INTERROGATORY #1

Interrogatory

References: (1) Exhibit B, Tab 1, Schedule 4, Sections 2.1 and 2.2
(2) Exhibit B, Tab 6, Schedule 5, Section 6, pages 9-12
(3) Exhibit B, Tab 6, Schedule 3, Section 5.2

Preamble:

Table 1 in Ref. 1 shows that the summer peak load in the Woodstock area supplied by Hydro One's 115 kV system is expected to reach about 110 MW in 2007 and increase to about 150 MW in 2010. The Table also shows a new 25 MW load for "Large Auto Assembly" starting in 2010. Table 1 in Reference (3) also shows a load forecast for stations in the area. The loads shown in the Table in Reference (1) are not consistent with those shown in Reference (3). Also, in Reference (3), the loads for the new auto plant starts in 2008 not 2010.

Reference (2) states that "The post-contingency voltage on the high voltage (HV) system at Woodstock shows excessive voltage declines for loads in excess of 102 MVA". It is also stated that the 102 MVA load assumes the addition of the second capacitor at Woodstock.

Board Staff would like some clarification regarding the need and timing of the subject project.

Questions:

(i) Please confirm the load forecast given in Table 1, Ref 1, and provide a revised Table, if necessary.

(ii) Please explain any discrepancies between the load forecasts shown in Ref 1 and Ref 3.

(iii) Please confirm the timing and load of the new auto plant referred to in Ref 1 and Ref 2.

(iv) What is the status of the proposed second capacitor at Woodstock TS? When is it expected to be in service?

(v) Please confirm the need date of the facilities that are the subject of this application.

(vi) If the need date is earlier than the proposed in-service date of 2010, what is Hydro One's plan to maintain an adequate supply until the new facilities are in service?

Response

(i) The load forecast provided in Table 1, Reference 1 is based on the load forecast assumed in 2006 when initial planning began on this project. We updated the load forecast to reflect a change in the overall Woodstock TS load; the timing of the Toyota load; and more recent load information for the large industrial load. The revised load forecast is provided in Table 1 below. The table provided in Reference 1 will be revised to reflect these changes and the evidence filed March 9, 2007 will be updated.

Table 1: Woodstock Area 115 kV Coincident Summer Peak Load Forecast

Station	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Woodstock	89.4	86.0	90.3	95.0	99.8	102.5	105.3	108.1	111.0	114.0	117.3
Large Industrial	10	11	11	11	11	11	11	11	11	11	11
Large Auto Assembly	0	8	15	25	25	25	25	25	25	25	25
115kV Load Sub-total	**99.4**	**105.0**	**116.3**	**131.0**	**135.8**	**138.5**	**141.3**	**144.1**	**147.0**	**150.0**	**153.3**

(ii) Differences between the forecast loads in Reference 1 and Reference 3 are due to the timing of available load forecast information. In Reference 1, Toyota load was assumed to be supplied from Woodstock TS prior to 2010, whereas Reference 3 reflects the most current assumption that the Toyota load will be supplied directly from the 115 kV system, and will require plant commissioning power starting in 2007.

(iii) In the evidence filed March 9, 2007, the new auto plant load was assumed to be supplied from Woodstock TS until it became directly connected to the 115 kV system in 2010. The March 9 evidence assumed, for planning purposes, that the Toyota load would double in the final year of the study based on the fact their connection station has been laid out to accommodate an additional transformer of the same size as currently planned. The assumptions for the Toyota load have been revised and the timing and load of the new auto plant load is currently forecast to be connected directly to the 115 kV system at the load levels provided in the response to part i.

(iv) Work on the installation of a second 21.6 MVAr capacitor bank at Woodstock TS was initiated in April 2007 and is expected to be in-service by the end of 2007.

(v) The need date for the facilities proposed in this application is 2007 since even with the new capacitor bank at Woodstock TS and the transfer of 8 MVA of Woodstock TS load to Ingersoll TS, the load on the subject facilities exceeds the voltage decline limit when pre-contingency loads in the Woodstock Area exceed 102 MVA, as described in section 2.2 of Exhibit B, Tab 1, Schedule 4 and page 11 of Exhibit B, Tab 6, Schedule 5.

(vi) As mentioned under (iv), Hydro One is in the process of installing a new capacitor bank at Woodstock TS in late 2007. In addition, standard operating measures and control actions will be put into place to manage the security of supply for the Woodstock area until such time as the proposed facilities are placed in-service at the earliest date of April 2010. Operating measures and control actions will include re-configuring Woodstock TS by operating with the bus-tie breaker open when load exceeds the reliable load meeting capability (voltage decline limit). This will expose about 43 MW of Woodstock TS load in 2007 to the risk of being curtailed in the event of an outage to the lines supplying Woodstock TS.

INTERROGATORY #2

Interrogatory

Reference: Exhibit B, Tab 6, Schedule 5, pages 12-19.

Preamble:

The evidence indicates that four alternatives were considered to address the supply problems in the Woodstock area. It is stated on page 18 that the alternatives were evaluated over a 40 year time period. The estimated costs (PV) of the alternatives range from $89 million for Alternative 4 to $149 million for Alternative 3. The proposed project, Alternative 1, as well as Alternative 2, are estimated at $107 million. It is also stated that the accuracy of the estimates is no better than +/- 10% and that a $3.8 million customer interruption cost is included in Alternative 4. We note that there is an $18 million difference in the cost between Alternative 4 and Alternatives 1 and 2, i.e., the cost of Alternative 4 is about 17% less that Alternatives 1 and 2.

Questions:

(i) Please explain/expand on the reasons why Alternative 4 was ruled out even though it has the lowest cost?

(ii) Are there any cost-effective measures that could improve the reliability of Alternative 4? If so, please explain and provide the costs of such measures.

Response

(i) Hydro One considers the cost of Alternatives 1, 2 and 4 to be essentially the same based on the +/- 10% accuracy of planning study estimates and given the overlap in the range of estimated costs. Alternative 4 was not selected as the preferred alternative because the cost per MVA of incremental transmission capacity provided by this alternative is $890k per MVA, which is significantly higher that the $252k per MVA of Alternative 1. Additionally, Alternative 4 does not accommodate any unforeseen increase in the capacity requirements of the Woodstock area, which would necessitate upgrades to the distribution facilities that are part of Alternative 4. Finally, the long distribution feeders integral to Alternative 4 provide a poor level of reliability for the Woodstock area load as compared to meeting the Woodstock Area needs via an upgrade to the transmission system.

(ii) There are no cost-effective measures to make the reliability of distribution feeders the same as the proposed transmission facilities.

INTERROGATORY #3

Interrogatory

References: (1) Exhibit B, Tab 4, Schedule 2
(2) Exhibit A, Tab 1, Schedule 1, page 1
(3) Section 6.6 of the Transmission System Code

Preamble:

Reference (1) indicates that the estimated total cost of the proposed project is $71.6 million. Of this, $42.9 million is for transmission line work and $28.7 million is for station and communication facilities.

The cost of building the proposed 14 km of 230 kV line works out to approximately $3.1 million per km.

Board Staff notes that in recent Leave to Construct applications, the estimated per km cost of constructing 230 kV transmission lines was significantly less as indicated below:

- Brampton line (EB-2006-0215): 4.2 km for $10.5 or $2.5 million per km.
- Southern Georgian Bay line (EB-2006-0242): 27 km for $48 million or $1.8 million per km.

Reference (2) states that "A 2 km portion of the new line from a proposed new transformer station (Karn TS) to Woodstock TS will be operated at 115 kV".

Questions:

(i) Please explain why the estimated cost per km for the two projects referenced in the preamble (EB-2006-0215 and EB-2006-0242) is significantly less (19% and 42%, respectively) than the proposed project?

(ii) Provide a detailed cost breakdown for the last three 230-115 kV transformer stations completed by Hydro One (or a predecessor company) that are most similar to the proposed project. Please detail these costs as to:

- Materials by major component;
- Construction;
- Engineering;
- Commissioning;
- Contingencies;
- Overheads (break down into Direct Overheads and Indirect Overheads); and
- AFUDC.

(iii) Please provide the rationale for building the 2 km portion of the new line from Karn TS to Woodstock TS using 230 kV construction but operating it initially at 115 kV.

(iv) Does Hydro One have a plan that would utilize the line section in (iv) at 230 kV? If so, please provide details of plan including rationale, timing and cost.

(v) What would be the cost of the proposed project if the line section in (iv) were built using 115 kV construction?

(vi) Would it be feasible to use the existing 115 kV line in the line section in (iv) instead of building a new line in this section? Please explain.

(vii) If the answer to (vii) is "yes", what would be the cost of the proposed project is the existing 115 kV line is used in the line section in (iv)?

(viii) The following relate to 6.6 of the Transmission System Code regarding contestability. For the proposed project, please provide:

a) those items that will be subject to competitive bidding;
b) those items that will be contracted out without competitive bidding;
c) those that will be neither competitively bid nor contracted out; and
d) the reasons why the items listed under (c) are neither contracted out nor competitively bid

Response

(i) The estimated cost per kilometre (km) for the proposed line facilities is higher than the cost for the other projects referenced in the preamble for the reasons given below.

Factors applicable to both the Brampton and Southern Georgian Bay lines:

- In order to utilize the existing 115kV right of way, which is approximately 66 feet in width, the spans for the 230 kV structures to be used on the proposed line must be shortened from the optimum span for these types of structures. Consequently, about 40% more structures per km will be used on the Woodstock project.
- The Woodstock line costs includes the cost of acquiring additional land rights, which are not required for the other projects referenced.

Additional factors applicable to the Southern Georgian Bay line:

- The conductor size used on the Woodstock lines is considerably larger (1143 kcmil vs 795 kcmil for Southern Georgian Bay). The cost of 1443 kcmil conductor is about 60% greater than 795 kcmil conductor.

- The Woodstock project has more road crossings and is located in a more urban area, which contributes to increased construction costs.
- The Southern Georgian Bay line is longer which introduces more economies of scale.

Additional factor applicable to the Brampton line:

- The Brampton line did not require the construction of a by-pass.

(ii) The projects in the following table are closest in scope to the Karn station proposed in the Woodstock application. The most similar one is Ansonville TS which was placed in service in 1992 (i.e. 18 years earlier than the proposed in service for Woodstock), although it involved a single, much smaller, autotransformer than will be used at Karn TS. Like Karn, Ansonville involved an entirely new station on a new site. The other two projects involved expanding existing stations. Cambridge Preston TS project is still under construction and is on budget and schedule for completion later in 2007.

	Karn TS	**Ansonville TS**	**Caledonia TS**	**Cambridge Preston TS**
	2x250 MVA 230/115 kV Transformers & 3x115 kV Breakers	**1x125 MVA 230/115 kV Transformer & 3x115 kV Breakers**	**2x125 MVA 230/115 kV Transformers & 2x115 kV Breakers**	**1x250 MVA 230/115 kV Transformer, 2x230 kV Circuit Switchers & 1x115 kV Breaker**
In Service Date	2010	1992	2003	2007
Project Management (includes Property)	1,300	194	106	133
Engineering	1,250	1,519	593	671
Procurement	14,900	5,859	4,642	6,191
Construction	4,250	5,334	2,366	1,631
Commissioning	800	859	470	332
Contingencies	2,300	-	0	206
Subtotal	**24,800**	**13,765**	**8,177**	**9,164**
Overhead	2,600	321	467	1,466
AFUDC	1,300	1,053	1,588	478
Total Station Work	**28,700**	**15,139**	**10,232**	**11,108**

(iii) It is proposed to build the 2 km portion of line from Karn TS to Woodstock TS at 230 kV because of a potential future need for this line to operate at 230 KV, as described in the response to part iv below, and because the incremental cost to build these facilities at 230 kV vs 115 kV is small, as described in the response to

part v below. In addition, the incremental cost to build the line at 230 kV as part of the proposed project is substantially less than what it would cost to come back into the community at some point in the future to replace a relatively new 115 kV line with a new 230 kV line.

(iv) Brant TS and Powerline MTS, which are connected to the same 115 kV line as Woodstock TS but are supplied radially from Burlington TS, have supply issues similar to those of Woodstock, but not quite as imminent as shown in Appendices E, F , G and H in Exhibit B, Tab 6, Schedule 5. Consideration is being given to supplying Brant and/or Powerline from the new supply to Woodstock sometime in the future depending on overall load growth at all area stations and other factors that may impact on the supply capacity available from Burlington as per the direction provided on page 14 of the SIA for Powerline MTS which is provided as an Attachment to this interrogatory.

Depending on the overall load growth at Woodstock, Brant, Powerline and other potential new stations in the area, consideration will be given to converting all stations to 230 kV and supplying them via the proposed new line between Ingersoll TS and Woodstock TS. If the conversion of all stations in the area to 230 kV were to occur, it would likely be in the 10 to 20 year time horizon and be done as an integrated plan that would also address the end-of-life issues at the existing Woodstock TS, which is now over 45 years old and a candidate for rebuild in the next 10 to 15 years. To reduce future costs, it was decided to pre-build the Karn TS to Woodstock TS portion of the new line to 230 kV. The cost of this future project has not been determined and would depend on the precise scope of the work.

(v) It is estimated that building the section of Line from Karn TS to Woodstock TS using 115 kV construction would reduce the total project cost by $0.5 to $1 million dollars, or about 1% of the total project cost.

(vi) No, it is not feasible to use the existing 115 kV line between Karn TS and Woodstock TS because as noted in section 2.2 ii) of Exhibit B, Tab 1, Schedule 4 the thermal capacity of the existing line is expected to be exceeded in 2010 and the existing structures cannot support the new conductor required to meet the specified line ratings.

(vii) Not applicable.

(viii) As requested:

(a) The supply of all major line station equipment including transformers and switches, station structures, insulators, hardware, conductor, and tower steel will be subject to competitive bidding. All other station and telecommunication permanent equipment & materials; supplies; consumable

materials; most transport & work equipment; surveys and geotechnical investigations will also competitively bid.

(b) In accordance with company purchasing policy, no items over $6,000 in value can be contracted without competitive bidding, unless specific permission is given. Such permission is subject to stringent review, must be shown to be in the best interest of the company and is granted under rare special circumstances.

(c) There are no material items that will neither be competitively bid nor contracted out. The majority of engineering, commissioning and construction labour are performed by Hydro One regular employees and casual construction trades and therefore do not require a bidding process.

(d) These services are generally provided by Hydro One regular employees and casual construction trade as provided under Hydro One's labour agreements with its unions. These groups have the specific experience and knowledge of the Hydro One power system facilities to carry out this work safely and efficiently.

INTERROGATORY #4

Interrogatory

Reference: Exhibit B, Tab 4, Schedule 3, page 1

Preamble:

Hydro One states that it requires no capital contribution from transmission customers for this project since the proposed facilities "meet the requirements of section 6.3.6 of the Transmission System Code" and have been included in the transmission plans for this area.

Questions:

(i) Hydro One states that this reinforcement was already included in its transmission plans and so under section 6.3.6 of the Transmission System Code (TSC), no capital contribution would be required. If this is the case, please describe all stages in the Hydro One planning, design, procurement and construction process for projects such as the one in question and submit corroborating documentation showing the steps that were completed when the Application was submitted to the Board.

(ii) Hydro One states that this reinforcement was already included in its transmission plans. With regard to this plan, please provide a copy of the plan in question as well as responses to the following questions:

a) When was the plan prepared?
b) Was the plan prepared by Hydro One on its own initiative, or was it prepared at the request of a third party?
c) If the plan was prepared by Hydro One on its own initiative, what triggered the preparation of the plan?
d) If the plan was prepared at the request of a third party, please identify the party.

(iii) Is the timing of the work on proposed project in accordance with the plan, or is it being advanced? If so, what are the advancement costs?

(iv) Provide a listing of all Hydro One projects for transmission connection reinforcement in the last two years and for each application state if a capital contribution was or was not requested by Hydro One and the reasons why a contribution was or was not requested.

(v) If the Board were to decide that capital contributions are required, please provide an estimate of what the contribution amounts would be from the transmission customers involved including details of calculation.

Response

(i) As stated in Exhibit B, Tab 4, Schedule 3, page 1, the proposed facilities meet the requirements of Section 6.3.6 of the Transmission System Code (TSC) since this project involves upgrading transmission facilities for Local Area Supply (LAS) and based on Hydro One's application for Approval of Connection Procedures (EB-2006-0189) these facilities do not require a capital contribution.

The following are the stages in the Hydro One planning, design procurement and construction process for projects such as this one.

i Identify the Need:

The need to reinforce the supply to the Woodstock area was identified by Hydro One staff over the last 12 months based on observations about the load growth in the Woodstock area being driven by increased industrial, commercial and residential activity. The need was confirmed through a Joint Utility Planning Study dated February 13, 2007, and provided in Exhibit B, Tab 6, Schedule 5 of the Application.

The work on this planning study began in July 2006 and followed analysis of the issues identified by the IESO in the SIA study report for Powerline Municipal Transformer Station (MTS) dated November 29, 2005, CAA ID 2005-196 in conjunction with on going planning studies being conducted to accommodate forecast load growth in the Woodstock area as a result of the proposed Toyota manufacturing plant. The Woodstock area and the Powerline/Brant area are joined by a 115 kV transmission circuit B8W that runs between Woodstock TS and Brant TS. When the Woodstock planning study began, options that attempted to solve both the Woodstock and Brant issues simultaneously were explored using B8W. It was found that new transmission reinforcement specifically for Woodstock or specifically for Brant could simultaneously solve both problems. These studies are documented in the Appendices of the Woodstock Area planning study. In October 2006, a decision was made to refocus the planning study to deal with Woodstock only since the Brant/Powerline issues were fairly complex and because other short-term options existed that could defer the need for major investment for Brant/Powerline. The short-tem options that were used for the Brant area are to simply increase the post-contingency support available from the 230/115 autotransformers at Burlington TS. These projects are now being implemented. However, this is only a short-term solution for Brant.

In October 2006, when the planning study was refocused on the Woodstock area, the input of the Woodstock area LDC's was sought and the planning study became a joint planning study.

The Ontario Power Authority (OPA) through the IPSP is now the authority to determine the need for system reinforcement to address area supply needs. As noted in Exhibit B, Tab 1, Schedule 4, page 2 of the application, the OPA has identified the need to reinforce the supply to the Woodstock area in IPSP "Discussion Paper 5: Transmission" and subsequently identified the proposed facilities as part of IPSP "Discussion paper 7: Integrating the Elements – A Preliminary Plan". The OPA also confirmed the need for reinforcement of the Woodstock area in their letter provided in Exhibit B, Tab 6, Schedule 2.

The IESO also identified the need for transmission enhancements in the June 2006 Ontario Reliability Outlook and subsequently reaffirmed the need in their March 2007 Ontario Reliability Outlook as discussed on page 1 of Exhibit B, Tab 1, Schedule 4.

ii Identify alternatives:

Viable alternatives to meet the need were then identified and evaluated. These were documented in the February 13, 2007, Joint Utility Planning Study referred to above. The alternatives considered for this project are documented in Exhibit B, Tab 3, Schedule 1 of this application. As discussed above, alternatives were initially explored that attempted to solve the transmission capacity issues that exist in both the Woodstock and Powerline/Brant areas simultaneously. These other alternatives were dropped when the planning study was refocused to concentrate on those that addressed Woodstock only.

iii Select preferred alternative:

After an evaluation of the viable alternatives was completed, the preferred alternative was identified as discussed in Exhibit B, Tab 3, Schedule 1. The selected option was found to be one that has the capability at sometime in the future of being expanded to solve the Brant/Powerline issues and also the future capacity issues at Burlington TS. No additional facilities, other than using 230 kV construction on the 2 km of line between Karn TS and Woodstock TS, are being provided at this time to accommodate those future needs.

iv Preliminary engineering:

Subsequent to the preferred alternative being identified, the preliminary engineering required to estimate the cost of the project was developed by Hydro One Networks' Engineering and Construction Services (E&CS) group. The

preliminary engineering work is based on the Planning Specification dated December 21, 2006 and the detailed estimates based on the planning specifications are provided in Exhibit B, Tab 4, Schedule 2 of the application.

The other stages in the Hydro One process include; the detailed design; procurement; construction; and commissioning. All of these activities will be initiated after the Leave to Construct, Section 92 has been approved by the Board.

The collaborating documentation submitted as part of this application includes

- The Woodstock Area Joint Utility Planning Study dated February 13, 2007, and provided in Exhibit B, Tab 6, Schedule 5;
- IESO's SIA for this Application provided in Exhibit B, Tab 6, Schedule 3.
- OPA's endorsement letter provided in Exhibit B, Tab 6, Schedule 2;
- The OPA's IPSP Discussion Paper 5 and Discussion Paper 7 referenced as part of Exhibit B, Tab 1, Schedule 4;
- The IESO's June 2006 Ontario Reliability Outlook referenced as part of Exhibit B, Tab 1, Schedule 4;
- The IESO's March 2007 Ontario Reliability Outlook provided in Exhibit B, Tab 6, Schedule 6;
- Exhibit B, Tab 3, Schedule 1 of this application describing the alternatives considered and the preferred alternative;
- The detailed cost estimates provided in Exhibit B, Tab 4, Schedule 2.
- IESO SIA for the Powerline MTS, dated November 29, 2005, CAA ID-2005-196, provided as an attachment to this interrogatory response.

(ii) Hydro One's Transmission Plan is not one document but rather a culmination of several planning documents that together become "The Transmission Plan". For this application the documents listed in part (i) of this interrogatory response are the transmission plan documents.

The chronology of events listed below provide Hydro One's response to parts (a) through (d) of this question;

- Spring 2006: Hydro One staff identify local area supply problems in the Woodstock Area and the Brant/Powerline area.
- July 2006: Work on the planning study commences with the view of solving the Woodstock and Brant/Powerline issues simultaneously.
- October 2006: Decision to use short-term measures to defer Brant/Powerline investment and refocus planning study on Woodstock area.
- October 23, 2006: Initial meetings with Woodstock area LDCs to discuss supply issues and planning study.
- November 24, 2006: Follow-up meetings with Woodstock area LDCs to discuss planning study.

- December 12, 2006: Hydro One applied for SIA of the Woodstock Area Reinforcement (CAA ID 2005-253).
- February 8, 2007: Final meeting with Woodstock area LDCs to discuss planning study. Letters of support obtained from Woodstock Hydro and Erie Thames Powerlines.
- February 13, 2007: Final report of Planning Study issued incorporating comments received at February 8 meeting.
- March 2, 2007: OPA provided Hydro One with their endorsement letter.

(iii) Exhibit B, Tab 1, Schedule 4 confirms the need of the project and there is no advancement of the contemplated work.

(iv) Hydro One has not filed any Leave to Construct applications with the OEB for transmission connection reinforcement projects in the last two years. Below, Hydro One has listed the types of transmission connection reinforcement projects that Hydro One has proposed over the last two years and whether a capital contribution has been required and / or requested and the reasons why.

Local Area Supply (LAS) Projects: Local Area supply projects are listed in Exhibit D1, Tab 3, Schedule 3, page 13 of our transmission rate application (EB-2006-0501). As discussed in that proceeding, none of these projects, other than the Leaside TS to Birch Junction transmission reinforcement project, are subject to any capital contribution based on Hydro One's application for Approval of connection Procedures (EB-2006-0189) in accordance with Section 6.3.6 of the Transmission System Code.

Generation Projects: Generation customer connection projects are listed in Exhibit D1, Tab 3, Schedule 3, page 14, EB-2006-0501. None of these projects are subject to any capital contribution since the proposed generator is responsible for all costs associated with connection facilities.

All Hydro One load connection projects require a capital contribution to cover the cost of the connection facility to meet the load customer's needs. A capital contribution may only be necessary to the extent that the cost of the connection facility is not recoverable in connection rate revenues. The following table provides a list of the load connection projects for the last two years:

Applicant	Type of Facility	Agreement Date	Capital Contribution
Utility A	Breaker positions at TS	Jan 26, 2005	None Required
Industry A	New transformer station	Feb 5, 2005	Yes
Utility B	8 New Feeder Breakers	Mar 1, 2005	None Required
Industry B	Connection to MTS	Dec 13, 2005	Yes
Utility C	Add Second DESN	Jan 11, 2006	None Required
Utility D	Four New Feeders and 2nd DESN	Jan 26, 2006	None Required
Industry C	Site connection	May 12, 2006	Yes
Industry D	Transformer Station and 115 kV Circuit Tap	June 26, 2006	Yes
Utility E	2 New Feeder Breakers	June 1, 2006	None Required
Utility F	TS Expansion Project	Nov 23, 2006	Yes
Utility G	Two 27.6 kV Feeder Breaker Positions	Dec 20, 2006	None Required
Utility H	TS – Increase Capacity	Mar 28, 2007	Yes

(v) The transmission customers triggering this area supply investment are Woodstock Hydro, Hydro One Distribution and Toyota. If the Board were to decide that a capital contribution is required, Hydro One will apportion the contribution among the three transmission customer based on their load as per a signed CCRA.

The estimated capital contribution from customers is determined using the discounted cash flow (DCF) model currently approved by the Board with the following assumptions:

1. Load forecast as per the response to part i in interrogatory #1.
2. Project costs as per Exhibit B, Tab 4, Schedule 1.
3. The capital cost of the project is split between Woodstock TS and Toyota based on the relative share of incremental load at the end of the longest study horizon.
4. The Woodstock TS capital contribution requirement is split 15% to Hydro One Networks and 85 % to Woodstock Hydro based on their relative load at Woodstock TS.
5. The study horizon for Toyota is assumed to be 15 years and for Woodstock TS it is assumed to be 25 years.

Using the assumptions noted above, it is estimated that contributions from Woodstock Hydro, Hydro One Distribution and Toyota will be approximately $41M, $7M and $24M, respectively. The capital contributions will have to be recalculated once all affected customers confirm their load forecast and sign a CCRA for the revised loads.

IESO SIA CAA ID-2005-196
Powerline MTS
November 29, 2005

REPORT

Power to Ontario.
On Demand.

System Impact Assessment Report

CONNECTION ASSESSMENT & APPROVAL PROCESS

Issue 1.0

Project: *POWERLINE MTS*
Applicant: Brantford Power Inc. & Brant County Power Inc.

CAA ID 2005-196

Transmission Assessments & Performance Department
November 29, 2005

Document ID	IESO_REP_0282
Document Name	System Impact Assessment Report
Issue	Issue 1.0
Reason for Issue	First issue.
Effective Date	November 29, 2005

System Impact Assessment Report

Powerline MTS

Acknowledgement

The IESO wished 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 approval or disapproval of the proposed connection under Chapter 4, section 6 of the Market Rules.

Approval of the proposed connection is based on information provided to the IESO by the connection applicant and the transmitter(s) 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 the transmitter(s) at the request of the IESO. Furthermore, the connection approval is subject to further consideration due to changes to this information, or to additional information that may become available after the approval has been granted. Approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed facility to the IESO-controlled grid. However, connection 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, you must be aware that the IESO may revise drafts of this report at any time in its sole discretion without notice to you. 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 it is using the most recent version of this report.

HYDRO ONE

Special Notes and Limitations of Study Results

The results reported in this study are based on the information available to Hydro One, at the time of the study, suitable for a preliminary assessment of a new generation or load 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 connection on facilities owned by other load and generation (including OPGI) customers.

In this study, short circuit adequacy is assessed only for Hydro One breakers and does not include other Hydro One facilities. The short circuit results are only for the purpose of assessing the capabilities of existing Hydro One breakers and identifying upgrades required to incorporate the proposed connection. These results should not be used in the design and engineering of new facilities for the proposed connection. The necessary data will be provided by Hydro One and discussed with the connection proponent 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 facility 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 connection have been identified to the extent permitted by a preliminary assessment under the current IESO Connection Assessment and Approval process. Additional facility 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.

System Impact Assessment Report

SIA Findings

Conclusions

This System Impact Assessment has examined the effect of supplying an additional DESN, Powerline MTS off the 115 kV line B12/B13 emanating from Burlington TS, on the reliability of the IESO-controlled grid. The studies concluded that:

1. The proposed project will not materially affect the reliability of the IESO-controlled grid or the load-meeting capability of the existing local 115 kV system.
2. The addition of the new supply point does not have a material effect on the short circuit currents observed at the other transformer stations connected to this circuit.
3. By 2006 the peak Burlington area load will exceed the Burlington TS load-meeting capability. For a contingency involving any one transformer, the flows over the remaining lower rated transformer(s) exceed their 10 day LTR. For a contingency involving any transformer other than T12, the15 minute LTR for T12 is exceeded. For the contingency of loss of T4 and T12 or T6 and T9 due to the stuck bus-tie breaker, the flows on the remaining two autotransformers exceed the 15 minute LTR of the transformers.
4. The 115 kV double circuit line B12/B13 from Burlington TS to Brant TS consists of two sections: Burlington to Horning and Horning to Brant. The thermal capability of the Burlington to Horning section in post-contingency situations will be adequate to supply the connected load for the next two years. The thermal capability of Horning to Brant section could be exceeded for the loss of the companion circuit starting in the summer of 2008.
5. With the recently installed additional capacitors in the Burlington area, the pre-contingency voltage and post-contingency voltage decline meet the Market Rules requirements.

Recommendations

Notification of Approval for Connection Proposal

It is recommended that Notification of Conditional Approval for connection be issued to Brantford Power Inc. & Brant County Power Inc. subject to IESO's Requirements for Connection listed below, and any further requirements that may be identified by Hydro One Networks Inc. in the Customer Impact Assessment.

IESO recommends that feeder tie switches, that are to be operated normally open, be installed at the new DESN. This arrangement will provide additional load supply flexibility under emergency or maintenance situations by allowing two feeders to be connected to the same LV breaker position.

IESO's Requirements for Connection

The IESO requirements for the connection of the proposed Powerline TS are as follows:

- Brantford Power Inc. & Brant County Power Inc. must install 20 MVar low voltage shunt capacitors at the new DESN.
- Hydro One must upgrade the section of the 115 kV line B12 and B13 between Horning Jct. and Brant TS with a conductor matching the rating of the line section from Burlington to Horning. This work may need to be complete before the summer of 2008.

- If the circuit upgrading is not complete before the load supplied by Brant TS and Powerline TS exceeds 140 MVA then the distributor may be directed by the IESO to operate with the LV bus tie breakers open at Brant TS and Powerline TS.
- Brantford Power Inc. & Brant County Power Inc. must install telemetry and communication equipment to provide IESO with continuous monitoring information as specified in Appendix 4.17 of the Market Rules. This includes high-voltage circuit and transformer MW and Mvar quantities, transformer under-load tap changer tap positions, the status of breakers and disconnect switches at 50 kV and above, and the status of transformer low-voltage winding and bus-tie breakers.

Hydro One must implement, as soon as possible, a plan to increase the transformation capability at Burlington TS or to provide loading relief at the station. The increase in the power transfer capability of Burlington TS could be achieved by either:

- installing an additional 230/115 kV transformer or
- increasing the capability of the existing transformers or replacing them with higher-rated units with typical ratings. Four 250 MVA transformers with a typical 10-day LTR of 350 MVA (1.4*250) would result in a total station capability of 1050 MVA, which could serve the area expected load until about 2020.

IESO recommends that Hydro One consider re-arranging the transformer connections in such a way as to avoid the loss of two transformers due to a stuck bus-tie breaker. If re-arranging of the transformers is not feasible, Hydro One should ensure that each of the transformers has adequate overload protection installed.

Before the installation of additional capacity at Burlington TS, if the loading of the station exceeds the LTR of the three lower rated transformers the IESO may be instructing the distributors in the area to reduce their load by an amount in excess of the transformer ratings.

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1. Project Description

The load in Brantford area is currently supplied from Brant TS, a 115/27.6 kV transformer station connected to the 115 kV double circuit line B2 & B3 and Brantford TS, a 230/27.6 kV transformer station connected to the 230 kV lines Between Middleport and Buchanan.

Brantford Power Inc. in partnership with Brant County Power Inc. is proposing to establish a new 115/28kV DESN station with 2×50/67/83 MVA transformers. The new station will be connected to the 115 kV radial circuits B12 and B13 out of Burlington TS. The planned station site is adjacent to circuits B12/B13 and about 200 m east of the existing Brant TS.

A schematic diagram of the 115 kV transmission system in the Burlington area and the location of the proposed Powerline MTS is shown in Figure 1.

The proposed new Powerline MTS will be a standard DESN arrangement with two 50/67/83 MVA transformers and associated HV and LV equipment as displayed in Figure 2.

The proposed ready for service date for the new TS is December 15, 2005.

– End of Section –

2. Review of Connection Proposal

2.1 Connection Arrangement

The proposed Powerline MTS will be equipped with two new 115 kV-28 kV dual winding transformers that will be connected to the 115 kV circuits B12/B13, as shown in Figure 2.

Each transformer will be connected to the IESO-controlled grid via one 115 kV motorized disconnect switch with the following ratings:

- Maximum operating voltage 138 kV
- Continuous current rating 1200 A
- Limited Time current rating N/A

The transformers are both identical and configured with a delta winding on the high side and wye (neutral grounded via 1.5 ohms reactor) winding on the low voltage side.

Each transformer is equipped with an under-load tap changer located on the high voltage winding with a range of about +13.0% to –8.7% that is to be achieved in ±12 steps.

Low voltage side isolation of each transformer is to be provided by a 2500 A, 34.5 kV circuit breaker. The LV bus-tie breaker, also rated for 2500 A, is to be operated normally closed. The station will have eight feeders and each feeder position is to be equipped with one 1250 A, breaker. The short circuit interrupting capability for all above breakers is 25 kA.

The line taps from the station to the 115 kV circuits will be provided by short spans; thus their impedance was considered negligible in this assessment. The points of connection or defined meter points will be located on the high voltage side of the transformer.

The exact location of the revenue meter must be provided by the connection applicant as part of the Facility Registration process.

It should be noted that a typical simple DESN arrangement includes feeder tie switches that are operated normally open, as shown in Figure 3.

IESO recommends that feeder tie switches, that are to be operated normally open, be installed at the new DESN. This arrangement will provide additional load supply flexibility under emergency or maintenance situations by allowing two feeders to be connected to the same LV breaker position.

The connection applicant has agreed that load transfers should be provided between feeders from Powerline MTS. However, the switchgear is Gas Insulated technology and it is difficult to incorporate feeder tie switches with the switchgear and the proposed tie switches cannot be maintained without isolation from both feeders.

2.2 Power Factor

The Market Rules require that wholesale customers and distributors connected to the IESO-controlled grid shall operate at a power factor within the range 90% lagging to 90% leading as measured at the defined meter point.

The information received with the connection application indicates that the power factor of the projected load is 0.94 and station design does not provide for installation of LV shunt capacitors and capacitor breakers. Load information in 2005 indicates that the average power factor is above 0.95 but the actual value was below 0.90 occasionally.

The applicant is required to ensure that load power factor, when measured at the defined meter point location, meets the Market Rules requirements. To provide satisfactory power factor, IESO requires that 20 MVar LV shunt capacitors be installed at Powerline TS.

2.3 Underfrequency Load Shedding Requirements

The Market Rules (Chapter 5 section 10.4) require that each distributor and connected wholesale customer, in conjunction with the relevant transmitter, make arrangements to enable the automatic disconnection of up to 35% of its peak demand for conditions of system under-frequency. To meet this requirement an under frequency load shedding (UFLS) scheme must be installed at the station. The single line diagram does not show the presence of the UFLS scheme.

The under frequency automatic load shedding should be provided by tripping 28 kV feeder breakers to achieve:

- Automatic load shedding of 12% of station load at a nominal set point of 59.3 Hz and
- Automatic load shedding of an additional 23% of station load at a nominal set point of 58.8 Hz, for a total load reduction of 35% of the total station load.

The Connection Applicant has confirmed that UFLS will be installed at the station to meet the Market Rules requirements.

2.4 Voltage Reduction Facilities Requirements

The Market Rules (Chapter 4 Appendix 4.3) require that distributors connected to the IESO controlled grid with directly connected load facilities of aggregated rating of 20 MVA or more and the capability to regulate distribution voltage under load, shall install and maintain facilities to provide voltage reduction capability to achieve load reduction during periods when supply resources are limited. Voltage reduction capability involves the capability to reduce demand by lowering the

customer voltage by 3% and 5% and requires the controlling authority to be able to effect the voltage reduction within five minutes of receipt of the direction from the IESO.

The Connection Applicant confirmed that voltage control would be available from a local or remote location to provide 3% or 5% reduction to support the operating obligations.

2.5 Protection Systems

With respect to the protection and telecommunication requirements, the connection applicant must follow the Transmission System Code technical requirements for tapped transformer stations supplying load.

The applicant has indicated that the station equipment and station control/protection were designed to meet the intent of the Transmission System Code. The diagram that was provided by the applicant shows each transformer being separated from the transmission system via a motorized disconnection switch. For this particular arrangement the Transmission System Code requires that the distributor send transfer trip to the Transmitter's breakers at the line terminal stations for transformer faults or for a condition of failure to operate of the LT breakers. In the case of Powerline TS, which is to be connected to the double circuit 115 kV lines B12/B13 the transfer trip must be sent to the Burlington TS and Newton TS terminals of the faulted circuit.

The protection systems associated with B12/B13 are to be revised as required.

– End of Section –

3. Data Verification

The proposed new Powerline MTS will be a standard DESN arrangement with two 50/67/83 MVA. Based on standards for supply of municipal electrical utilities the capability of a DESN station is defined as the maximum load that one transformer can carry for a predefined period of time. This value is usually computed using specific transformer data and daily load curves, and temperature data specific to the transformer location. Brantford Power Inc. & Brant County Power Inc. have provided a 10 day summer Limited Time Rating of 120 MVA.

Technical specifications of the transformers are as follows:

Manufacturer	VA Tech.
Transformation	115/28 kV
Continuous rating	50/67/83 MVA
Limited Time Rating (10 day)	125 MVA (Winter) 120 MVA (Summer)
Impedance	12% based on 50 MVA
Configuration	3 phase, High side: delta, Low voltage side: wye (neutral grounded via 1.5 ohms reactor)
Tapping	under-load tap changer with 25 steps providing voltage range of 105 kV – 130 kV

A schematic diagram of the 115 kV transmission system in the Burlington area and the location of the proposed Powerline MTS is shown in Figure 1.

The system performance standards listed in the Transmission System Code require that the 115 kV and 28 kV systems be designed for fault levels up to 50 kA and 17 kA, respectively. The LV breakers proposed for installation at Powerline MTS meet the interrupting capability recommended by the Transmission System Code.

A full description of the connection arrangement of the proposed Powerline TS is included in Section 2.1 of this report.

– End of Section –

4. Fault Level Assessment

The customer has advised that there are no generators or large synchronous motors connected to their distribution system.

In general, radial loads do not have a large impact on the system fault levels, but a small contribution in short circuit currents can be observed due to the grounding of the transformers. In the case of Powerline MTS the high voltage winding is ungrounded, hence line-to-ground faults occurring on the distribution side will have no impact on the short circuit levels.

– End of Section –

5. Impact on System Reliability

This connection assessment study is concentrated on identifying the effect of the proposed DESN on thermal loading of the transmission lines and transformers, and system voltages for pre and post contingency situations. In addition, the adequacy of the existing Burlington area transmission system to supply the 2006 area load was investigated and concerns related to the ability of the area transmission to supply the future load growth were identified.

The studies were performed for a system with all elements in service and single contingencies under conditions of peak load conditions.

5.1 Description of Area Transmission

The 115 kV and 230 kV area transmission is shown in Figure 1 together with the proposed location of Powerline TS. The Beach-Burlington load which is connected to the 115 kV transmission system is supplied via a number of 115 kV circuits emanating from Burlington 115 kV and Beach 115 kV switchyards. Burlington 230/115 kV and Beach 230/115 kV transformer stations effectively supplying the entire 115 kV load in the area. The local 115 kV transmission comprises of:

- The double circuit 115 kV lines H5K/H6K from Beach and B10/B11 from Burlington which join at Gage TS at a point which is operated normally open providing for the separate supply of Gage T5/T6/T8/T9 via B10/B11 and Gage T3/T4 via H5K/H6K,
- The double circuit 115 kV line HL3/HL4 from Beach TS to Newton SS which is operated normally split between Stirton TS and Elgin TS thus supplying Birmingham TS, Slater Steel and Stirton TS from the Beach end and Elgin TS from Burlington end,
- The double circuit 115 kV line B12/B13 from Burlington TS to Newton SS also providing radial supply to Dundas TS#2 and Brant TS,
- The double circuit 115 kV line B3/B4 from Burlington TS to Newton which supplies Dundas TS, McMaster TS and Mohawk TS and
- The double circuit 115 kV line B6G/B5G from Burlington TS which provides radial supply to Westover TS, Puslinch TS, ABB, Guelph Hanton and Cedar TS loads.
- The double circuit 115 kV line B7/B8 from Burlington TS which provides radial supply to Bronte TS.

The area transmission is also equipped with 230 kV, 2×300 MVar and 115 kV, 125 MVar shunt capacitors installed at Burlington TS.

The 115 kV Burlington transmission system is equipped with a number of in-line disconnect switches which are used to transfer the loads, if needed, from Burlington TS to other bulk transformer stations.

Normal Operation

Under normal operating conditions, Burlington TS provides supply to:

- Gage T5/T6/T8/T9
- Brant TS, Dundas #2,
- Westover TS, Puslinch TS, Guelph Hanton, ABB load, Cedar TS,
- Dundas TS, McMaster TS, Mohawk TS, Newton TS, and Elgin TS.
- Bronte TS

Load Transfer Alternatives

In-line disconnect switches are available to provide for alternative supplies for some of the area loads in case of an outage involving one transformer at Burlington TS. Present operating practices allow for the transfer of:

- the loads connected to the 115 kV double circuit line B6G/B5G to Detweiler TS via D9G/D7G to a maximum of 120 MW,
- Gage T5/T6/T8/T9 load to Beach TS to a maximum of 100 MW, and
- Maximum 50 MW of Brant TS load to Buchanan TS via the 115 kV circuit B8W only in emergency situation.

The loading ability of Detweiler TS (T2, T3 and T4) and Beach TS (T1, T7 and T8) was investigated based on their actual maximum load in 2005 (until September 25) and the results are shown in Table 1 below.

Table 1. Load Capability at Detweiler TS and Beach TS

Station	Continuous rating (MVA)	Continuous MW rating @pf 0.9	Peak load in 2005 (MW)	Available capability (MW)
Detweiler TS	725	653	443	**210**
Beach TS	700	630	434	**196**

It can be seen that both Detweiler TS and Beach TS have enough capability to supply extra load transferred from Burlington TS as described above.

5.2 Area Loads

Forecast

The actual power flowing over the Burlington autotransformers recorded during 2002, 2003, 2004 and 2005 (until 18 July) was analyzed and the maximum flows for each period time are shown in Table 2 below. It can be seen that the peak loads fluctuates close to 800 MVA in recently years. In this study a peak load of 820 MVA was used for Burlington 115kV peak load conditions in year 2006.

Table 2. Actual Peak Load Flow to 2005

Year	2002	2003	2004	2005
Load (MVA)	774	811	770	743
P.F	0.95	0.96	0.97	0.98

Table 3 below lists the expected summer peak load growth at the stations that are connected to the Burlington 115 kV system.

The assumptions used in determining the 115 kV area loads are as follows:

- All loads were escalated by 1.77% per year until 2015, which is the factor corresponding to the normal load growth forecast for the Southwest zone.
- The new Powerline TS, upon coming into service will assume 24 MW of existing load, thus relieving the loading of the Brant TS and Brantford TS.
- Since the loads at Brantford TS and Brant TS exceeded their load capability. Loads at these two stations are to be limited within the station capability and all the load growth based on their capability by 1.77% per year will be included in the load forecast for Powerline TS.
- All loads were modeled with a power factor equal or close to 0.9 measured at the 115 kV connection point.

Table 3. Load Growth Forecast to 2015

Forecast Summer Peak Loads (MW)										
Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Station	**Loads Supplied via B3/B4 and B12/B13**									
Elgin TS	87	89	90	92	93	95	97	98	100	102
Dundas TS	106	108	110	112	114	116	118	120	122	124
McMaster TS	17	17	18	18	18	19	19	19	20	20
Mohawk TS	87	89	90	92	93	95	97	98	100	102
Dundas TS#2	42	43	43	44	45	46	47	47	48	49
Newton TS	47	48	49	50	50	51	52	53	54	55
Brant TS	86	86	86	86	86	86	86	86	86	86
Powerline TS	24	29	33	38	43	48	52	57	62	66
Total Brant &Powerline (MW / MVA)	110/ 122	115/ 128	119/ 132	124/ 138	129/ 143	134/ 149	138/ 153	143/ 159	148/ 164	152/ 169
Station	**Loads Supplied via B3/B4 and B5G/B6G**									
IPP Westover	6	6	6	6	6	7	7	7	7	7
Puslinch	22	22	23	23	24	24	24	25	25	26
Guelph Hanton	43	44	45	45	46	47	48	49	49	50

ABB	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Cedar TS	45	46	47	47	48	49	50	51	52	53
Total Burlington 115 kV Area Load (including radial loads supplied via B7/B8, andB10/B11)										
Load (MW)	770	784	797	812	826	841	855	871	886	902

Actual Loads

The actual load at Brant TS for winter and summer of 2005 was higher than indicated by the load forecast above. During this summer's hot weather, the system coincident-peak load (July 13, 2005) at Brant TS was 102 MVA. In June 2005 load at Brantford reached 167 MW (174 MVA) which exceeded its load capability. Even higher loading of Brant TS was recorded on September 2, 2005 but it is believed that this is due to LV temporary load transfer from Branford TS. The actual loads are shown in Table 4.

Table 4. Peak Loads at Brant TS and Brantford TS

Date	**July 13, 2005**		**September 2, 2005**	
Stations	**Brant TS**	**Brantford TS**	**Brant TS**	**Brantford TS**
Real Power (MW)	99	159	129	120
Reactive Power (MVar)	26	63	2	10
Power (MVA)	**102**	**172**	**130**	**121**
Load Capability (MVA)	95	173	95	173

5.3 Impact on Local Area Supply

This section covers the study on the reliability of the area transmission system near the proposed development. Although the planned Powerline TS will improve the reliability of the supply to the local customers, it is necessary to investigate the possible problems in Burlington area such as the load capability of Burlington TS, the load ability of 115 kV circuits and the voltage decline. Since the scheduled in-service date for the new station is December 15, 2005, year 2006 peak load conditions were considered the starting point in the studies.

5.3.1 Assessment of Burlington 230/115 kV Load Capability

This study was carried out to investigate the load capability of Burlington TS for year 2006 summer peak load conditions with all transmission elements in service, and for the loss of one critical element. It was estimated that in 2006 the Burlington area summer peak load including losses could reach about 820 MVA.

The thermal ratings of the Burlington TS autotransformers that were used in this study are summarized in Table 5. The ratings are from Hydro One's operational information data base.

Table 5. Transformer Ratings

Facility Name	Continuous (MVA)	10 Day LTR (MVA)	15 Minute LTR (MVA)
Burlington T4	215	256	290
Burlington T6	215	256	290
Burlington T9	250	262	300
Burlington T12	250	262	275

It was found that the higher rated transformer T12 has a lower 15 Minute LTR. This needs to be confirmed by Hydro One.

The Burlington TS load capability is 768 MVA (3×256 = 768 MVA).

A set of transmission distribution factors and outage distribution factors was established for the transmission elements of interest, as listed in Table 6.

Table 6. Power Distribution Factors (All in Service and Outage)

Element	Burlington T4	Burlington T6	Burlington T9	Burlington T12
Transfer Distribution Factor	0.248	0.237	0.256	0.259
Outage Element	**Outage Distribution Factors**			
	T4	**T6**	**T9**	**T12**
T4	-1.000	0.325	0.333	0.335
T6	0.315	-1.000	0.319	0.320
T9	0.340	0.336	-1.000	0.345
T12	0.344	0.339	0.348	-1.000

With the existing configuration of Burlington 230 kV switchyard the clearing of a fault associated with either T6 or T9 requires the opening of the bus-tie breaker H1H2. Should this breaker fail to operate, then the isolation of the entire H1-H2 bus must follow and hence both T6 and T9 would become disconnected from the system. The situation is identical for the other two autotransformers connected to the A1-A2 bus. Therefore in this study the loss of T4 and T12 as well as the loss of T6 and T9 needs to be considered.

All the results are summarized in Table 7.

Table 7. Estimates of Pre and Post Contingency Power Flows for 2006

Transmission Element (cont., 10day, 15-minute LTR)	Pre contingency Flows (MVA) % of cont. Rating	Post Contingency Flows					
		Outage Element				Loss of T6&T9 %15 min LTR	Loss of T4&T12 %15 min LTR
		T4 % 10 Day LTR	T6 % 10 Day LTR	T9 % 10 Day LTR	T12 % 10 Day LTR		
Burlington T4 (215, 256 MVA, 290 MVA)	203.4 **95%**	0	266.5 **104%**	273.1 **107%**	274.7 **107%**	401.1 **138%**	0
Burlington T6 (215, 256 MVA, 290 MVA)	194.3 **90%**	258.3 **101%**	0	261.6 **102%**	262.4 **103%**	0	394.2 **140%**
Burlington T9 (250, 262 MVA, 300 MVA)	209.9 **84%**	278.8 **106%**	275.5 **105%**	0	282.9 **108%**	0	425.8 **142%**
Burlington T12 (250, 262 MVA, 275 MVA)	212.4 **85%**	282.1 **108%**	278.0 **106%**	285.4 **108%**	0	418.9 **152%**	0

The study results indicate that:

1. By 2006 the peak Burlington area load (820 MVA) will exceed the Burlington TS load capability (768 MVA).
2. The power flows on the lower rated autotransformers, T4 and T6, are near their maximum continuous ratings in the pre-contingency situation.
3. For a contingency associated with any one of the 230/115 kV autotransformers, the post-contingency power flow over the remaining three autotransformers will exceed their 10 day LTR.
4. For a contingency associated with any one of the 230/115 kV autotransformers, the post-contingency power flow over T12 will exceed its 15 minute LTR.
5. For a contingency associated with T6 or T9 and assuming that H1H2 bus-tie breaker does not operate, both transformers will be temporarily lost by configuration and the flows on the remaining two autotransformers will exceed the 15 minute LTR of the transformers.
6. For a contingency involving T4 or T12 and assuming that A1A2 bus-tie breaker does not operate both transformers will be temporarily lost by configuration and the flows on the remaining two autotransformers will exceed the 15 minute LTR of the transformers.

Considering load transfers are available to provide for alternative supplies from Beach TS and Detweiler TS, an outage involving one transformer at Burlington TS, the power flow on the transformers was analyzed and the results indicate that:

1. In case of an outage involving one transformer at Burlington TS and if there is spare capability available, over 200 MW load can be transferred to the neighbouring 115 kV systems and all the remaining transformers would be within their 10-day LTR.
2. In case of an outage involving two transformers T4/T12 or T6/T9 due to stuck bus-tie breaker condition, the remaining autotransformers will exceed the 15-minute LTR of the transformers.

It can be concluded that under normal operating conditions the two lower rated transformers will be close to their continuous ratings. This situation will gradually become worse as the load in Burlington area increases. Any contingencies associated with a transformer will result in overloading of the remaining transformers. Although load transfers are available to provide for alternative supplies for some of the area loads and avoid the overloading in case of an outage involving one transformer at Burlington TS as described above, the transformers are still at an increased risk of overload and failure in case of an outage involving two transformers T4/T12 or T6/T9 due to stuck bus-tie breaker condition.

This study indicated that if the two lower rated transformers, T4/T6, are replaced with transformers having similar ratings with T9/T12, the Burlington TS load capability increases only from 768 to 786 MVA. This is because the 10 day LTR's of the four transformers are almost the same. Even if the two lower rated 215 MVA autotransformers, T4 and T6 are replaced, the operational capacity of Burlington TS will continue to be restricted and load transfers are required in case of a contingency involving a transformer.

Hydro One must implement, as soon as possible, a plan to increase the transformation capability at Burlington TS or to provide loading relief at the station. The increase in the power transfer capability of Burlington TS could be achieved by either:

- installing an additional transformer or
- increasing the capability of the existing transformers or replacing them with higher-rated units with typical ratings. Four 250 MVA transformers with a typical 10-day LTR of 350 MVA (1.4*250) would result in a total station capability of 1050 MVA, which could serve the area expected load until about 2020.

IESO recommends that Hydro One consider re-arranging the transformer connections in such a way as to avoid the loss of two transformers due to a stuck bus-tie breaker. If re-arranging of the transformers is not feasible, Hydro One should ensure that each of the transformers has adequate overload protection installed.

Before the installation of additional capacity at Burlington TS, if the loading of the station exceeds the LTR of the three lower rated transformers the IESO may be instructing the distributors in the area to reduce their load by an amount in excess of the transformer ratings.

5.3.2 Thermal Loading Assessment for the 115 kV Circuits

This section covers an investigation of loading ability of 115 kV circuits related to the proposed project.

For the 115 kV circuits affected by the proposed connection in the Burlington area the following ratings were used:

Table 8. 115 kV Lines Thermal Ratings

Circuits	Sections	Thermal Ratings Amps MVA@118 kV				
		Continuous (35°C)	15-M LTR (50% Prld)	15-M LTR (75% Prld)	15-M LTR (85% Prld)	15-M LTR (95% Prld)
B3&B4	Burlington x Horning	1194 224	1552 317	1427 292	1363 279	1294 264
	Horning x Newton	873 178	1035 212	982 201	956 195	927 189
	Horning x Mohawk	431 88	478 98	464 95	456 93	449 92
B12&B13	Burlington x Horning	979 200	1214 248	1134 232	1095 224	1052 215
	Horning x Brant	682 139	783 160	751 153	736 150	720 147

It should be noted that the line ratings are for summer peak conditions (i.e.: temperature: 35 °C, wind speed: 5 km/h, and illumination: Day) and 15 minute LTR depends on % pre-contingency loading of the circuit.

Load flow analysis was performed to establish the thermal capability of the Burlington area transmission facilities to supply the load using the thermal ratings shown in Table 8. The contingencies of loss one element including double circuit B12 or B13 were considered and all the results are summarized in Table 9. The results listed in Table 9 apply to the Burlington to Horning section of the four 115 kV circuits.

The capability of the Horning to Brant line-section of the double circuit 115 kV line B12 & B13 is treated at the end of this section.

Table 9. Estimates of Pre and Post Contingency Power Flows for 2006

Transmission Element	Pre contingency Flows (MVA) % of cont. Rating	Post Contingency Flows			
		B3 % of cont. Rating	B4 % of cont. Rating	B12 % of cont. Rating	B13 % of cont. Rating
B3	128 **57%**	0	175 **78%**	168 **75%**	167 **75%**
B4	128 **57%**	175 **78%**	0	168 **75%**	167 **75%**
B12	115 **58%**	159 **80%**	159 **80%**	0	156 **78%**
B13	116 **58%**	157 **79%**	158 **79%**	154 **77%**	0

The results of this assessment indicate that:

1. With all transmission elements in service the power flows on 115 kV circuits are within the continuous thermal capability of the respective elements.
2. For a contingency involving the loss of one 115 kV circuits between Burlington and Newton, the post contingency power flow over the remaining three circuits will be well under the continuous ratings of these circuits.
3. A contingency involving the double circuit line B3/B4 will result in loss of power supply to about 200 MW of load consisting of Dundas TS, McMaster TS and Mohawk TS. Since there is no alternative HV supply for these stations, it is expected that restoration of load can be achieved in less than eight hours as required by the load supply criteria.

There are no overloading concerns identified in the Burlington to Horning section of the related 115 kV circuits.

As identified in Table 8 the B12 & B13 line-section from Horning to Brant TS is rated lower than the rest of the line. This section of line is effectively supplying the loads at Brant TS and the new Powerline TS. The load flow analysis results for the load flow on B12/B13 of Horning to Brant section for the loss of the companion circuit are shown in Table 10. The results with the load forecast in Table 3 indicated that the thermal capability of Horning to Brant section would be exceeded for the loss of the companion circuit starting in the summer of 2008. It can be concluded that the 115 kV circuits will be adequate to supply the load in the Brantford area for the next two years.

Table 10. Post Contingency Power Flows on B12/B13

Year	2006	2007	2008
Loads at Brant & Powerline (MVA)	122	128	132
Load flow on B12/B13 (MVA)	127	138	**146**
% of continuous rating	91%	98%	**104%**

Hydro One must upgrade the section of the 115 kV line B12 and B13 between Horning Jct. and Brant TS with a conductor matching the rating of the line section from Burlington to Horning. This work may need to be complete before the summer of 2008. If the circuit upgrading is not complete before the load supplied by Brant TS and Powerline TS exceeds 140 MVA then the distributor may be directed by the IESO to operate with the LV bus tie breakers open at Brant TS and Powerline TS.

5.3.3 Voltage Assessment

A study was carried out to evaluate the steady state and post contingency voltages that will likely be experienced in 2006 for peak load conditions in the Burlington area.

The loss of T4 or T9 at Burlington TS was selected as the most critical single element contingency because the clearing of this fault will also be taking out of service the 230 kV shunt capacitor SC21 or SC22 due to the present arrangement of Burlington 230 kV switchyard. In addition, as described previously, the contingencies involving T4 or T12 with A1A2 stuck breaker situation and T6 or T9 due to H1H2 stuck breaker condition should be also considered.

The results of this study including pre and post contingency voltages and voltage declines are summarized in Table 11.

Table 11. Voltage Assessments with Contingencies of Transformers at Burlington TS

Station	Year 2006				
	Pre-contingency (kV)	Contingency (% Station Voltage Decline)			
	Shunt Cap I/S @ Burlington 230 kV	Loss of T4 and Shunt Cap	Loss of T9 and Shunt Cap	Loss of T4 & T12 and Shunt Cap	Loss of T6 & T9 and Shunt Cap
Burlington 230 kV	243.3	238.1 **2.1%**	238.0 **2.2%**	236.4 **2.8%**	236.3 **2.9%**
Burlington 115 kV	122.1	117.9 **3.4%**	117.8 **3.5%**	113.2 **7.3%**	113.1 **7.4%**
Brant 115 kV	118.3	113.5 **4.1%**	113.4 **4.1%**	108.1 **8.6%**	108.0 **8.7%**
Cedar 115 kV	117.5	112.9 **3.9%**	112.8 **4.0%**	107.6 **8.4%**	107.5 **8.5%**

The impact of loss of B12 or B13 on the voltage at Brant TS was also investigated. The results with and without 20 MVar capacitors at the new Powerline TS are shown in Table 12.

Table 12. Voltage Assessments for Brant TS with Contingencies of B12/B13

Capacitors @ Powerline TS (MVA)	Year 2006		
	Pre-contingency (kV)	Contingency (% Station Voltage Decline)	
		Loss of B12	Loss of B13
20	118.3	112.4 **5.0%**	112.4 **5.0%**
0	117.6	108.4 **8.4%**	108.4 **8.4%**

It can be seen that with the recent installation of the additional 230 kV and 115 kV capacitor banks, rated at 300 MVar and 125 MVar respectively in Burlington TS, the voltage profile in this area has been improved. The study results indicate that

1. All the pre-contingency voltages and post-contingency voltage declines meet the Market Rules requirements.
2. For pre-contingency peak load conditions, voltages at Burlington 115 kV bus could be as low as 120.5 kV and, Brant TS and Cedar TS voltages are just a little higher than the minimum voltage required by the Market Rules. The condition of the voltage will gradually become worse as the load in the Burlington area increases.
3. For post-contingency involving the loss of T4 or T9 and connected shunt capacitors, the voltage decline at each 115 kV station in the area meets the requirements of the Market Rules.
4. For post-contingency associated with the loss of T4, T12 and shunt capacitors, or the loss of T6 T9 and shunt capacitors, the voltage decline at each 115 kV station in the area meet the requirements of the Market Rules.
5. The installation of 20 MVar capacitor banks at the new Powerline TS will improve the voltage profile at Brant TS and Powerline TS under a contingency involving B12 or B13.

It is believed that with the improvement plan described in 5.3.1 the voltage in Burlington area in the future will meet the minimum requirement for 113 kV pre-contingency system voltage and 10% post-contingency voltage decline.

– End of Section –

6. Customer Impact Assessment

The customer has advised that there is no generation or large synchronous motors connected to their distribution system. Hydro One Networks Inc., has not conducted a Customer Impact Assessment (CIA) to determine whether or not the new MTS will have an adverse impact on any of the existing connected customers in the area. Upon completion of the CIA by Hydro One, some studies might be repeated if necessary and if necessary, this SIA Report will be amended to include Hydro One's recommendations and findings.

– End of Section –

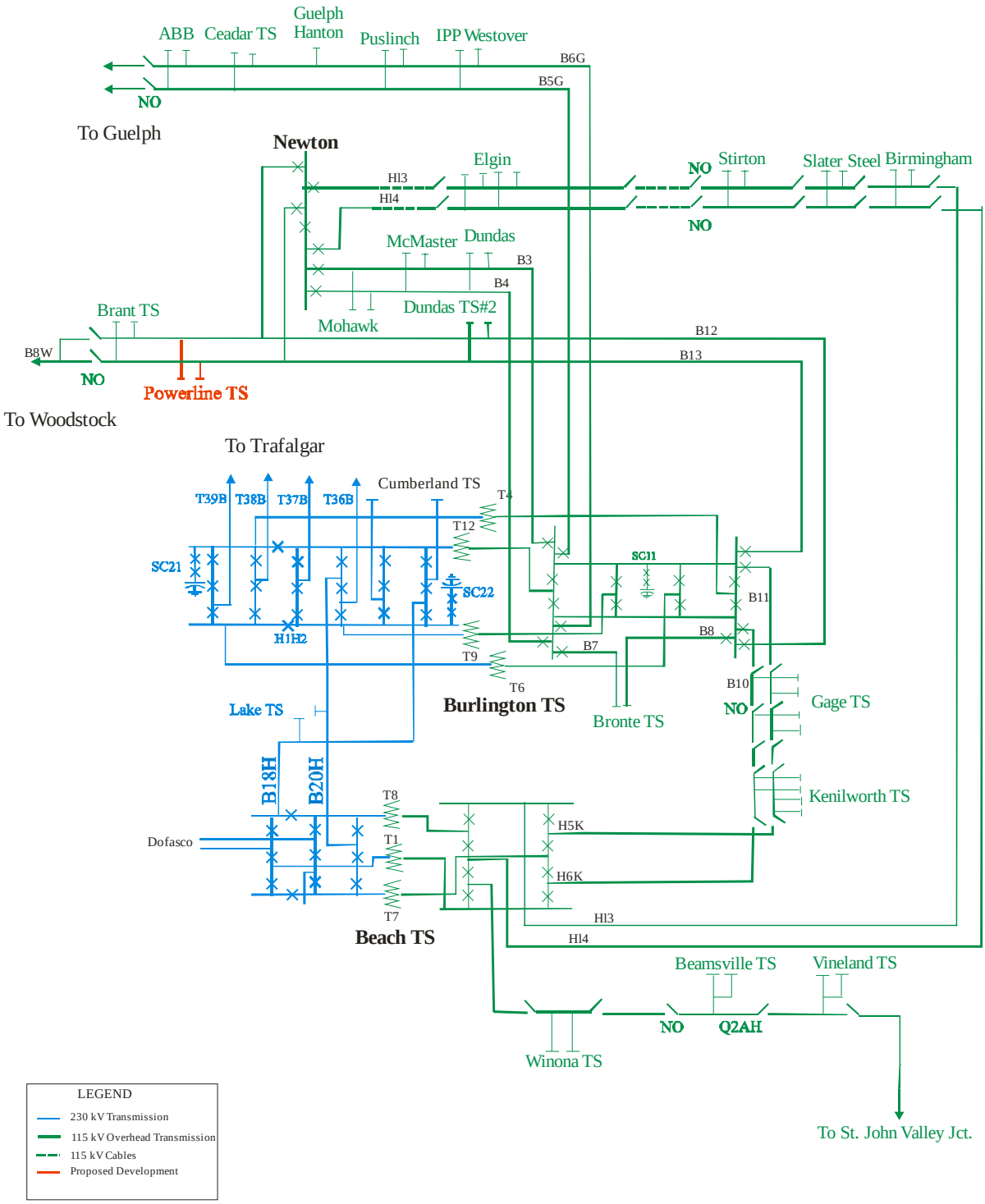

Figure 1. Burlington to Beach Area 115 kV Transmission

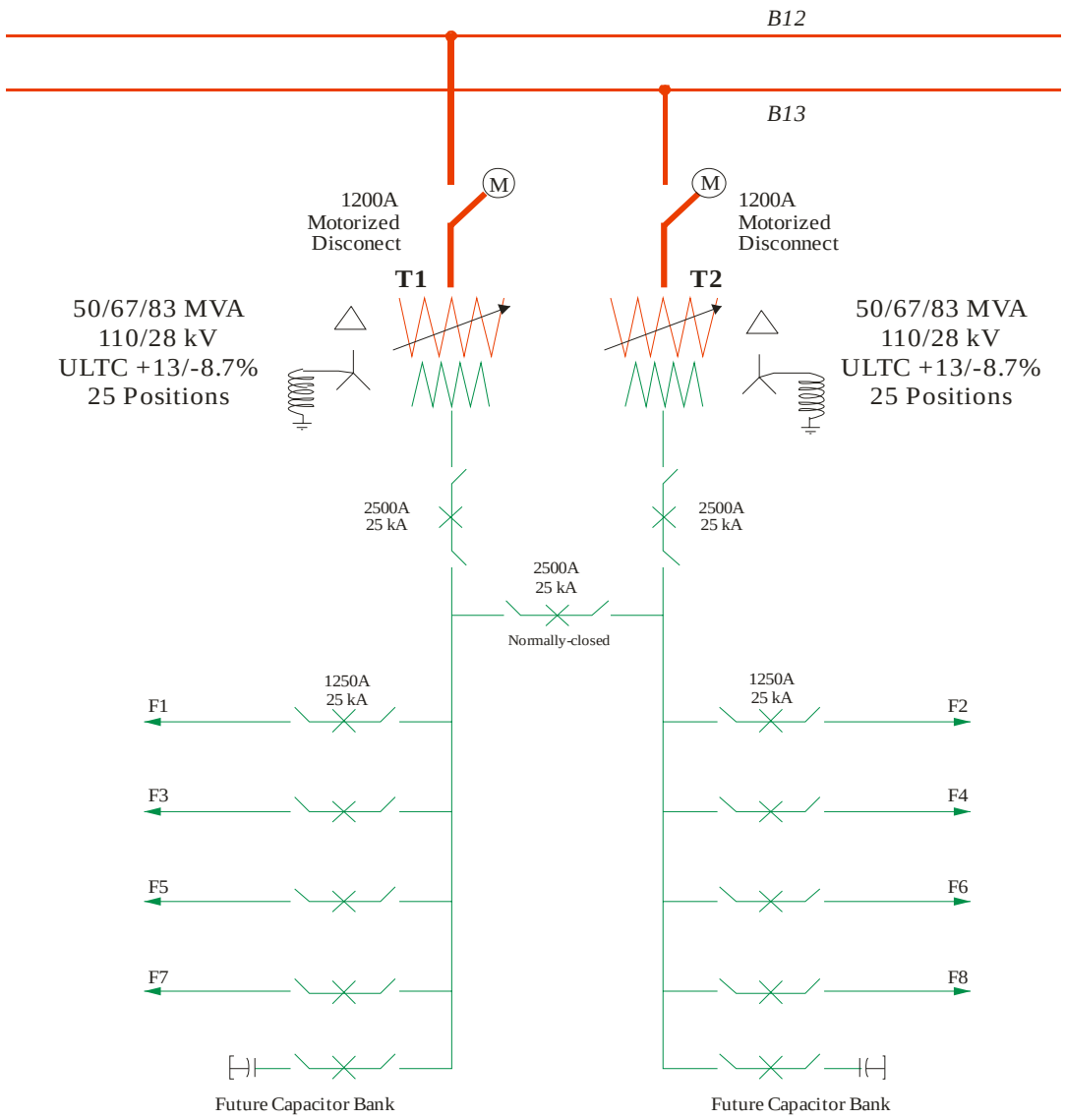

Figure 2. Powerline TS - Proposed Facilities

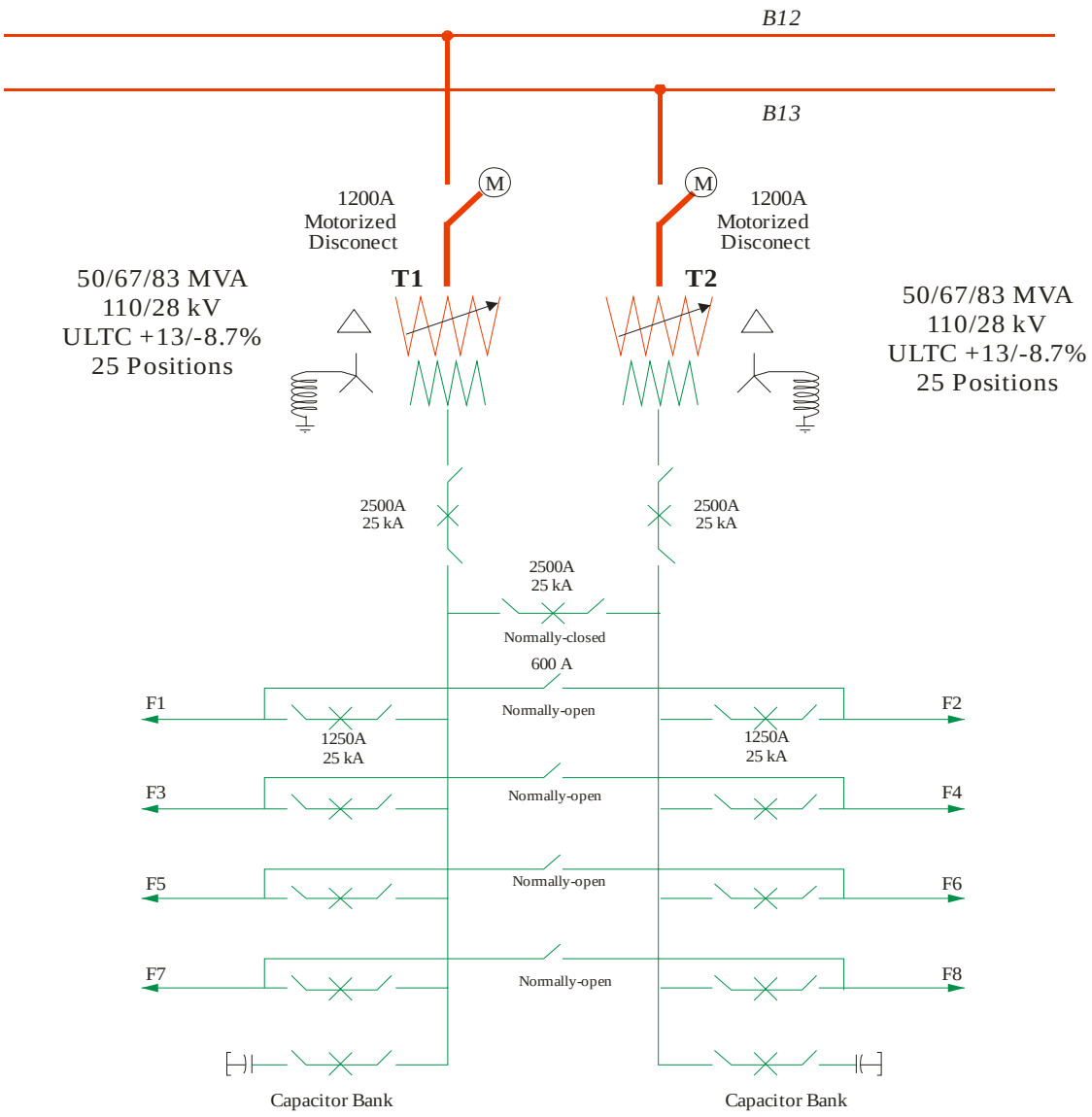

Figure 3. Powerline TS - Recommended Facilities with Normally Open Tie Switches

– End of Document –

INTERROGATORY #5

Interrogatory

References: (1) Exhibit B, Tab 6, Schedule 3, pages 2-3
(2) Exhibit B, Tab 6, Schedule 4

Preamble:

Reference 1, the System Impact Assessment, provides the IESO's requirements for the proposed connection

Reference 2, the Customer Impact Assessment, concludes that "the Woodstock Area Transmission Reinforcement Plan can be incorporated without any adverse impact on W7W/W12W/B8W and M32W/M33W customers provided that facilities conforming to TSC requirements are installed.

Questions:

(i) Please confirm that the IESO's connection requirements for the proposed project will be implemented.

(ii) Please confirm that any requirements identified in the Customer Impact Assessment will be implemented and that the facilities will conform to TSC requirements.

Response

(i) Hydro One confirms that the IESO's connection requirements as specified in Reference 1 will be implemented.

(ii) Hydro One confirms that the requirements identified in the Customer Impact Assessment as specified in Reference 2 will be implemented and that the facilities installed as part of this project will conform to TSC requirements.

INTERROGATORY #6

Interrogatory

Reference: Exhibit B, Tab 6, Schedule 1

Questions:

Please provide an update on the status of the EA process including:

(i) Timing/results of any Public Information Centres held or to be held;

(ii) Timing/results of any other communications with the public/stakeholders;

(iii) Date that the Draft Environmental Assessment Report is expected; and

(iv) Any known issues/concerns with respect to the EA process.

Response

(i) A first Public Information Centre (PIC) was held on December 7, 2006 as described in detail on page 3 of Exhibit B, Tab 6, Schedule 1. A second PIC will be held on May 29, 2007 at the Quality Hotel & Suites in Woodstock. Local municipal officials have been invited to a preview of the PIC on the same day at the same location.

(ii) Details of stakeholder and community consultation are provided in Exhibit B, Tab 6, Schedule 7. Information on other communications with the public/stakeholders since the Application was filed is provided below:

- Meeting with 3 representatives of South-West Oxford Township (Allen Forrester – Clerk Treasurer- Administrator, Jim Hayes – Mayor, and Bill Freeman – Works Superintendent) on April 23 to discuss the proposed ROW with respect to Karn Road
- A number of meetings, on various dates, have been held with the property owners of potential sites for the proposed Karn TS
- Invitation letter to second PIC sent to municipal officials (May 18), government agencies (May 18), local MPP (May 22), Woodstock & District Chamber of Commerce (May 22), and Southside Public School and Thames Valley District School Board Officials (May 22)
- Contacted the owners of the lands that were previously approached with respect to siting the proposed Karn TS to inform them of our preferred site (May 22)

- Newspaper ads: Woodstock Sentinel Review: Tue May 22, Fri May 25, Tue May 29 Oxford Review: Sat May 26 Ingersoll Times: Wed May 23
- Direct mail outs of newspaper ad sent on Tuesday May 22 (property owners within 500 m of existing ROW)

(iii) The Draft Environmental Study Report (ESR) will be ready approximately two weeks following the second Public Information Centre planned for May 29, 2007. The Draft Environmental Study Report will be made available at several local libraries (one in Woodstock; one in Ingersoll, and one in South-West Oxford) and municipal offices (Zorra, Ingersoll, Woodstock , South-West Oxford and the County of Oxford), and will be available for download from the project website. The ESR public review and comment period will be open for 30 days.

(iv) Hydro One is not aware of any challenges to the Class EA process. Details of issues identified as part of the EA process, and the proposed mitigation, are listed in section 3.0 Exhibit B, Tab 6, Schedule 7. Information on other issues identified since the Application was filed is provided below:

- South-West Oxford's Mayor suggested that the centre line of the proposed ROW be relocated further from the edge of Karn Road to reduce the potential for accidents caused by vehicles colliding with transmission towers. Additional details on this issue, including proposed mitigation is provided in the response to part iv of interrogatory # 7.
- There are no willing sellers in the area to accommodate the proposed Karn TS. Hydro One will proceed with expropriation to acquire the land rights of the preferred site for Karn TS, and the affected property owner is aware of this. Hydro One has been working with the property owner, a local developer, and his planner to develop a station layout which would have the least impact on the future development potential of the lands.

INTERROGATORY #7

Interrogatory

References: (1) Exhibit B, Tab 6, Schedule 1
(2) Exhibit B, Tab 6, Schedule 8
(3) Letter from Township of South-West Oxford dated April 24, 2007

Preamble:

The evidence indicates that:

- the majority of land rights required to construct the proposed line facilities have already been acquired in connection with the existing transmission line facilities;
- new land rights are required at select locations along the transmission right-of-way ("ROW") and for the new Karn TS site;
- some temporary access rights are also required to construct the proposed facilities.

Reference (3) expresses a concern by the Township of South-West Oxford regarding the placing of the transmission line on the road allowance along Karn Road for approximately 8 km.

Questions:

(i) Please provide details of the new land rights required along the ROW and for Karn TS including status.

(ii) Please provide details of the temporary access rights required and the status.

(iii) Please provide a list of outstanding approvals and permits needed to complete construction of the proposed facilities.

(iv) Is Hydro One aware of the concern expressed by Township of South-West Oxford regarding the placement of the proposed transmission line within the road allowance of Karn Road? Has this issue been resolved? If not, what is Hydro One's proposal for resolving the issue and what is the status of negotiations.

Response

(i) The new land rights required are described on page 1 of Exhibit B, Tab 6, Schedule 8 and consist of the following:

- Approximately 8 acres of land adjacent to the existing ROW to be acquired in ownership for the Karn TS site
- Approximately 17 feet of additional width on both sides of the ROW will need to be acquired as new permanent easements at 6 locations along the ROW where new larger angle towers will replace the existing angle towers.

(ii) The temporary access rights required are described on page 2 of Exhibit B, Tab 6, Schedule 8 and consist of 17 feet in additional ROW width along the northern edge of the existing right of way between Ingersoll TS and the Karn TS site. The temporary rights will be required for about 18 months starting in mid 2008.

(iii) Section 7.0 of Exhibit B, Tab 6, Schedule 1 lists the Provincial and Federal approvals and permits that Hydro One may have to acquire in order to construct the proposed facilities. The specific approvals and permits required will be identified as part of the design and construction phase of the project, which will commence following the Leave to Construct decision by the Board.

(iv) Hydro One is aware of the concern expressed by the Township of South-West Oxford in its letter to the Board dated April 24th, 2007.

The existing corridor is located partially on the road allowance and partially on private properties on which Hydro One has easement rights. Section 41(1) of the Electricity Act, 1998, S.O. 1998, c. 15, Schedule A states that "a transmitter or distributor may, over, under or on any public street or highway, construct or install such structures, equipment and other facilities as it considers necessary for the purpose of its transmission or distribution system, including poles and lines". The new line will be built on the existing corridor, reducing Hydro One's need to acquire additional land rights and thus minimizing public impact. Furthermore, by building on the existing right of way, Hydro One is consistent with Provincial policy to make use of existing corridors as articulated in the Ministry of Municipal Affairs and Housing, 2005 Provincial Policy Statement.

Hydro One met with the Mayor, Clerk Treasure-Administrator and Works Superintendent for the Township of South-West Oxford on April 23rd, 2007, to hear their concerns, clarify Hydro One's position, and discuss possible mitigation measures. At the meeting, Hydro One clarified that moving the existing transmission centre line would result in the loss of existing easement rights to construct, operate and maintain Hydro One's facilities on the existing right-of-way, and would require Hydro One to acquire new easement rights from landowners. Relocating the line to the North would also severely impact nearby residences and farm buildings, and possibly necessitate the buy-out of entire properties. The issue has not been resolved, but Hydro One is committed to working with municipal officials to address their concerns by taking the following actions:

- Review possible use of sand barriers around some foundations to minimize the impact of car collisions with the hydro structures.
- Review preliminary structure locations with the Works Superintendent prior to the start of construction.
- Review access to Karn TS with the Works Superintendent prior to the start of construction.

INTERROGATORY #8

Interrogatory

(i) Has the Hydro One made inquiries to determine if there are First Nations communities who may be affected by the proposed project?

(ii) If there are First Nations communities who are affected by the proposed project, has Hydro One consulted with them? If so, have those communities identified any specific issues and concerns in respect of the project? How have those issues or concerns been mitigated or accommodated?

(iii) Has Hydro One determined if any First Nations communities have any filed or outstanding claims or litigation concerning their treaty rights or treaty land entitlement or aboriginal title or rights, which may potentially be affected by the project? If so, what is the status of those claims or litigation?

(iv) If Hydro One has not made inquiries to determine if there are First Nation communities who may be affected by the proposed project, please advise if Hydro one intends to do so.

(v) Provide details of any known Crown involvement in consultations with Aboriginal groups in respect of the applied-for project.

Response

(i) Yes, Hydro One has identified six First Nations communities who may be affected by the proposed project. They are Chippewas of the Thames First Nation, Walpole Island First Nation, Munsee-Delaware Nation, Oneida Nation of the Thames, Mississaugas of the New Credit, and Six Nations of the Grand River.

(ii) The six First Nations identified in part i) were contacted by telephone on or about April 3 and an information package about the Woodstock project similar to the one provided to the municipalities for review was sent to the following parties:

Chief Joseph Gilbert
Walpole Island First Nation

Chief Kelly Riley
Chippewas of the Thames First Nation

Chief D.M. General
Chief A. MacNaughton
Six Nations of the Grand River

Chief Randall Phillips
Oneida Nation of the Thames

Chief Patrick Waddilove
Munsee-Delaware Nation

Chief Bryan LaForme
Mississaugas of the New Credit

The First Nations listed above were invited to contact Hydro One for any additional information required or to discuss any concerns. To date, Hydro One has only been contacted by the Six Nations of the Grand River who did not identify any specific issues or concerns with the proposed project.

(iii) The agencies noted in the response to part v provided the following information on land claims and litigation involving First Nations: Six Nations/Haudenosaunee (the Confederacy) for lands surrounding the Grand River (Haldimand Tract area); Walpole Island has asserted hunting and fishing rights over federally and provincially held lands in large parts of south-western Ontario. Mississaugas of the New Credit have a large claim in an area that includes Toronto and the southwestern part of Ontario.

(iv) Not Applicable.

(v) The First Nations groups deemed to have a potential interest in the project were identified through research and consultation with representatives from the Ontario Secretariat Aboriginal Affairs (OSAA), and Indian and Northern Affairs Canada (INAC).