCG Area

Customers	Station
Ameri Steel Cambridge	Gerdau-Courtice Steel CTS
Cambridge and North Dumfries Hydro Inc.	Cambridge NDum MTS#1
	Galt TS
	Preston TS
	Wolverton DS
Centre Wellington Hydro Ltd.	Fergus TS
Guelph Hydro Electric System - Rockwood Division	Fergus TS
Guelph Hydro Electric Systems Inc.	Arlen MTS
	Campbell TS
	Cedar TS
	Hanlon TS
Halton Hills Hydro Inc.	Fergus TS
Hydro One Networks Inc.	Fergus TS
	Puslinch DS
	Wolverton DS
Kitchener-Wilmot Hydro Inc.	Kitchener MTS#1
	Kitchener MTS#3
	Kitchener MTS#4
	Kitchener MTS#5
	Kitchener MTS#6
	Kitchener MTS#7
	Kitchener MTS#8
	Kitchener MTS#9
Milton Hydro Distribution Inc.	Fergus TS
Waterloo North Hydro Inc.	Elmira TS
	Fergus TS
	Rush MTS
	Scheifele MTS
	Waterloo North MTS 3
Wellington North Power Inc	Fergus TS
Westover	Enbridge Westover CTS

3.1 Study Assumptions

The short circuit study was carried out with the following primary system assumptions:

(1) Generation Facilities In-service

East

Lennox G1-G4 Chenaux G1-G8
Kingston Cogen G1-G2 Mountain Chute G1-G2
Wolf Island 300 MW Stewartville G1-G5
Arnprior G1-G2 Brockville G1
Barrett Chute G1-G4 Havelock G1
Chats Falls G2-G9 Saunders G1-G16
Cardinal Power G1, G2

Toronto

Pickering units G1, G4-G8 Sithe Goreway G11-13, G15
Darlington G1-G4 TransAlta Douglas G1-G3
Portlands GS G1-G3 GTAA G1-G3
Algonquin Power G1, G2 Brock west G1
Whitby Cogen G1

Niagara

Thorold GS GTG1, STG2 Beck 2 G11-G26
Beck 1 G3-G10 Beck 2 PGS G1-G6
Decew G1, G2, ND1

South West

Nanticoke G5-G8 Kingsbridge WGS 39.6 MW
Halton Hills GS G1-G3 Amaranth WGS 199.5 MW

Bruce

Bruce A G1-G4 Ripley WGS 76 MW
Bruce B G5-G8 Underwood WGS 198 MW
Bruce A Standby SG1

West

Lambton units G3-G4 Imperial Oil G1
Brighton Beach G1, G1A, G1B Kruger Port Alma WGS 101.2 MW
Greenfield Energy Centre G1-G4 Gosfield Wind Project 50.6 MW
St. Clair Energy Centre CTG3, STG3, CTG4, STG4 Kruger Energy Chatham WF 101 MW
East Windsor Cogen G1-G2 Raleigh Wind Energy Centre 78 MW
TransAlta Sarnia G861, G871, G881, G891 Talbot Wind Farm 98.9 MW

Ford Windsor CTS STG5 Dow Chemicals G1, G2, G5
TransAlta Windsor G1, G2 Port Burwell WGS 99 MW
West Windsor Power G1, G2 Fort Chicago London Cogen 23 MVA
Great Northern Tri-Gen Cogen 15 MVA

(2) Previously Committed Generation Facilities

• Port Dover and Nanticoke
• Big Eddy GS and Half Mile Rapids GS • Grand Renewable Energy Park
• White Pines Wind Farm • Green Electron
• Amherst Island • Comber East C24Z
• York Energy Centre • Comber West C23Z

• Conestogo Wind Energy Centre 1 • Pointe-Aux-Roches Wind
• Dufferin Wind Farm • South Kent Wind Farm
• Summerhaven Wind Farm • Wolfe Island Shoals
• Bluewater Wind Energy Centre • East Lake St. Clair Wind
• Jericho Wind Energy Centre • Adelaide Wind Power Project
• Bornish Wind Energy Centre • Gunn's Hill Wind Farm
• Goshen Wind Energy Centre • Silvercreek Solar Park
• Cedar Point Wind Power Project Phase II • K2 wind
• Adelaide Wind Energy Centre • Armow
• Grand Bend Wind Farms • 300 MW wind at Orangeville
• Grand Valley Wind Farms (Phase 3) • 100 MW wind at S2S
• Erieau Wind

(3) Existing and Committed Embedded Generation

• Essa area: 264 MW • Niagara area: 52 MW
• Ottawa area: 90 MW • Southwest area: 348 MW
• East area: 580 MW • Bruce area: 26 MW
• Toronto area: 168 MW • West area: 585 MW

(4) Transmission System Upgrades

• Woodstock Area transmission reinforcement (CAA2006-253);
  - Karn TS in-service and connected to M31W & M32W at Ingersol TS
  - W7W/W12W terminated at LFarge CTS
  - Woodstock TS connected to Karn TS

• Rodney (Duart) TS DESN connected to W44LC and W45LS 230 kV circuits (CAA2007-260)

(5) System Operation Conditions

• Lambton TS 230 kV operated *open*
• Claireville TS 230 kV operated *open*
• Leaside TS 230 kV operated *open*
• Leaside TS 115 kV operated *open*
• Middleport TS 230 kV bus operated *open*
• Hearn SS 115 kV bus operated *open*
• Preston T2 connected to M21D
• Cherrywood TS north & south 230kV buses operated ***open***
• Richview TS 230 kV bus operated ***open***
• All tie-lines in-service and phase shifters on neutral taps
• Maximum voltages on the buses

4.0 Results of Assessment

4.1 Short-Circuit Analysis

The GATR project will have no material impact on fault levels after completion of the Project, therefore, existing levels at each bus are shown in Table 2 and 3. Two cases were included to simulate scenarios whether the Cedar 115 kV bus is split and closed (ring bus). 2016 system conditions have the Cedar 115 kV bus split.

Table 2: Present Fault Levels

Area Customers	Fault Levels (kA)			
	3-phase		Line-to-ground	
	Symmetrical	Asymmetrical	Symmetrical	Asymmetrical
Ameri Steel CTS 230kV	11.449	13.388	9.715	11.662
Burlington TS 230kV	51.410	61.691	43.592	55.718
Cambridge MTS #1 230kV M20D	8.916	10.422	6.349	6.814
Cambridge MTS #2 230kV M21D	10.344	12.080	8.901	11.004
Detweiler TS 230kV	23.608	27.687	23.116	29.508
Kitchener MTS #6 230kV M20D	17.938	20.908	16.092	18.554
Kitchener MTS #6 230kV M21D	17.897	20.865	16.110	18.575
Kitchener MTS #8 230kV M20D	17.584	20.830	14.409	16.560
Kitchener MTS #8 230kV M21D	17.424	20.661	14.443	16.656
Kitchener MTS #9 230kV D4W	14.738	17.106	11.452	12.839
Kitchener MTS #9 230kV D5W	14.738	17.106	11.463	12.849
Middleport TS 230kV DK1	47.130	59.276	44.120	57.728
Middleport TS 230kV DK2	42.868	55.035	40.126	54.459
Orangeville TS 230kV	19.411	22.207	20.916	24.991
Scheifele CTS 230kV D6V	16.211	18.489	13.637	15.311
Scheifele CTS 230kV D7V	16.180	18.454	13.610	15.280
Waterloo North CTS 230kV D6V	18.752	21.494	16.825	19.338
Waterloo North CTS 230kV D7V	18.667	21.390	16.735	19.225
Arlen MTS 115kV B5G	5.017	5.097	2.606	2.624
Arlen MTS 115kV B6G	5.017	5.097	2.605	2.623
Burlington TS 115kV	34.996	43.549	39.214	50.887
Detweiler TS 115kV	24.602	28.487	28.510	35.151
Enbridge Westover CTS 115kV North	5.222	5.223	3.315	3.315
Enbridge Westover CTS 115kV South	5.024	5.025	3.196	3.196
Kitchener MTS #1 115kV D11K	14.219	14.944	11.382	11.873
Kitchener MTS #1 115kV D12K	14.220	14.944	11.383	11.873
Kitchener MTS #3 115kV D7F	13.875	14.928	11.292	11.903
Kitchener MTS #3 115kV D9F	11.322	12.251	8.587	8.916
Kitchener MTS #4 115kV D11K	14.286	15.020	11.455	11.952
Kitchener MTS #4 115kV D12K	14.287	15.021	11.455	11.953
Kitchener MTS #5 115kV F12C	10.207	10.707	7.540	7.850
Kitchener MTS #5 115kV F11C	8.298	8.769	5.727	5.888
Kitchener MTS #7 115kV D7F	14.374	15.586	12.426	13.299
Kitchener MTS #7 115kV D9F	10.690	11.575	8.143	8.416
Puslinch DS 115kV B5G	5.382	5.458	2.894	2.914
Puslinch DS 115kV B6G	5.382	5.458	2.893	2.914
Rush MTS 115kV D10	14.005	14.562	11.360	11.784
Rush MTS 115kV D8S	13.812	14.331	11.297	11.703
Wolverton DS 115kV	5.899	5.899	3.941	3.941
Fergus TS 44kV	14.514	14.707	6.911	8.097
Elmira TS 27.6kV	7.062	7.062	7.188	7.188
Galt TS 27.6kV J	12.293	12.657	9.845	11.315
Galt TS 27.6kV Y	12.227	12.587	9.816	11.278
Preston TS 27.6kV J	12.359	12.960	9.771	11.287
Preston TS 27.6kV Q	12.712	13.293	9.919	11.436
Campbell TS 13.8kV BY	16.940	17.221	8.328	9.760
Campbell TS 13.8kV EZ	17.367	17.729	8.397	9.885
Campbell TS 13.8kV JQ	16.924	17.183	8.324	9.744
Cedar TS 13.8kV JQ	13.109	13.109	7.691	7.691
Cedar TS 13.8kV BY	14.061	14.061	6.819	7.435
Cedar TS 13.8kV EZ	13.998	13.998	6.805	7.410
Hanlon TS 13.8kV BY	13.939	13.939	7.858	7.858

Table 3: Fault Levels with Implementation of GATR
(CEDAR bus split – 4 in-line breakers)

Area Customers	Fault Levels (kA)			
	3-phase		Line-to-ground	
	Symmetrical	Asymmetrical	Symmetrical	Asymmetrical
Ameri Steel CTS 230kV	11.970	13.982	10.068	12.052
Burlington TS 230kV	52.661	63.061	44.375	56.591
Cambridge MTS #1 230kV M20D	8.969	10.499	6.387	6.852
Cambridge MTS #2 230kV M21D	10.932	12.771	9.329	11.517
Detweiler TS 230kV	24.726	28.857	24.030	30.483
Kitchener MTS #6 230kV M20D	18.545	21.541	16.548	19.005
Kitchener MTS #6 230kV M21D	18.515	21.509	16.561	19.023
Kitchener MTS #8 230kV M20D	18.030	21.305	14.668	16.818
Kitchener MTS #8 230kV M21D	17.942	21.210	14.744	16.956
Kitchener MTS #9 230kV D4W	15.064	17.445	11.623	13.007
Kitchener MTS #9 230kV D5W	15.064	17.445	11.634	13.017
Middleport TS 230kV DK1	47.212	59.369	44.175	57.792
Middleport TS 230kV DK2	42.953	55.137	40.185	54.535
Orangeville TS 230kV	20.169	23.062	21.555	25.744
Scheifele CTS 230kV D6V	16.957	19.281	14.297	15.989
Scheifele CTS 230kV D7V	16.955	19.279	14.298	15.986
Waterloo North CTS 230kV D6V	19.551	22.328	17.489	20.013
Waterloo North CTS 230kV D7V	19.479	22.239	17.408	19.908
Arlen MTS 115kV B5G	13.071	13.509	9.656	9.899
Arlen MTS 115kV B6G	12.597	13.048	6.414	6.449
Burlington TS 115kV	39.372	48.028	43.055	55.019
Detweiler TS 115kV	27.474	31.332	31.142	37.811
Enbridge Westover CTS 115kV North	5.976	5.976	3.811	3.812
Enbridge Westover CTS 115kV South	5.716	5.717	3.654	3.655
Kitchener MTS #1 115kV D11K	15.129	15.821	11.776	12.248
Kitchener MTS #1 115kV D12K	15.129	15.822	11.776	12.249
Kitchener MTS #3 115kV D7F	16.247	17.272	12.521	13.094
Kitchener MTS #3 115kV D9F	14.255	15.160	10.073	10.388
Kitchener MTS #4 115kV D11K	15.205	15.907	11.854	12.333
Kitchener MTS #4 115kV D12K	15.205	15.907	11.854	12.333
Kitchener MTS #5 115kV F12C	11.763	12.231	8.236	8.523
Kitchener MTS #5 115kV F11C	10.331	10.767	6.626	6.777
Kitchener MTS #7 115kV D7F	17.634	18.821	14.420	15.247
Kitchener MTS #7 115kV D9F	14.434	15.319	10.111	10.373
Puslinch DS 115kV B5G	11.524	11.740	7.999	8.113
Puslinch DS 115kV B6G	11.231	11.457	6.033	6.060
Rush MTS 115kV D10	14.858	15.384	11.747	12.152
Rush MTS 115kV D8S	14.656	15.144	11.687	12.074
Wolverton DS 115kV	6.062	6.063	3.992	3.993
Fergus TS 44kV	14.745	14.986	6.948	8.167
Elmira TS 27.6kV	7.111	7.111	7.222	7.222
Galt TS 27.6kV J	12.335	12.712	9.863	11.347
Galt TS 27.6kV Y	12.270	12.641	9.834	11.311
Preston TS 27.6kV J	12.409	13.036	9.791	11.329
Preston TS 27.6kV Q	12.764	13.371	9.940	11.478
Campbell TS 13.8kV BY	17.254	17.617	8.378	9.864
Campbell TS 13.8kV EZ	17.680	18.124	8.445	9.984
Campbell TS 13.8kV JQ	17.238	17.576	8.374	9.846
Cedar TS 13.8kV JQ	16.653	16.653	8.387	8.649
Cedar TS 13.8kV BY	16.498	16.981	7.160	8.269
Cedar TS 13.8kV EZ	16.410	16.856	7.145	8.227
Hanlon TS 13.8kV BY	17.226	17.226	8.461	8.715

Table 4: Fault Levels with CEDAR bus closed
(Future arrangement – 6 breaker ring bus – ultimate design)

Table 4: Fault Levels with Implementation of GATR (Cedar Solid Buses)

Area Customers	Fault Levels (kA)			
	3-phase		Line-to-ground	
	Symmetrical	Asymmetrical	Symmetrical	Asymmetrical
Ameri Steel CTS 230kV	12.008	14.021	10.086	12.071
Burlington TS 230kV	52.661	63.061	44.389	56.608
Cambridge MTS #1 230kV M20D	8.970	10.501	6.387	6.853
Cambridge MTS #2 230kV M21D	10.980	12.821	9.352	11.542
Detweiler TS 230kV	24.729	28.861	24.038	30.493
Kitchener MTS #6 230kV M20	18.547	21.543	16.580	19.036
Kitchener MTS #6 230kV M21	18.516	21.511	16.576	19.037
Kitchener MTS #8 230kV M20	18.031	21.306	14.672	16.821
Kitchener MTS #8 230kV M21	17.942	21.210	14.747	16.959
Kitchener MTS #9 230kV D4W	15.064	17.446	11.625	13.008
Kitchener MTS #9 230kV D5W	15.064	17.446	11.636	13.018
Middleport TS 230kV DK1	47.212	59.370	44.176	57.793
Middleport TS 230kV DK2	42.958	55.142	40.188	54.539
Orangeville TS 230kV	20.170	23.064	21.557	25.746
Scheifele CTS 230kV D6V	17.005	19.336	14.320	16.015
Scheifele CTS 230kV D7V	16.972	19.299	14.306	15.995
Waterloo North CTS 230kV D6V	19.575	22.355	17.503	20.029
Waterloo North CTS 230kV D7V	19.482	22.243	17.410	19.911
Arlen MTS 115kV B5G	15.295	15.666	10.451	10.661
Arlen MTS 115kV B6G	15.293	15.665	10.439	10.648
Burlington TS 115kV	39.374	48.029	43.077	55.044
Detweiler TS 115kV	27.499	31.357	31.192	37.863
Enbridge Westover CTS 115kV North	6.023	6.023	3.824	3.825
Enbridge Westover CTS 115kV South	5.759	5.760	3.666	3.667
Kitchener MTS #1 115kV D11	15.136	15.829	11.783	12.255
Kitchener MTS #1 115kV D12	15.137	15.830	11.783	12.255
Kitchener MTS #3 115kV D7F	16.334	17.355	12.555	13.126
Kitchener MTS #3 115kV D9F	14.573	15.468	10.827	11.207
Kitchener MTS #4 115kV D11	15.212	15.914	11.861	12.340
Kitchener MTS #4 115kV D12	15.213	15.915	11.861	12.340
Kitchener MTS #5 115kV F12	11.846	12.311	8.264	8.549
Kitchener MTS #5 115kV F11	10.582	11.010	7.141	7.325
Kitchener MTS #7 115kV D7F	17.861	19.038	14.521	15.342
Kitchener MTS #7 115kV D9F	14.980	15.849	11.356	11.717
Puslinch DS 115kV B5G	12.789	12.962	8.406	8.501
Puslinch DS 115kV B6G	12.788	12.961	8.400	8.495
Rush MTS 115kV D10	14.865	15.391	11.753	12.158
Rush MTS 115kV D8S	14.663	15.151	11.693	12.080
Wolverton DS 115kV	6.063	6.064	3.993	3.993
Fergus TS 44kV	14.746	14.987	6.948	8.167
Elmira TS 27.6kV	7.111	7.111	7.222	7.222
Galt TS 27.6kV J	12.338	12.714	9.864	11.349
Galt TS 27.6kV Y	12.272	12.644	9.835	11.312
Preston TS 27.6kV J	12.412	13.039	9.793	11.330
Preston TS 27.6kV Q	12.768	13.375	9.942	11.480
Campbell TS 13.8kV BY	17.254	17.618	8.378	9.864
Campbell TS 13.8kV EZ	17.681	18.125	8.445	9.984
Campbell TS 13.8kV JQ	17.238	17.577	8.374	9.847
Cedar TS 13.8kV JQ	16.654	16.654	8.387	8.649
Cedar TS 13.8kV BY	16.501	16.994	7.160	8.273
Cedar TS 13.8kV EZ	16.412	16.867	7.145	8.230
Hanlon TS 13.8kV BY	17.228	17.228	8.462	8.716

Notes

1. Pre-fault voltages of 250 kV at 230 kV stations and 29 kV at 27.6 kV stations are assumed.
2. A breaker contact parting time of 25ms was assumed for asymmetrical current calculation for 230kV breakers and a contact parting time of 30ms was assumed for asymmetrical current calculation for 27.6kV breakers.
3. 2 units at Lambton GS, 6 units at Nanticoke, latest FIT project additions and all 5 phases of Samsung projects were considered.

4.2 Observations

Results show that fault levels are within maximum symmetrical three-phase and single line-to-ground faults (kA) of 230 kV, 115kV, 27.6 kV and 13.8 kV systems for all equipment connected to Hydro One transmission system as set out in Appendix 2 of the TSC when the Cedar 115kV bus is split or closed.

The largest changes observed were found to be at Arlen MTS, 8.4 kA, Cedar TS, 3.5 kA and Hanlon TS 3.3 kA. As noted above, the magnitude of these changes are acceptable.

The maximum symmetrical three-phase and single line-to-ground faults given for those voltages in the TSC may be summarized as follows:

Nominal Voltage (kV)	***Max. 3-Phase Fault (kA)***	***Max. SLG Fault (kA)***
230	63	80 (usually limited to 63 kA)
115	50	50
44	20	19 (usually limited to 8 kA)
27.6	17	12 (4 wire)/ 0.45 (3 wire)
13.8	21	10

5.0 Conclusions and Recommendations

This CIA report presents results of incorporating the transmission facilities planned for meeting the reliability needs of the Kitchener-Waterloo-Cambridge-Guelph Area in the near- and medium-terms. In particular, the results of short-circuit analyses have been presented.

Short-circuit studies were carried out to determine the new projected fault levels at customer transmission connection points. The short-circuit levels observed at connection points are within the requirements of the Transmission System Code.

It is recommended that the customers review the impact of the short-circuit change on their facilities and take appropriate and timely action to address any safety/technical issues arising out of these changes which will result following incorporation of the transmission facilities in the Fall of 2015.

STAKEHOLDER AND COMMUNITY CONSULTATION

1.0 INTRODUCTION

Hydro One identified and consulted with affected property owners and stakeholders who may have an interest in the proposed transmission refurbishment project. This exhibit describes Hydro One's consultation process, input received and the results to date. The Class EA and consultation for this project were initiated in 2009. In March 2012, the OPA advised Hydro One that the regional planning study had advanced sufficiently to confirm the need and scope of the Guelph Area Transmission Refurbishment Project (**"GATR"**). The majority of this exhibit and its appendices focus on the consultation undertaken after the Class EA process recommenced in spring 2012.

Hydro One's practice is to continue communication with property owners, residents and local officials in the project area through to project completion, in an effort to ensure any questions or concerns during the design and construction phase are adequately addressed. Hydro One has also committed to keeping municipal and county officials and government agency representatives informed of the Project's status, as well as individuals who have asked to be on the project contact list.

Hydro One carried out a parallel engagement process with neighbouring First Nations communities as described in **Exhibit B, Tab 6, Schedule 6**.

2.0 PUBLIC CONSULTATION OBJECTIVES AND APPROACH

The intent of the public consultation process is to identify and inform affected and potentially-affected property owners, stakeholders, government agencies and ministries, and members of the general public about the project and to provide opportunities for all parties to ask questions and provide their feedback. The consultation process is initiated as early as possible to allow for the identification of potential issues. Hydro One will attempt to address and resolve all issues in order to complete the Class EA process and prior to the formal OEB review and public hearing process.

Several fundamental principles underpin Hydro One's approach to communication and consultation, including: early, ongoing and timely communications; clear and complete project information and documentation; open, transparent, and flexible communications and consultation processes; and respectful dialogue with all stakeholders.

Hydro One uses a variety of methods to communicate with identified stakeholders about a proposed undertaking and to establish the opportunity for two-way communication. For this project, communications vehicles included: newspaper advertisements; correspondence and in some cases also meetings with key stakeholders; Canada Post ad mail or direct mail notices to directly-affected property owners and those in close proximity to the facilities Hydro One is proposing to refurbish; the establishment of a project website (www.HydroOne.com/projects) and a designated contact person for ongoing communication; a series of public information centres ("**PICs**") – two in 2009 and two in 2012 upon r ecommencement of the Class EA – to speak directly with interested and/or affected parties; and one community information meeting in 2012 t o discuss issues of interest and concern to residents in a particular neighbourhood. The activities and outcomes of the consultation process are described in the following sections.

All issues identified during the consultation process are given full and fair consideration, and Hydro One will develop project plans to address them, where appropriate. A summary of the key issues raised and how Hydro One addressed them is provided in Section 5 of this exhibit.

3.0 CONTACT WITH STAKEHOLDERS AND THE PUBLIC

The OPA actively supported Hydro One in communicating information relative to the need for the project. OPA staff accompanied members of Hydro One's project team to meetings with municipal officials, and attended the PICs and the community information meeting.

Guelph Hydro Inc. (**"Guelph Hydro"**) supports the project and sent representatives to all meetings with the City of Guelph officials and all public consultation events held within the city. Guelph Hydro also assisted Hydro One with property owner notification for the Notice of Recommencement mailing in May 2012. Ongoing communication between Hydro One and Guelph Hydro ensured that Guelph Hydro's leadership team and employees were briefed on the project status and aware of all communications being sent to their customers and City officials. Letters of support from Guelph Hydro and the other LDCs serving the Kitchener-Waterloo-Cambridge-Guelph are attached in **Exhibit B, Tab 6, Schedule 2**.

3.1 Municipal and County Officials

Prior to notifying property owners, stakeholders and the public and before advertising for the Public Information Centres, Hydro One contacted the Clerk or Chief Administrative Officer of the County of Wellington, the Township of Centre Wellington and the City of Guelph by telephone to arrange for project information to be circulated in advance to Council. Hydro One, in its June 2012 communications, invited members of council and staff to the planned PICs and also offered to make a deputation on the project. Hydro One also communicated directly with City of Guelph councillors whose Wards fall within the project area and offered to brief them and their staff. Please see **Exhibit B, Tab 6,**

Schedule 5, Attachment 1 for examples of the correspondence sent to municipal and county officials in 2012 upon resumption of the Class EA process for this project (June 5), Notice of Completion of draft ESR (August 8) and Notice of Completion of Class EA (November 8, 2012).

Meetings were held in May 2012 with elected officials and senior staff from the Township of Centre Wellington and the County Councillor representing the Guelph North Junction area, and also with City of Guelph staff representing a range of departments. A letter of support for the project from Chief Administrative Officer Pappert, City of Guelph is attached in **Exhibit B, Tab 6, Schedule 2, Attachment 3.**

3.2 Members of Provincial Parliament ("MPPs") and Members of Parliament ("MPs")

The project area falls within the provincial and federal ridings of Guelph and Wellington – Halton Hills. The MPPs and MPs for these ridings were notified in advance of all public communications about the project and invited to the public information centres. Hydro One also offered to brief the MPPs and MPs and their constituency staff at key stages of the project. Hydro One sent correspondence to MPPs and MPs in 2012 similar to those in Attachment 1 above.

3.3 Government Ministries and Agencies

Prior to introducing the project to local stakeholders and members of the public in 2009, and prior to recommencing work on the Class EA in 2012, Hydro One informed and sought input on the proposed undertaking from a broad range of provincial government ministries and agencies, federal departments, and the Grand River Conservation Authority. The government agencies were kept informed of project status throughout the consultation process and made aware of public and stakeholder consultation events. The government agency list can be found in the appendices of the final Environmental Study Report (**"ESR"**) for this project, posted on the project website at www.HydroOne.com/projects. Similar correspondence letters, as provided in Attachment 1, were also sent to government agencies in 2012.

3.4 Community Stakeholders

Hydro One identified and provided project information to several local interest groups, including Chambers of Commerce, agricultural associations, and nature/naturalist groups, etc. Theses stakeholders were invited to participate in public consultation events and to provide input on the proposed undertaking and on the draft ESR for the project. The stakeholder list can be found in the appendices of the final ESR for this project, posted on the project website at www.HydroOne.com/projects.

4.0 PUBLIC INFORMATION CENTRES

4.1 Schedule and Notification

Hydro One held a total of four public information centres. The first two PICs were held in 2009: the first one on June 10 at the First Christian Reformed Church in Guelph, and the second one on November 25 at the Marden Community Centre, northwest of Guelph. These initial PICs served to introduce the proposed undertaking to residents who live in the project study area and to give them an opportunity to speak with and provide comments to members of Hydro One's project team and representatives from the OPA.

Hydro One used various methods to notify the local community and stakeholders about the project and the PICs, including Canada Post unaddressed ad mail, flyers, direct mail and newspaper ads. A Notice of Commencement newspaper advertisement and invitation to PIC #1 was placed in the *Guelph Mercury* on May 29 and June 5, 2009, and in the *Guelph Tribune* on May 29 and June 2, 2009. For PIC #2, a newspaper advertisement was placed on November 13 and 20, 2009, in the *Guelph Mercury*, the *Guelph Tribune* and the *Wellington Advertiser*.

The newspaper ad contained details about the proposed undertaking and included a map of the project study area. It also identified a Hydro One contact name and contact information and a link to Hydro One's website where more information about the project could be obtained. A copy of the newspaper ad was provided in advance to municipal officials, MPPs and MPs so they would be prepared to handle any questions they might receive from their constituents. In addition, property owners within the identified study area were notified of the project and of the public information centres by way of a flyer sent by Canada Post unaddressed ad mail.

When Hydro One resumed the Class EA process in 2012, two more PICs were scheduled to reintroduce the project to local stakeholders. PIC #3 was held on June 14, 2012, at the First Christian Reformed Church in Guelph, which is located close to Cedar TS. PIC #4 was held on June 19, 2012, at the Ponsonby Public School which is in the vicinity of Hydro One's Guelph North Junction.

Hydro One used various methods to advise the local community and stakeholders about the recommencement of the project and the planned PICs including direct addressed mail to all properties (about 1,000 in total) within 150 metres of the facilities to be upgraded in the City of Guelph. This list of premise addresses only (names withheld) was provided by Guelph Hydro. Hydro One Real Estate also provided names and addresses for a direct mailing to owners of properties immediately adjacent to the transmission corridor along Deerpath Drive in Guelph, and those properties on Bronwyn Court in Guelph, on which

Hydro One has easement rights. Hydro One Real Estate also provided current property owner information for about 25 properties within 500 metres of the Guelph North Junction so that these owners could be directly notified about the recommencement of the study. A copy of the post card notice and PIC invitation mailed to these property owners / occupants is attached as **Exhibit B, Tab 6, Schedule 5, Attachment 2**.

For broad public notification, a Notice of Recommencement newspaper advertisement and invitation to PICs #3 and #4 was placed in the *Guelph Mercury* on June 7, 2012, the *Guelph Tribune* on June 12 and 14, 2012, and the *Wellington Advertiser* on June 15, 2012. A copy of the Notice of recommencement newspaper advertisement is attached as **Exhibit B, Tab 6, Schedule 5, Attachment 3**.

4.2 Public Information Centre Format

The PICs were held in an open house format where visitors could drop in anytime between 5 p.m. and 8 p.m. After signing in at the registration desk, visitors were provided with handouts of the display panels and a comment form on which they could record their feedback both on the project in general and on the PIC. Handouts on EMFs and energy conservation were also available. Hydro One and OPA employees representing various disciplines were on hand to speak one-on-one with visitors about the proposed project and to answer their questions.

Hydro One's experience with the open house format over the years is that it provides an effective way for visitors to gain a better understanding of the project being proposed, while giving them the opportunity to freely and informally express their views and to direct any questions to the appropriate technical or subject-matter expert.

Hydro One had table-sized aerial photographs of the project study area which allowed property owners to see their properties in relation to the facilities that Hydro One is proposing to upgrade. Information panels were also displayed around the room explaining the need for the project, what it would entail, the regulatory approvals process, the project schedule, and information about electric and magnetic fields. A copy of the display panels and a sample comment form used at PICs #3 and #4 in June 2012 are filed as **Exhibit B, Tab 6, Schedule 5, Attachments 4 and 5**.

4.3 PIC Attendance and Summary of Feedback

Twenty-seven people attended PIC #1 in Guelph on June 10, 2009, including one City of Guelph councillor. Five comments forms were completed. Twenty people attended PIC #2 in Marden on November 25, 2009, and one comment form was completed. The written comments together with those expressed verbally by visitors indicated no significant issues with the proposed undertaking, only a few minor concerns.

Fifty people attended PIC #3 in Guelph on June 14, 2012, including one City of Guelph Councillor representing Ward 4. Eight comment forms were received. Eighty per cent of the respondents said they found the information, displays and maps helpful in explaining the project and that Hydro One and OPA representatives were able to adequately answer their questions. Thirteen people attended PIC #4 on June 19, 2012 in Ponsonby, including one Township of Centre Wellington Councillor. About half of the attendees in Ponsonby were residents from the Deerpath Drive neighbourhood who had attended PIC#3 the week earlier. No comment forms were completed at the Ponsonby PIC.

The majority of the comments and concerns expressed on the comment forms and verbally to members of the project team related to the transmission line portion of the proposed undertaking within the City of Guelph, specifically in the vicinity of Deerpath

Drive (located in Ward 4). Common concerns included: the visual appearance of the proposed 230 kV transmission line and its taller structures; the proposed location of the 230 kV transmission structure(s) closer to the curb along Deerpath Drive; the perceived impact the project could have on residential property values; a concern about potential health effects from electric and magnetic fields. There were requests from several members of this community for Hydro One to consider other routing options, including moving the transmission line closer to the Hanlon Pkwy or burying the transmission line. These options and Hydro One's evaluation of them are addressed in greater detail in Section 4.4 below.

There were also several comments about the untidiness of the right-of-way and the vacant lot along Deerpath Drive. Hydro One advised residents that this vacant lot is privately owned and that Hydro One has easement rights allowing its facilities to occupy a portion of the property. The residents subsequently addressed their issues with the property owner and the local Councillor in attendance at the PIC.

4.4 Guelph Ward 4 Community Information Meeting

Because of the specific concerns expressed at the PICs on June 14 and June 19, 2012, by residents who live in the Deerpath Drive neighbourhood, and their request for more detailed information specific to the proposed transmission line upgrade, Hydro One organized a Community Information Meeting. The meeting was held at Guelph's West End Community Centre on June 27, 2012, from 6:30 p.m. – 8:30 p.m. Notification for the meeting was done by email to Ward 4 residents who had left their contact information at one of the PICs a few weeks earlier. One of the City's Ward 4 councillors also assisted in notifying residents about the meeting.

The format for the community information meeting was a PIC-style open house between 6:30 p.m. and 7:00 p.m., allowing visitors who had not previously attended one of the PICs to view the display panels and to sign in. Representatives from Hydro One's project team and a representative from the OPA were available to speak informally with residents and answer their questions. Hydro One provided handouts including information on electric and magnetic fields and comment forms, on which visitors were asked to indicate their transmission structure preference, whether steel pole or conventional lattice steel tower. A copy of the comment form for the June 27 community information meeting is attached as **Exhibit B, Tab 6, Schedule 5, Attachment 6**.

At 7:00 p.m., Hydro One delivered a formal PowerPoint presentation in a theatre-style setting, focusing on the details of the proposed undertaking in this specific community and acknowledging and addressing the concerns several residents had expressed at PICs a few weeks earlier. An independent consultant was engaged by Hydro One to facilitate the meeting in order to make best use of the available meeting time and to ensure that all participants had the opportunity to ask questions and express their views. The consultant also provided a dedicated note-taker. The consultant's meeting summary notes are attached as **Exhibit B, Tab 6, Schedule 5, Attachment 7**. A copy of Hydro One's flyer for the community information meeting and its PowerPoint presentation are appended to the meeting summary notes.

About 50 people attended the community information meeting including one of the City of Guelph's Ward 4 councillors, the Director of Land Development for Armel Corporation, the owner for the vacant lot on Deerpath Drive, and two lead spokespersons for the Guelph Wellington West Residents Association. Only two comment forms were filled out. Both indicated that the facilitator was effective in conducting the meeting and providing everyone with the opportunity to speak. One respondent stated a preference for steel poles over conventional lattice steel transmission structures, while the other stated no preference.

Several residents and the spokespersons for the Guelph Wellington West Residents Association reiterated their desire for Hydro One to investigate options. In the weeks and months following the community information meeting, Hydro One investigated the feasibility, estimated cost and potential environmental / social impacts of the following options:

1) *The undertaking as proposed* - A double circuit 230 kV line utilizing steel pole suspension structures (120'-130' tall) on an existing 110' wide corridor easement and located at the centreline of the corridor, meaning the new structures would be 25' closer to the curb along Deerpath Drive than the existing twin wood pole structures.
2) *Expanding the existing transmission corridor width by 30'* – This would allow the new 230 kV steel poles suspension structures to be located the same distance from the curb along Deerpath Drive as the existing twin wood pole structures. Additional easement rights would have to be obtained from the developer.
3) *Moving the transmission corridor to the back of the developer's property with no overlap on other properties* - This option would necessitate the use of a double steel pole structure at each of the two turning points where the line would have to deviate from the existing easement, an anchor lattice tower (a heavier steel construction than a suspension lattice tower) at the intermediate turning point at the back of the property and a narrow base lattice suspension tower adjacent to Hanlon Parkway. Hydro One would require a 'like-for-like' easement swap with the developer.
4) *Moving the transmission corridor to the back of the developer's property with overlap on other properties* - This option would necessitate the use of the same structures outlined in Option #3. Hydro One would require a 'like-for-like' easement swap with the developer and would have to negotiate easement rights with one or

more of the property owners adjacent to the developer's property, which include the City of Guelph, the Ministry of Transportation (**"MTO"**), and CN Rail.

5) *Burying the new transmission line on the existing corridor* - This option would consist of double circuit 230 kV underground transmission cables placed within the existing corridor easements and within the road allowance where it forms part of the corridor. At the termination points, where the underground section cables would revert to overhead transmission lines, a cable junction would be required. Each junction would need a lattice steel anchor tower, six lattice tapping towers, six pothead structures and six surge arrestor structures within a fenced area. For system security, cable junctions must also be on Hydro One-owned property, not on an easement.

The above options were explained in detail in the draft ESR which was issued for public review and comment on August 9, 2012 and is posted on www.HydroOne.com/projects. Burying the transmission line was dismissed by Hydro One as it does not conform to standard Company practice or policy. Burying the line would also have significant visual effect for residents who live close to the required cable junctions, and a very high incremental cost of approximately $9 million (including property acquisition costs for the cable junction sites) compared to the proposed undertaking.

Options #2 and #3 were unacceptable to the developer. A meeting was convened on September 11, 2012 between representatives of Hydro One, City of Guelph Real Estate Department, Armel Corporation and one of the City councillors representing Ward 4 to review Option #4. Ultimately, this option was ruled out as unacceptable to Hydro One because permanent easement rights cannot be obtained from either CN Rail or the MTO.

An update on the outcome of Hydro One's investigation of the various routing options suggested by the community was subsequently emailed on September 21, 2012, to local municipal elected officials and the local MPP, City of Guelph staff, Armel Corporation, and the lead representatives of the Guelph Wellington West Residents' Association. The update was also hand delivered in flyer format to approximately 125 households in the Deerpath Drive neighbourhood. A copy of the flyer is attached as **Exhibit B, Tab 6, Schedule 5, Attachment 8**. A copy of the Notice of completion advertisement, originally published in local newspapers on August 9 and 10, 2012, was also distributed with the flyer to remind interested parties of the process and timelines for submitting comments on the draft ESR. The Notice of completion is attached as **Exhibit B, Tab 6, Schedule 5, Attachment 9**.

4.5 Comments on the Draft Environmental Study Report

This project was planned in accordance with the *Class Environmental Assessment for Minor Transmission Facilities,* approved under the *Environmental Assessment Act.* Consistent with the Class EA process, Hydro One prepared a draft ESR. It was issued for a 60-day public review and comment period beginning August 9, 2012, and ending Tuesday, October 9, 2012.

As noted above, a Notice of Completion advertisement was placed in the *Guelph Mercury* and *Guelph Tribune* on August 9, 2012, and the *Wellington Advertiser* on August 10, 2012. The Notice advises interested parties that the draft ESR can be downloaded or viewed on Hydro One's website, and that hard copies of the document are available at three public locations noted in the advertisement. The Notice also provides information on the process and timelines for interested parties to submit comments on the draft ESR and the rights of individuals to submit a Part II Order to the Minister of the Environment requesting that the project be subjected to a higher level of assessment (an individual Environmental Assessment). An advance copy of the Notice of completion was emailed to all key stakeholders, including municipal leaders, MPPs, MPS and municipal staff and interest groups. All individuals on Hydro One's project contact list received a copy of the Notice of completion either by email or mail.

Hydro One received three submissions on the draft ESR: one from the City of Guelph's Parks and Recreation Department, one from the City of Guelph's Planning, Building, Engineering and Environment departments, and one from the Guelph Wellington West Residents Association. No Part II Order requests were received. The Residents Association sought confirmation that Hydro One had discussed Option #3 ("Moving the transmission line to the back of the developer's property with no overlap on other property") with Armel Corporation and requested additional information on the rationale for this option being discarded. The Residents Association also formally indicated its preference for single steel pole structures in their neighborhood which is consistent with the submission of the City of Guelph's Planning Department. Key elements of the City's submissions are summarized in the table in the following section.

Hydro One documented comments received on the draft ESR into the final ESR which was filed with the Ministry of the Environment on October 30, 2012, and is posted on www.HydroOne.com. The final ESR also documents the outcome of the investigation into the transmission line routing options proposed by residents who live in the Deerpath Drive area.

5.0 SUMMARY OF KEY ISSUES AND HYDRO ONE RESPONSES

The following is a list of the main issues expressed during Hydro One's consultation process and the company's response or proposed method to address or mitigate the issue.

1

FROM GOVERNMENT AGENCIES AND MUNICIPALITIES		
Issue/Comment	**Description**	**Hydro One Response / Action**
Crossing of navigable waterways	Transport Canada noted that permits are required if construction activities will cross navigable waters (i.e. Speed River).	The line section which crosses the Speed River (CGE Jct to Cedar TS) is already built to operate at 230 kV with existing 230 kV towers and conductors and therefore is not being rebuilt. The grounding conductor (skywire) is to be replaced with Optic Ground Wire. A permit under the *Navigable Waters Protection Act* will be obtained and adhered to.
Work near the Hanlon Pkwy	The Ministry of Transportation (**"MTO"**) advised that encroachment permits would be required, and also stressed the need for coordination on any planned future upgrades.	Hydro One has worked closely with the MTO and will continue to share plans and seek appropriate permits during all stages of the project.
Speed River Wetland Complex	The Ministry of Natural Resources (**"MNR"**) identified that the Speed River Wetland Complex, located near the CGE Jct and within the project study area, is provincially significant. MNR also requested that a biological inventory be conducted.	Hydro One will ensure protection of the adjacent wetland features during any work in the CGE Jct area. A biological inventory was conducted in fall 2008/early winter 2009 to collect baseline environmental information for this project.
Secondary land use on transmission corridor	The City of Guelph Parks and Recreation Department noted its interest in opportunities for utilizing the transmission corridor for trails and community gardens. It was also recommended that Hydro One continue discourse with City and County staff to ensure wherever possible minimal	Secondary land use on provincially-owned transmission corridor lands that is compatible with Hydro One's operational requirements can be considered under license to external parties. Since each use is evaluated on its own merits, the City was provided with the contact information for Hydro One's Real Estate representative to discuss future plans. Hydro One met with City Parks & Recreation staff in September 2012 to discuss the trails and transmission refurbishment project. Further consultation will occur during the design stage of the project.

	impact and maximum accommodation of existing and proposed trail systems in both the City of Guelph and within the County of Wellington.	
Noise and visual impact at Cedar TS	City of Guelph Planning staff recommended noise and visual mitigation at Cedar TS where feasible	Environmental compliance approval for noise will be required from the Ministry of the Environment (MOE) and Hydro One will comply with all noise mitigation requirements. Since landscaping on the north side of Cedar TS would be difficult due to the proximity to private property, consideration will be given to plantings on the east side of the station along Edinburgh Road South.
Transmission structure type and preference	City of Guelph Planning staff recommended Hydro One utilize steel poles instead of lattice steel towers in areas currently residential and also in "intensification" areas (intended for mixed use including residential within a 20-year planning horizon). The West Wellington Residents' Association and a few individuals in the Deerpath Drive community also expressed their preference for steel poles.	Hydro One's practice is to consider the use of steel poles instead of lattice steel towers in areas that are currently residential. Hydro One is proposing to install steel poles in current residential areas, i.e. both the Deerpath Drive community and adjacent to other residential communities along the Hanlon Parkway. As such, steel poles are recommended for that section of the transmission corridor extending from the railway just north of the Speed River to just south of Willow Road.
Natural heritage features	City of Guelph Planning staff recommended expansion of Section 3 of the ESR to recognize natural heritage features on the transmission corridor between CGE Jct and Cedar TS and potential impacts of the project on them and possible mitigation.	Hydro One clarified in Section 3 of the ESR that the approximately 1.5 km line section from CGE Jct to Cedar TS is already built to operate at 230 kV (with existing 230 kV towers and conductors); hence this section of the line will not require removal or rebuilding. In association with this project and to facilitate telecommunication capability, one sky wire on this line section is to be replaced with Optical Ground Wire (**"OPGW"**). However, this work is minimal and is not subject to Class EA approval.

1

FROM INTERESTED INDIVIDUALS AND GROUPS		
Issue/Comment	**Description**	**Hydro One Response / Action**
Opportunities for public input	During the consultation process, several residents from the Deerpath Drive neighbourhood wanted to know how their issues and concerns would be considered in the decision-making process for this project.	The Class EA process provides opportunities for on-going input whether through conversations and comment forms at public information centres or community meetings, or contact with Hydro One's project team via the toll-free Community Relations telephone line, email box or fax number. Residents were advised that formal written submissions would also be received by Hydro One during the public review and comment period for the draft Environmental Study Report between August 9 and October 9, 2012. The Company would make best efforts to resolve any outstanding concerns during that period. Concerned parties may also submit a written request (Part II Order) prior to the end of the public review and comment period for the draft ESR asking the Minister of the Environment to subject the Class EA project to a higher level of assessment (an individual EA). There are also formal opportunities for interested parties to participate in the Ontario Energy Board's public hearing on Hydro One's "Leave to Construct" application.
Electric & Magnetic Fields (EMFs)	Several residents from the Deerpath Drive neighbourhood expressed concern that upgrading the transmission line from 115 kV to 230 kV would increase their exposure to EMFs and be harmful to their health.	Hydro One expects the EMF levels along the transmission corridor will be similar to those found along any similar 230 kV corridor in Ontario. For more than 30 years, research studies have examined questions about EMF and health. Health agencies and a large number of reputable scientific organizations around the world have concluded that scientific research does not demonstrate that EMFs cause or contribute to adverse health effects. However, some scientific questions remain and are the subject to ongoing research. Hydro One looks to the expertise of organizations such as Health Canada and the

		World Health Organization to assess the body of scientific research on this subject and to provide advice and guidance regarding public policy. At present, it is Health Canada's position that: "(*the public) does not need to take action regarding daily exposures to electric and magnetic fields at extremely low frequencies. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those located just outside the boundaries of power line corridors.*" [Health Canada's Fact Sheet, It's Your Health: Electric and Magnetic Fields at Extremely Low Frequencies (2010).] The Federal-Provincial-Territorial Radiation Protection Committee -- Canada is of the opinion that: *"there is insufficient scientific evidence showing exposure to EMFs from power lines can cause adverse health effects such as cancer. Therefore, a warning to the public to avoid living near or spending time in proximity to power lines is not required."* [Response Statement to Public Concerns Regarding Electric and Magnetic Fields (EMFs) from Electrical Power Transmission and Distribution Lines, November 8, 2008] Hydro One makes information about EMFs available to the public at consultation events and provides links to information published by expert agencies on the EMF page at www.HydroOne.com.
Property Values	Several residents from the Deerpath Drive neighbourhood expressed concern that upgrading the existing transmission line might have a detrimental effect on their property values.	Hydro One does not believe there is a material, sustained impact on the value of adjacent or nearby properties when a transmission line is being upgraded. Based on Hydro One's experience, any impact on property value would typically be evident during the project construction period, with any impacts decreasing over time following project completion. Given that Hydro One's existing transmission

	A few individuals wanted to know if they would be compensated by Hydro One for any potential impacts on property values.	line has been in this community since the 1950s and that development has subsequently been approved in the area, any impact on the value of properties adjacent to or near the existing transmission line should have been factored into the selling price of these properties. It is Hydro One's practice to pay compensation to owners of properties from which Hydro One requires property or property rights to build its project. This is consistent with the practice of similar utilities or agencies that are building infrastructure such as gas pipelines or highways. No additional property rights are required for the project with the possible exception of temporary access rights for construction on the transmission line. Hydro One will pay for these temporary rights through negotiated agreements with affected property owners.
Tidiness of the vacant lot on Deerpath Drive	Residents who live in this community noted at Public Information Centre #3 held in June 2012 that there has been a lot of dumping on the property and would like to see it cleaned up.	Hydro One has easement rights for its transmission line on this property but does not own the property. As such, residents raised the issue with the property owner and their local Councillor.
Burying the transmission line	Several residents from the Deerpath Drive neighbourhood asked Hydro One to consider burying the line to eliminate visual impact, EMFs, and perceived impacts on property values.	Hydro One's policy is to build high-voltage lines above ground. Generally, transmission lines are buried only if there is a technical or space constraint that would prevent overhead construction. The cost of burying transmission lines is prohibitive, often five to seven times more than overhead construction. This would place a heavy burden on project costs and thus on Ontario's electricity ratepayers, if Hydro One's project funding proposal is approved by the Ontario Energy Board. It should be noted that burying the transmission line would not totally eliminate EMFs.
Visual appearance of the	Several residents from the Deerpath Drive	The existing five 115 kV twin wood pole structures along the Deerpath Drive section of

proposed 230 kV transmission line	neighbourhood expressed concern about the visual change taller transmission structures would have on their community and enjoyment of their properties.	the transmission corridor range in height from 18 m-24 m (60 ft-80 ft.) depending on topography of the individual location. The Guelph Wellington West Residents' Association and individuals in this community indicated their preference for steel poles instead of conventional lattice steel structures. Because the 230 kV structures are taller, the spans between them can be longer. As such, Hydro One would be able to replace the existing five twin wood pole structures with fewer steel poles, thus reducing somewhat the visual appearance of the proposed facility. It is anticipated that there would only need to be one structure along the corridor adjacent to Deerpath Drive. Hydro One would attempt to locate this structure so that it is not directly in front of anyone's property.
Location of the existing transmission corridor	Several residents in the Deerpath Drive area expressed concern that the new 230 kV transmission structures would be moved closer to the curb along Deerpath Drive. It was suggested that Hydro One explore moving the transmission line and corridor closer to the Hanlon Pkwy.	Hydro One's existing easement along this section of the transmission corridor is 34 m (110 ft.) wide with the structures located approximately 8 m (25 ft.) east of centre. This width can accommodate a 230 kV transmission line; however, to maintain adequate clearance for the conductor (wires) from the eastern edge of the corridor, Hydro One would locate the new 230 kV structure along Deerpath Drive about 8 m (25 ft.) closer to the centre, and therefore closer to the curb. Hydro One committed to exploring options to relocate the transmission line and corridor closer to the Hanlon Pkwy. However, as described in Section 4.5.4 of the final Environmental Study Report (posted at www.HydroOne.com/projects), it was determined that no other options were feasible or acceptable.
Structural stability of the transmission structures	One resident expressed concern that severe weather, such as the 1998 Ice Storm, could cause transmission structures to fail and that this would not be an acceptable risk in a residential neighbourhood.	Hydro One's transmission towers are designed in accordance with Canadian Standards Association (**"CSA"**) standards to withstand severe weather conditions such as high winds and ice accumulation on conductors. In many cases, Hydro One's design criteria exceed CSA requirements. Should extreme weather conditions prevail, transmission towers are

		designed to buckle or crumple in the direction of the right-of-way. The tension of the conductors (wires) pulling between towers also ensures they will buckle in the direction of the right-of-way, and not fall like a tree being cut at its base. Therefore, one cannot conclude that a tower that is as tall or taller than half of the right-of-way width presents a hazard to structures adjacent to the transmission corridor. It is extremely rare for transmission towers to fail. During more than 100 years of running Ontario's transmission system, a Hydro One (or Ontario Hydro) tower has never failed and struck an adjacent home or building. There has never been a failure of a steel pole transmission structure, such as the ones Hydro One is proposing to use in the residential areas for this project. It is true that a number of older transmission towers in eastern Ontario did buckle during the Ice Storm which affected significant portions of Eastern Canada and the Northeastern United States from January 4-10, 1998. Environment Canada, in a post-storm report, described this storm as unparalleled in its duration, scope, and overall severity, noting that the amount of precipitation that physically became ice adhering to surfaces of objects at ground level was unprecedented, and has not been experienced in periods reaching more than hundreds of years.
Width of the existing transmission corridor	Several residents were aware that Hydro One had inquired with the landowner/developer to increase the width of the existing easement, and wondered if the corridor is wide enough for a 230 kV transmission line.	Corridor widths for 230 kV transmission lines vary across the province from as little as 20 m (66 ft.) to more than 37 m (120 ft.). Ideally Hydro One would have liked to obtain additional easement rights from the landowner/developer to expand the width of the existing right-of-way so that the new 230 kV centre line could remain the same distance from the outer curb on Deerpath Drive. However, this option was not acceptable to the landowner/developer.

Attachment 1

- Letter to Mayor Farbridge
- Guelph Area Transmission Map
- Sample Letter to Municipal Leaders Regarding EA Comment Period
- Sample Letter to Municipal Leaders Regarding Completion of EA

Hydro One Networks Inc.
Community Relations
483 Bay St., 8th Fl. South Tower
Toronto, ON M5G 2P5

Tel: 1-877-345–6799
Fax : 416-345-6984

Community.Relations@HydroOne.com

www.HydroOne.com /projects

June 5, 2012

Mayor Karen Farbridge
and Members of Council
City of Guelph
1 Carden Street
Guelph, ON N1H 3A1

VIA EMAIL

Dear Mayor Farbridge and Council:

Guelph Area Transmission Refurbishment Project:
Recommencement of Class Environmental Assessment

In 2009, Hydro One Networks Inc. (Hydro One) began a Class Environmental Assessment (EA) process and held two initial public information centres for a project that would refurbish parts of the aging high-voltage electricity infrastructure serving Guelph and the surrounding area. The Class EA process was put on hold in 2010 when an initiative was launched to develop a broader regional plan for the Kitchener-Waterloo-Cambridge-Guelph area.

The regional plan is being conducted by the Ontario Power Authority (OPA) along with a working group made up of local utility partners, including Guelph Hydro. The plan has advanced sufficiently to confirm the need for the Guelph Area Transmission Refurbishment Project. The OPA has recommended that the project include the following refurbishments to ensure an adequate and reliable supply of electricity for customers in this area:

- Installation of two new auto-transformers within the existing fenced area at Cedar Transformer Station (TS), 255 Edinburgh Road South, Guelph (Ward 5);
- Upgrading five kilometres of an existing transmission line from 115 to 230 kilovolts, between CGE Junction near Wellington Avenue West and Hanlon Pkwy and Campbell TS, 460 Edinburgh Road North, Guelph (Wards 3 and 4); and
- Upgrading the existing Guelph North Junction in the Township of Centre Wellington to a switching station by installing new facilities and fencing on Hydro One owned property.

The attached map outlines the project study area and the location of these facilities.

The Class EA is being carried out in accordance with the process described in the *Class EA for Minor Transmission Facilities*. The transmission line upgrade portion of the project must also obtain Section 92 "Leave to Construct" approval from the Ontario Energy Board (OEB). Contingent on obtaining these approvals, construction could begin in mid-2013, with the new facilities in service by the end of 2015.

Public involvement is a key part of the Class EA process and also the OEB's public hearing process. Hydro One is hosting two public information centres (PICs) to discuss the proposed project components with local residents, groups and businesses and seek their input. The PICs are on:

Thursday June 14, 2012
First Christian Reformed Church
5:30 p.m. to 8:30 p.m.
287 Water Street, Guelph

Tuesday June 19, 2012
Ponsonby Public School
5:30 p.m. to 8:30 p.m.
5923 Wellington Road 7, near Sideroad 14

The PICs will be advertised in the *Guelph Mercury*, *Guelph Tribune* and *Wellington Advertiser* beginning on June 7. I have attached a copy of the newspaper ad for your information. In addition, all owners/ occupants within 150 metres of the facilities to be refurbished in Guelph are being notified directly.

Following the PICs, Hydro One will make a draft Environmental Study Report available on our website at www.HydroOne.com/projects and at public locations for review. Details on how members of the community and interested parties may comment on the draft report will be advertised in local newspapers, and will be communicated directly to all individuals and groups on our project contact list.

On May 31, representatives from the OPA, Hydro One and Guelph Hydro met with senior staff at the City to discuss the project and lay the foundation for communication during project design, development and construction. We have also offered a briefing for Councillors representing Wards 3, 4 and 5, as our project activities would be concentrated in these parts of the City.

Hydro One will keep Council and City staff informed of the status of consultations with the community and with our progress in completing the Class EA process and submission to the Ontario Energy Board. We will also work closely with staff and citizens who live and work in the project area to minimize potential project effects on the environment and construction-related disturbances.

If you have any questions about the project, or receive inquiries from residents or business owners, please feel free to refer them to Hydro One's toll-free Community Relations line at 1-877-345-6799.

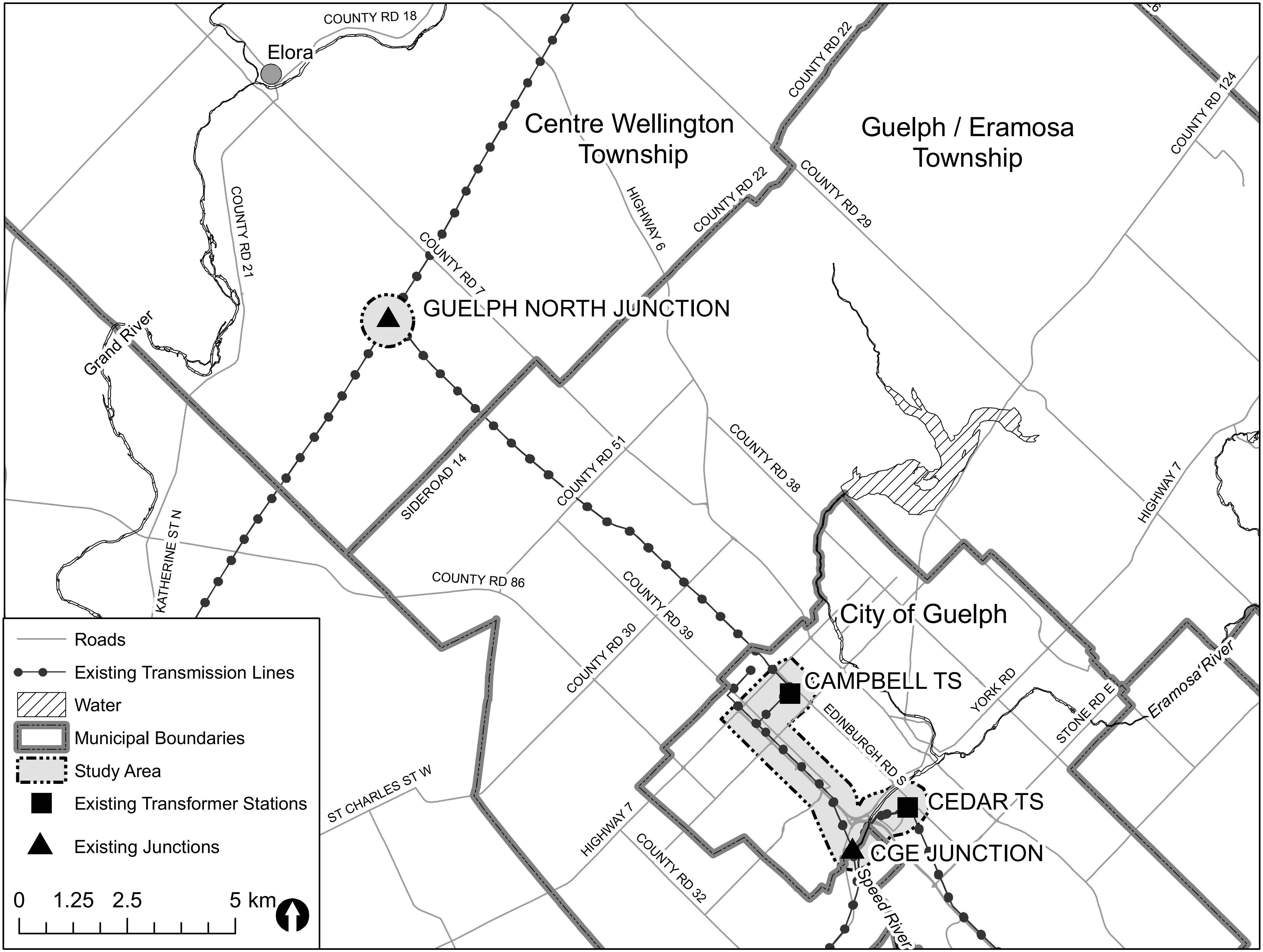
Best Regards,

CL Ognibene

Carrie-Lynn Ognibene
Senior Advisor, Corporate Relations

Encl. (2)

cc
Ms. A. Pappert, Chief Administrative Officer
Ms. J. Laird, Executive Director, Planning, Building, Engineering and Environment
Mr. B. Labelle, City Clerk
Mr. B. Chuddy, President & CEO, Guelph Hydro Inc.



COUNTY RD 18
Elora
Centre Wellington Township
Guelph / Eramosa Township
COUNTY RD 22
COUNTY RD 124
COUNTY RD 21
COUNTY RD 29
HIGHWAY 6
COUNTY RD 7
GUELPH NORTH JUNCTION
Grand River
SIDEROAD 14
COUNTY RD 51
COUNTY RD 38
HIGHWAY 7
KATHERINE ST N
COUNTY RD 86
COUNTY RD 39
City of Guelph
COUNTY RD 30
CAMPBELL TS
YORK RD
STONE RD E
Eramosa River
EDINBURGH RD S
ST CHARLES ST W
CEDAR TS
CGE JUNCTION
COUNTY RD 32
Speed River
Roads
Existing Transmission Lines
Water
Municipal Boundaries
Study Area
Existing Transformer Stations
Existing Junctions
0
1.25
2.5
5 km

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Tel: 1-877-345-6799
Fax: 416- 345- 6984

www.HydroOne.com

August 8, 2012

SAMPLE LETTER TO MUNICIPAL LEADERS RE PUBLIC REVIEW AND COMMENT PERIOD FOR DRAFT ESR

VIA EMAIL

Dear :

UPDATE: Guelph Area Transmission Refurbishment
Hydro One issues draft Environmental Study Report for public review and comment

Hydro One has completed its draft Environmental Study Report (ESR) for this project and is making it available for public review and comment beginning Thursday, August 9 through to Tuesday, October 9, 2012. The draft ESR outlines the studies and consultation undertaken by Hydro One for this proposed undertaking which is required to ensure an adequate and reliable supply of electricity for the City of Guelph and the surrounding area.

The attached newspaper advertisement advises where interested parties may view the draft ESR and how they may express their comments or concerns about this proposed undertaking. The advertisement will run in the *Guelph Mercury* and the *Guelph Tribune* on Thursday, August 9, and in the *Wellington Advertiser* on Friday, August 10, 2012.

Hydro One is notifying all individuals who attended one of our Public Information Centres or consultation meetings or otherwise contacted us about this project that the draft ESR is available for review and comment. Please do not hesitate to contact me if you have any questions.

Sincerely,

Carrie-Lynn Ognibene
Sr. Advisor, Corporate Relations

Encl.

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Fax: 416- 345- 6984

www.HydroOne.com

November 8, 2012

SAMPLE LETTER TO MUNICIPAL LEADERS ON COMPLETION OF CLASS EA PROCESS

VIA EMAIL

Dear :

Hydro One completes Class Environmental Assessment Process for the Guelph Area Transmission Refurbishment (GATR) Project

Hydro One has completed the planning and consultation process for this project in accordance with the *Class Environmental Assessment for Minor Transmission Facilities* approved under Ontario's *Envrionmental Assessment Act.*

Hydro One submitted its final Environmental Study Report (ESR) to the Ministry of the Environment on October 30, 2012. The report incorporates comments and suggestions received from government agencies, municipal staff, and residents in the project area during the August 9-October 9 public review and comment period for the draft ESR. The final ESR can be viewed on Hydro One's website at www.HydroOne.com/projects.

Hydro One is preparing to submit its "Leave to Construct" application to the Ontario Energy Board (OEB) later this fall. We will keep you informed of the Board's direction and schedule for a public hearing on Hydro One's application. Pending OEB approval, Hydro One hopes to begin detailed project planning and design engineering later in 2013.

If you have any questions, please don't hesitate to contact me.

Sincerely,

CL Ognibene

Carrie-Lynn Ognibene
Sr. Advisor, Corporate Relations

Encl.

You are invited to a PUBLIC INFORMATION CENTRE Guelph Area Transmission Refurbishment Project

hydro one
Partners in Powerful Communities

Hydro One is planning to refurbish components of its high-voltage electricity transmission system supplying Guelph and the surrounding area. Existing facilities are operating at capacity and the proposed refurbishments are needed to ensure an adequate and reliable supply of electricity for customers in this area.

What would this project involve?

- Installation of two new autotransformers within the existing fenced area at Cedar Transformer Station (TS) in Guelph.
- Upgrading five kilometres of an existing transmission line from 115 to 230 kilovolts between CGE Junction and Campbell TS in Guelph.
- Upgrading Guelph North Junction in the Township of Centre Wellington to a Switching Station by installing new facilities and fencing on Hydro One owned property.

See project study area map on the reverse side.

This project is being planned in accordance with the *Class Environmental Assessment for Minor Transmission Facilities*, approved under the *Environmental Assessment Act*. The transmission line upgrade will require Ontario Energy Board (OEB) approval.

How can I provide input?

Public involvement is an integral part of the environmental planning process and the OEB's public hearing process. Representatives from Hydro One and the Ontario Power Authority would like to discuss the project with you and receive your feedback.

PLEASE JOIN US at one of our Public Information Centres:

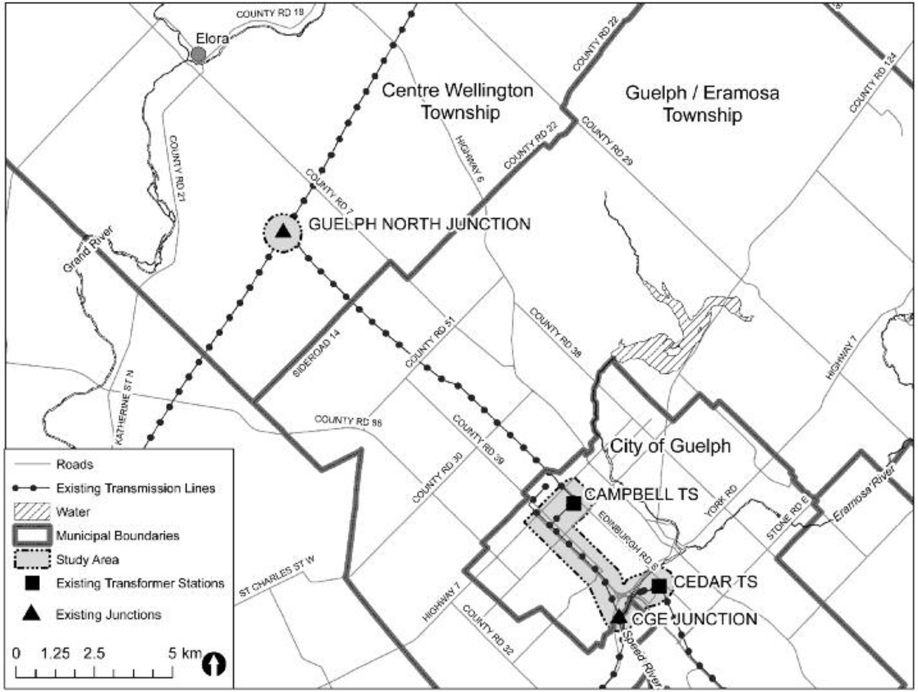
Thursday, June 14, 2012
5:30 p.m. – 8:30 p.m.
First Christian Reformed Church
287 Water St, Guelph

Tuesday, June 19, 2012
5:30 p.m. – 8:30 p.m.
Ponsonby Public School
5923 Wellington Rd 7, near SR 14

For more information please contact:

Carrie-Lynn Ognibene
Hydro One Community Relations
Tel: 1-877-345-6799
Email: Community.Relations@HydroOne.com
www.HydroOne.com/projects

Guelph Area Transmission Refurbishment Project

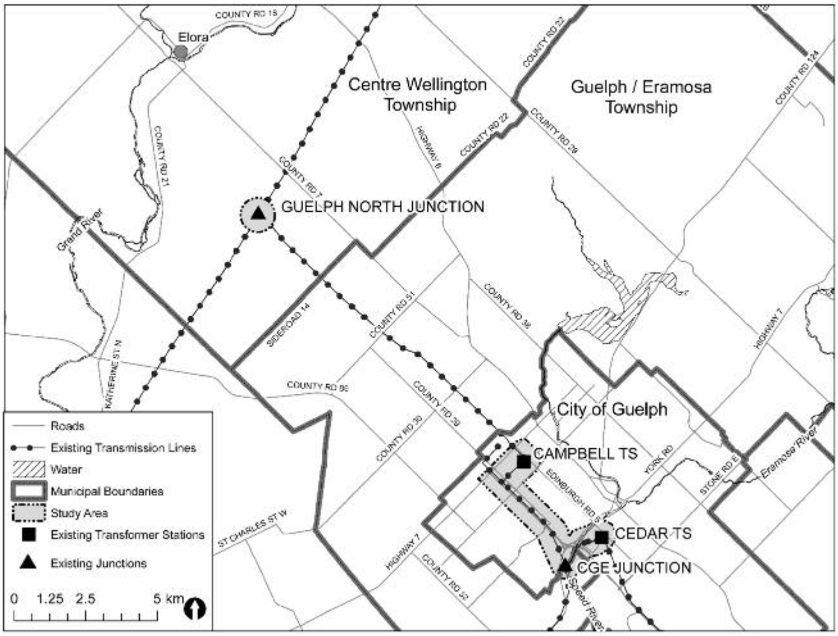


You are invited to a Public Information Centre

Guelph Area Transmission Refurbishment Project
Class Environmental Assessment

Hydro One Networks Inc. (Hydro One) invites you to a public information centre to learn about plans to refurbish components of its high-voltage electricity transmission system supplying Guelph and the surrounding area. The Ontario Power Authority, in consultation with local distribution companies, has confirmed that facility refurbishments are needed to ensure an adequate and reliable supply of electricity for customers in the Guelph area.

The project area is shown on the map below and proposed refurbishments would include:
- Installation of two new autotransformers at Cedar Transformer Station (TS) in Guelph.
- Upgrading five kilometres of an existing transmission line from 115 to 230 kilovolts between CGE Junction and Campbell TS in Guelph.
- Upgrading Guelph North Junction in the Township of Centre Wellington to a switching station by installing new facilities and fencing on Hydro One owned property.



Planning and Approvals
This project is being planned in accordance with the *Class Environmental Assessment for Minor Transmission Facilities*, approved under the *Environmental Assessment Act*. The transmission line upgrade is also subject to "Leave to Construct" approval under Section 92 of the *Ontario Energy Board Act, 1998*. Opportunities for public input exist throughout both the environmental planning process and the Ontario Energy Board public hearing process.

Public Information Centres
Please join us at one of these public information centres to learn more about the project:

Thursday, June 14, 2012
5:30 p.m. – 8:30 p.m.
First Christian Reformed Church
287 Water Street, Guelph

Tuesday, June 19, 2012
5:30 p.m. – 8:30 p.m.
Ponsonby Public School
5923 Wellington Road 7, near Sideroad 14

For more information please contact:
Carrie-Lynn Ognibene
Hydro One Community Relations
Tel: 1-877-345-6799
Email: Community.Relations@HydroOne.com
Website: www.HydroOne.com/projects

hydro one
Partners in Powerful Communities

Welcome to our Public Information Centre

Purpose of the Public Information Centre

- Present information on the proposed Guelph Area Transmission Refurbishment (GATR) project
- Provide you with an opportunity to discuss the project directly with our project team and to provide your comments
- Outline the next steps in project planning, approvals and implementation

Key Organizations

Hydro One Networks Inc.

- Builds, owns, operates and maintains electricity transmission and distribution facilities across Ontario

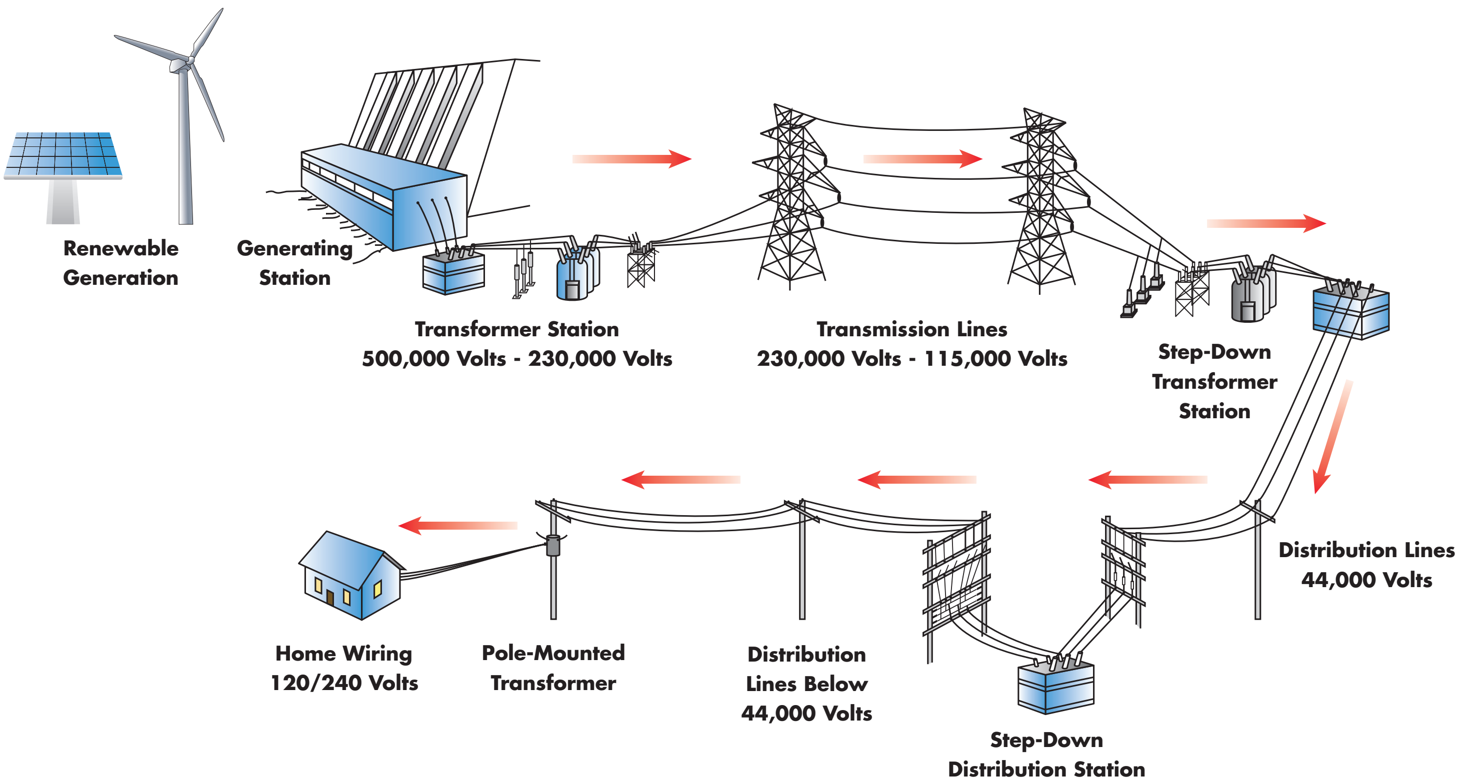
Guelph Hydro Electric Systems Inc.

- Distributes electricity supplied by Hydro One's transmission system to 50,000 residential, commercial and industrial customers in Guelph and Rockwood

Ontario Power Authority

- Develops plans to ensure electricity needs are met for the benefit of Ontario, both now and in the future

Electricity Flow Diagram

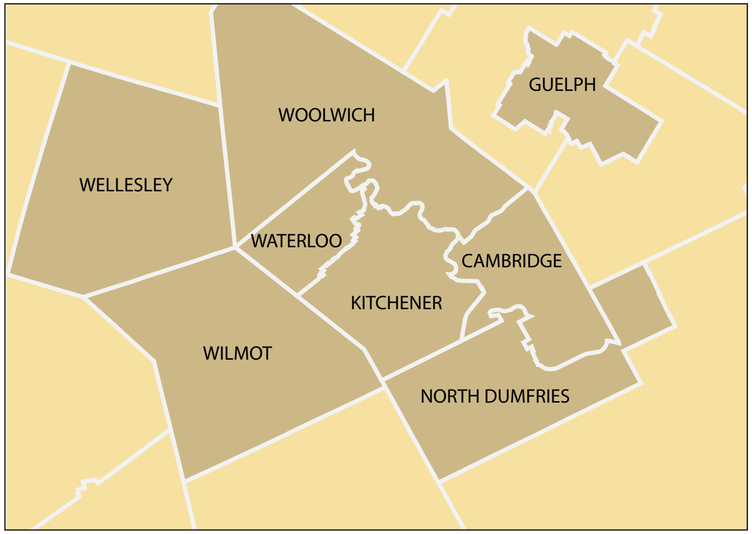


Partners in Powerful Communities

hydro one

Area Electricity Demand

- Demand for electricity in Guelph, Waterloo Region and the surrounding area (KWCG*) peaked at over 1,400 megawatts (MW) last summer; it is one of the larger load centres in Ontario
- The OPA, Hydro One, local distribution companies (LDCs) and the Independent Electricity System Operator (IESO) are developing near- and longer-term plans for maintaining a reliable supply of electricity to the area

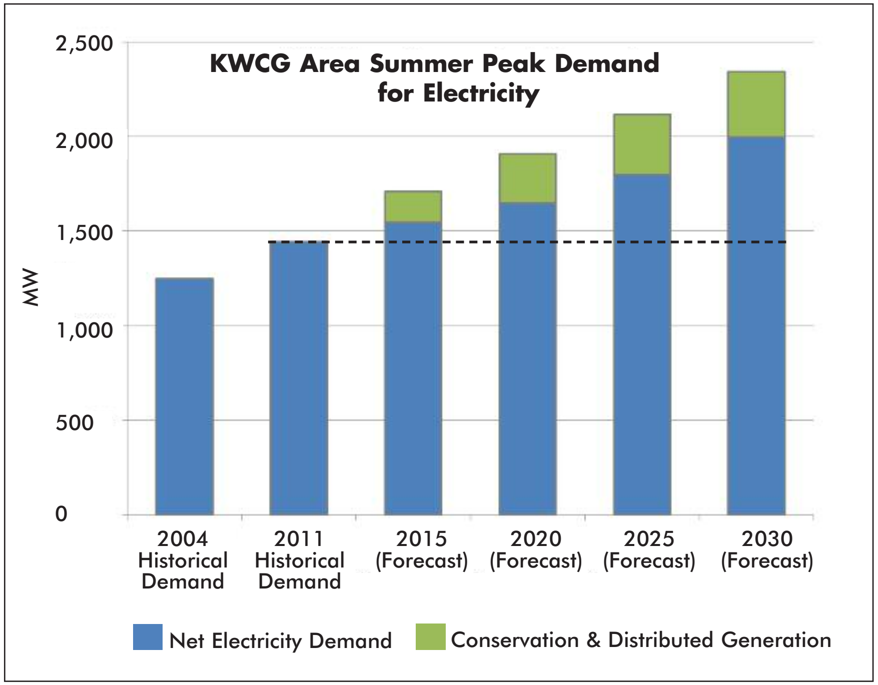


In addition to the LDC service territories (shown in brown), the KWCG area includes customers served by Hydro One's distribution system

* Kitchener-Waterloo-Cambridge-Guelph

Forecast for Robust Growth in Electricity Demand

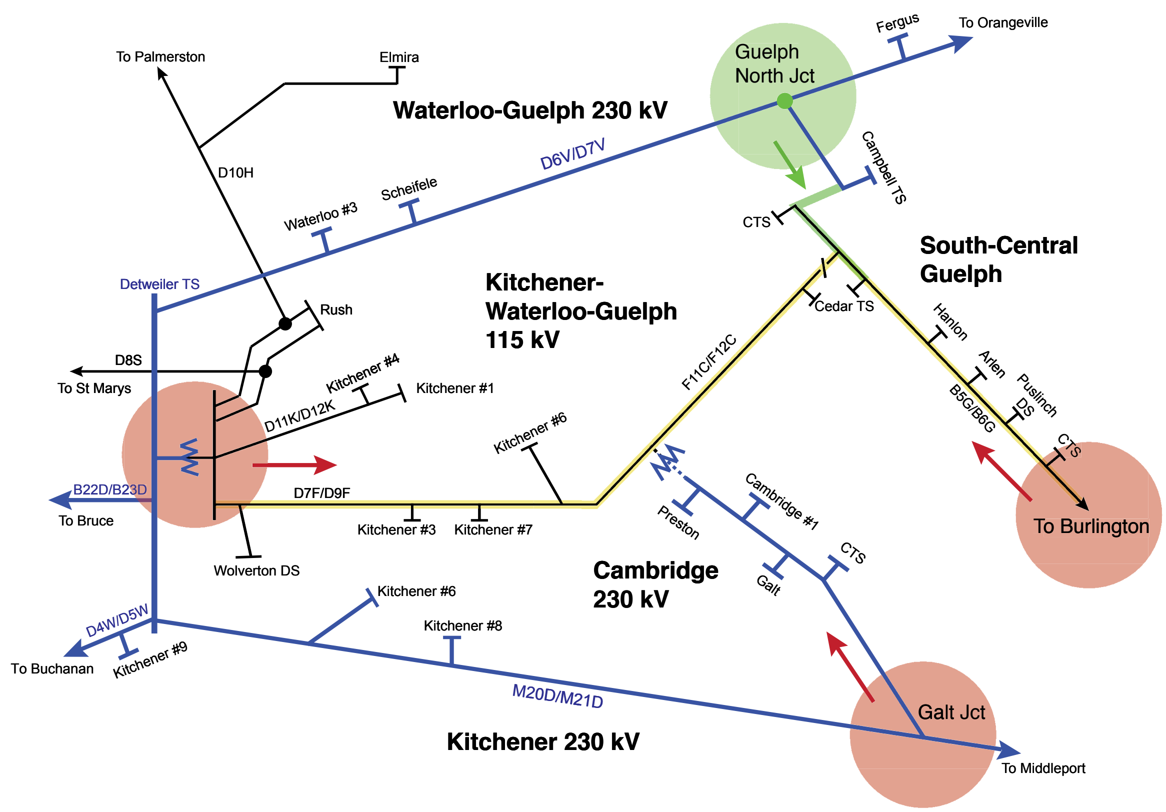
- Demand in the KWCG area has recovered since the recession; forecast to grow by roughly 3% per year to 2020, and then by 2% per year to 2030
- Conservation and distributed generation resources will help to meet this demand and moderate the rise in electricity usage in the area
  - Nearly 10% of the KWCG area's electricity needs will be met through conservation and distributed generation by 2015
  - By 2030, over 1/3 of the growth in the area will be met through conservation and distributed generation



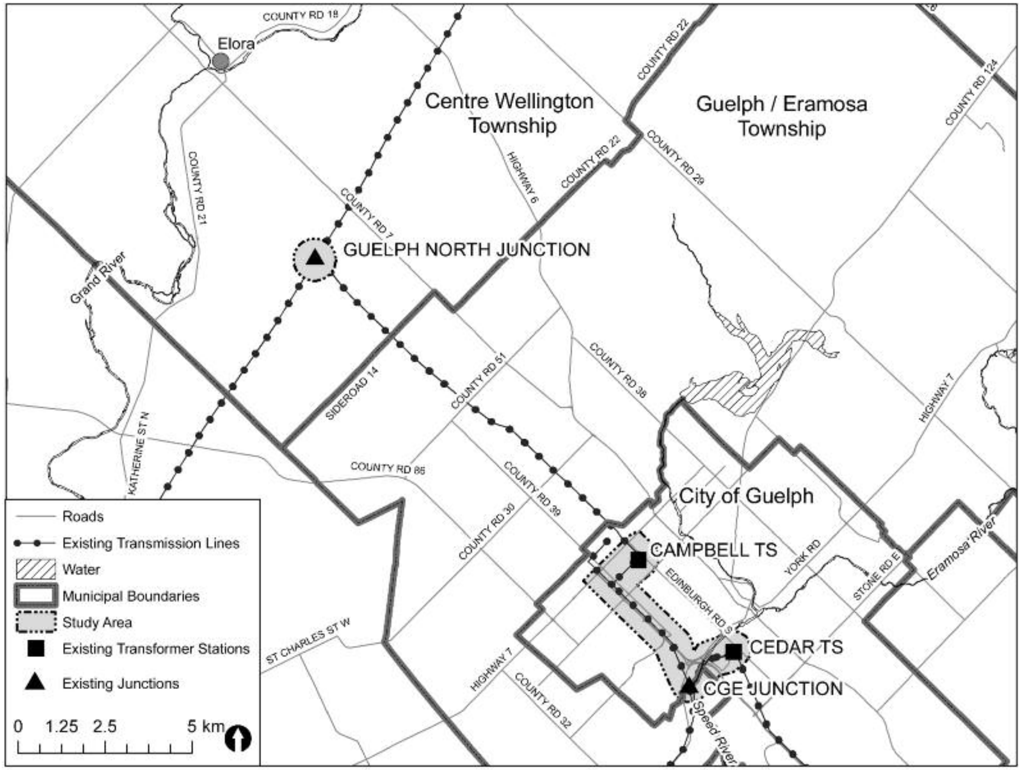
Electricity Supply to the Area & the Need for Refurbishment

- There are four major sources of electricity supply from the grid to the KWCG area (shown as circles on the diagram)
- Three of these sources (the red circles) have reached, or are approaching, their maximum capacity for planning purposes
- The GATR project (shown in green) will allow access to the northern supply, providing increased capacity for growth in the South-Central Guelph and Kitchener areas (highlighted in yellow) to the end of the decade or beyond
- The GATR project will also improve the reliability of service to customers in the area by reducing the impact of transmission outages (such as the one that took place on February 29, 2012) and providing backup capability to the area

Area Electricity Supply Diagram



Project Area



Recommended Refurbishments

- Install two new 230 / 115 kilovolt (kV) auto-transformers at the existing Cedar Transformer Station (TS) in the City of Guelph
- Upgrade approximately five kilometres of an existing transmission line from 115 kV to 230 kV, between CGE Junction and Campbell TS in the City of Guelph
- Upgrade the existing Guelph North Junction in the Township of Centre Wellington to a switching station

Cedar Transformer Station

New equipment would include:

- Two 230/115 kV auto-transformers, associated equipment and a 115 kV switchyard
- Small buildings to house system protection and control equipment and auxiliary station power supply
- Grounding, drainage, environmental controls, and noise attenuation components

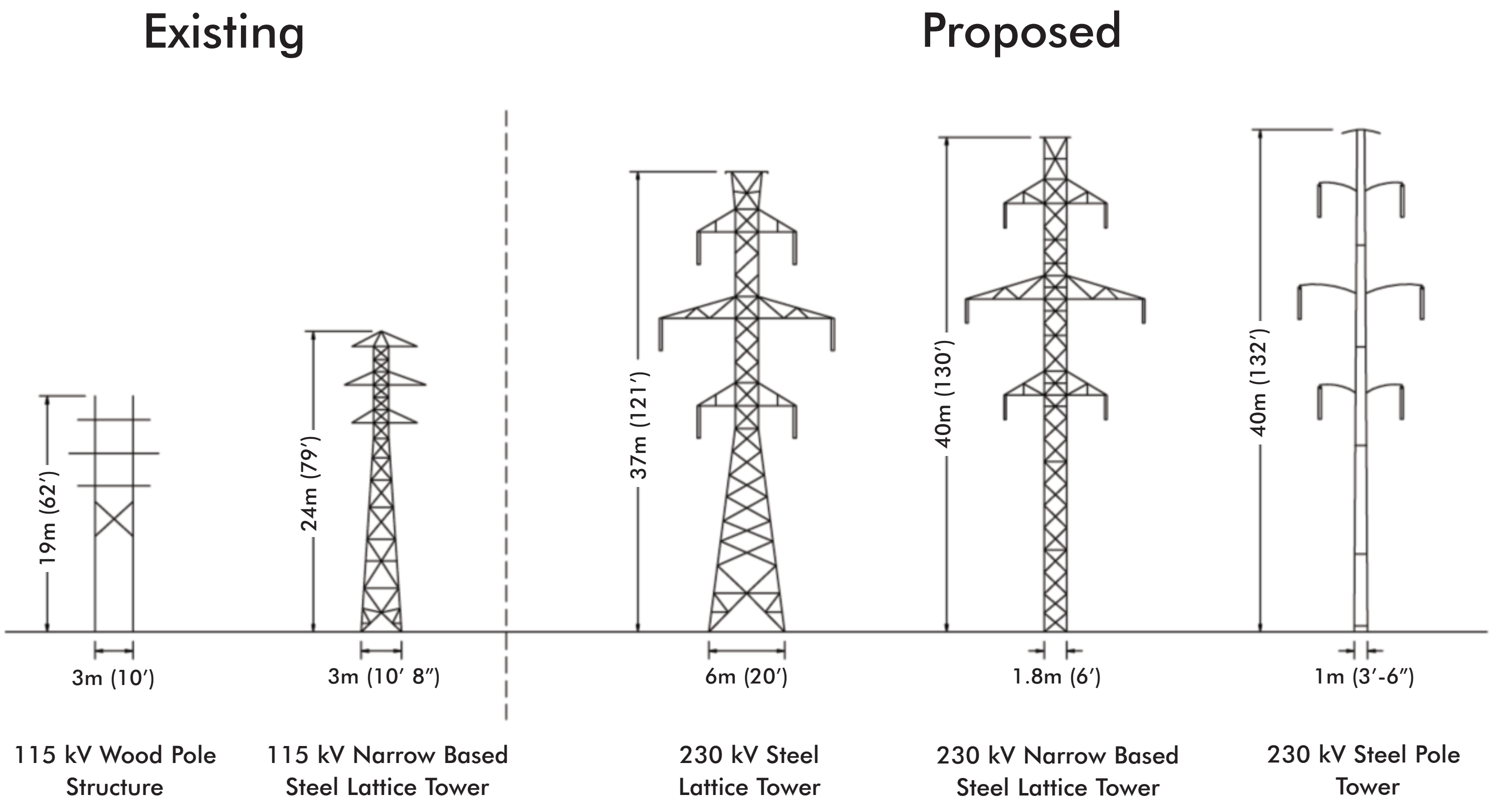
View of east side of Cedar TS from Cedar Street

Transmission line upgrade CGE Jct to Campbell TS

Construction activities would include:

- Removing existing 115 kV transmission line and structures
- Clearing vegetation, as required, for temporary access roads and work areas around towers
- Pouring new tower foundations
- Assembling and erecting new 230 kV structures
- Installing 230 kV conductor (wire) and insulators
- Upon project completion, restoring right-of-way to pre-construction condition

Transmission Structures



Guelph North Junction

Upgrading this site to a switching station would involve:

- Grading a two hectare (five acre) site and installing a crushed stone base, grounding and drainage
- Installing new switching facilities and small buildings to house system protection and control equipment and auxiliary station power supply
- Fencing the station perimeter
- Building an access road to the station entrance

View of existing Junction

Typical Switching Station

Nova Switching Station near Sarnia

Class EA Process

- In 1978, a *Class EA for Minor Transmission Facilities* was developed and approved by the Ontario Ministry of the Environment (MOE) and implemented by Ontario Hydro (now Hydro One). The Class EA was updated in 1992.
- The Class EA process is an effective way of ensuring that minor transmission projects that have a predictable range of effects are planned and carried out in an environmentally-acceptable manner.
- Following the consultation process, a draft Environmental Study Report (ESR) will be available for public, First Nation and Métis communities, and stakeholder review and comment.

Class EA Process *(continued)*

- If no concerns are expressed during the review period, the project is considered acceptable. Hydro One will file the final ESR with the Ontario Ministry of the Environment
- If concerns are expressed during the review period, Hydro One will attempt to resolve them in order to complete the Class EA process
- If stakeholders are dissatisfied with the process or Hydro One's project recommendations, a higher level of assessment referred to as a Part II Order can be requested by writing to the Minister of the Environment

Environmental Planning Process

The potential effects of the project will be identified during project planning and design, as part of the Class Environmental Assessment process, including potential effects related to:

- Business and residential property owners
- Planned land uses and existing infrastructure
- Biodiversity and habitat (terrestrial and aquatic)
- Agricultural lands and productivity
- Archaeological (heritage) resources
- Forestry and mineral resources
- Recreational resources and landscape appearance
- Storm water management

Environmental Mitigation Measures

Measures to prevent or mitigate potentially adverse environmental effects during design, construction and operation include:

- Spill containment and storm water management
- Minimization of erosion and soil compaction
- Protecting electrical equipment from fire hazards
- Environmental management during construction and operation
- Minimizing effects on prime agricultural lands and vegetation
- Controlling mud, dust, and traffic disturbances during construction
- Protecting archaeological (heritage) resources
- Minimizing effects on landowners and existing and planned land uses

Electric and Magnetic Fields (EMFs)

- EMFs are invisible forces that surround electrical equipment, power cords, and power lines. You cannot see or feel EMFs.
- Every time you use electricity and electrical appliances, you are exposed to EMFs at extremely low frequencies. EMFs produced by both power lines and use of electrical appliances, belong to this category.
- EMFs are strongest when close to the source. As you move away from the source, the strength of the fields fades rapidly.

Health Canada's Position on EMFs

- There is no compelling scientific evidence that EMF in living and school environments, regardless of locations from power transmission lines, cause ill health such as cancer. This position is consistent with the overall opinions from most national and international scientific bodies.[1]
- You do not need to take action regarding daily exposures to electric and magnetic fields at extremely low frequencies. Health Canada does not consider guidelines for the Canadian public necessary because the scientific evidence is not strong enough to conclude that exposures cause health problems for the public.[2]

Sources:

1) Health Canada submission to the British Columbia Environmental Assessment Office on the Vancouver Island Transmission Reinforcement Project; 2006.

2) Health Canada Fact sheet – Electronic and Magnetic Fields At Extremely Low Frequencies (January 2010)

Approval Requirements

Ontario Environmental Assessment Act

The facilities are subject to provincial *Environmental Assessment Act* approval in accordance with the *Class Environmental Assessment for Minor Transmission Facilities*, as a precursor to any other separate approvals.

Ontario Energy Board Act

"Leave to Construct" approval is required under Section 92 of the *Ontario Energy Board Act, 1998*.

Other

Hydro One will meet all other legislative and permitting requirements for individual projects.

Project Schedule and Next Steps

Commencement of Class Environmental Assessment and Public Information Centres (PICs)	2009
Final PICs to present recommended refurbishments	June 2012
Issue draft Environmental Study Report (ESR) for 60-day public review and comment period	Summer 2012
Submit final ESR to Ministry of the Environment	Fall 2012
Submit Section 92 application to Ontario Energy Board	Fall 2012
Planned start of design and construction	Spring 2013
Planned in-service	End of 2015

Your Input is Important to Us

- Thank you for attending our Public Information Centre
- Please fill out a comment form before you leave, or send us your comments afterward
- For project information, please contact us at:

  Website: www.HydroOne.com/projects

  Email: Community.Relations@HydroOne.com

  Information Line: 1-877-345-6799

  Fax: 416-345-6984

COMMENT FORM – JUNE 2012 PICs

COMMENT FORM

Guelph Area Transmission Refurbishment Project
Public Information Centres

June 14, 2012 (Guelph) and June 19, 2012 (Township of Centre Wellington)

THANK YOU for attending Hydro One's Public Information Centre. Please take a moment to answer a few questions and note your comments or questions about the information presented.

1. Please tell us how you learned about the Public Information Centre:

☐ Newspaper ad
☐ Hydro One website
☐ Notice delivered to your home/business
☐ From a friend or neighbour
☐ Other__________________________

2. Did you find the information, displays and maps helpful in explaining the project? Yes / No

3. Did Hydro One & Ontario Power Authority employees adequately answer your questions? Yes / No

4. How could the Public Information Centre have been improved?

____

5. Do you have any particular comments, questions, or concerns regarding this project or the proposed construction activities? (Additional space on reverse)

____

____

Please provide your contact information so that we may follow up with you on your comments or questions, and add you to our project contact list for future communications.

Name: ____

Mailing Address & Postal Code: ____

Tel: ____________________________________Email: _____________________________________

Please give your comment form to one of Hydro One's representatives at the Public Information Centre, or send your comments to:

Carrie-Lynn Ognibene, Hydro One Networks Inc.
483 Bay Street, 8th Floor, South Tower, Toronto, ON M5G 2P5
Tel. 1-877-345-6799; Fax: 416-345-6984; Email: Community.Relations@HydroOne.com

Please be advised that any of your personal information contained on this comment form will become part of the public record files for this project, and may be released, if requested, to any person, unless you state on this form that you do not consent to your personal information becoming part of the public record files and disclosed to any person upon request.

(additional comment space on reverse)

Guelph Area Transmission Refurbishment Project
Public Information Centres
June 14, 2012 (Guelph) and June 19, 2012 (Township of Centre Wellington)

Comments or Questions:

COMMENT FORM – JUNE 27, 2012 COMMUNITY INFORMATION MEETING

COMMENT FORM

Guelph Area Transmission Refurbishment Project

Community Information Meeting for Ward 4 residents
June 27, 2012, West End Community Centre

THANK YOU for attending Hydro One's Community Information Meeting. Please take a moment to answer a few questions and note your comments or questions about the session and the information presented.

1. Did you find the session helpful in understanding the proposed transmission line refurbishment in your neighbourhood? **Yes / No**

2. Did you have an adequate opportunity to express you views to Hydro One's project team? **Yes / No**

3. Was the meeting facilitator effective in conducting the meeting and providing everyone with the opportunity to speak? **Yes / No**

4. Would you prefer steel lattice towers or steel poles for the transmission line in your neighbourhood?

   ____

5. Do you have any particular comments, questions, or concerns regarding this project? (Additional space on reverse)

   ____

   ____

Please provide your contact information so that we may follow up with you on your comments or questions, and add you to our project contact list for future communications.

Name: ____

Mailing Address & Postal Code: ____

Tel: ___________________________________Email: ___________________________________

Please leave your comment form in the comment box at this meeting or send it to:

Carrie-Lynn Ognibene, Hydro One Networks Inc.
483 Bay Street, 8th Floor, South Tower, Toronto, ON M5G 2P5
Tel. 1-877-345-6799; Fax: 416-345-6984; Email: Community.Relations@HydroOne.com

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(additional comment space on reverse)

Guelph Area Transmission Refurbishment Project
Community Information Meeting for Ward 4 residents
June 27, 2012, West End Community Centre, Guelph

Comments or Questions:

HAUSSMANN
HAUSSMANN
HAUSSMANN
HAUSSMANN
HAUSSMANN
CONSULTING

Meeting Summary Notes

Proposed Guelph Area Transmission Refurbishment Project

Community Information Meeting for Ward 4 Residents

West End Community Centre

Guelph, Ontario

June 27, 2012

Prepared for:
Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

Prepared by:
Haussmann Consulting Inc.
435 Roehampton Ave.
Toronto, Ontario
M4P 1S3
416-484-6570

Table of Contents

1. BACKGROUND

In 2009, Hydro One Networks Inc. (Hydro One) began a Class Environmental Assessment (EA) process to refurbish parts of the aging high-voltage electricity infrastructure serving Guelph and the surrounding area. Three alternatives were proposed and presented at public information centres (PICs) on June 10, 2009 at the First Christian Reformed Church, 278 Water Street, Guelph, and on November 25, 2009 at the Marden Community Centre, 7368 Wellington Road 30, northwest of Guelph.

The Class EA process was put on hold in 2010 when an initiative was launched to develop a broader regional plan for the Kitchener-Waterloo-Cambridge-Guelph area. The regional plan is being conducted by the Ontario Power Authority (OPA) along with a working group made up of local utility partners, including Guelph Hydro.

In March 2012, the OPA advised Hydro One that the regional planning study had advanced sufficiently to confirm the need to proceed with the Guelph Area Transmission Refurbishment Project. The OPA confirmed that facility refurbishments are needed to ensure an adequate supply of electricity for Guelph and the surrounding area and to improve the reliability of electricity service in the region. The OPA therefore recommended that Hydro One continue with development work for the Guelph Area Transmission Refurbishment Project including the completion of the environmental and regulatory approvals processes.

The OPA is now recommending that the project include the following refurbishments:

- Installing two new auto-transformers at the existing Cedar Transformer Station (TS) in Guelph;
- Upgrading approximately five kilometres of an existing transmission line from 115 to 230 kilovolts, between CGE Junction and Campbell TS in Guelph; and,
- Upgrading the existing Guelph North Junction in the Township of Centre Wellington to a switching station by installing new facilities and fencing on Hydro One owned property.

Hydro One held two additional PICs in June 2012 to discuss and provide an update on the project with people who live and work in the project study area and any other interested parties: on June 14 at the First Christian Reformed Church, 278 Water Street, Guelph; and, on June 19 at Ponsonby Public School, 5923 Wellington Road 7, northwest of Guelph.

At the request of residents who live in the vicinity of the transmission corridor west of Hanlon Parkway between Wellington Street West and Paisley Road, and Ward 4 Councillor Cam Guthrie, Hydro One held an additional community information meeting to discuss the proposed project and transmission line. The meeting notice is attached as Appendix A.

This document reports on the community meeting that took place on June 27, 2012 at the West End Community Centre, 21 Imperial Road South, Guelph.

2. WELCOME AND INTRODUCTIONS

From 6:30 to 7:00 p.m., meeting attendees were able to review the panels, maps and displays from the June 14 and 19 PICs and speak directly with members of the Hydro One project team.

The formal meeting began at 7 p.m. Randy Church, Hydro One's Manager, Project Development & Oversight, introduced himself and welcomed the participants, which included Ward 4 Councillor Cam Guthrie, two spokespersons for the Guelph Wellington West Residents' Association, and a representative from Armel Corporation and the Ontario Power Authority. He then introduced the other Hydro One staff who were present to help answer residents' questions, as well as Tracey Ehl and Peter Mueller from Haussmann Consulting Inc. He explained that Haussmann Consulting had been asked by Hydro One to facilitate the meeting, that Tracey and Peter were not Hydro One employees, that Tracey would act as a neutral facilitator, and that Peter was the rapporteur who would document the meeting and discussion. A list of meeting participants is attached as Appendix C.

The objectives of the meeting were to ensure that stakeholders understood the project that Hydro One is proposing and the approvals process for the project; to provide any additional information about the proposed project that stakeholders require; to address the questions and concerns raised by members of the community at the June 14 and 19 PICs and in correspondence with Hydro One; and, to identify and document any additional questions or concerns about the project. Randy noted that Hydro One will review and consider all comments received. Comments will also be documented and addressed in the draft Environmental Study Report (ESR) which will be available for a 60 day public review and comment period later this summer. During the public review period, Hydro One will attempt to resolve any outstanding issues or concerns with the project.

The facilitator welcomed all in attendance and asked participants to speak one at a time to respect everyone's right to be heard.

3. HYDRO ONE PRESENTATION

This section provides a brief description of the presentation made by Randy Church, Manager, Project Development and Oversight, Hydro One. The presentation is included in this document as Appendix B and is also available at: www.HydroOne.com/projects.

3.1 Why the Guelph Area Transmission Refurbishment Project (GATR) is needed

- The Kitchener-Waterloo-Cambridge-Guelph area is one of the largest electricity load centres in Ontario and is forecast to experience a 3% per year growth in electricity demand to 2020, and 2% thereafter to 2030. Guelph's population is expected to grow from the current 120,000 to 175,000 by 2031, with employment expected to increase from the current level of 66,000 jobs to 100,000 over the same period.

- The transmission grid's capacity to deliver power to the area has reached or is approaching capacity for planning purposes. The Ontario Power Authority (OPA, the long-range electricity planners for the province), has therefore recommended that Hydro One continue the Environmental Assessment, planning and development for the Guelph Area Transmission Refurbishment (GATR) Project initiated in 2009, with a view to completing the project in 2015 in order to meet future demand and improve system reliability.

3.2 The Key Elements of GATR

- The proposed project would require that Hydro One install two new 230 kV to 115 kV auto-transformers at the existing Cedar Transformer Station (TS) to step the 230 kV voltage from the upgraded lines coming from Campbell TS down to 115 kV.

- Approximately five kilometres of the existing 115 kV transmission line between CGE Junction and Campbell TS in Guelph require upgrading to 230 kV, including the section of the right-of-way parallel to Deerpath Drive where five double wood pole transmission structures currently exist.

- The existing Guelph North Junction in the Township of Centre Wellington would also have to be upgraded to a switching station by installing new facilities and fencing on Hydro One owned property.

3.3 The Planning and Approvals Process for GATR

- The proposed GATR project is required to undergo a "Class Environmental Assessment (EA) for Minor Transmission Facilities" pursuant to Ontario's *Environmental Assessment Act,* and approved by the Ministry of the Environment. Consultation with government and community stakeholders is an integral part of this process.

- Once the Class EA process has been completed, a draft Environmental Study Report (ESR) is issued and made available to the public and stakeholders for a review and comment period, which is normally 30 days. However, since Hydro One expects that the draft ESR will be completed and made available during peak vacation season this summer, a 60 day review and comment period will be provided for the GATR Project draft ESR.

- The upgrade of five kilometres of existing 115 kV transmission line to 230 kV between CGE Junction and Campbell TS in Guelph will also require the approval of the Ontario Energy Board (OEB). Hydro One will file a "Leave to Construct" application with the OEB in accordance with Section 92 of the *Ontario Energy Board Act, 1998*. This is for the line component of the GATR Project only. Approval for capital expenditures for station components will be sought as part of Hydro One's next transmission rate application before the OEB.

- The OEB will review Hydro One's application based on four primary factors – need, price, quality and reliability of electrical service. Hydro One has identified the upgraded transmission line as a network transmission line. This means that Hydro One will suggest that the cost for the line be recovered from all Ontario ratepayers through the transmission component of their electricity bills.

- The proposed project is also consistent with the *Provincial Policy Statement*, 2005 which requires that existing infrastructure in public service facilities be optimized wherever feasible before consideration is given to developing new infrastructure (Section 1.6.2). That is why the GATR Project proposes utilizing Hydro One's existing land rights and upgrading existing facilities unless there is another technically and environmentally superior option that would not increase the cost of the project.

- Once the final ESR has been filed with the Ministry of the Environment and approval is obtained from the OEB, Hydro One must obtain the approval of its Board of Directors.

3.4 The Existing and Proposed Transmission Corridor

- The existing 115 kV transmission line was built in the 1950s. Hydro One has easement rights, not ownership along the 34 metre wide right-of-way adjacent to Deerpath Drive. There are five twin wood pole structures varying in height from 18 to 24 metres and spaced approximately 100 metres apart in this stretch of the easement. The current structures are positioned about eight metres east of centre.

- Hydro One is proposing to use the existing corridor and easement rights adjacent to Deerpath Drive for the upgraded 230 kV transmission line. Existing structures would be replaced with either steel poles or narrow base steel lattice towers with a height of between 37 and 40 metres. Because the new structures would be taller, spans between structures can be longer, and it is therefore anticipated that three 230 kV structures could replace the existing five 115 kV structures. However, the new structures adjacent to Deerpath Drive would be positioned at the actual centre of the right-of-way, or approximately 8 metres (25 feet) closer to the curb.

3.5 Key Community Concerns Raised to Date

Opportunity to Provide Input to the Process

- Members of the public will have further opportunities to make input to the decision process during the 60-day ESR public review period, and also during the OEB Leave to Construct hearing process.

- Notification will appear in local newspapers, and stakeholders who are on the project mailing list will be notified directly when the draft ESR is available to be viewed or downloaded from Hydro One's website and in public locations such as local libraries. Comments and concerns from the public or stakeholders can be sent to Hydro One during the 60 day review period. Hydro One will respond to any comments received and will attempt to resolve outstanding issues and concerns through dialogue with stakeholders. Hydro One will then revise or modify the draft ESR as appropriate, and submit a final ESR to the Ministry of the Environment.

- Approximately two weeks after Hydro One files its Leave to Construct application with the OEB, Hydro One will receive a Letter of Direction from the OEB instructing Hydro One to notify key stakeholders and to arrange for the placement of OEB Public Notices in newspapers notifying the public about the hearing for this project and outlining the process for individuals to indicate their desired level of participation in the hearing. Hydro One will ensure that all individuals or groups who have asked to be on the GATR project mailing list are informed about the OEB public hearing process and how to participate. Interested parties will be able to register for either observer or intervenor status at the proceedings or may choose to provide a letter of comment to outline concerns about Hydro One's proposed project. The OEB will decide if an application is heard through a written or an oral public hearing. Interested parties have the opportunity to request and justify the type of hearing they prefer.

Electromagnetic Fields

- Potential health effects from electromagnetic fields (EMFs) are often raised as a concern by residents living near transmission lines. Hydro One monitors independent research with respect to EMFs on an ongoing basis. Information and links to independent studies by Health Canada and the World Health Organization are available on the Hydro One website and elsewhere on the Internet. Numerous studies, including one published in 2008 by the Federal Provincial Territorial Radiation Protection Committee of Canada (copies were available at the meeting) have concluded that there is insufficient scientific evidence that exposure to EMFs from power lines causes adverse health effects such as cancer, and that a warning to the public to avoid living near or spending time near power lines is not required.

Property Values

- Hydro One has not seen changes to property values as a result of the presence of its transmission facilities. Temporary fluctuations in property values have sometimes occurred during the construction phase of a project, but given the many factors that affect housing prices (the economy, interest rates, etc.); it is difficult to know what the relationship is between home values and the presence of transmission facilities. Hydro One does not provide compensation for perceived declines in property values.

Tidiness of the Vacant Lot on Deerpath Drive

- Hydro One has an easement right on the land but does not own it. It is therefore the responsibility of the landowner to keep the lot and easement tidy.

Desire to Bury the Line Underground

- Hydro One only buries lines if there is a compelling technical reason to do so. Burying transmission lines is five to seven times more expensive than constructing overhead lines, and trenching is very disruptive to the right-of-way and the environment. As there is no technical reason to bury the line, Hydro One is not considering this option. It should be noted that buried lines also emit EMFs.

Visual Appearance of the New Transmission Line

- Although more expensive, Hydro One normally provides the option in urban residential communities to install steel poles instead of conventional lattice transmission structures. Most people find they are more visually appealing. Hydro One would like to get an indication from meeting participants as to their structure preference. This can be done using the comment form available at this meeting or by contacting Hydro One.

Desire to Move the Transmission Line Closer to Hanlon Pkwy

- Hydro One has had discussions with Armel Corporation to see what alternatives might be available. If moving the transmission line closer to the Hanlon Pkwy were agreeable to the property owner and viable from a project cost perspective (i.e., if the cost is unchanged), Hydro One would consider this option. Hydro One would have to justify the cost of its preferred alternative in its application to the Ontario Energy Board (OEB).

4. SUMMARY OF DISCUSSION

This section documents comments and questions raised by meeting participants and Hydro One's responses. It is organized according to the various themes that emerged during the discussion.

Many of the comments and questions were presented by Jim McMeekin and Angelo DeNardis, spokespersons for the recently formed Guelph Wellington West Residents Association. The residents association also asked participants to sign a petition. They made the following opening statement:

> *Guelph Wellington West Residents Association is the largest stakeholder and as residents of this community we should have the largest voice. Lots of people didn't know about this Hydro One project. This is a big issue for us. The consensus is that we do not like this project as currently proposed. We are not disputing that demand is increasing and upgrades are needed. Opinions will vary about the health risks or the potential impact on property values. We want to let Hydro One know that there are alternatives to running lines through Deerpath, and we hope that Hydro One will be a good corporate citizen and listen to all the voices here tonight and come up with a solution that is best for everyone.*

Chris Corosky, Director of Land Development for Armel Corporation (Armel), provided comments and responded to some questions from meeting participants. Armel owns the land on which Hydro One holds the easement for the transmission corridor, and also owns the vacant lot adjacent to Deerpath Drive.

4.1. Public Consultation Process and Project Timeline

Numerous questions were asked about the steps leading up to final approval of the project, and how the public could make input to the process:

- *How will we know when the draft ESR is available and how can we get a copy?*
- *How will you modify the draft ESR in response to comments received? What does modify mean?*
- *Please explain in lay terms the timeline and schedule for the proposed project, and all the approval steps required from the start to the completion of the project.*
- *What is the 60 day period and how does it work? Will every resident be notified? What is the distance for notification?*
- *Does the OEB get involved?*
- *If approved, can we expect the 130-foot towers will be there by 2015, wherever you decide to put them?*
- *So what will be provided to the community when the EA is completed?*
- *Can you ensure that our residents association is made aware of the publication of the draft ESR and receives a copy?*
- *Is Hydro One willing to have other meetings with our community?*
- *Is Hydro One building any brand new lines in this or any other community and how is that process going? Are they also unhappy?*
- *The Guelph Wellington West Residents Association opposes the project as currently proposed by Hydro One. Please clarify the timeline as it relates to filing of our objections to the project and the appropriate challenges we have available. Please explain it in laymen's terms.*

The proposed project is currently in the development phase, during which Hydro One will file the draft and final ESR with the Ministry of Environment and the Leave to Construct application with the OEB, as well as seeking any other approvals that are needed to start construction. The plan is to have all approvals in place so that the Hydro One Board can give their approval to begin construction in the Spring of 2013. Once approval has been obtained, engineering work and the procurement process will begin, followed by the start of construction late in 2013 on the 3 components of the project. The project is expected to be completed and in service by the end of 2015. Construction activity (poles, new lines) in the corridor adjacent to Deerpath Drive will take several months.

The draft ESR will be posted for viewing and will be accessible for downloading from Hydro One's website. A hard copy will also be placed in selected public locations such as local libraries and the municipal Clerk's office. Notification will appear in local newspapers and individuals who are on the project mailing list will be notified directly when the draft ESR is published. Residents within 150 metres of the corridor and the two stations (Guelph North Junction and Cedar) received notification of the Public Information Centres earlier this month. Addresses for the notices were obtained from Guelph Hydro's customer system, but did not include residents' names because Hydro One is not allowed to collect personal information from another agency. Hydro One's Real Estate department did the property searches for the homes that are most directly affected (along Deerpath Drive and Bronwyn Court and near Cedar Transformer Station and Guelph North Junction).

Going forward, if people have self identified by putting their names on our project contact list or by signing in at our community meetings indicating they want to receive information directly from Hydro One, they will receive information directly from us. Otherwise, we will communicate through community groups, the municipality and local elected officials. They can then make it available to residents they think may be interested. We will also use local newspapers to make people aware of the availability of information for comment, whether the draft ESR or the Leave to Construct application to the Ontario Energy Board. The OEB will also direct Hydro One to notify certain stakeholders (a 'must notify' list), such as directly affected property owners, people on whose properties Hydro One has easements, First Nations, and other key stakeholders.

Once the draft Environmental Study Report (ESR) is completed and made available for comment, stakeholders will be notified in the manner described. New information will also be posted to the Hydro One web site. Interested parties will have 60 days to provide their comments and input. Hydro One will maintain a consultation record to track and document all comments and concerns, which will be summarized in the draft ESR (no personal information such as individual names is included). Hydro One will attempt to negotiate and resolve issues where possible, or indicate why Hydro One lacks the flexibility to do so. Hydro One will then revise or modify the ESR as appropriate, and submit a final ESR to the Ministry of the Environment. If individuals are unhappy with the process or how an issue has been dealt with by Hydro One, they can request that the Minister of the Environment subject this project to a higher level of environmental study called an Individual Environmental Assessment (EA). This is known as a Part II Order request, and a copy of any such request should also be sent to Hydro One. If granted, new terms of reference would be required for a more intensive study. Ministry staff will ask the requesting party and Hydro One what was done to resolve the issue(s) that triggered the Part II Order request. The Minister of the Environment will then decide, based on all the evidence provided, whether Hydro One should conduct an Individual Environment Assessment.

The OEB has its own process as described in Section 3.5. They look at the project from a cost-benefit, service quality and reliability perspective. All interested parties have an opportunity to voice their concerns in this regard through the OEB's consultation process. Hydro One will receive direction from the OEB within two weeks of filing as to how the community is to be notified. We will inform the community in advance of our Leave to Construct filing so that you are aware of it. The community will receive notices in the mail, and there will be announcements in the local newspaper. People can submit an application to the OEB for either observer or intervenor status. The OEB will review written objections and concerns and if it feels it is necessary, the OEB will change the hearing from written to oral format. The OEB will then make its ruling based on the information presented by all parties.

With respect to future meetings with the community, if there is a new development, Hydro One will be willing to carry on the discussion.

This project is really a rejuvenation of old and existing infrastructure; making better use of an existing asset. Hydro One wouldn't be doing this in a community where we didn't have an existing right-of- way and transmission line because we would have to displace some homes. Most of the projects we have done in the last few years or have on the go involve upgrading existing and aging infrastructure (sometimes as old as 100 years) and making better use of existing assets. Examples of rejuvenation projects are found in Kitchener and more recently in Woodstock, both with homes backing on to an existing corridor. The Woodstock project is in its final stages. Our relationship with that community has been excellent and people are satisfied. Other examples include the Bruce to Milton line where Hydro One added an additional transmission line and expanded the width of the existing corridor.

4.2. EMF, Health and Safety Concerns

A number of questions were raised regarding the effects of electro-magnetic fields (EMFs) and related health effects:

- *I have done some research on EMFs. There is conflicting evidence as to whether EMFs cause cancer, leukemia in our children and other health issues. So how can you say that your report (2008 Federal Provincial Territorial Radiation Protection Committee report) is more valid than other reports on the Internet?*

- *EMF levels will not be very low for the people living near the line. It's going to be more. You are moving the line 25 feet closer to the curb.*
- *I have a gauss meter on my counter right now. We are already exposed to many sources of EMFs. That's why we have a concern about the new transmission line which will double our exposure. This one might be controllable.*
- *In the presentation pictures, sometimes the wires hang low and dip down between towers, and sometimes they are at the level of the upper posts. Can you tell me how they will hang?*
- *Who is responsible if we find out 25 years from now that EMFs are harming our kids?*
- *What if there is a health issue? The studies are inconclusive. Many things in a person's life affect their health. The stress of worrying about possible health effects and perhaps having to move and find a new job, or the possibility that the value of your house has gone down - all affect people's health and families.*
- *What if there is a health issue? The studies are inconclusive. Many things in a person's life affect their health. The stress of worrying about possible health effects and perhaps having to move and find a new job, or the possibility that the value of your house has gone down - all affect people's health and families.*

The reports referenced regarding the effects of EMFs are from studies published by the World Health Organization and Health Canada. Numerous studies have been done on this subject over the past several decades with varying results. This is why Hydro One looks to the expertise of organizations such as Health Canada and the WHO to assess the body of scientific studies and provide their assessment and advice. We urge you to read these studies. They are independent organizations which have the expertise to review and analyze the methodology and science used in various studies.

Health Canada's recent conclusion (noted on the display panels) is that "there is no compelling scientific evidence that EMF in living and school environments, regardless of locations from power transmission lines, cause ill health such as cancer." The Canadian Federal-Provincial-Territorial Radiation Protection Committee similarly concluded that "adverse health effects from exposure to power-frequency EMFs at levels normally encountered in homes, schools and offices have not been established." (FPTRPC Position Statement, November 2008, available at the meeting).

EMFs from transmission lines reduce exponentially as you move away from the line. So the levels are very low at the edge of the corridor. Hydro One makes sure to respect the clearance requirements for the voltage level on the lines. Line sag will depend on how heavily loaded a line is at any particular time. Higher loads increase the sag, but we make sure it is within the limits designed for the transmission system. Public safety due to sag is not an issue as Hydro One designs its facilities to industry standards. There will be no more EMFs associated with this line than with any other transmission lines in the province that pass through neighborhoods or close to schools. Individuals have the opportunity to raise concerns regarding EMF exposure in the Class EA and OEB public review processes.

Hydro One has a program whereby people may borrow a gauss meter to measure EMF levels in their home or anywhere they want. Sometimes the levels from various sources in the home are actually higher than from power lines along the transmission corridor. To borrow a meter, call Hydro One's toll-free EMF information line at 1-800-728-9533. Hydro One would be happy to lend a meter to anyone who lives near one of our transmission facilities**.**

4.3. Project Design and Easement Location

Some questions and comments addressed specific project design and right-of-way location considerations:

- *How many wires will the proposed new line have? When they are running full tilt, how far will the EMFs radiate out? There will be a school there as well as homes.*
- *Has Hydro One considered burying or moving the lines from their existing location? Why is burying the lines not an option?*
- *Why do we have to widen the easement? Why can't we just move the 110 foot corridor rather than expanding it? Are you not working with Armel right now on relocating the line?*
- *Why are you moving the lines and bigger towers even closer to our homes? Why not move it the other way, further away from our homes?*
- *What is a turning structure?*
- *Based on the map you showed I don't understand why you need all those new turning structures to move the line toward Hanlon. Right now you have structures where the line crosses Hanlon and where it forks to go to Cedar. The rest of the line parallel to Deerpark is straight.*
- *Earlier this evening Hydro One said that they were not looking at expanding the right-of-way. I have an email in front of me from Hydro One dated June 4, 2012 in which they ask about acquiring easement rights from Armel for another 20 to 30 feet. This is a really important technical question.*
- *The most interesting comment I've heard tonight came from Armel. He said that the existing easement is not wide enough for the proposed project. Is that correct? If so, has Hydro One addressed this problem?*

- *For those of us who don't know the technical details, when we hear that the corridor is not wide enough we wonder why we haven't been told, and it makes it appear that if we don't ask the right questions we won't get certain types of information. This is a real negative.*

There will be 6 wires on this new line.

Before the PICs held in June, our plan was to use the existing easement in accordance with the Provincial Policy Statement, 2005, which requires that existing infrastructure in public service facilities be optimized wherever feasible before consideration is given to developing new infrastructure. As a result of the community input Hydro One received at the PICs to consider moving the lines closer to the Hanlon Pkwy, we have been exploring with the property owner the possibility of how the lines might be moved. However, Hydro One must consider and be able to justify the cost of doing so to the OEB. If the cost is relatively neutral, and there are no environmental or technical constraints, we will be happy to consider a change to our current plan. As it stands right now, our existing rights do not allow us to consider the options you are proposing. Hydro One does not have the land rights to deviate from the current right-of-way. And if the cost is a lot higher, it will be very challenging to get OEB approval.

Hydro One only buries lines if there is a compelling technical reason to do so. Burying transmission lines is five to seven times more expense than constructing overhead lines, and trenching is very disruptive to the right-of-way and the environment. There is no technical reason to bury the line in this area. It should be noted that buried lines also emit EMFs.

Burying this line at general ratepayer expense without a compelling technical reason would set a precedent that others in the Province may look to for their projects. This is not a decision Hydro One can make. It is a decision for the OEB.

The existing corridor has a 115 kV line but is adequate for a 230 kV line. The current easement is 110 feet wide. Ideally, Hydro One would like 120 feet, but we can work with the current width. One of the plans considered was to expand the corridor to 130 feet and move the poles further away from the homes, but we don't have the land rights to do that.

In general, the higher the voltage the wider the right-of-way that is required. The taller steel poles proposed will allow for a greater distance between poles and fewer structures than currently in place. Hydro One also has certain requirements for maintenance, the swing of the conductors and limitations on EMF levels at the edge of the right-of-way. The current 115 kV line and poles are not on the centre line of the right-of-way. To meet all of the requirements for the 230 kV line, we would move the new transmission line and poles to the centre line of the corridor, which shifts it closer to the curb.

When the transmission line is straight Hydro One uses towers that are called suspension structures that simply hold the wires. But when the line deviates from straight, a larger turning structure is required because it is carrying not only the weight of the wires but also resisting the lateral pull on the tower. If we made an arrangement with Armel to move the corridor closer to Hanlon in the area nearest to Deerpath, that section would still be a straight run. But we would need the larger turning structures to turn the line off and then back on to the existing right-of-way before and after the Deerpath section.

4.4. Environmental Assessment Factors

- *What factors are studied by the environmental assessment process?*
- *The area has changed since the line was built in the 1950s when this was a forest and fields. Now this is a neighborhood. How can you justify putting the towers and lines even closer to people's homes, and in some cases directly across the street? How is this factored into the process?*
- *Who does the work on the ESR?*
- *If you saw large towers from your house the way Hydro One is proposing, would you buy a property here?*
- *Has the social impact piece of the EA been completed?*
- *Other than cost, can you name one or two technical end environmental issues that would have to be looked at before moving the right-of-way?*

As required by the *Environmental Assessment Act*, the project is subject to the process described in the Class EA for Minor Transmission Facilities. The study includes eight criteria such as species impacts, visual appearance, social, agricultural and land use impacts. For this project, Hydro One coordinated the work, but an independent consultant based in Toronto (Dillon) has carried out the required research and studies under our direction. As noted earlier, the draft ESR will be available soon for public review and comment.

Social impacts are part of the EA. The comments provided at this meeting will also be taken into consideration. Hydro One will review the EA work completed to date and update it to ensure all comments from the recent PICs and from this meeting are reflected in draft ESR. House values and EMF are not sufficient reasons that the OEB will accept as justification to bury or move the lines.

To move the corridor and go around most of the Deerpark Drive homes Hydro One would have to make an arrangement with Armel to swap corridors. In addition to the cost implications that Hydro One would have to justify to the OEB, there would also be other implications. For example, other residents may object to the new visual impacts created by the large turning structures close to their homes.

4.5. Cost

A number of questions and comments addressed the desire to see a cost comparison of the project with the alternatives of moving the right-of-way or burying the lines:

- *Will the comparative cost of various options be made public – the current proposed option, moving the line closer to the Hanlon Pkwy using steel poles, and moving the line closer to the Hanlon Pkwy using narrow base lattice towers? The comparison should also take into account that although the project is five kilometres long, the section of primary concern to the closest residents on Deerpath Drive is only about one half kilometer in length.*
- *Will there be a comparison of costs for various options including burying the line?*
- *We have asked many times for the cost of this project, and Hydro One this evening has emphasized that cost justification is a key factor in getting OEB approval. Hydro One has also explained that every resident in Ontario will be paying for this upgrade. There are probably also other transmission line projects elsewhere in the province that we are not aware of but that we are helping to pay for. We have asked for the cost per kilometer and were told that it is approximately $2 million/km. We are concerned about a one half km section in a five km project where our homes are close enough to be affected by the lines. We were told that the cost of burying the lines in this half km section would result in a one-and-a-half cent increase in our electricity bills versus a one cent increase if Hydro One does what it is currently proposing. No one in Ontario would notice a one-and-a-half cent increase on their bill for the cost of these lines.*

Hydro One does not generally share detailed cost information with community groups. We will however consider sharing a high level cost comparison of alternatives. The total cost of the proposed project (line and station components) will be included in the Leave to Construct application to the OEB which will be available to the public. We could provide the costs for burying the line versus overhead lines for comparative purposes. The option to move the line closer to the Hanlon Pkwy is not really available to us right now because Hydro One doesn't currently have land rights except for the existing easement. We can only estimate the costs for an option for which we have the land rights.

It would be challenging for us to justify to the OEB the higher cost of burying the line or selecting an alternative route that does not use existing land rights. The OEB will ask us why we are proposing such options when a lower cost alternative that meets technical criteria (reliability, quality) is available.

4.6. Armel Corporation

As noted in Section 2, a representative of the Armel Corporation attended the meeting. Participants wanted to know if Armel had had discussions with Hydro One about the current location of the line along Deerpath Drive, or moving the line closer to the Hanlon Pkwy. Hydro One acknowledged having had discussions with Armel.

The Armel representative then took the opportunity to explain their involvement to date, as follows:

In the spring of 2010 Hydro One explained to us that the EA process was beginning. After this initial meeting, Armel responded with our views as to what Hydro One was proposing. We suggested that the line be moved to the east of the Hanlon Parkway because, as it travels north, most of the line is already on the east side of the Parkway and there is an opportunity for a cross-over before the line jogs north. Secondly, we suggested the right-of-way be moved to the rear of our property.

Armel understands that Hydro One must work with its existing right-of-way. But Hydro One also said it needed an expansion of their existing right-of-way, i.e. more width to accommodate the new transmission line. For Armel, this means that less of our property on the east side of Deerpath Drive that is zoned for apartments and townhouses will be usable, which has an economic impact on Armel.

In addition, Armel has pointed out to Hydro One that we also own a number of properties in the area. There are a several vacant sites on Paisley Road, a number of which have been purchased by builders over the last 10 to 15 years. People look at a number of factors when purchasing a property, but the aesthetics of having hydro wires running across the front of the property probably doesn't help. When that site is developed, residents will have to pass underneath the wires.

Historically, this area was a gravel pit. The demand for power has changed, but this neighborhood has also changed into a mature residential community. Hydro One has expressed its concern about the financial impact of alternatives to the proposed project.

Armel's understanding of the EA process is that it looks at the environmental, economic and social impacts on the people affected by what is being proposed, and that the project proponent has to come up with solutions to minimize those impacts.

Armel is prepared to continue discussions with Hydro One to explore options to move the right-of-way to the rear of our site. We need to know what the whole property ownership pattern is back there - the city and MTO own some of the land.

Armel has had three points of contact with Hydro One since 2010, two of which have been recent. One was initiated by Hydro One; everything else has been follow-up and comments from Armel. Armel has not supported the project as currently proposed by Hydro One, but we are open to further discussion with Hydro One to explore the options.

Hydro One assured particip ants that if there are n ew developments, they will make sure the community is informed.

The Armel representative noted that residents would have to cross under the wires to get to where they live, if it were to be developed, a currently unde veloped 10 acre triangular site owned by Armel. He inquired whether it is typical that people have to cross under Hydro One transmission lines to get to where they live?

Hydro One note d that, while not id eal, that situation exists in m any other communities, generally because ove r time residential developments have been approved in proxim ity to existing transmission rights-of-way.

In summary, Hydro One committed to:

1) Advising the Guelph Wellington West Residents Association when the draft ESR is available for review and comment and providing them with a hard copy;
2) Considering other potentially vi able tran smission line r outing options in the vicinity of Deerpath Drive and sharing a high-level comparative cost and impact analysis with meeting participants; and,
3) Considering a follow-up meeting with the community if new developments arise.

The Guelph Wellington West Residents Association representative asked that Hydro One be forward thinking and do the right thing by adopting one of the preferred alternatives to the current proposal.

5. CLOSING REMARKS

Tracey Ehl thanked participants for attending the meeting and indicated Hydro One staff would remain for a short time to hear any additional questions people may have. Randy Church asked participants to complete the comment form and to indicate the type of tower structure they prefer.

The meeting was adjourned at 8:45 p.m.

APPENDIX A: Meeting Invitation

COMMUNITY INFORMATION MEETING
Guelph Area Transmission Refurbishment Project

Dear Residents,

Hydro One recently held two Public Information Centres on June 14 in Guelph and on June 19 in Centre Wellington to discuss the project with people who live and work in the study area for this project.

At the request of residents who live in the vicinity of the transmission corridor west of Hanlon Pkwy between Wellington Street West and Paisley Road, and Ward 4 Councillor Cam Guthrie, Hydro One will hold an additional information meeting to discuss the proposed transmission line upgrade in your neighbourhood (see attached map).

Please join us on: Wednesday, June 27, 2012
6:30 p.m. – 8:30 p.m., presentation at 7:00 p.m.
West End Community Centre, Gymnasium
21 Imperial Road South, Guelph

Residents who were unable to attend one of the earlier Public Information Centres will have the opportunity to review the same maps and displays and speak directly with members of Hydro One's project team. The meeting will be moderated by an independent facilitator to make best use of the available time and to ensure comments and questions are captured.

Hydro One will review and consider all comments within the context of the planning and consultation process outlined in the *Class Environmental Assessment for Minor Transmission Facilities.* Comments will also be documented and addressed in the draft Environmental Study Report which will be available for a 60-day public review and comment period this summer. During the public review period, Hydro One will attempt to resolve any outstanding issues or concerns with the project.

If you are unable to attend the meeting, please refer to the project information on Hydro One's website: www.HydroOne.com/projects. We will be pleased to receive your input and questions at any time.

Hydro One Community Relations
483 Bay Street, 8th Floor, South Tower
Toronto, ON M5G 2P5
Tel: 1-877-345-6799
Email: Community.Relations@HydroOne.com.

June 22, 2012

APPENDIX B: Hydro One Presentation

Hydro One Networks

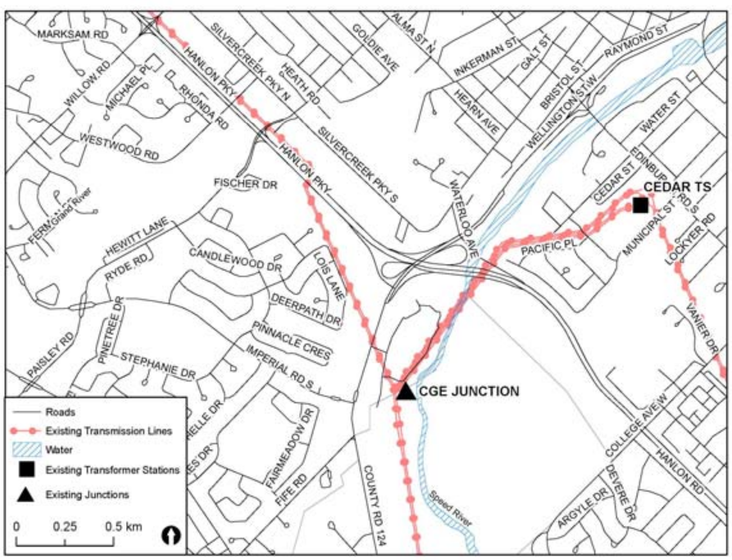
Guelph Area Transmission Refurbishment (GATR) Project

Presentation to Ward 4 residents
West End Community Centre, Guelph

June 27, 2012

hydro one

Location of existing facilities



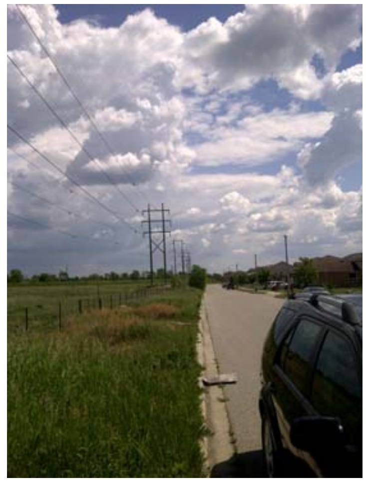
Aerial view of corridor

Planning & approvals

- Class Environmental Assessment for Minor Transmission Facilities, approved under provincial *Environmental Assessment Act*
- Ontario Energy Board
  - "Leave to Construct" (Section 92) approval
  - *Recovery of project costs through transmission rates*
- *Provincial Policy Statement, 2005*
- Design & construction according to industry standards and best practices
- Other municipal, provincial or conservation authority permits, as required

Existing transmission corridor

- 115 kilovolt (kV) transmission line built in the 1950s
- Easement rights, not ownership on this section of the right-of-way
- Right-of-way is 34 m (110’) wide along Deerpath Drive, with structures located 9 m (30’) east of centre
- Twin pole structures approx. 18-24 m (60’-80’) tall and spaced about 100 m (330’) apart
- Six twin pole structures between the railway and Hanlon Pkwy crossing; the latter is an angle structure



View along Deerpath Drive

Proposed transmission corridor

- Upgrade transmission line to 230 kilovolt (kV) on existing corridor under existing easement
- Replace existing structures with steel poles, conventional or narrow base steel lattice towers, approx. 37-40 m (120’-130’) tall
- Spans between poles can be longer; e.g. three poles could replace five existing structures
- New structures adjacent to Deerpath Drive will be closer to the curb

View of steel poles in residential neighbourhood in Woodstock

230 kV steel lattice tower types

Conventional
(shown in Essex County)

Narrow based (
(shown west of Barrie)

7

Woodstock transmission line upgrade 115 kV to 230 kV

2007

2012

View from Augusta Place, Woodstock

8

Community issues and concerns

- Opportunity to provide input into the process
- Electric and magnetic fields
- Property values
- Tidiness of the vacant lot on Deerpath Drive
- Desire to bury the line underground
- Visual appearance of the new transmission line
- Desire to move the transmission line closer to Hanlon Pkwy

Questions and Discussion

APPENDIX C: Meeting Participants

Community Representatives

Chris Corsky, spokesperson for Armel Corporation
Angelo DeNardis, spokesperson for the Guelph Wellington West Residents Association
Cam Guthrie, Councillor, Ward 4, City of Guelph
John McMeekin, spokesperson for the Guelph Wellington West Residents Association

Approximately 50 members of the community

Hydro One

Randy Church, Manager, Project Development and Oversight
Denise Jamal, Manager, Public Affairs
Andrew Luis, Real Estate Coordinator
Janice Martin, Environmental Planner
Robert Mongiat, Manager, Power System Projects
Carrie-Lynn Ognibene, Senior Advisor, Corporate Relations
John Sabiston Manager, Transmission Planning

Ontario Power Authority

Charlene de Boer, Transmission Planner

Haussmann Consulting Inc.

Tracey Ehl, Facilitator
Peter Mueller, Rapporteur

COMMUNITY UPDATE

September 21, 2012

Dear Residents,

Hydro One's Guelph Area Transmission Refurbishment Project

This letter is to update you on Hydro One's investigation of routing options for the proposed transmission line upgrade in your community.

In response to suggestions from several members of your community, Hydro One assessed a number of transmission line routing options in the vicinity of Deerpath Drive. These options are outlined in Section 4 of the draft Environmental Study Report (ESR). This report can be viewed at www.HydroOne.com/projects and at the locations listed in the attached *Notice of Completion.*

Since releasing the draft ESR, Hydro One has continued discussions with area landowners on the viability of moving the existing transmission corridor closer to Hanlon Parkway. Our investigation has concluded that moving the transmission corridor closer to Hanlon Parkway is not viable. As such, Hydro One's proposed undertaking in your community remains to upgrade the existing transmission line on the existing transmission corridor.

The outcome of Hydro One's routing investigation will be documented in the final ESR along with comments received during the public review of the draft ESR. We want to remind you that comments on Hydro One's draft ESR for this project are due by Tuesday, October 9, 2012. The *Notice of Completion,* published on August 9, 2012, outlines the process for submitting comments.

The final ESR will be submitted to the Ministry of the Environment and will be posted on Hydro One's website. Hydro One is also preparing its "Leave to Construct" application for the proposed undertaking for submission to the Ontario Energy Board later this year.

Carrie-Lynn Ognibene
Hydro One Community Relations
Tel: 1-877-345-6799
Email: Community.Relations@HydroOne.com

Attachment

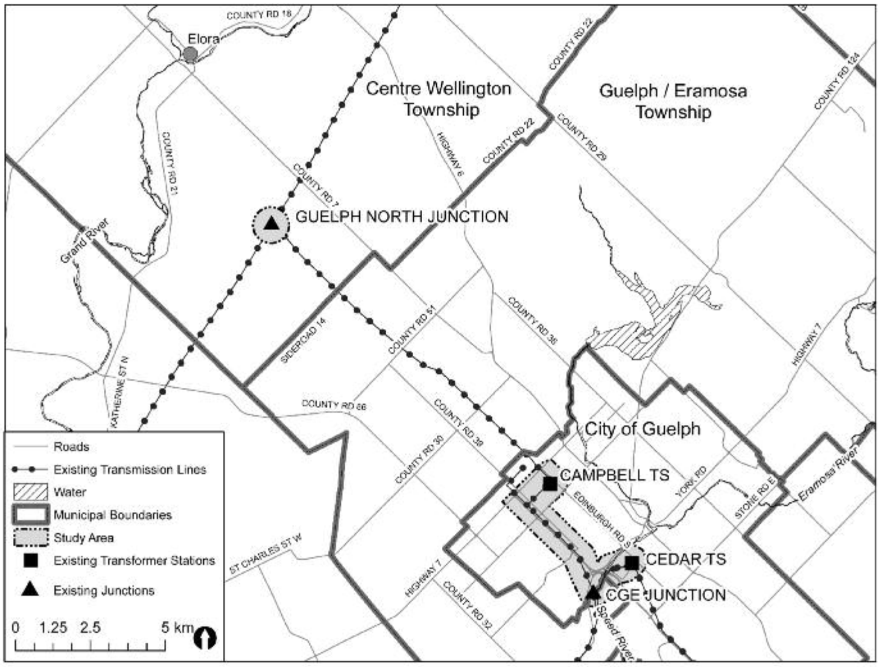
Notice of Completion of the draft Environmental Study Report

Guelph Area Transmission Refurbishment Project

Hydro One Networks Inc. (Hydro One) has completed the draft Environmental Study Report for the Guelph Area Transmission Refurbishment Project. The proposed project is needed to ensure an adequate supply of electricity for Guelph and the surrounding area and to improve electrical service reliability in the Kitchener-Waterloo-Cambridge-Guelph region.

The project area is shown on the map and proposed refurbishments would include:

- Installation of two new auto-transformers at Cedar Transformer Station (TS) in Guelph.
- Upgrading five kilometres of an existing transmission line from 115 to 230 kilovolts between CGE Junction and Campbell TS in Guelph.
- Upgrading Guelph North Junction in the Township of Centre Wellington to a switching station by installing new facilities and fencing on Hydro One owned property.



How to provide your input

This project is being planned in accordance with the *Class Environmental Assessment for Minor Transmission Facilities,* approved under Ontario's *Environmental Assessment Act*. Hydro One is making the draft Environmental Study Report (ESR) available for public review and comment, commencing Thursday, August 9, 2012. The draft ESR can be viewed at www.HydroOne.com/projects.

Hard copies of the draft ESR are also available for review at the following locations. Please call for hours of operation.

ServiceGuelph
City Hall
1 Carden Street, Guelph
Tel: 519-822-1260

Guelph Public Library
West End Branch
21 Imperial Road South, Guelph
Tel: 519-829-4403

Wellington County Library
Marden Branch
7368 Wellington Road 30, Guelph
Tel: 519-763-7445

Written questions or comments on the draft ESR must be received by Hydro One no later than 4:30 p.m. on Tuesday, October 9, 2012.

Please address your correspondence to:

Janice Martin, Environmental Planner
Hydro One Networks Inc.
483 Bay Street, South Tower, 6th Floor
Toronto, ON M5G 2P5
Email: Community.Relations@HydroOne.com
Tel: 1-877-345-6799; Fax: 416-345-6919

Hydro One will respond to and make best efforts to resolve any issues raised by concerned parties during the public review period. If no concerns are expressed, Hydro One will finalize the ESR and file it with the Ministry of the Environment. The project will then be considered acceptable and may proceed as outlined in the ESR.

The Environmental Assessment Act has provisions that allow interested parties to ask for a higher level of assessment for a Class EA project if they feel that outstanding issues have not been adequately addressed by Hydro One. This higher level of assessment is referred to as a Part II Order request. Such requests must be addressed in writing to the Minister of the Environment and received no later than 4:30 p.m. on October 9, 2012, at the following address:

Ministry of the Environment
135 St. Clair Avenue West, 12th Floor
Toronto, ON M4V 1P5

Please note that a duplicate copy of a Part II Order request must also be sent to Hydro One's Environmental Planner at the address noted.

hydro one
Partners in Powerful Communities

FIRST NATIONS & MÉTIS CONSULTATION PROCESS

1.0 INTRODUCTION

Hydro One recognizes the importance of early engagement with First Nations and Métis communities regarding the Guelph Area Transmission Refurbishment Project (“**the Project**”). The following sets out Hydro One’s process for engaging with First Nations communities who may have an interest in, or may be potentially affected by, the Project.

2.0 IDENTIFICATION OF FIRST NATIONS & MÉTIS COMMUNITIES

On July 18, 2008, Hydro One sent a letter including a Project Study Area Map to the Ontario Ministry of Aboriginal Affairs and Indian and Northern Affairs Canada (now known as Aboriginal Affairs and Northern Development Canada) requesting input on First Nations and/or Métis communities with potential interests in or who may be potentially affected by the Project. In a letter to Hydro One dated September 26, 2008, the Ontario Ministry of Aboriginal Affairs advised that the project did not appear to be located in an area where First Nations may have existing or asserted rights that could be impacted by the Project. In a letter to Hydro One dated August 4, 2008, Indian and Northern Affairs Canada determined that a specific claim has been submitted by Mississaugas of the New Credit First Nation and advised Hydro One to apprise the First Nation of its intentions. In addition, Indian and Northern Affairs Canada indicated that Six Nations of the Grand River First Nation is in the general vicinity of the Project area. See **Exhibit B, Tab 6, Schedule 6, Attachment 1** for copies of the above communications.

On April 27, 2012, Hydro One sent a letter including a Project Study Area Map to the Ontario Ministry of Energy indicating that Hydro One would be re-commencing work on the Project. In this letter, Hydro One also indicated that it in tends to re-notify Mississaugas of the New Credit First Nation and Six Nations of the Grand River First Nation of project re-commencement and requested that the Ontario Ministry of Energy advise of additional First Nations interests that may occur within the general vicinity of the Project area. On June 25, 2012, t he Ontario Ministry of Energy responded advising that they had determined that there is a very low likelihood the Project will potentially affect any First Nations or Métis rights and therefore recommended that consultation is not necessary. See **Exhibit B, Tab 6, Schedule 6, Attachment 2** for copies of the above communications.

3.0 ENGAGEMENT PROCESS FOR FIRST NATIONS & MÉTIS COMMUNITIES

Hydro One's First Nations and Métis engagement process is designed to provide relevant Project information to neighbouring First Nations and Métis communities in a timely manner and for Hydro One to respond to and consider issues, concerns or questions raised by First Nations and Métis communities in a cl ear and transparent manner throughout the regulatory review processes (e.g., the Environmental Assessment ("**EA**") and OEB processes). Engagement activities with potentially impacted First Nations and Métis communities include:

- Providing Project-related information to neighbouring First Nations and Métis communities including, project notification letters which describe the need and nature of the project, and ensuring that all publicly available information is also made available to First Nations and Métis communities;
- Offering meetings with the First Nations and Métis communities to provide Project-related information, to identify concerns, issues or questions about the Project, and

respond to questions and wherever possible, address concerns, in relation to the Project;

- Providing information, when requested, on the OEB's regulatory process, the EA process or any other decision-making processes applicable to the Project;
- Giving consideration to all issues and concerns raised by the First Nations and Métis communities as to how the Project may affect them;
- Recording all forms of engagement with the First Nations and Métis communities, maintaining a record of the concerns and issues raised by the First Nations and Métis communities regarding the Project and Hydro One's responses thereto, and communicating the same with the Ministry of Energy.

4.0 ENGAGEMENT TO DATE WITH FIRST NATIONS COMMUNITIES

Hydro One has undertaken the following engagement activities:

- On June 2, 2009 and November 10, 2009, Hydro One sent letters notifying the Mississaugas of the New Credit First Nation and Six Nations of the Grand River First Nation Elected Council (“**the First Nations**”**)** of the Project, advised them of planned Public Information Centres concerning the Project, and offered to meet with them to discuss the Project.
- On August 9, 2010, Hydro One contacted the First Nations by letter and email to update them on the Project and repeated the offer to meet.
- On August 26, 2010, Hydro One contacted the Haudenosaunee Confederacy Council by letter to update them on the Project and to extend an offer to meet.
- On September 7, 2010, Hydro One received a reply from Six Nations of the Grand River First Nation Elected Council via email indicating a desire to provide input on the Project.
- On October 6, 2010, Hydro One and Six Nations of the Grand River First Nation Elected representatives met to discuss the Project.

- On October 28, 2010, Hydro One transmitted via Canada Post and electronic mail to Six Nations of the Grand River First Nation Elected Council, a meeting follow-up package that addressed all action items identified in the meeting minutes.
- On May 22, 2012, Hydro One transmitted via Canada Post and electronic mail to Mississaugas of the New Credit First Nation, Six Nations of the Grand River First Nation Elected Council, and the Haudenosaunee Confederacy Council notification of Project re-commencement, planned Public Information Centres and an offer to meet to discuss the Project.
- On June 14, 2012, Hydro One telephoned Mississaugas of the New Credit First Nation, Six Nations of the Grand River First Nation Elected Council, and the Haudenosaunee Confederacy Council to follow-up with the Project notification letter sent on May 22, 2012.
- On June 14, 2012, the Haudenasaunee Confederacy Council indicated by telephone that they would not be attending the Public Information Centre and will be in contact with Hydro One regarding the Project. Hydro One has not received any additional correspondence from the Haudenosaunee Confederacy Council.

See **Exhibit B, Tab 6, Schedule 6, Attachment 3** for copies of the above communications.

5.0 SUMMARY

Hydro One is prepared to continue engagement efforts with these First Nations relating to the Guelph Area Transmission Refurbishment Project. To date, no issues or concerns have been raised by the above mentioned First Nations communities. Hydro One will work to resolve any issues or concerns in the event that anything should arise.

Attachment 1

- July 18, 2008 Letter from Hydro One to Ministry of Aboriginal Affairs and INAC
- September 26, 2008 Letter from Ministry of Aboriginal Affairs
- August 4, 2008 Letter from INAC

Hydro One Networks Inc.
483 Bay Street
TCT12, North Tower
Toronto, Ontario, M5G 2P5
mccormick.bj@hydroone.com

Tel: 416-345-6597
Fax: 416-345-6919
Cell: 416-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

July 18, 2008

Mr. Alan Kary
Deputy Director
Ontario Ministry of Aboriginal Affairs
Policy and Relationships Branch
720 Bay Street 4th Floor
Toronto, Ontario
M5G 2K1

RE: Guelph Area Transmission Reinforcement Project Class Environmental Assessment

Dear Mr. Kary:

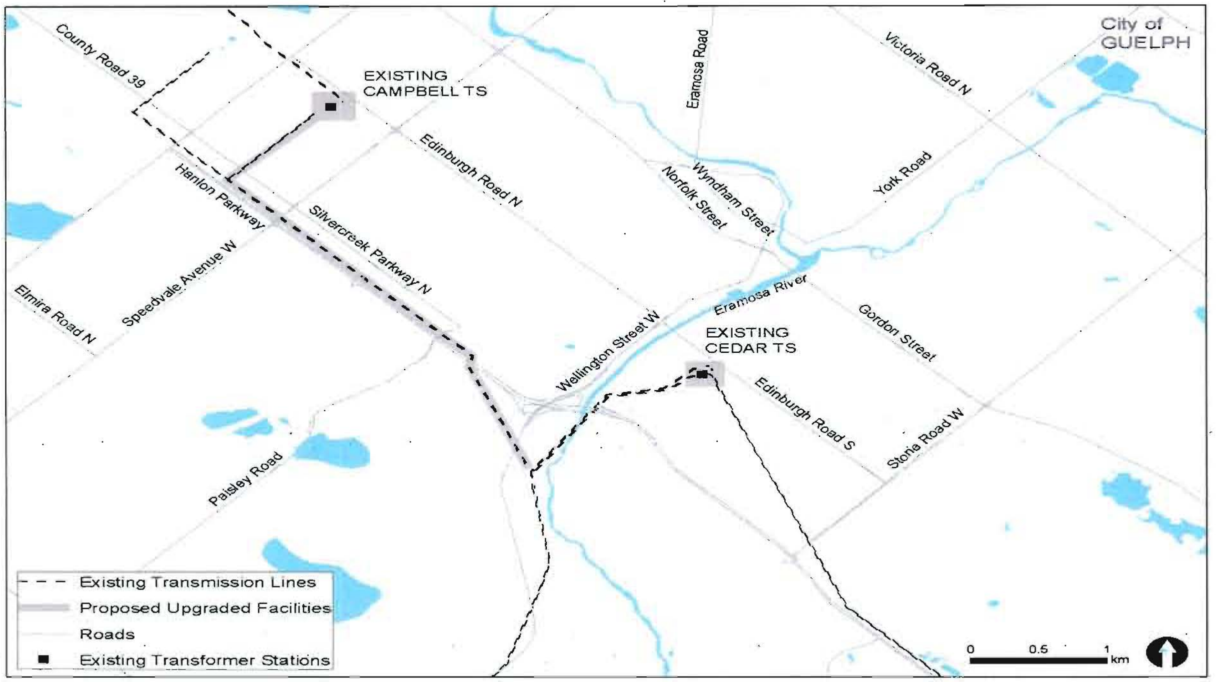
Hydro One Networks Inc. (Hydro One) is about to begin a project to reinforce the electrical infrastructure and better serve residents and businesses in the City of Guelph. Transmission options were therefore proposed by the Ontario Power Authority in the Integrated Power System Plan to increase the transmission supply capacity to the Guelph Area.

Hydro One will soon initiate a Class Environmental Assessment (Class EA) in the Guelph area with two distinct alternatives involving: a station upgrade (or new station) and a transmission line upgrade. The alternatives are as follows (please see map):

Alternative 1:
- Install two 230/115 kV autotransformers on a new property adjacent to the existing Guelph Campbell Transformer Station (TS) (or on a new property along the transmission line between Guelph Campbell TS and Guelph Cedar TS); and
- Rebuild/upgrade approximately 5 km of existing 115 kV transmission line between Guelph Campbell TS and Guelph Cedar TS.

Alternative 2:
- Install two 230/115 kV autotransformers within the existing Guelph Cedar TS; and
- Rebuild/upgrade approximately 5 km of existing 115 kV transmission line between Guelph Campbell TS and Guelph Cedar TS to a 2 circuit 230 kV line.

The proposed undertaking is subject to provincial Environmental Assessment (EA) Act approval, in accordance with the Class EA for Minor Transmission Facilities. Also, the transmission line rebuild/upgrade would be subject to "Leave to Construct" approval from the Ontario Energy Board (OEB). The Class EA may involve the identification and comparative evaluation of alternate sites to select a preferred site for the TS. Contingent on the outcome of the Class EA and the OEB approval processes, the new facilities could be placed in service as early as April 2011.



Hydro One recognizes the need to begin consultation with First Nations Communities in the preliminary stages of project planning. To assist us in doing this, could you please provide us with information on whether there are any First Nations Reserves, land claims, interests or treaties of which we should be aware in the project area. Inquiries have also been sent to one other person in OMAA; Surrinder Singh Gill, Policy Advisor – Policy and Relationships Branch.

Our first Public Information Centre (PIC) will occur later this year to provide interested parties the opportunity to learn more about the project, provide their input on project options, and discuss any issues or concerns with our project team. We will advise you of the details of the PIC via an invitation letter closer to the date. For our records, please complete and return the attached **Fax Back Form** indicating the appropriate contact person.

If you have any questions regarding this project please feel free to contact me at (416) 345-6597, or Janice Martin at (416) 345-5357.

Sincerely,

Brian McCormick
Manager, Environmental Services & Approvals

Cc Lee Anne Cameron, Director – First Nation and Métis Relations, Hydro One

FAX BACK FORM

To: Janice Martin, Hydro One Networks Inc. Date:____________

Fax: (416) 345-6919

RE: Guelph Area Transmission Reinforcement Project

Class Environmental Assessment

Contact Name: ______________________________

Position Title: ______________________________

Department: ______________________________

Municipality/Agency: ______________________________

Address: ______________________________

____

Phone: ______________________________

Fax: ______________________________

Email: ______________________________

Please indicate the appropriate response:

___ We are interested in providing input regarding this study.

___ We are not interested in providing input regarding this study but would like to be kept on Hydro One's mailing list.

___ Please take us off Hydro One's mailing list for this study.

Municipality/Agency's areas of interest or concern/preliminary comments:

____

____

____

Please provide the information of additional contact persons. (Attach additional sheets if required.)

Any questions may be directed to Janice Martin, Environment Specialist at (416) 345-5357.

Hydro One Networks Inc.
483 Bay Street
TCT12, North Tower
Toronto, Ontario, M5G 2P5
mccormick.bj@hydroone.com

Tel: 416-345-6597
Fax: 416-345-6919
Cell: 416-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

July 18, 2008

Franklin Roy, Director
Indian and Northern Affairs Canada
Litigation Management and Resolution Branch
10 Wellington Street
25 Eddie 1430
Gatineau, QC
K1A 0H4

RE: Guelph Area Transmission Reinforcement Project Class Environmental Assessment

Dear Mr. Roy:

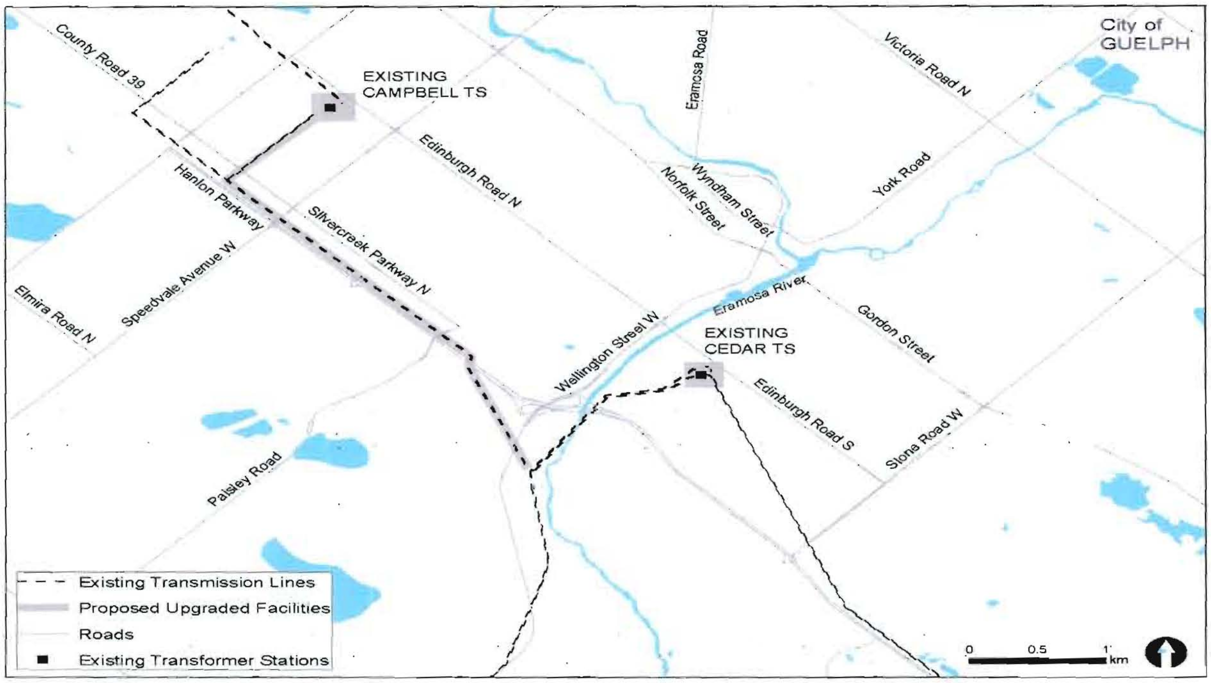
Hydro One Networks Inc. (Hydro One) is about to begin a project to reinforce the electrical infrastructure and better serve residents and businesses in the City of Guelph. Transmission options were therefore proposed by the Ontario Power Authority in the Integrated Power System Plan to increase the transmission supply capacity to the Guelph Area.

Hydro One will soon initiate a Class Environmental Assessment (Class EA) in the Guelph area with two distinct alternatives involving: a station upgrade (or new station) and a transmission line upgrade. The alternatives are as follows (please see map):

Alternative 1:
- Install two 230/115 kV autotransformers on a new property adjacent to the existing Guelph Campbell Transformer Station (TS) (or on a new property along the transmission line between Guelph Campbell TS and Guelph Cedar TS); and
- Rebuild/upgrade approximately 5 km of existing 115 kV transmission line between Guelph Campbell TS and Guelph Cedar TS.

Alternative 2:
- Install two 230/115 kV autotransformers within the existing Guelph Cedar TS; and
- Rebuild/upgrade approximately 5 km of existing 115 kV transmission line between Guelph Campbell TS and Guelph Cedar TS to a 2 circuit 230 kV line.

The proposed undertaking is subject to provincial Environmental Assessment (EA) Act approval, in accordance with the Class EA for Minor Transmission Facilities. Also, the transmission line rebuild/upgrade would be subject to "Leave to Construct" approval from the Ontario Energy Board (OEB). The Class EA may involve the identification and comparative evaluation of alternate sites to select a preferred site for the TS. Contingent on the outcome of the Class EA and the OEB approval processes, the new facilities could be placed in service as early as April 2011.



Hydro One recognizes the need to begin consultation with First Nations Communities in the preliminary stages of project planning. To assist us in doing this, could you please provide us with information on whether there are any First Nations Reserves, land claims, interests or treaties of which we should be aware in the project area. Inquiries have also been sent to two other people in INAC; Louise Trépanier, Director - Comprehensive Claims Branch and Fred Hosking, Senior Claims Analyst - Specific Claims Branch.

Our first Public Information Centre (PIC) will occur later this year to provide interested parties the opportunity to learn more about the project, provide their input on project options, and discuss any issues or concerns with our project team. We will advise you of the details of the PIC via an invitation letter closer to the date. For our records, please complete and return the attached **Fax Back Form** indicating the appropriate contact person.

If you have any questions regarding this project please feel free to contact me at (416) 345-6597, or Janice Martin at (416) 345-5357.

Sincerely,

Brian McCormick
Manager, Environmental Services & Approvals

Cc Lee Anne Cameron, Director – First Nation and Métis Relations, Hydro One pls scan

Ministry of Aboriginal Affairs

720 Bay Street
4th Floor
Toronto, ON M5G 2K1

Tel: (416) 326-4741
Fax: (416) 326-4017

Ministère des Affaires autochtones

720, rue Bay
4e étage
Toronto, ON M5G 2K1

Tél: (416) 326-4741
Téléc: (416) 326-4017

website: www.aboriginalaffairs.gov.on.ca

Ontario

Reference: PAR 368
0809-258

Brian McCormick
Manager, Environmental Services & Approvals
Hydro One
483 Bay Street
TCT12, North Tower
Toronto, ON M5G 2P5

Re: Guelph Area Transmission Reinforcement

Dear Mr. McCormick:

Thank you for your inquiry dated July 18, 2008, regarding the above noted project.

The responsibilities of the Ministry of Aboriginal Affairs (MAA) include conducting land claim and related negotiations on behalf of the Province. MAA can provide you with information about land claims that have been submitted to the Ministry, are currently in active negotiations, or are being implemented. We can also advise as to whether there is any litigation with an Aboriginal community that may be relevant to your project.

You should also be aware that many First Nations and Métis communities either have or assert rights to hunt and fish in their traditional territories. These territories often include lands and waters outside of a First Nation reserve. As well, in some instances project work may affect archaeological and burial sites. Aboriginal communities with an interest in such sites may include communities other than those in the vicinity of the proposed project.

With respect to your project, we have reviewed the brief materials you have provided, and can advise that this project does not appear to be located in an area where First Nations may have existing or asserted rights that could be impacted by your project.

.../2

MAA is not the approval or regulatory authority for your project. You should consider the information provided in this letter in light of the statutes and guidance materials provided by the appropriate approval or regulatory authority for consultation requirements with Aboriginal communities on a project such as you are proposing. Should you have questions on the process please contact the appropriate ministry.

The Government of Canada sometimes receives claims that Ontario does not receive, or with which Ontario does not become involved. For additional information, MAA recommends the proponent contact the following:

Mr. Fred Hosking
Senior Claims Analyst
Ontario Research Team
Indian and Northern Affairs Canada
10 Wellington St.
Gatineau, QC K1A 0H4
Tel: (819) 953-1940
Fax: (819) 997-9873

Mr. Kevin Clement
A/Director,
Financial Issues and Cost-Sharing
Indian and Northern Affairs Canada
10 Wellington St. 8th Floor
Gatineau, QC K1A 0H4
Tel: (819) 997-8369
Fax: (819) 997-9147

For federal information on litigation contact:

Jonathan Allen
Litigation Team Leader for Ontario
1430-25 Eddy Street
Gatineau, QC K1A 0H4
Tel: (819) 956-3181
Fax: (819) 953-6143

You should also be aware that information upon which the above comments are based is subject to change. First Nation or Métis communities can make assertions at any time, and other developments can occur that might require additional communities to be notified.

Yours truly,

R. Hahn for P. Wheaton.

Pam Wheaton
Director
Aboriginal and Ministry Relationships Branch

FAX BACK FORM

hydro one

To: Janice Martin, Hydro One Networks Inc. Date: AUG AOUT 0 4 2008

Fax: (416) 345-6919

RE: Guelph Area Transmission Reinforcement Project

Class Environmental Assessment

Contact Name: Marie-Laurence Daigle

Position Title: Claims Analyst

Department: INAC

Municipality/Agency:

Address:

Phone: (819) 953-3170

Fax: (819) 997-9873

Email:

Please indicate the appropriate response:

___ We are interested in providing input regarding this study.

___ We are not interested in providing input regarding this study but would like to be kept on Hydro One's mailing list.

✓ Please take us off Hydro One's mailing list for this study.

Municipality/Agency's areas of interest or concern/preliminary comments:

Guelph

Please provide the information of additional contact persons. (Attach additional sheets if required.)

Any questions may be directed to Janice Martin, Environment Specialist at (416) 345-5357.

Comments:

We have conducted a brief search of our records and determined that a specific claim has been submitted by a First Nation in the area of interest. You may wish to apprise them of your attentions.

Mississaugas of the New Credit First Nation
2789 MISSISSAUGA ROAD R.R. #6 HAGERSVILLE ON N0A 1H0
(905) 768-1133

In addition, there is another First Nation in the general vicinity of your area of interest. They can be contacted at:

Six Nations of the Grand River
P.O. Box 5000 OHSWEKEN ON
N0A 1M0
(519) 445-2201

For more information, you may wish to consult a "Public Information Status Report" on all claims which have been submitted to date. This information is available to the public on the Indian and Northern Affairs Canada (INAC) website and can be found at http://www.ainc-inac.gc.ca/ps/clm/pis_e.html.
It should be noted that the reports available on the INAC website are updated quarterly and therefore, you may want to check this site at regular intervals for updates. In accordance with legislative requirements, confidential information has not been disclosed.
You may also wish to visit http://www.ainc-inac.gc.ca/nr/iss/acp/acp-eng.asp on the INAC website for information regarding the Federal Action Plan on Aboriginal Consultation and Accommodation.
Please rest assured that it is the policy of the Government of Canada as expressed in *Outstanding Business: A Native Claims Policy* that "in any settlement of specific native claims the government will take third party interests into account. As a general rule, the government will not accept any settlement which will lead to third parties being dispossessed."
We can only speak directly to claims filed under the Specific Claims Policy in the Province of Ontario. We cannot make any comments regarding potential or future claims, or claims filed under other departmental policies. This includes claims under Canada's Comprehensive Claims Policy or legal action by a First Nation against the Crown. You may wish to contact INAC's Comprehensive Claims Branch at (819)994-7521, and its Litigation Management and Resolution Branch at (819) 934-2185 directly for more information. In addition, you may wish to consult the unit responsible for Special Claims at (819) 994-6453, and the Consultation and Accommodation Unit at (613) 944-9313.
To the best of our knowledge, the information we have provided you is current and up-to-date. However, this information may not be exhaustive with regard to your needs and you may wish to consider seeking information from other government and private sources (including Aboriginal groups). In addition, please note that Canada does not act as a representative for any Aboriginal group for the purpose of any claim or the purpose of consultation.

Attachment 2

- April 27, 2012 Letter from Hydro One to Ontario Ministry of Energy
- June 25, 2012 Letter from Ministry of Energy

Hydro One Networks Inc.
483 Bay Street
TCT4, South Tower
Toronto, Ontario, M5G 2P5
www.HydroOne.com

Tel: (416)-345-6597
Fax: (416)-345-6919
Cell: (416)-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

April 27, 2012

Amy Gibson
Manager, First Nation and Métis Policy and Partnerships Office
Ministry of Energy
880 Bay Street, 3rd Floor
Toronto, Ontario, M7A 2C1

Re: Guelph Area Transmission Refurbishment Project

Dear Ms. Gibson:

Hydro One Networks Inc. (HONI) has received a letter dated March 8, 2012 from the Ontario Power Authority (OPA) recommending that HONI continue with the project development work for the Guelph Area Transmission Refurbishment Project (the Project). Please find enclosed a copy of the letter from the OPA.

In response to this direction received from the OPA, HONI is re-commencing work on the Environmental Assessment for the Project. In brief, the project includes three proposed components: the refurbishment of approximately 5 km of existing transmission line in the City of Guelph; the upgrade of Hydro One's Cedar Transformer Station (TS) in the City of Guelph; and the installation of a switching station at Hydro One's Guelph North Junction located in the Township of Centre Wellington, northwest of Guelph. Please find enclosed a map showing the project study area.

The proposed undertaking is subject to the provincial Environmental Assessment (EA) Act approval, in accordance with the Class EA for Minor Transmission Facilities.

In early 2009, a Class EA study commenced for the Project however it was put on hold in Fall 2010. As part of our First Nations and Métis consultation, HONI sent request letters to the Ministry of Aboriginal Affairs (MAA) and Indian and Northern Affairs Canada (INAC) seeking input regarding First Nations and Métis interests within the vicinity of the project area. MAA advised that the project did not appear to be located in an area where First Nations may have existing or asserted rights that could be impacted by the project. INAC determined that Mississaugas of the New Credit and Six Nations of the Grand River were communities with a potential interest in the Project. Both communities were sent project notification letters, invitations to PICs, a project update, and at the request of the community, HONI held one meeting with Six Nations elected representatives.

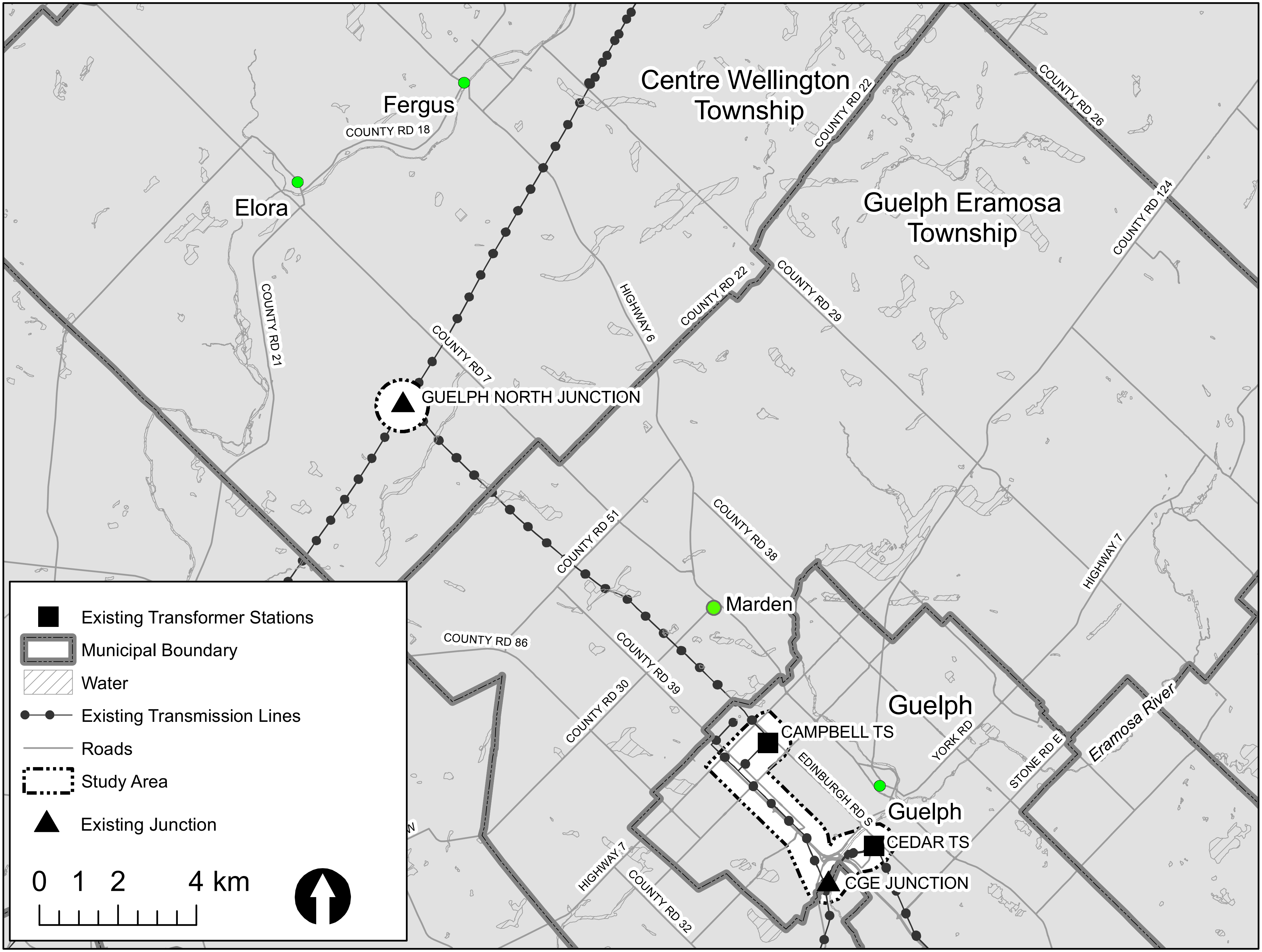
HONI intends to re-notify the First Nations listed above of project commencement. If you have additional advice regarding First Nations interests that may occur within the general vicinity of the project area, please provide us with a list of First Nations Communities for the study area. We understand that according to the Métis Nation of Ontario's community map, there are no Métis interests in the project area.

If you have any questions or concerns regarding this matter, please feel free to contact me at (416) 345-6596, or Janice Martin at (416) 345-5357.

Sincerely,

Brian J. McCormick, Manager
Environmental Services & Approvals

Cc:
Pam Wheaton, Manager, Consultation Unit, Aboriginal Relations and Ministry Partnerships Division, Ministry of Aboriginal Affairs
Christine Goulais, Sr. Manager, First Nations and Métis Relations (Hydro One)


Centre Wellington Township
Guelph Eramosa Township
Fergus
Elora
Marden
Guelph
Guelph
GUELPH NORTH JUNCTION
CAMPBELL TS
CEDAR TS
CGE JUNCTION
COUNTY RD 18
COUNTY RD 21
COUNTY RD 7
COUNTY RD 22
COUNTY RD 22
COUNTY RD 26
COUNTY RD 124
COUNTY RD 29
HIGHWAY 6
COUNTY RD 51
COUNTY RD 38
COUNTY RD 86
COUNTY RD 39
COUNTY RD 30
HIGHWAY 7
HIGHWAY 7
COUNTY RD 32
EDINBURGH RD S
YORK RD
STONE RD E
Eramosa River
Existing Transformer Stations
Municipal Boundary
Water
Existing Transmission Lines
Roads
Study Area
Existing Junction
0 1 2 4 km

Ministry of Energy

880 Bay Street
3rd Floor
Toronto ON M7A 2C1

Tel: (416) 327-2116
Fax: (416) 327-3344

Ministère de l'Énergie

880, rue Bay
3e étage
Toronto ON M7A 2C1

Tél: (416) 327-2116
Téléc: (416) 327-3344

Ontario

First Nation and Métis Policy and Partnerships Office

June 25, 2012

Brian J. McCormick
Manager, Environmental Services and Approvals
Hydro One Networks Inc.
483 Bay Street, South Tower, 4th Floor
Toronto, ON M5G 2P5

Re: Guelph Area Transmission Refurbishment Project

Dear Mr. McCormick:

Thank you for your letter of April 27, 2012 in which you are seeking advice regarding potential First Nations interests in the proposed Guelph Area Transmission Refurbishment Project ("the project").

For clarity, the Ministry of Energy examined the potential for infringements on Aboriginal or treaty rights as a result of the project. We have determined that there is a very low likelihood the project will potentially affect any First Nation or Métis rights. We therefore recommend that consultation is not necessary at this time.

Notwithstanding this recommendation, Hydro One Networks Inc. ("Hydro One") may wish to continue to notify the Six Nations of the Grand River and the Mississaugas of the New Credit as part of its broader public consultations on the project, or any other Aboriginal communities that may otherwise be interested in the project.

With respect to the Six Nations, I understand that Hydro One has previously notified both the Six Nations Elected Council and the Haudenosaunee Confederacy Chiefs Council. Energy concurs with this approach and we recommend that further notifications to this community continue to include both organizations.

If any First Nation or Métis communities claim that an Aboriginal or treaty right may be impacted as a result of the proposed project, please bring this to the attention of the Environmental Approvals Branch at Ministry of the Environment as soon as possible.

Please do not hesitate to contact me if you have any questions or wish to discuss this matter in more detail.

Sincerely,

Amy Gibson

Amy Gibson
Manager
First Nation and Métis Policy and Partnerships Office

c: Agatha Garcia-Wright, Director
Environmental Approvals Branch, Ministry of the Environment

Wendy Cornet, Manager
Consultation Unit, Ministry of Aboriginal Affairs

Christine Goulais, Senior Manager
First Nations and Métis Relations, Hydro One

Attachment 3

- June 2, 2009 Hydro One letters to Mississaugas of the New Credit and Six Nations of the Grand River
- November 10, 2009 Hydro One letters to Mississaugas of the New Credit and Six Nations of the Grand River
- August 9, 2010 E mail and letter to Mississaugas of the New Credit and Six Nations of the Grand River
- August 26, 2010 Letters to Haudenosaunee Confederacy Council
- September 7, 2010 Email from Six Nations of the Grand River
- October 28, 2010 Hydro One follow up package to Six Nations of the Grand River
- May 22, 2012 Hydro One letter to Mississaugas of the New Credit, Six Nations of the Grand River and Haudenosaunee Confederacy Council

Hydro One Networks Inc.
483 Bay Street
TCT12, North Tower
Toronto, Ontario, M5G 2P5
mccormick.bj@hydroone.com

Tel: 416-345-6597
Fax: 416-345-6919
Cell: 416-525-1051 (Preferred)

Brian McCormick
Manager, Environmental Services and Approvals

Chief Bryan LaForme
Mississaugas of the New Credit First Nation
2789 Mississauga Road, RR#6
Hagersville, ON N0A 1H0

June 2, 2009

RE: Guelph Area Transmission Infrastructure Refurbishment Class Environmental Assessment

Dear Chief LaForme:

This letter is to inform you that Hydro One Networks Inc. (Hydro One) is initiating a Class Environmental Assessment (EA) to refurbish parts of the aging high-voltage electricity infrastructure serving the City of Guelph. Please accept this invitation to a public information centre (PIC) on June 10th to learn more about the project and meet with our staff.

Parts of the high-voltage electricity system serving Guelph were installed starting in 1910 and require upgrades to keep pace with the economic growth and development in the area. This need and transmission solution were identified by the Ontario Power Authority, and confirmed by the local utility Guelph Hydro. Conservation and demand management and distributed generation will, however, continue to play a role in the electricity plan for the community.

To ensure that Guelph Hydro customers continue to receive a safe and reliable supply of power Hydro One proposes two alternatives to refurbish the electricity infrastructure – both will involve upgrading the existing 115 kV transmission lines between Campbell Transformer Station (TS) and CGE Junction (see attached Notice). This will be coupled with either building a new transformer station within the study area or expanding our existing station at Cedar TS. No changes to the transmission line between CGE Junction and Cedar TS are required.

The Class EA is being carried out in accordance with the process described in Hydro One's *Class EA for Minor Transmission Facilities*. The project must also be approved by the Ontario Energy Board (OEB). Contingent on the outcome of the Class EA approval process, construction is expected to begin in late 2010 with the new facilities in-service by spring of 2012.

The first PIC will be held on **Wednesday, June 10, 2009 from 4 p.m. to 8 p.m. at the First Christian Reformed Church located at 278 Water Street, Guelph Ontario**. Please refer to the attached map for information on the location of the study area and the PIC. The PIC will provide the community an opportunity to learn more about the project, provide input about project options, as well as discuss any issues or concerns with our project team.

A second PIC will be held later this year to present the proposed transmission line upgrade, the TS site selection process and seek public input on Hydro One's preferred TS site.

We welcome your participation in this project and hope you will be able to attend the PIC. We would also be pleased to arrange a meeting to gather your input and feedback and discuss with you the areas of interest and/or concern regarding this project. A representative from Hydro One will be following up with your Band Office to discuss this further.

For our records, please complete and return the attached **Fax Back Form** indicating the appropriate contact person.

If you have any questions regarding this project please feel free to contact me at (416) 345-6597 or Janice Martin, Environmental Specialist, Hydro One at (416) 345-5357 or by email at jc.Martin@HydroOne.com.

Sincerely,

Brian McCormick
Manager, Environmental Services and Approvals

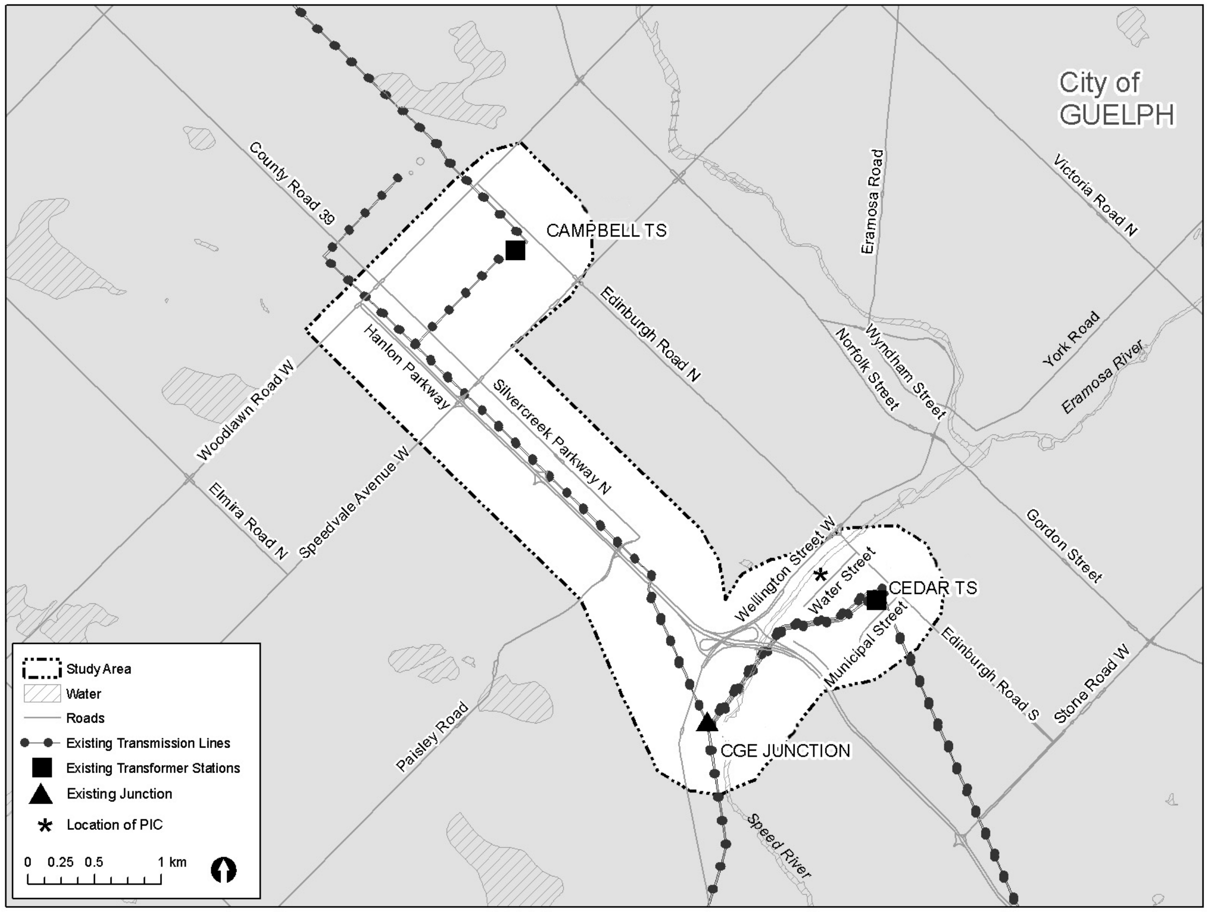
Cc: Lee Anne Cameron, Director, First Nations and Métis Relations (Hydro One Networks Inc.)
Hillary Thatcher, Senior Policy Adviser, Ministry of Energy and Infrastructure

Notice of Commencement and Invitation to Public Information Centre #1

Guelph Area Transmission Infrastructure Refurbishment Class Environmental Assessment

Hydro One Networks (Hydro One) is initiating a *Class Environmental Assessment* (EA) to refurbish parts of the high-voltage electricity infrastructure serving the City of Guelph, originally built starting in 1910. Strong economic growth and development have also resulted in the need to upgrade the transmission capacity in this area. This immediate need and the transmission refurbishment was identified by the Ontario Power Authority and confirmed by the local utility Guelph Hydro. Conservation and demand management and distributed generation will continue to play an important role in the overall electricity plan for Guelph.

To ensure that Guelph Hydro customers continue to receive a safe and reliable supply of power Hydro One proposes two alternatives to address the area's needs (see map):



<u>Alternative 1:</u>

- Build a new transformer station (TS) with two 230-115 kV transformers on a new site within the study area.
- Replace approximately 5 km of an aging 115 kV transmission line between Campbell TS and CGE Junction with a two circuit 230 kV line. The line would operate initially at 115 kV.

<u>Alternative 2</u>:

- Install two 230-115 kV transformers at the existing Cedar TS site.
- Replace approximately 5 km of aging 115 kV transmission line between Campbell TS and CGE Junction with a two circuit 230 kV line. The line would operate at 230 kV.

No changes to the transmission line between CGE Junction and Cedar TS are required.

This project is subject to the *Class Environmental Assessment for Minor Transmission Facilities* process, in accordance with the provincial *Environmental Assessment Act*. Construction of the proposed facilities must also be approved by the Ontario Energy Board (OEB). Pending the review and approvals process, construction is expected to begin in late 2010 with the new facilities in-service by spring of 2012.

COMMUNITY CONSULTATION

The Class EA and OEB processes provide opportunities for public and stakeholder consultation and your feedback is very important to us. We invite you to a Public Information Centre (PIC) to learn more about our plan to refurbish the aging electricity infrastructure in the City of Guelph. At this first PIC we will provide information about the need for the project, alternatives, environmental, socio-economic and technical considerations, and the planning and approvals process.

We encourage members of the public to actively participate in the EA and OEB processes by attending the PIC or contacting us directly with comments or questions.

Visit our project Website at:
www.HydroOneNetworks.com/newprojects

hydro one
Partners in Powerful Communities

PUBLIC INFORMATION CENTRE #1

Wednesday, June 10, 2009
4 p.m. – 8 p.m.
First Christian Reformed Church
287 Water Street, Guelph, Ontario

A second PIC will be held later this year to present the proposed transmission line upgrade, the TS site selection process and seek public input on Hydro One's preferred transformer station site.

FOR MORE INFORMATION

If you have any questions or wish to be added to the project mailing list, please contact:

Nancy Shaddick
Community Relations
Hydro One Networks Inc.
Tel: (416) 345-6799 or 1-877-345-6799
E-mail: Community.Relations@HydroOne.com

FAX BACK FORM

To: Janice Martin, Hydro One Networks Inc. Date: __________

Fax: (416) 345-6919

RE: Guelph Area Transmission Infrastructure Refurbishment Class Environmental Assessment

---

Contact Name: ______________________________

Position Title: ______________________________

Department: ______________________________

Municipality/Agency: ______________________________

Address: ______________________________

____

Phone: ______________________________

Fax: ______________________________

Email: ______________________________

Please indicate the appropriate response:

___ We are interested in providing input regarding this study.

___ We are not interested in providing input regarding this study but would like to be kept on Hydro One's mailing list.

___ Please take us off Hydro One's mailing list for this study.

Your areas of interest or concern/preliminary comments:

____

____

____

____

Please provide the information of additional contact persons. (Attach additional sheets if required).

Any questions may be directed to Janice Martin, Environmental Specialist, at (416) 345-5357, or by email at jc.martin@HydroOne.com.

Hydro One Networks Inc.
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Cell: 416-525-1051 (Preferred)

Brian McCormick
Manager, Environmental Services and Approvals

Chief William Montour
Six Nations of the Grand River
P.O. Box 5000
Ohsweken, ON N0A 1M0

June 2, 2009

RE: Guelph Area Transmission Infrastructure Refurbishment Class Environmental Assessment

Dear Chief Montour:

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To ensure that Guelph Hydro customers continue to receive a safe and reliable supply of power Hydro One proposes two alternatives to refurbish the electricity infrastructure – both will involve upgrading the existing 115 kV transmission lines between Campbell Transformer Station (TS) and CGE Junction (see attached Notice). This will be coupled with either building a new transformer station within the study area or expanding our existing station at Cedar TS. No changes to the transmission line between CGE Junction and Cedar TS are required.

The Class EA is being carried out in accordance with the process described in Hydro One's *Class EA for Minor Transmission Facilities*. The project must also be approved by the Ontario Energy Board (OEB). Contingent on the outcome of the Class EA approval process, construction is expected to begin in late 2010 with the new facilities in-service by spring of 2012.

The first PIC will be held on **Wednesday, June 10, 2009 from 4 p.m. to 8 p.m. at the First Christian Reformed Church located at 278 Water Street, Guelph Ontario**. Please refer to the attached map for information on the location of the study area and the PIC. The PIC will provide the community an opportunity to learn more about the project, provide input about project options, as well as discuss any issues or concerns with our project team.

A second PIC will be held later this year to present the proposed transmission line upgrade, the TS site selection process and seek public input on Hydro One's preferred TS site.

We welcome your participation in this project and hope you will be able to attend the PIC. We would also be pleased to arrange a meeting to gather your input and feedback and discuss with you the areas of interest and/or concern regarding this project. A representative from Hydro One will be following up with your Office to discuss this further.

For our records, please complete and return the attached **Fax Back Form** indicating the appropriate contact person.

If you have any questions regarding this project please feel free to contact me at (416) 345-6597 or Janice Martin, Environmental Specialist, Hydro One at (416) 345-5357 or by email at jc.Martin@HydroOne.com.

Sincerely,

Brian McCormick
Manager, Environmental Services and Approvals

Cc: Lee Anne Cameron, Director, First Nations and Métis Relations (Hydro One Networks Inc.)
Hillary Thatcher, Senior Policy Adviser, Ministry of Energy and Infrastructure

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Brian McCormick
Manager, Environmental Services and Approvals

Chief Bryan LaForme
Mississaugas of the New Credit First Nation
2789 Mississauga Road, RR#6
Hagersville, ON N0A 1H0

November 10, 2009

RE: Guelph Area Transmission Infrastructure Refurbishment
Class Environmental Assessment – Project Update

Dear Chief LaForme:

In June 2009, Hydro One Networks Inc. (Hydro One) initiated a Class Environmental Assessment (EA) study to refurbish parts of the aging high-voltage electricity infrastructure in the City of Guelph. The transmission refurbishments coupled with Guelph's conservation and demand management and distributed generation initiatives will help ensure the City's continued economic growth and development.

An initial public information centre (PIC) about this project was held on June 10, 2009 at the First Christian Reformed Church in Guelph. We are writing to inform you that Hydro One has introduced a new station alternative following public feedback received at the June session. This new alternative will be evaluated in the Class EA study. It also provides improved power supply reliability to Guelph and the surrounding area.

Hydro One originally proposed two alternatives to refurbish the electricity infrastructure and ensure that customers continued to receive a safe and reliable supply of power. Hydro One's third alternative involves installing a new switching station at the Guelph North Junction, which is north-west of Guelph in the Municipality of Centre Wellington (see attached Notice for location), upgrading the existing 115 kV transmission line between Campbell Transformer Station (TS) to CGE Junction, and replacing two of the existing transformers at Cedar TS. Please note that the transmission line upgrades proposed between Campbell TS and Cedar TS are similar for all three alternatives.

The new alternative station site at Guelph North Junction is outside of the original study area for this project. As such, a public information centre is planned to advise the affected community and stakeholders about the project and provide them an opportunity to participate in the Class EA process and provide their input.

This second PIC will be held on **Wednesday, November 25, 2009 from 4 p.m. to 8 p.m. at the Marden Community Centre, 7368 Wellington Road 30 (Marden Road), Township of Guelph/Eramosa**. Please refer to the attached map for further information.

In the new year, a third PIC will be held to present Hydro One's preferred station site, the site selection process and the proposed transmission line upgrade, and seek public and stakeholder input.

We welcome your participation in this project and hope you will be able to attend the PIC. We would also be pleased to arrange a meeting to gather your input and feedback and discuss with you the areas of interest and/or concern regarding this project. A representative from Hydro One will be following up with your Band Office to discuss this further.

If you have any questions regarding this project or the new Alternative #3 please contact me at (416) 345-6597 or Janice Martin, Environmental Specialist at (416) 345-5357 or by email at jc.martin@HydroOne.com

Sincerely,

Brian McCormick
Manager, Environmental Services and Approvals

Cc: Lee Anne Cameron, Director, First Nations and Métis Relations (Hydro One Networks Inc.)
Hillary Thatcher, Senior Policy Adviser, Ministry of Energy and Infrastructure

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Cell: 416-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

Chief William Montour
Six Nations of the Grand River
P.O. Box 5000
Ohsweken, ON N0A 1M0

November 10, 2009

RE: Guelph Area Transmission Infrastructure Refurbishment
Class Environmental Assessment – Project Update

Dear Chief Montour:

In June 2009, Hydro One Networks Inc. (Hydro One) initiated a Class Environmental Assessment (EA) study to refurbish parts of the aging high-voltage electricity infrastructure in the City of Guelph. The transmission refurbishments coupled with Guelph's conservation and demand management and distributed generation initiatives will help ensure the City's continued economic growth and development.

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If you have any questions regarding this project or the new Alternative #3 please contact me at (416) 345-6597 or Janice Martin, Environmental Specialist at (416) 345-5357 or by email at jc.martin@HydroOne.com

Sincerely,

Brian McCormick
Manager, Environmental Services and Approvals

Cc: Lee Anne Cameron, Director, First Nations and Métis Relations (Hydro One Networks Inc.)
Hillary Thatcher, Senior Policy Adviser, Ministry of Energy and Infrastructure

KAUFMANN Brian

From:	YU Cynthia
Sent:	Monday, August 09, 2010 3:14 PM
To:	'bryanlaforme@newcreditfirstnation.com'
Cc:	MCCORMICK Brian; MARTIN Janice
Subject:	Hydro One - GATR - Project Update

Dear Chief Bryan LaForme,

Please see the attached Notice of Project Update below for Hydro One's Guelph Area Transmission Infrastructure Refurbishment Project. A hardcopy will be sent to you shortly.

Sincerely,

H1-GATR-Chief LaForme.pdf

Guelph Area Transmission Nov...

Cynthia Yu
Environmental Planner
Environmental Services & Approval
*Hydro **One** Networks Inc.*
Tel: 416-345-5045
Fax: 416-345-6919
E-Mail: Cynthia.Yu@hydroone.com

KAUFMANN Brian

From: YU Cynthia
Sent: Monday, August 09, 2010 3:23 PM
To: 'wkm@sixnations.ca'; 'arleenmaracle@sixnations.ca'
Cc: MCCORMICK Brian; MARTIN Janice
Subject: Hydro One - GATR - Project Update

Dear Chief William Montour,

Please see the attached Notice of Project Update below for Hydro One's Guelph Area Transmission Infrastructure Refurbishment Project. A hardcopy will be sent to you shortly.

Sincerely,

H1-GATR-Chief Montour.pdf   Guelph Area Transmission Nov...

Cynthia Yu
Environmental Planner
Environmental Services & Approval
Hydro **One** *Networks Inc.*
Tel: 416-345-5045
Fax: 416-345-6919
E-Mail: Cynthia.Yu@hydroone.com

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Cell: 416-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

August 9 2010

Chief Bryan LaForme
Mississaugas of the New Credit First Nation
2789 Mississauga Rd., R.R. #6
Hagersville, ON NOA 1HO

<u>Project Update: Guelph Area Transmission Infrastructure Refurbishment Project</u>

Dear Chief Bryan LaForme,

This letter is to update you on the Guelph Area Transmission Refurbishment Project. As you know, in June 2009 Hydro One launched a Class Environmental Assessment (EA) study to upgrade some of the area's aging electricity infrastructure and to address new growth in the community. Parts of the high-voltage electricity system in Guelph were installed starting in 1910 and require upgrades to keep pace with the economic growth and development in the area. As well, conservation and demand management will continue to play a large role in the energy plans for the area.

Hydro One originally developed two alternatives to meet the Guelph area's needs and presented these at a Public Information Centre (PIC) on June 10, 2009 at the First Christian Reformed Church in Guelph.

Alternative 1

- Build a new transformer station (TS) with two 230-115 kV transformers on a new site within the study area.
- Replace approximately 5 km of an aging 115 kV transmission line between Campbell TS and CGE Junction with a two circuit 230 kV line. The line would operate initially at 115 kV.
- Replace two existing transformers at Cedar TS that are nearing their end of life.

Alternative 2

- Install two new 230-115 kV transformers at the existing Cedar TS site.
- Replace approximately 5 km of aging 115 kV transmission line between Campbell TS and CGE Junction with a two circuit 230 kV line. The line would operate at 230 kV.
- Replace two of the existing transformers at Cedar TS that are reaching their end of life.

Based on studies today, Hydro One has developed a third alternative that would also meet the electricity needs for the region and presented all three options at a PIC at the Marden Community Centre in November 25, 2009.

Alternative 3

- Replace two of the existing transformers at Cedar TS that are reaching their end of life.
- Replace approximately 5 km of aging 115 kV transmission line between Campbell TS and CGE Junction with a two-circuit 230 kV line.
- Install a new switching station at the Guelph North Junction

Since our last PIC, we have modified Alternatives 1 and 2 to also include the replacement of the two aging transformers at Cedar TS. As such, this component is now common to all three alternatives. These transformers are more than 50 years old and would be scheduled for replacement in the next few years as part of Hydro One's regular asset maintenance program. It makes sense to co-ordinate this transformer replacement work with the other Guelph Area transmission refurbishments.

Hydro One is continuing its analysis of the three alternatives and plans to present a preferred alternative to the community at a third PIC to be held in the fall of 2010. The project is expected to be in-service in spring 2014.

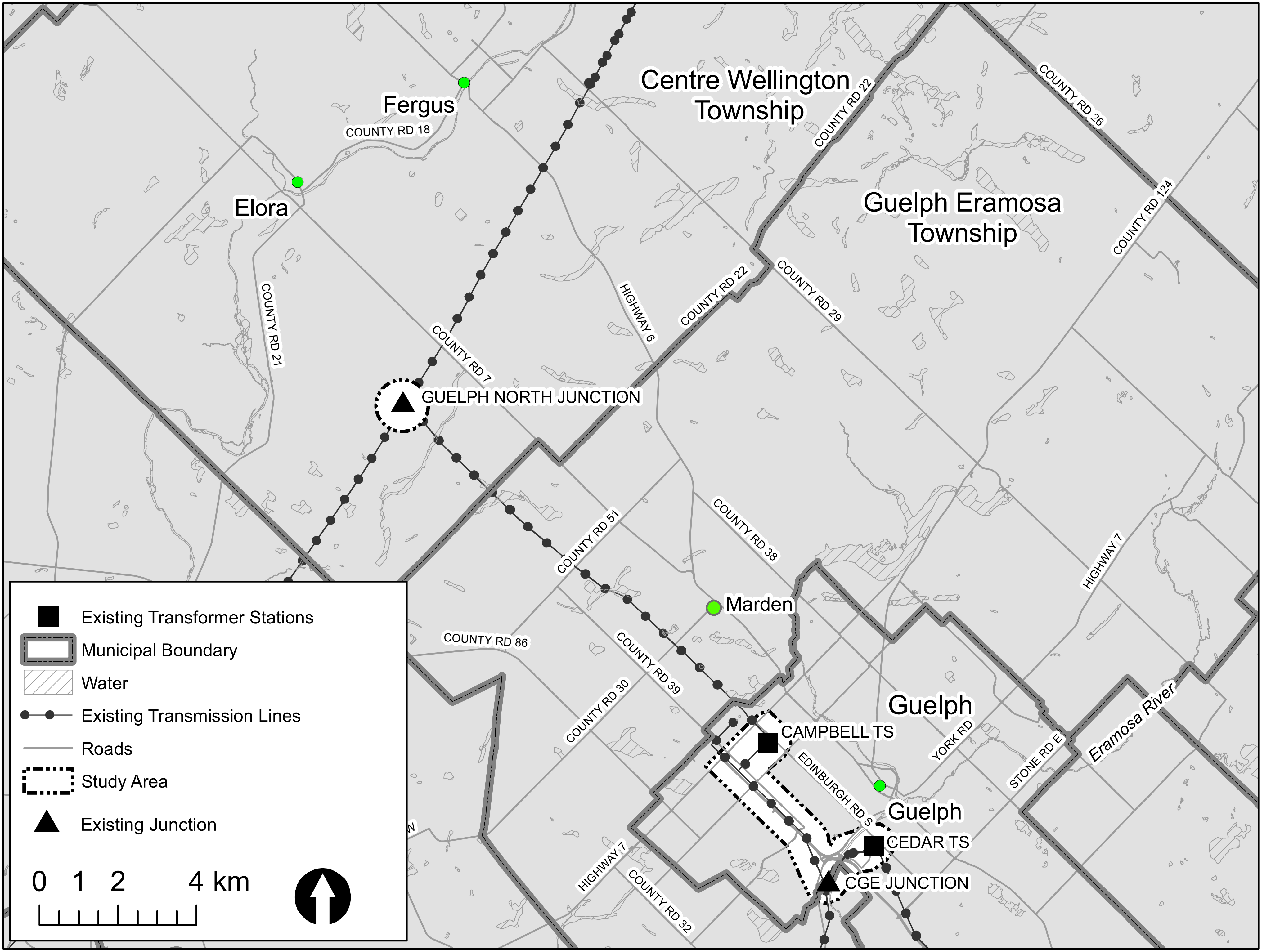
We welcome your participation in this project and will continue to keep you informed as this project moves forward. We would also be pleased to arrange a meeting to gather your input and feedback and discuss with you the areas of interest and/or concerns regarding this project. A representative from Hydro One will be following up with you via phone to discuss this further.

Please do not hesitate to contact me at 416-345-6597, or Janice Martin at 416-345-5357. Information regarding this project is also available on our website at http://www.hydroone.com/projects/Pages/Default.aspx

Sincerely,

Brian McCormick
Manager, Environmental Services & Approvals

cc. Margaret Sault, Director of Lands, Membership and Research, Mississaugas of the New Credit First Nation



Centre Wellington Township
Fergus
COUNTY RD 18
Elora
COUNTY RD 22
COUNTY RD 26
Guelph Eramosa Township
COUNTY RD 124
COUNTY RD 21
HIGHWAY 6
COUNTY RD 22
COUNTY RD 29
COUNTY RD 7
GUELPH NORTH JUNCTION
COUNTY RD 51
COUNTY RD 38
HIGHWAY 7
Marden
COUNTY RD 86
COUNTY RD 39
COUNTY RD 30
Guelph
CAMPBELL TS
YORK RD
STONE RD E
Eramosa River
EDINBURGH RD S
Guelph
CEDAR TS
CGE JUNCTION
HIGHWAY 7
COUNTY RD 32
Existing Transformer Stations
Municipal Boundary
Water
Existing Transmission Lines
Roads
Study Area
Existing Junction
0 1 2 4 km

Hydro One Networks Inc.
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Cell: 416-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

August 9, 2010

Chief William K. Montour
Six Nations of the Grand River
P.O. Box 5000
Ohsweken, ON
N0A 1M0

Project Update: Guelph Area Transmission Infrastructure Refurbishment Project

Dear Chief William Montour,

This letter is to update you on the Guelph Area Transmission Refurbishment Project. As you know, in June 2009 Hydro One launched a Class Environmental Assessment (EA) study to upgrade some of the area's aging electricity infrastructure and to address new growth in the community. Parts of the high-voltage electricity system in Guelph were installed starting in 1910 and require upgrades to keep pace with the economic growth and development in the area. As well, conservation and demand management will continue to play a large role in the energy plans for the area.

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We welcome your participation in this project and will continue to keep you informed as this project moves forward. We would also be pleased to arrange a meeting to gather your input and feedback and discuss with you the areas of interest and/or concerns regarding this project. A representative from Hydro One will be following up with you via phone to discuss this further.

Please do not hesitate to contact me at 416-345-6597, or Janice Martin at 416-345-5357. Information regarding this project is also available on our website at http://www.hydroone.com/projects/Pages/Default.aspx

Sincerely,

Brian McCormick
Manager, Environmental Services & Approvals

cc. Lonny Bomberry, Director of Land and Resources, Six Nations of the Grand River

Hydro One Networks Inc.
483 Bay Street
South Tower, 4th Floor
Toronto, Ontario M5G 2P5
mccormick.bj@hydroone.com

Tel: 416-345-6597
Fax: 416-345-6919
Cell: 416-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

hydro one

August 26, 2010

Mr. Paul Wiliams
Haudenosaunee Confederacy
Box 91
Ohsweken, ON N0A 1M0

<u>Project Update: Guelph Area Transmission Infrastructure Refurbishment Project</u>

Dear Mr. Paul Wiliams,

This letter is to update you on the Guelph Area Transmission Refurbishment Project. In June 2009 Hydro One launched a Class Environmental Assessment (EA) study to upgrade some of the area's aging electricity infrastructure and to address new growth in the community. Parts of the high-voltage electricity system in Guelph were installed starting in 1910 and require upgrades to keep pace with the economic growth and development in the area. As well, conservation and demand management will continue to play a large role in the energy plans for the area.

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- Install two new 230-115 kV transformers at the existing Cedar TS site.
- Replace approximately 5 km of aging 115 kV transmission line between Campbell TS and CGE Junction with a two circuit 230 kV line. The line would operate at 230 kV.
- Replace two of the existing transformers at Cedar TS that are reaching their end of life.

Based on studies to date, Hydro One has developed a third alternative that would also meet the electricity needs for the region and presented all three options at a PIC at the Marden Community Centre in November 25, 2009.

Alternative 3

- Replace two of the existing transformers at Cedar TS that are reaching their end of life.
- Replace approximately 5 km of aging 115 kV transmission line between Campbell TS and CGE Junction with a two-circuit 230 kV line.
- Install a new switching station at the Guelph North Junction

Since our last PIC, we have modified Alternatives 1 and 2 to also include the replacement of the two aging transformers at Cedar TS. As such, this component is now common to all three alternatives. These transformers are more than 50 years old and would be scheduled for replacement in the next few years as part of Hydro One's regular asset maintenance program. It makes sense to co-ordinate this transformer replacement work with the other Guelph Area transmission refurbishments.

Hydro One is continuing its analysis of the three alternatives and plans to present a preferred alternative to the community at a third PIC to be held in the fall of 2010. The project is expected to be in-service in spring 2014.

We welcome your participation in this project and will continue to keep you informed as this project moves forward. We would also be pleased to arrange a meeting to gather your input and feedback and discuss with you the areas of interest and/or concerns regarding this project. A representative from Hydro One will be following up with you via phone to discuss this further.

Please do not hesitate to contact me at 416-345-6597, or Janice Martin at 416-345-5357. Information regarding this project is also available on our website at http://www.hydroone.com/projects/Pages/Default.aspx

Sincerely,

Brian McCormick
Manager, Environmental Services & Approvals

Hydro One Networks Inc.
483 Bay Street
South Tower, 4th Floor
Toronto, Ontario M5G 2P5
mccormick.bj@hydroone.com

Tel: 416-345-6597
Fax: 416-345-6919
Cell: 416-525-1051

Brian McCormick
Manager, Environmental Services and Approvals

August 26, 2010

Leroy Hill, Secretary
Haudenosaunee Confederacy Council
Haudenosaunee Resource Centre
2634 Sixth Line
RR 2
Oshweken, ON N0A 1M0

Project Update: Guelph Area Transmission Infrastructure Refurbishment Project

Dear Leroy Hill,

This letter is to update you on the Guelph Area Transmission Refurbishment Project. In June 2009 Hydro One launched a Class Environmental Assessment (EA) study to upgrade some of the area's aging electricity infrastructure and to address new growth in the community. Parts of the high-voltage electricity system in Guelph were installed starting in 1910 and require upgrades to keep pace with the economic growth and development in the area. As well, conservation and demand management will continue to play a large role in the energy plans for the area.

Hydro One originally developed two alternatives to meet the Guelph area's needs and presented these at a Public Information Centre (PIC) on June 10, 2009 at the First Christian Reformed Church in Guelph.

Alternative 1

- Build a new transformer station (TS) with two 230-115 kV transformers on a new site within the study area.
- Replace approximately 5 km of an aging 115 kV transmission line between Campbell TS and CGE Junction with a two circuit 230 kV line. The line would operate initially at 115 kV.
- Replace two existing transformers at Cedar TS that are nearing their end of life.

Alternative 2

- Install two new 230-115 kV transformers at the existing Cedar TS site.
- Replace approximately 5 km of aging 115 kV transmission line between Campbell TS and CGE Junction with a two circuit 230 kV line. The line would operate at 230 kV.

- Replace two of the existing transformers at Cedar TS that are reaching their end of life.

Based on studies to date, Hydro One has developed a third alternative that would also meet the electricity needs for the region and presented all three options at a PIC at the Marden Community Centre in November 25, 2009.

Alternative 3

- Replace two of the existing transformers at Cedar TS that are reaching their end of life.
- Replace approximately 5 km of aging 115 kV transmission line between Campbell TS and CGE Junction with a two-circuit 230 kV line.
- Install a new switching station at the Guelph North Junction

Since our last PIC, we have modified Alternatives 1 and 2 to also include the replacement of the two aging transformers at Cedar TS. As such, this component is now common to all three alternatives. These transformers are more than 50 years old and would be scheduled for replacement in the next few years as part of Hydro One's regular asset maintenance program. It makes sense to co-ordinate this transformer replacement work with the other Guelph Area transmission refurbishments.

Hydro One is continuing its analysis of the three alternatives and plans to present a preferred alternative to the community at a third PIC to be held in the fall of 2010. The project is expected to be in-service in spring 2014.

We welcome your participation in this project and will continue to keep you informed as this project moves forward. We would also be pleased to arrange a meeting to gather your input and feedback and discuss with you the areas of interest and/or concerns regarding this project. A representative from Hydro One will be following up with you via phone to discuss this further.

Please do not hesitate to contact me at 416-345-6597, or Janice Martin at 416-345-5357. Information regarding this project is also available on our website at http://www.hydroone.com/projects/Pages/Default.aspx

Sincerely,

Brian McCormick
Manager, Environmental Services & Approvals

KAUFMANN Brian

From: YU Cynthia
Sent: Thursday, September 16, 2010 2:05 PM
To: 'Lonny Bomberry'
Cc: William Montour; Phil Monture; MARTIN Janice; MCCORMICK Brian; YU Cynthia
Subject: RE: Hydro One - GATR - project updated
Attachments: Notice to Six Nations - June 2009.pdf; GATRP FN letters Nov 11 09-Six Nations.pdf

Dear Mr. Bomberry,

Thank you very much for taking time to review our project update letter for the Guelph Area Transmission Reinforcement Project. As you may know, the Notice of Project Commencement and PIC #1 and Notice of PIC #2 regarding the proposed Guelph refurbishment work were sent to Chief Montour in June and November 2009. I've attached both letters for your records. We're would be happy to meet with you to discuss Guelph Area Transmission Reinforcement Project. I will be contacting you in the next few days to discuss the matter and to arrange a meeting time.

I look forward to speaking with you.

Sincerely,

Cynthia

From: Lonny Bomberry [mailto:lonnybomberry@sixnations.ca]
Sent: Tuesday, September 07, 2010 2:32 PM
To: YU Cynthia
Cc: William Montour; Phil Monture
Subject: RE: Hydro One - GATR - project updated

Cynthia: You or Brian McCormick should contact us to begin Consultation and Accommodation talks on the proposed refurbishment. The lines and stations are at a minimum located within the Haldimand Treaty (1784) area, Blocks 3 and 4, which we have an interest in. Although accommodation did not occur when the infrastructure was originally put in, now is the time to correct the mistakes of the past and accommodate Six Nations to reflect our interest in those lands.

Lonny C. Bomberry
Director, Lands and Resources
(P): 519-753-0665 ext 12
(F): 519-753-3449
lonnybomberry@sixnations.ca

From: Cynthia.Yu@HydroOne.com [mailto:Cynthia.Yu@HydroOne.com]
Sent: September 7, 2010 11:44 AM
To: Lonny Bomberry
Cc: jc.martin@HydroOne.com
Subject: Hydro One - GATR - project updated

Hi Mr. Lonny Bomberry,

As discussed, please see the attached Project Update Letter for Guelph Area Transmission Refurbishment project. Please feel free to contact us if you have any concerns or comments.

Sincerely,

<<H1-GATR-Chief Montour.pdf>> <<Guelph Area Transmission Nov4 2009.pdf>>

Cynthia Yu

Environmental Planner

Environmental Services & Approval

*Hydro **One** Networks Inc.*

Tel: 416-345-5045

Fax: 416-345-6919

E-Mail: Cynthia.Yu@hydroone.com

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483 Bay Street
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jc.martin@HydroOne.com

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Fax: 416-345-6919

Janice Martin
Environment / Forestry Specialist

October 28, 2010

Mr. Lonny Bomberry
Lands and Resources Director
Six Nations of the Grand River
2498 Chiefswood Road
P. O. Box 5000
Ohsweken, ON N0A 1M0

Re: Meeting with Six Nations of the Grand River

Dear Mr. Bomberry,

Thank you for meeting with me and my colleagues on October 6, 2010 to discuss plans of the proposed Guelph Area Transmission Refurbishment project (the Guelph Project). As follow-up from our meeting, please find a record of our discussion for your reference (attached).

As you may recall from our discussion, parts of the high-voltage electricity system in the Guelph area are nearing end of life and will require upgrades to keep pace with the economic growth and development in the area. As was discussed during our meeting, Hydro One has developed three alternatives to meet the Guelph area's needs. These alternatives were developed with careful consideration of impact on current and potential conservation and demand management practices on the energy plans for the area.

During our discussion we committed to conducting follow up on your inquiries regarding 1) the origin of the lines and the power that serve the Guelph Area, 2) the cost of each alternative, 3) whether this Project was on hold due to the Long Term Energy Plan, and 4) an inventory of Hydro One facilities within the Haldimand Tract.

After consulting with related Hydro One internal groups, we are able to provide the following responses to your inquiries.

1. What is the origin of the lines and power that serve the Guelph Area?

Response: the lines that supply Guelph come from three points. A) South Central Guelph is supplied from the Burlington transmission station; B) Northern Guelph is supplied via a line that comes from Orangeville TS and C) West-Central Guelph is supplied by a line that comes from Kitchener. In all cases, the power comes off the "Power Grid" and it is impossible to identify the distinct source.

2. What is the cost of each alternative?

Response: At this current time, we are still estimating the cost of each alternative. We will provide you with the answer once the costs are ready.

3. Is the Guelph Project on hold or impacted by the Long Term Energy Plan?

Response: The Guelph project, although delayed is not on hold. Guelph is the subject of a separate initiative that is underway by the Ontario Power Authority (OPA) that is looking at the entire Kitchener-Waterloo-Cambridge-Guelph (KWCG) area. The project is not impacted by the Long Term Energy Plan. An interim report that will concentrate on the supply to Guelph is to be completed by 2010 year-end.

4. Can Hydro One provide an inventory of its facilities within the Haldimand Tract?

Response: A Hydro One facilities map for Ontario is available on the website below:
http://www.hydroone.com/RegulatoryAffairs/Documents/EB-2010-0002/A/A-06-01%20Transmission%20System%20Maps.pdf

Additionally, for your specific need, we developed a map specifying Hydro One facilities within the area you are interested in. Please see attached.

Once again, thank you for providing the chance to meet with us. We will keep you updated as the project moves forward. At the same time, should you have additional questions or concerns, please do not hesitate to contact me at 416-345-5357, or Cynthia Yu, Environmental Planner, at 416-345-5045. You could also visit our project website at:
http://www.hydroone.com/projects/Pages/Default.aspx

Sincerely,

Janice C. Martin

Janice Martin
Environment Specialist

cc.
Joanne Thomson, Consultation Officer, Six Nations of the Grand River
Matt Jamieson, Director of Economic Development, Six Nations of the Grand River
Phil Montour, Land Consultant, Native Lands Ltd.
Ian Jacobsen, Sr. Manager, First Nations & Métis Relations

Engineering & Construction Services		
Notes of Meeting		

hydro one

NOTES OF MEETING:	Project Name Guelph Area Refurbishment	**WRITTEN BY:**	Cynthia Yu
DATE OF MEETING:	October 6, 2010	**SIGNATURE:**	Cynthia Yu
LOCATION:	Six Nations – Tourism Boardroom		
SUBJECT:	Guelph Meeting with Six Nations		
PRESENT: Ian Jacobsen Christine Goulais Janice Martin Cynthia Yu	 - First Nation & Métis Relations - First Nation & Métis Relations - ES&A - ES&A	**PRESENT:** Lonny Bomberry Matt Jamieson Phil Montour	 - Director of Lands and Resources, Six Nations of the Grand River - Director of Economic Development, Six Nations of the Grand River - Land Consultant, Native Lands Ltd.

Shaded items denote business from previous weeks.

Item No.	Item Description	Action	Date
1.	The meeting commenced @ 10 am, began with introductions		
2.	Janice presented the project based on the PIC #2 panels, indicating the project need, all the alternatives, project schedule, etc. During the presentation, Six Nations asked questions regarding the project.		
3.	Phil asked whether it is an accommodated project. Ian responded that the project involves completing a Class EA which means that typically the environmental impacts are more or less known and can be easily mitigated.		
4.	Matt double checked whether Hydro One has already held PICs, when the Six Nations was informed. Janice confirmed two PICs were held for the project. Cynthia presented them the copies of PIC invitation letter and project update letter.		
5.	Phil asked where the lines and the power originate from. Janice responded that the line is from Orangeville and Burlington.	Janice/Cynthia will check with line engineering further.	
6.	Phil asked whether Guelph Hydro was involved in establishing the project need. Janice responded Guelph Hydro did not, but they support the project.		
7.	Phil asked which alternative is the preferred one. Janice responded we are still analyzing the three alternatives. At this point, alternative 3 is preferred.		
8.	Hydro One indicated no archaeological potential was identified at Alternatives 1&2. Guelph North Junction site has archaeological potential.		
9.	Cynthia presented the archaeological assessment process, and presented them the Stage 1 report.		

10.	Lonny suggested we contact Joanne Thomson regarding the archaeological assessment, as well as further consultation. Joanne is the Six Nations contact for consultation and HONI should information to her and Lonny	Cynthia will add Joanne to consultation list. Lonny to provide Ian/Cynthia with Joanne's contact information.	
11.	Phil asked whether Hydro One received any opposition from local communities. Janice detailed that communities in the City of Guelph, adjacent to Cedar TS and on Deerpath Drive had expressed concerns.		
12.	Matt asked the cost of each alternative	Janice/Cynthia will provide this information when it is available.	
13.	Matt asked whether this project was on hold now, with the Province's intention to update the IPSP into the Long Term Energy Plan. Janice responded we are only aware of the OPA load analysis which may affect the project	Janice/Cynthia will get back with the answer.	
14.	Matt asked the depth of consultation with Six Nations, and how the consultation goes through. Janice responded the consultation started from the Notice of Commencement, and it is a continuing process.		
15.	Matt and Phil express that not enough consultation for them, generally. However, for this project, Hydro One consulted early enough.		
16.	Six Nations asked whether accommodation is included in the Class EA process. Ian and Janice responded only consultation is included at this point.		
17.	Phil and Matt expressed they need a high level vision on projects, and requested an inventory/map of Hydro One facilities through the Haldimand tract including corridors, stations and the voltage of the lines.	Janice / Cynthia will get back to Six Nations.	
18.	Lonny expressed that Six Nations should be financed for consultation and accommodation.		
19.	Ian responded for individual EA, Hydro One generally provides capacity funding to affected First Nations community as the project timelines are much longer and the environmental impacts may be more significant that Class EA projects. For Class EA, no funding is provided generally, considering no significant effect on natural and social environment. Hydro One understands that capacity is an issue which is why we make efforts to meet with the communities when requested to provide more in depth project information than what would normally be provided in PIC.		

END

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inergi

Produced By: Inergi LP, GIS Services
Date: October 21, 2010
Map08-46_GuelphProjectArea

Transformer Stations
Junctions
Tranmission Lines
115 kV
230 kV
500 kV
Highways
Roads
Municipal Boundary
Water

Hydro One Facilities in the Guelph Project Area

0 10 20
km

hydro one

inergi

Produced By: Inergi LP, GIS Services
Date: October 21, 2010
Map08-46_GuelphProjectArea_34x44

Transformer Stations
Junctions
Tranmission Lines
115 kV
230 kV
500 kV

Highways
Roads
Municipal Boundary
Water

Hydro One Facilities in the Guelph Project Area

0 10 20 km

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www.HydroOne.com

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Fax: (416)-345-6919

Brian McCormick
Manager, Environmental Services and Approvals

May 22, 2012

Chief Bryan LaForme
Mississaugas of the New Credit First Nation
2789 Mississauga Rd., RR #6
Hagersville, ON N0A 1H0

Re: Guelph Area Transmission Refurbishment (GATR) Project
Recommencement of Class Environmental Assessment

Dear Chief LaForme,

As a follow-up to our previous communication, in 2009 Hydro One Networks Inc. (Hydro One) began a Class Environmental Assessment (EA) process for a project that would refurbish parts of the aging high-voltage electricity infrastructure serving the City of Guelph and the surrounding area. Public Information Centres (PICs) were held in Guelph in June 2009 and Marden in November 2009 to introduce the project to interested parties and solicit input. In 2010 the Class EA process was put on hold while the Ontario Power Authority (OPA) commenced a broader regional planning study for the Kitchener-Waterloo-Cambridge-Guelph area.

The regional planning study conducted in consultation with local utility partners has advanced sufficiently to confirm the need and urgency for the GATR project. This project will address the continued increase in electricity demand forecast for Guelph and the surrounding area.

In a letter to Hydro One, dated March 8, 2012, the OPA recommends that Hydro One continue with development work for the GATR project including the completion of the environmental and regulatory approval processes. The OPA also recommends that the project include the following facilities to address the specific needs of South-Central Guelph and improve overall reliability of electricity supply for the region:

- Install two new 230/115 kilovolt (kV) autotransformers at the existing Cedar Transformer Station (TS) in Guelph;
- Upgrade approximately five kilometres of existing transmission line from 115 kV to 230 kV, between CGE Junction and Campbell TS in Guelph; and
- Upgrade the existing Guelph North Junction in the Township of Centre Wellington to a switching station.

The enclosed map outlines the project study area.

The Class EA is being carried out in accordance with the process described in the *Class EA for Minor Transmission Facilities*. The transmission line upgrade portion of the project must also obtain Section 92 "Leave to Construct" approval from the Ontario Energy Board

(OEB). Contingent on obtaining Class EA and Section 92 approvals, construction is scheduled to begin in mid-2013, with completion expected by the end of 2015.

Hydro One is planning to host final PICs in June 2012 to present the proposed project components, project schedule and provide opportunities for public and stakeholder input.

PIC details are as follows:

Thursday June 14, 2012	Tuesday June 19, 2012
First Christian Reformed Church	Ponsonby Public School
5:30 pm to 8:30 pm	5:30 pm to 8:30 pm
287 Water Street, Guelph	5923 Wellington Road 7, near Sideroad 14

Following the PICs, Hydro One will make a draft Environmental Study Report available for public review and comment, and will proceed to file its Section 92 application with the Ontario Energy Board.

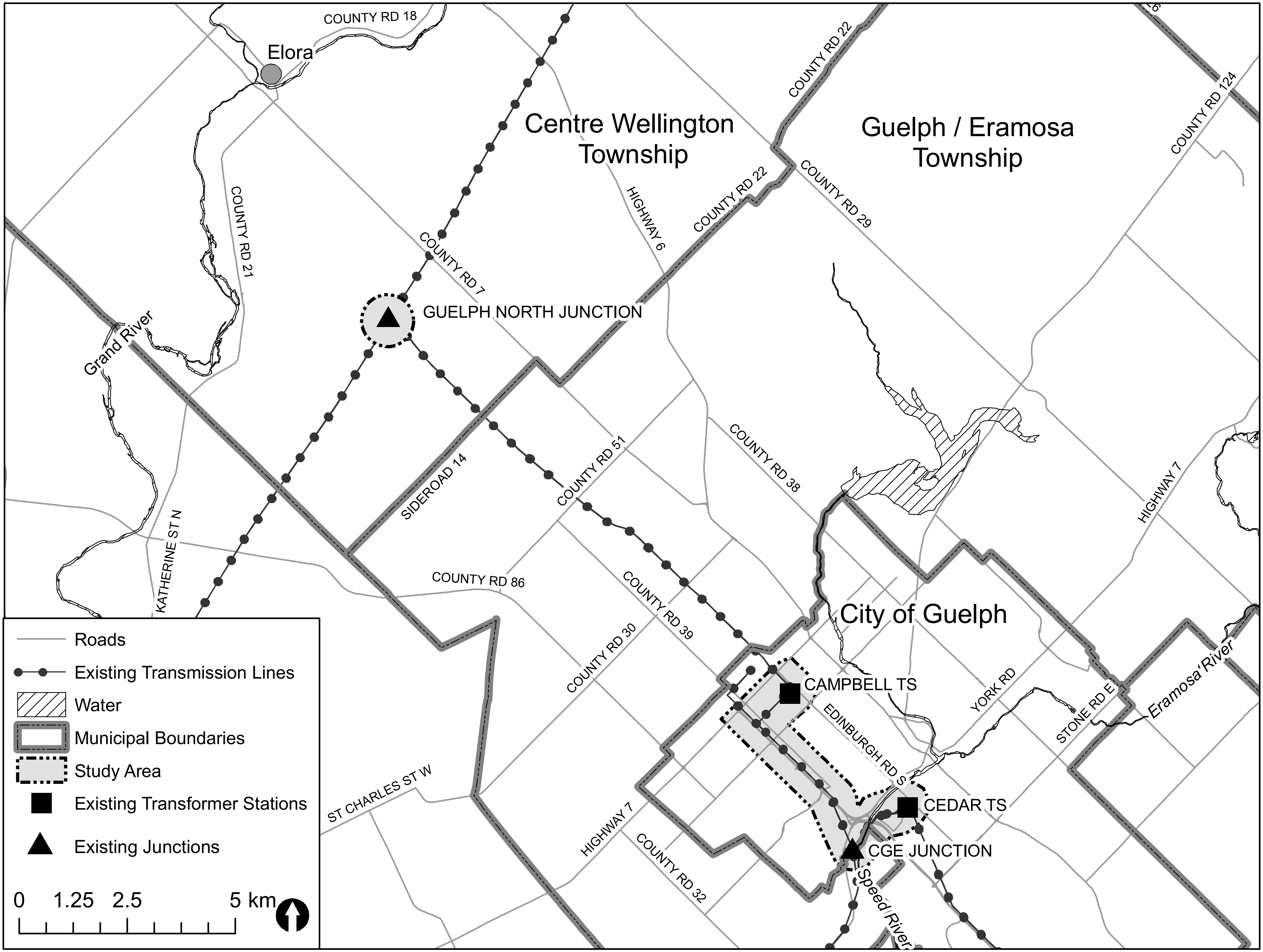
We welcome your comments and feedback on the Guelph Area Transmission Refurbishment project. If you are interested, we would be pleased to arrange a meeting to gather your input and discuss project details.

Please complete and return the attached Project Participation Form, indicating the appropriate contact person. If you have any questions regarding this project please feel free to contact me at (416) 345-6597, or Janice Martin, Environment Specialist at (416) 345-5357 or by email at jc.martin@HydroOne.com.

Sincerely,

Brian J. McCormick
Manager, Environmental Services & Approvals

cc: Margaret Sault, Director of Lands, Membership and Research, Mississaugas of the New Credit



COUNTY RD 18
Elora
Centre Wellington
Township
Guelph / Eramosa
Township
COUNTY RD 22
COUNTY RD 124
COUNTY RD 21
COUNTY RD 29
HIGHWAY 6
COUNTY RD 7
GUELPH NORTH JUNCTION
Grand River
SIDEROAD 14
COUNTY RD 51
COUNTY RD 38
HIGHWAY 7
KATHERINE ST N
COUNTY RD 86
COUNTY RD 39
City of Guelph
COUNTY RD 30
CAMPBELL TS
YORK RD
STONE RD E
Eramosa River
EDINBURGH RD S
CEDAR TS
CGE JUNCTION
ST CHARLES ST W
COUNTY RD 32
Speed River
Roads
Existing Transmission Lines
Water
Municipal Boundaries
Study Area
Existing Transformer Stations
Existing Junctions
0
1.25
2.5
5 km

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Brian McCormick
Manager, Environmental Services and Approvals

May 22, 2012

Chief William K. Montour
Six Nations of the Grand River First Nation
1695 Chiefswood Road
Ohsweken, ON N0A 1M0

Re: Guelph Area Transmission Refurbishment (GATR) Project
Recommencement of Class Environmental Assessment

Dear Chief Montour,

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The regional planning study conducted in consultation with local utility partners has advanced sufficiently to confirm the need and urgency for the GATR project. This project will address the continued increase in electricity demand forecast for Guelph and the surrounding area.

In a letter to Hydro One, dated March 8, 2012, the OPA recommends that Hydro One continue with development work for the GATR project including the completion of the environmental and regulatory approval processes. The OPA also recommends that the project include the following facilities to address the specific needs of South-Central Guelph and improve overall reliability of electricity supply for the region:

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We welcome your comments and feedback on the Guelph Area Transmission Refurbishment project. If you are interested, we would be pleased to arrange a meeting to gather your input and discuss project details.

Please complete and return the attached Project Participation Form, indicating the appropriate contact person. If you have any questions regarding this project please feel free to contact me at (416) 345-6597, or Janice Martin, Environment Specialist at (416) 345-5357 or by email at jc.martin@HydroOne.com.

Sincerely,

Brian J. McCormick
Manager, Environmental Services & Approvals

cc: Lonny Bomberry, Director of Lands and Resources, Six Nations of the Grand River

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Toronto, Ontario, M5G 2P5
www.HydroOne.com

Tel: (416)-345-6597
Fax: (416)-345-6919

Brian McCormick
Manager, Environmental Services and Approvals

May 22, 2012

Mr. Paul Williams
Haudenosaunee Confederacy
Box 91
Ohsweken, ON N0A 1M0

Re: Guelph Area Transmission Refurbishment (GATR) Project
Recommencement of Class Environmental Assessment

Dear Mr. Williams,

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Brian J. McCormick
Manager, Environmental Services & Approvals

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Brian McCormick
Manager, Environmental Services and Approvals

May 22, 2012

Leroy Hill, Secretary
Haudenosaunee Confederacy Council
Haudenosaunee Resource Centre
2634 Sixth Line
RR 2
Ohsweken, ON N0A 1M0

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Recommencement of Class Environmental Assessment

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Sincerely,

Brian J. McCormick
Manager, Environmental Services & Approvals

LAND MATTERS

1.0 DESCRIPTION OF LAND REQUIRED

The proposed Guelph Area Transmission Refurbishment Project will involve upgrading the conductor (wire) and twin wood-pole tower structures on the existing 115 kV overhead transmission corridor to 230 kV lattice towers and steel poles between Campbell Transformer Station ("**TS**") and CGE Junction ("**Jct"**), a distance of approximately 5 kilometres. In addition, Hydro One is proposing to build a switching station ("**SS")** at Guelph North Junction located in the Township of Centre Wellington, and install new auto-transformers to be built at Cedar TS located in the City of Guelph.

The existing corridor from Campbell TS to CGE Jct is a combination of:

- Provincially-owned property segments whose title is held by the Ministry of Infrastructure, and managed by Infrastructure Ontario;
- easement rights on private properties;
- municipal road corridors; and
- rail crossing agreements.

These rights consist of the existing statutory easement rights Hydro One enjoys on all of the provincially-owned corridor lands, as well as its existing permanent easements rights on private property lands.

New land rights at various locations from Campbell TS to CGE Jct will be required to accommodate the proposed transmission facilities. T emporary rights for construction purposes will also be required at specific locations along the corridor.

No new temporary or permanent rights will be required for the proposed facility upgrades and construction at the Cedar TS and Guelph North Jct.

2.0 DESCRIPTION OF LAND RIGHTS

The existing corridor crosses approximately 20 privately-owned properties from Campbell TS to Guelph North Jct. The properties traversed by the corridor are mainly commercial and retail operations, but there are also residential, industrial, and recreational land uses and open space. The transmission line crosses seven municipal road allowances owned by the City of Guelph, and one highway (Hanlon Expressway #6) owned by the Ministry of Transportation. The line also intersects three rail spurs, one owned by the Guelph Junction Railway and two by Canadian National Railway (operated by RailAmerica). Additional easement rights will need to be secured in areas where the existing rights-of-way are widened, or the existing transmission centre-line is moved (from Paisley Road to CGE Junction). Hydro One also requires the securement of easement rights on existing corridor lands where access and occupation rights are currently enjoyed.

3.0 LAND ACQUISITION PROCESS

Hydro One will be using a combination of new easement rights and existing land rights along the corridor from Campbell TS to CGE Jct. Additional temporary working rights will be required, but these are not expected to be significant. Temporary property rights may be required when crossing or paralleling existing or planned utilities (e.g., pipelines, power lines) or other planned infrastructure (e.g., highways), and building construction access roads and working pads. These requirements will be determined and confirmed at the engineering design stage. Access agreements with landowners will be required.

Copies of the Offer to Grant an Easement, Off-Corridor Temporary Access and Access Road, Temporary Construction License Agreement for construction staging, and a Damage Claim Agreement and Release Form which will be used as the basis for compensation related to construction impacts such as crop damage, are included at the end of this schedule (please refer to **Exhibit B, Tab 6, Schedule 7, Attachments 1,2, 3 and 4 respectively**).

Landowners have been informed of this project as part of the stakeholder and community consultation process described in **Exhibit B, Tab 6, Schedule 5**. Landowners have been notified of the proposed transmission upgrade as part of the EA approval process and will be as part of the OEB's Section 92 Notice of Application requirements.

OFFER TO GRANT AN EASEMENT TO HYDRO ONE NETWORKS INC.

I, *INSERT NAME* (the "Transferor"),

Being the owner of *INSERT LEGAL DESCRIPTION OF PROPERTY* (herein called the "Lands") in consideration of payment of the sum of $*INSERT VALUE* (*INSERT VALUE*) (THE "**OFFER CONSIDERATION**"), and other good and valuable consideration (the sufficiency of which consideration is hereby acknowledged), hereby covenants and agrees as follows:

1. (a) THE Transferor hereby grants to Hydro One Networks Inc. its successors and assigns (the "Transferee") the exclusive right, irrevocable during the periods of time below specified in paragraph 2, (the **"Offer")** to purchase, free from all encumbrances and upon the terms and conditions hereinafter set out, the perpetual rights, easements and privileges set out in the Transfer and Grant of Easement document (the **"Transfer of Easement"** annexed hereto as Schedule "A" (the **"Rights")** in, through, under , over, across, along and upon that portion of the above Lands as shown as *INSERT DESCRIPTION* (the **"Strip"**).
(b) THE purchase price for the Rights shall be the sum of *INSERT VALUE* **DOLLARS ($ *INSERT VALUE*)** lawful money of Canada to be paid by cash or uncertified cheque to the Transferor on Closing (the "**Purchase Price**").

2. THIS Offer may be accepted by the Transferee any time within 60 Days from the date of this Agreement by a letter delivered or facsimile transmission or mailed postage prepaid and registered, to the Transferor at the address set out in paragraph 12. If this Offer is not accepted within this time frame, this Agreement and everything herein contained shall be null, void and of no further force or effect. If this Offer is accepted by the Transferee in the manner aforesaid, this Agreement and the letter accepting such Offer shall then become a binding contract between the parities, and the same shall be completed upon the terms herein provided for.

3. THE Transfer of Easement arising from the acceptance of this Offer shall be executed and delivered to the Transferee on or before the One Hundred and Twentieth (120th) day after the date of Transferee's acceptance of this Offer (the "**Closing**") and time shall in all respects be of the essence hereof.

4. IF the Transferee accepts the Offer herein: a) the Transferee shall not grant or transfer an easement or permit, or create any encumbrance over or in respect of the Strip prior to registration of the Transfer of Easement, and b) the Transferee has permission to approach prior encumbrancers or any third parties who have existing interests in the strip to obtain all necessary consents, postponements or subordinations (in registrable form) from all current and future prior encumbrancers and third parties, if necessary, consenting to this Transfer of Easement, and/or postponing their respective rights, title and interest so as to place such Rights and Transfer of Easement in first priority on title to the Strip.

5. TITLE to the Strip shall at Closing be good and free from all registered restrictions, charges, liens, easements and encumbrances of any kind whatsoever except for those matters disclosed in Schedule "B" annexed hereto.

6. The Transfer of Easement and all ancillary documents necessary to register same on title shall be prepared by and at the expense of the Transferee and shall be substantially in the form as the annexed Schedule "A". The Transferor hereby covenants and agrees that the Transferee may, at its option, register this Agreement or Notice thereof, and the Transfer of Easement on title to the Lands, and the Transferor hereby covenants and agrees to execute, at not further cost or condition to the Transferee, such other instruments, plans and documents as may reasonably be required by the transferee to effect registration of this Agreement or Notice thereof prior to closing and the Transfer of Easement at any time hereafter.

7. THE Transferor covenants and agrees with Transferee that it has the right to convey the Rights without restriction and that Transferee will quietly possess and enjoy the Rights and that the Transferor will execute upon request such further assurances of the Rights as may be requisite to give effect to the provisions of this Agreement.

8. AS of the date of the Transferee's acceptance of the Offer, the Transferor grants to the Transferee, in consideration of the Offer Consideration, free from all encumbrances, easements and restrictions the following unobstructed and exclusive rights, easements, rights of way, covenants, agreements and privileges in, through, under, over, across, along and upon the Strip:

(a) To enter and lay down, install, construct, erect, maintain, open, inspect, add to, enlarge, alter, repair and keep in good condition, move, remove, replace, reinstall, reconstruct, relocate, supplement and operate and maintain at all times in, through, under, over, across, along and upon the strip an electrical transmission system and telecommunications system consisting in both instances of pole structures, steel towers, anchors, guys and braces and all such aboveground or underground lines, wires, cables, telecommunication cables, grounding electrodes, conductors, apparatus, works accessories, associated material and equipment, and appurtenances pertaining to or required by either such system (all or any of which are herein individually or collectively called the **"Works")** as in the opinion of the Transferee are necessary or convenient thereto for use as required by Transferee in its undertaking from time to time, or a related business venture.

(b) To enter on and selectively cut or prune, and to clear and keep clear, and remove all trees (subject to compensation to Owners for merchantable wood values), branches, bush and shrubs and other obstructions and materials in, over or upon the Strip, and without limitation, to cut and remove all leaning or decayed trees located on the Lands whose proximity to the Works renders them liable to fall and come in contact with the Works or which may in any way interfere with the safe, efficient or serviceable operation of the Works or this easement by the Transferee.

(c) To conduct all engineering, legal surveys, and make soil tests, soil compaction and environmental studies and audits in, under, on and over the Strip as the Transferee in its discretion considers requisite.

(d) To erect, install, construct, maintain, repair and keep in good condition, move, remove, replace and use bridges and such gates in all fences which are now or may hereafter be on the Strip as the Transferee may form time to time consider necessary.

(e) To clear the Strip and keep it clear of all buildings, structures and other obstructions of any nature whatever including removal of any materials which in the opinion of the Transferee are hazardous to the line. Notwithstanding the foregoing, in all cases where in the sole discretion of the Transferee the safe operation and maintenance of the line is not endangered or interfered with, the Transferor from time to time or the person or persons entitled thereto, may with prior written approval of the Transferee, at his or her own expense, construct and maintain roads, lanes, walks drains, sewers, water pipes, oil and gas pipelines, and fences (not to exceed 2 metres in height) on or under the Strip or any portion thereof, provided that prior to commencing any such installation, the Transferor shall give the Transferee 30 days notice in writing so as to enable Transferee to have a representative inspect the site and be present during the performance of the work and that the Transferor complies with any instructions which may be given by such representative in order that such work may be carried out ins such a manner as not to endanger, damage or interfere with the line.

(f) To enter on, and exit from, and to pass and repass at any and all times in, over, along, upon, across, through and under the Strip and so much of the Lands as may be reasonably necessary, at all reasonable times, for the Transferee and its respective officers, employees, workers, permittees, servants, agents, contractors and subcontractors, with or without vehicles, supplies, machinery, plant, material and equipment for all purposes necessary or convenient to the exercise and enjoyment of the said rights and easement subject to payment by the Transferee of compensation for any crop or other physical damage only to the Land caused by the exercise of this right of entry and passageway; and

(g) To remove, relocate and reconstruct the line on or under the Strip, subject to payment by the Transferee of additional compensation for any damage caused thereby.

9. THE Transferor consents to Transferee, its respective officers, employees, agents, contractors, subcontractors, workers and permittees or any of them entering on, exiting and passing and repassing in, on, over, along, upon, across, through and under the Strip and so much of the Lands as may be reasonably necessary, at all reasonable times after the date of the Agreement until such time as this Offer is accepted and the purchase is completed with or without all plant, machinery, material, supplies, vehicles, and equipment, for all purposes necessary or convenient to the exercise and enjoyment of the Rights, subject to compensation afterwards for any crop or other physical damage only to the Lands or permitted structures sustained by the Transferor caused by the exercise of this right of entry and passageway.

10. THIS Agreement and Grant of Easement Rights shall both be subject to the condition that the provisions of the *Planning Act*, R.S.O. 1990, c. P. 13, as amended, have, in the opinion of Transferee, been satisfactorily complied with. If after consultation with Provincial agencies and Municipalities, Hydro One Networks Inc., decides that the provisions of the *Planning Act*, R.S.O., c.P. 13, and amendments thereto, have not been or cannot be complied with, it may , at its option, cancel this Agreement.

11. ANY documents or money payable hereunder may be tendered upon the parties hereto or their respective solicitors and money may be tendered by negotiable uncertified cheque or cash.

12. ANY acceptance of this Offer, demand, notice or other communication to be given in connection with this Agreement shall be given in writing and shall be given by personal deliver, by registered mail postage prepaid,or by facsimile transmission, addressed to the recipient as follows:

TO TRANSFEROR:	TO TRANSFEREE:
	Hydro One Networks Inc.
NAME	Real Estate Services
ADDRESS	PO BOX 1050
PHONE NUMBER	Milton, ON, L9T 5B9
	Attention:
	Fax:

or to such other address, facsimile number or individual as may be designated by notice given by either party to the other. Any acceptance of this offer, demand notice or other communication shall be conclusively deemed to have been given when actually received by the addressee or upon the second day after the day of mailing.

13. THE Transferor represents that he is not now and at the time of Closing shall not be a spouse within the meaning of the *Family Law Act*, R.S.O. 1990, c.F. 3, as amended, failing which, the Transferor shall cause this Agreement and all related documents to be accepted and consented to in writing by the spouse of the Transferor to the satisfaction of the Transferee and at not further cost or condition.

14. IN the event of and upon acceptance of this Offer by Hydro One Networks Inc. in manner aforesaid this Agreement and the letter accepting such Offer shall then become a binding contract of sale and purchase between the parties, and the same shall be completed upon the terms herein provided for.

15. HYDRO ONE NETWORKS INC. will covenant and agree with the Transferor to indemnify and save harmless the Transferor, his tenants, or other lawful occupiers of the Strip for any loss, damage and injury caused by the acceptance of the Offer and the granting and thereafter of Rights or anything done pursuant thereto or arising from any accident (not including any Act of God) that would not have happened but for the presence of its line on the Strip, provided, however, that Hydro One Networks Inc. shall not be liable to the extent to which such loss, damage, or injury is caused or contributed to by the neglect or default of the Transferor, his tenants, guests, invitees or other lawful occupiers of the Strip or their servants, agents, or workmen.

16. THE Transferor covenants and agrees that if and before the Transferor sells, transfers, assigns, disposes (or otherwise parts with possession) of all or part of the Lands to a third party(the "Third Party") the Transferor shall use best efforts to ensure that the third party assumes the burden and benefit of this Agreement, and agrees to be bound by it. Accordingly the Transferor covenants and agrees to use best efforts to obtain from the Third Party a written acknowledgement and agreement that the Third Party is aware of this Agreement and will continue to be bound by the terms, conditions and stipulations of this Agreement.

17. ALL covenants herein contained shall be construed to be several as well as joint, and wherever the singular and the masculine are used in this Agreement, the same shall be construed as meaning the plural or the feminine or neuter, where the context or the identity of the Transferor/Transferee so requires.

18. THE burden and benefit of this Agreement shall run with the Strip and the works and undertaking of the Transferee and shall be binding upon and enure to the befit of the parties hereto and their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF the Transferor has hereunto set his hand and seal to this Agreement, this ________day of ____________, 2012.

SIGNED, SEALED AND DELIVERED	)))))	In the presence of ______________________________

INSERT NAME

SIGNED, SEALED AND DELIVERED		
In the presence of	)	Consent Signature & Release of
	)	Transferor's Spouse, if non-owner
	)	
	)	
	)	______________________________

SCHEDULE "A"

TRANSFER AND GRANT OF EASEMENT

The Transferor is the owner in fee simple and in possession of *INSERT LEGAL DESCRIPTION OF PROPERTY* (The **"Lands"**).

The Transferee has erected, or is about to erect, certain Works (as more particularly described in paragraph 1(a) in, through, under, over, across, along and upon the Lands.

1. THE Transferor hereby grants and conveys to Hydro One Networks Inc., its successors and assigns the rights and easement, free from all encumbrances and restrictions, the following unobstructed and exclusive rights, easements, rights-of-way, covenants, agreements and privileges in perpetuity (the **"Rights")** in, through, under, over across, along and upon that portion of the Lands of the Transferor described herein as *INSERT DESCRIPTION* (the **"Strip"**) for the following purposes:

(a) To enter and lay down, install, construct, erect, maintain, open, inspect, add to, enlarge, alter, repair and keep in good condition, move, remove, replace, reinstall, reconstruct, relocate, supplement and operate and maintain at all times in, through, under, over, across, along and upon the Srip an electrical transmission system and telecommunications system consisting in both instances of pole structures, steel towers, anchors, guys and braces and all such aboveground or underground lines, wires, cables, telecommunications cables, grounding electrodes, conductors, apparatus, works, accessories, associated material and equipment, and appurtenances pertaining to or required by either such system (all or any of which are herein individually or collectively called the ("**Works**") as in the opinion of the Transferee are necessary or convenient thereto for use as required by Transferee in its undertaking from time to time, or a related business venture.

(b) To enter on and selectively cut or prune, and to clear and keep clear, and remove all trees (subject to compensation to Transferor for merchantable wood values), branches, bush and shrubs and other obstructions and materials, over or upon the Strip, and without limitation, to cut and remove all leaning or decayed trees located on the Lands whose proximity to the Works renders them liable to fall and come in contact with the Works or which may in any way interfere with the safe, efficient or serviceable operation of the Works or this easement by the Transferee.

(c) To conduct all engineering, legal surveys, and make soil tests, soil compaction and environmental studies and audits in, under, on and over the Strip as the Transferee in its discretion considers requisite.

(d) To erect, install, construct, maintain, repair and keep in good condition, move, remove, replace and use bridges and such gates in all fences which are now or may hereafter be on the Strip as the Transferee may from time to time consider necessary.

(e) Except for fences and permitted paragraph 2(a) installations, to clear the Strip and keep it clear of all buildings, structures, erections, installations, or other obstructions of any nature (hereinafter collectively called the **"obstruction"**) whether above or below ground, including removal of any materials and equipment or plants and natural growth, which in the opinion of the Transferee, endanger its Works or any person or property or which may be likely to become a hazard to any Works of the Transferee or to any person or property or which do or may in any way interfere with the safe, efficient or serviceable operation of the Works or this easement by the Transferee.

(f) To enter on and exit by the Transferor's access routes and to pass and repass at all times in, over, along, upon and across the Strip and so much of the Lands as is reasonably required, for Transferee, its respective officers, employees, agents, servants, contractors, subcontractors, workmen and permittees with or without all plant machinery, material, supplies, vehicles and equipment for all purposes necessary or convenient to the exercise and enjoyment of this easement subject to compensation afterwards for any crop or other physical damage only to the Lands or permitted structures sustained by the Transferor caused by the exercise of this right of entry and passageway.

(g) To remove, relocate and reconstruct the line on or under the Strip subject to payment by the Transferee of additional compensation for any damage caused thereby.

2. THE Transferor agrees that:

(a) It will not interfere with any Works established on or in the Strip and shall not, without the Transferee's consent in writing erect or cause to be erected or permit in, under or upon the strip any obstruction or plant or permit any trees, bush, shrubs, plants or natural growth which does or may interfere with the Rights granted herein. The Transferor agrees it shall not, without the Transferee's consent in writing, change or permit the existing configuration, grade or elevation of the Strip to be changed and the Transferor further agrees that no excavation or opening or work which may disturb or interfere with the existing surface of the Strip shall be done or made unless consent therefore in writing has been obtained from Transferee, provided however, that the Transferor shall not be required to obtain such permission in case of emergency. Notwithstanding the foregoing, in cases where in the reasonable discretion of the Transferee, there is no danger or likelihood of danger to the Works of the Transferee or to any persons or property and the safe or serviceable operation of this easement by the Transferee is not interfered with, the Transferor may at its expense and with the prior written approval of the Transferee, construct and maintain roads, lanes walks, drains, sewers water pipes, oil and gas pipelines, fences (not to exceed 2 metres in height) and service cables on or under the Strip (the **"Installation"**) or any portion thereof; provided that prior to commencing such Installation, the transferor shall give to the Transferee thirty (30) days notice in writing thereof to enable the Transferee to have a representative present to inspect the proposed Installation during the performance of such work, and provided further that Transferor comply with all instructions given by such representative and that all such work shall be done to the reasonable satisfaction of such representative. In the event of any unauthorised interference aforesaid or contravention of this paragraph, or if any authorised interference, obstruction or Installation is not maintained in accordance with the Transferee's instructions or in the Transferee's reasonable opinion, may subsequently interfere with the Rights granted herein, the Transferee may at the Transferor's expense, forthwith remove, relocate, clear or correct the offending interference, obstruction , Installation or contravention complained of from the Strip, without being liable for any damages cause thereby.

(b) notwithstanding any rule of law or equity, the Works installed by the Transferee shall at all times remain the property of the Transferee, notwithstanding that such Works are or may become annexed or affixed to the Strip and shall at anytime and from time to time be removable in whole or in part by Transferee.

(c) no other easement or permission will be transferred or granted and no encumbrances will be created over or in respect to the Strip, prior to the registration of a Transfer of this grant of Rights.

(d) The Transferor will execute such further assurances of the Rights in respect of this grant of easement as may be requisite.

(e) The Rights hereby granted:

(i) shall be of the same force and effect to all intents and purposes as a covenant running with the Strip

(ii) is declared hereby to be appurtenant to and for the benefit of the Works and undertaking of the Transferee described in paragraph 1(a)

3. THE Transferee covenants and agrees to obtain at its sole cost and expense all necessary postponements and subordinations (in registrable form) from all current and future prior encumbrancers, postponing their respective rights, title and interest to the transfer of Easement herein so as to place such Rights and easement in first priority on title to the Lands.

4. THERE are no representations, covenants agreements, warranties and conditions in any way relating to the subject matter of this grant of Rights whether expressed or implied, collateral or otherwise except those set forth herein.

5. NO waiver of a breach or any of the covenants of this grant of Rights shall be construed to be a waiver of any succeeding breach of the same or any other covenant.

6. THE burden and benefit of this transfer of Rights shall run with the Strip and the Works and undertaking of the Transferee and shall extend to, be binding upon and enure to the benefit of the parties hereto and their respective heirs, executors, administrators, successors and assigns.

SCHEDULE "B"

PERMITTED EMCUMBRANCES

NIL

Temporary Access and Temporary Access Road

THIS AGREEMENT made in duplicate the ___________day of _______________20XX

Between:

INSERT NAME OF OWNER

(hereinafter referred to as the "Grantor")

OF THE FIRST PART

--- and ---

HYDRO ONE NETWORKS INC.

(hereinafter referred to "HONI")

OF THE SECOND PART

WHEREAS the Grantor is the owner in fee simple and in possession of certain lands legally described as, ***INSERT LEGAL DESCRIPTION*** (the "Lands").

WHEREAS HONI in connection with its **[Insert Project Name]** Project (the "Project") desires the right to enter onto the Lands in order to construct temporary access roads on, over and upon the Lands in order to access the construction site associated with the "Project.

WHEREAS the Grantor is agreeable in allowing HONI to enter onto the Lands for the purpose of constructing temporary access roads on, over and upon the Lands, subject to the terms and conditions contained herein.

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the sum of ***INSERT CONSIDERATION*** to be paid by HONI to the Grantor, and the mutual covenants herein contained and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. The Grantor hereby grants, conveys and transfers to HONI in, over, along and upon that part of the Lands highlighted in yellow as shown in Schedule "A" attached hereto (the "Access Lands"), the rights privileges, and easements as follows:

(a) for the servants, agents, contractors and workmen of HONI at all times with all necessary vehicles and equipment to pass and repass over the Access Lands for the purpose of access to the construction site associated with the Project, subject to payment of compensation for damages to any crops caused thereby;
(b) to construct, use and maintain upon the Access Lands, a temporary road to the construction site associated with the Project, together with such gates, bridges and drainage works as may be necessary for HONI's purposes (collectively, the "Works"), all of which Works shall be removed by HONI upon completion of the construction associated with the Project.; and
(c) to cut and remove all trees, brush and other obstructions made necessary by the exercise of the rights granted hereunder

2. The term of this Agreement and the permission granted herein shall be XXXX from the date written above (the "Term"). HONI may, in its sole discretion, and upon 60 days notice to the Grantor, extend the Term for an additional length of time, which shall be negotiated between the parties.

3. Upon the expiry of the Term or any extension thereof, HONI shall repair any physical damage to the Access Lands and/or Lands resulting from HONI's use of the Access Lands and the permission granted herein; and, shall restore the Access Lands to its original condition so far as possible and practicable.

4. All agents, representatives, officers, directors, employees and contractors and property of HONI located at any time on the Access Lands shall be at the sole risk of HONI and the Grantor shall not be liable for any loss or damage or injury (including loss of life) to them or it however occurring except and to the extent to which such loss, damage or injury is caused by the negligence or willful misconduct of the Grantor.

5. HONI agrees that it shall indemnify and save harmless the Grantor from and against all claims, demands, costs, damages, expenses and liabilities (collectively the "Costs") whatsoever arising out of HONI's presence on the Access Lands or of its activities on or in connection with the Access Lands arising out of the permission granted herein except to the extent any of such Costs arise out of or are contributed to by the negligence or willful misconduct by the Grantor.

6. Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

TO HONI:

Hydro One Networks Inc.
Real Estate Services
5th Floor
483 Bay Street South Tower
Toronto, Ontario M5G 2P5

Attention:
Fax:

TO GRANTOR:

7. Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5th) business day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable herein. The parties hereto submit themselves to the exclusive jurisdiction of the Courts of the Province of Ontario.

8. Any amendments, modifications or supplements to this Agreement or any part thereof shall not be valid or binding unless set out in writing and executed by the parties with the same degree of formality as the execution of this Agreement.

9. The burden and benefit of this Agreement shall run with the Lands and everything herein contained shall operate to the benefit of, and be binding upon, the respective heirs; successors, permitted assigns and other legal representatives, as the case may be, or each of the Parties hereto.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed by their duly authorized representatives as of the day and year first above written.

SIGNED, SEALED & DELIVERED In the presence of:	**OWNER:**
______________________ Witness	______________________
______________________ Witness	______________________

HYDRO ONE
HST #

HYDRO ONE NETWORKS INC.

By: ______________________
Name:
Title:

I have authority to bind the Corporation

<u>SCHEDULE "A"</u>

PROPERTY SKETCH

TEMPORARY CONSTRUCTION LICENCE

THIS AGREEMENT made in duplicate the X day of X 20XX

BETWEEN:

HYDRO ONE NETWORKS INC.	(hereinafter called the "HONI") OF THE FIRST PART
and	
XXXXX	(hereinafter called the "Owner") OF THE SECOND PART

WHEREAS:

(a) The Owner is the registered owner of lands legally described as ***INSERT LEGAL DESCRIPTION*** (the "Lands").

(b) HONI will be constructing new electrical transmission facilities in the area highlighted in yellow on a portion of the Lands more particularly shown on Schedule "A" attached hereto (the "Project") and requires a portion of the Lands as a temporary construction area.

(c) The Owner is agreeable in allowing HONI to enter onto the Lands and using a portion of the Lands for the purposes of a temporary construction area, which area is more particularly shown in red on Schedule "A" attached hereto in order to facilitate construction work on HONI's adjacent transmission corridor.

NOW THEREFORE THIS AGREEMENT WITNESSES THAT IN CONSIDERATION of the sum of Five Dollars ($5.00) now paid by each party to the other and the respective covenants and agreements of the parties hereinafter contained (the receipt and sufficiency of which are hereby acknowledged by the parties hereto), the parties hereto agree as follows:

1. The Owner hereby grants to HONI the right to enter upon a portion of the Lands highlighted in red, being XX acres, for the purpose of a temporary construction area (the "Licenced Area").

2. HONI will pay the Owner the amount of ***INSERT CONSIDERATION*** for the rights granted herein (the "Licence Fee").

3. HONI agrees that it shall take all reasonable care in its construction practices. HONI agrees that it shall erect such barriers and take such other appropriate safety precautions (i.e. gating system), as may be reasonably required to effectively prevent death or injuries to persons or the Owner's property during the Term of this Agreement.

4. All agents, representatives, officers, directors, employees and contractors and property of HONI located at any time on the Licenced Area shall be at the sole risk of HONI and the Owner shall not be liable for any loss or damage or injury (including loss of life) to them or it however occurring except and to the extent to which such loss, damage or injury is caused by the negligence or willful misconduct of the Owner.

5. HONI agrees that it shall indemnify and save harmless the Owner from and against all claims, demands, costs, damages, expenses and liabilities (collectively the "Costs") whatsoever arising out of HONI's presence on t he Lands or of its activities on or in connection with the Licenced Area arising out of the permission granted herein except to the extent any of such Costs arise out of the negligence or willful misconduct of the Owner.

6. This Agreement and the permission granted herein shall be for a XXXXX term commencing from XXXXX until XXXXX (the "Term").

7. This Agreement and the permission granted herein may be renewed by HONI on a month to month basis up to an additional one year term, upon the same terms and conditions contained herein, including the Licence Fee, which amount shall be pro-rated to a monthly amount if applicable, save and except any further right to renewal. In the event HONI desires to renew this Licence, it shall provide notice in writing to the Owner of its desire to renew the Licence, at least thirty (30) days prior to the end of the Term, or any renewal thereof.

8. Upon the expiry of this Licence, HONI shall remove all equipment and debris from the Licenced Area and shall restore the Licenced Areas to as close as is practicable to its original condition immediately prior to HONI's occupancy at HONI's sole cost and expense.

9. Any notice to be given to the Owner shall be in writing and shall be delivered by pre-paid registered post or by facsimile, at the address noted below:

   in the case of the Owner, to:

   Attention:
   Fax No.:

   in the case of the HONI, to:

   Attention:
   Fax No.:

   Such notice shall be deemed to have been given, in, writing or delivered, on the date of delivery, and, where given by registered post, on the third business day following the posting thereof, and if sent by facsimile, the date of delivery shall be deemed to be the date of transmission if transmission occurs prior to 4:00 p.m. (Toronto time) on a business day and on the business day next following the date of transmission in any other case. It is understood that in the event of a threatened or actual postal disruption in the postal service in the postal area through which such notice must be sent, notice must be given in writing by delivery or by facsimile, in which case notice shall be deemed to have been given as set out above. "Business day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario.

10. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable herein. The parties hereto submit themselves to the exclusive jurisdiction of the Courts of the Province of Ontario.

11. The burden and benefit of this Agreement shall run with the Lands and everything herein contained shall operate to the benefit of, and be binding upon, the respective heirs; successors, permitted assigns and other legal representatives, as the case may be, or each of the Parties hereto.

12. Any amendments, modification or supplement to this Agreement or any part thereof shall not be valid or binding unless set out in writing and executed by the parties with same degree of formality as the execution of this Agreement.

IN WITNESS WHEREOF the parties hereto have executed this Agreement by the hands of their duly authorized signing officers in that regard.

Per: ____________________________

Name:

Title:

I have authority to bind the Corporation

HYDRO ONE NETWORKS INC.

Per: ____________________________

Name:

Title:

I have authority to bind the Corporation

SCHEDULE “A”

Damage Claim

THIS MEMORANDUM OF AGREEMENT dated the day of 20XX

Between:

herein called the “Claimant”

-and-

Hydro One Networks Inc.

herein called “HONI”

Witnesseth:

The Claimant agrees to accept ………………………………………………………………($) in full payment and satisfaction of all claims or demands for damages of whatsoever kind, nature or extent which may have been done to date by HONI during the construction, completion, operation or maintenance of the works of HONI constructed on Lot(s) ………………………………… , Concession(s) ………………………………. or according to Registered Plan No. ………………… in the ……………………………………………………… of ……………………………………………… of which property the Claimant is the ………………………………… and which damages may be approximately summarized and itemized as:

WITNESS

Name:

Address:

CLAIMANT

Name:

Address:

HYDRO ONE
HST#

HYDRO ONE NETWORKS INC.

Per:

Name:
Title:

I have authority to bind the Corporation

RELEASE AND WAIVER

FULL AND FINAL RELEASE

IN CONSIDERATION of the payment or of the promise of payment to the undersigned of the aggregate sum of [INSERT SETTLEMENT AMOUNT] ($), the receipt and sufficiency of which is hereby acknowledged, I/We, the undersigned, on behalf of myself/ourselves, my/our heirs, executors, administrators, successors and assigns (hereinafter the "Releasors"), hereby release and forever discharge HYDRO ONE NETWORKS INC., its officers, directors, employees, servants and agents and its parent, affiliates, subsidiaries, successors and assigns (hereinafter the "Releasees") from any and all actions, causes of action, claims and demands of every kind including damages, costs, interest and loss or injury of every nature and kind, howsoever arising, which the Releasors now have, may have had or may hereafter have arising from or in any way related to [INSERT DESCRIPTION OF THE DAMAGE CAUSED] on lands owned by [INSERT PROPERTY OWNER NAME] and specifically including all damages, loss and injury not now known or anticipated but which may arise or develop in the future, including all of the effects and consequences thereof.

AND FOR THE SAID CONSIDERATION, the Releasors further agree not to make any claim or take any proceedings against any other person or corporation who might claim contribution or indemnity under the provisions of the *Negligence Act* and the amendments thereto from the persons or corporations discharged by this release.

AND FOR THE SAID CONSIDERATION, the Releasors further agree not to disclose, publish or communicate by any means, directly or indirectly, the terms, conditions and details of this settlement to or with any persons other than immediate family and legal counsel.

AND THE RELEASORS hereby confirm and acknowledge that the Releasors have sought or declined to seek independent legal advice before signing this Release, that the terms of this Release are fully understood, and that the said amounts and benefits are being accepted voluntarily, and not under duress, and in full and final compromise, adjustment and settlement of all claims against the Releasees.

IT IS UNDERSTOOD AND AGREED that the said payment or promise of payment is deemed to be no admission whatsoever of liability on the part of the Releasees.

AND IT IS UNDERSTOOD AND AGREED that this Release may be executed in separate counterparts (and may be transmitted by facsimile) each of which shall be deemed to be an original and that such counterparts shall together constitute one and the same instrument, notwithstanding the date of actual execution.

IN WITNESS WHEREOF, the Releasors have hereunto set their respective hands this .... day of ...., 20XX.

SIGNED, SEALED & DELIVERED In the presence of: ____________________ Witness	 ____________________ Name
SIGNED, SEALED & DELIVERED In the presence of: ____________________ Witness	 ____________________ Name

Initials_______