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Susan Frank
Vice President and Chief Regulatory Officer
Regulatory Affairs

BY COURIER

March 25, 2008

Mr. Quinn Ross
The Ross Firm
Barristers & Solicitors
138 Courthouse Square
Goderich ON N7A 1M9

Dear Mr. Ross:

EB-2007-0050 – Hydro One Networks' Section 92 Bruce - Milton Transmission Reinforcement Application – Hydro One Networks' Response to Interrogatory Questions from The Ross Firm To Hydro One, the OPA and the IESO

I am attaching a paper copy of the responses to the interrogatory questions in your lists to Hydro One, Ontario Power Authority and the Independent Electricity System Operator.

All Intervenors and the Ontario Energy Board will also be sent electronic text searchable Acrobat files by email for the following Interrogatory Responses:

OEB Staff List 2
Updated response to OEB Staff Interrogatory C-1-2.6
Pollution Probe List 4 and List 5
Energy Probe List 2, 3 and List 4
Ross Interrogatories to Hydro One List 1
Ross Interrogatories to the Ontario Power Authority List 1
Ross Interrogatories to the Independent Electricity System Operator List 1
Powerline Connection List 1

One complete paper copy of all the EB-2007-0050 Interrogatory Responses organized in binder sets will be sent to your attention shortly. Electronic text-searchable copy of interrogatory responses will also continue to be available for download from the Hydro One Networks regulatory website.

Sincerely,

ORIGINAL SIGNED BY ODED HUBERT

Oded Hubert

c. Ms. Kirsten Walli, Ontario Energy Board

Ross - INTERROGATORY #1 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendices 1, 2, 5, (and October 15 Technical Conference)
Issue Number: 1 Project Need and Justification
1.1. Issue: Has the need for the proposed project been established?
Request:

1. The 1985 Ontario Hydro Transmission System was designed to be sufficiently scalable for eight units at the Bruce Generation Complex.

   i. Please provide the reports and data prepared, referred to or relied upon to support the position that the Transmission System was sufficiently scalable to support eight units at the Bruce.

   ii. Please provide reports prepared, referred to, or relied upon for the current project which substantiates the need for increased transmission capacity from the Bruce.

2. Please provide all transmission records from 1985 to present. It is of note that Federal Regulations require keeping generation records for seventy-five (75) years after a unit is decommissioned. Based on this fact, clearly the information is available to Hydro One forthwith.

Response

1.

   i) Hydro One has declined to respond to this Interrogatory. Please refer to correspondence on behalf of Hydro One dated March 13, 2008.

   ii) The information that has been relied upon is that which has been filed in this proceeding. For example, please refer to the updated evidence, Exhibit B Tab 6 Schedule 5 Appendix 1 for the OPA's Analysis of Need for Proposed Facilities.

2. Please refer to Hydro One's correspondence dated March 13, 2008 in regard to this request.

Ross- INTERROGATORY #2 List 1

Interrogatory

Ref. October 15 Technical Conference, PowerPoint Presentation, Page 16, Slide 1
Issue Number: 2 Project Alternatives

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

Preamble:
The Bruce to Kleinburg to Claireville and Bruce to Crief options were determined to be not feasible for the sole reason that they were inconsistent with Provincial Land Use Policy.

Request

1. Please provide copies of all legal opinions obtained with regard to the interpretation and implementation of the above-mentioned Provincial Land Use Policy.

2. Please provide all internal memos, letters, and/or reports discussing the interpretation of the Provincial Land Use Policy.

Response

1. Hydro One has declined to respond to this Interrogatory. Please refer to the correspondence on behalf of Hydro One dated March 13, 2008.

2. Hydro One has declined to respond to this Interrogatory. Please refer to the correspondence on behalf of Hydro One dated March 13, 2008.

Ross- INTERROGATORY #3 List 1

Interrogatory

Ref. October 15, 2007 Technical Conference, PowerPoint Presentation, Page 14, Slide 2

Issue Number: 2 Project Alternatives 2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

Preamble:
This slide deals with screening and evaluation criteria. The first point deals with the concept of Government Policy.

Request:
Kindly provide a list of all government policies, regulations, and statutes that were considered under this heading. Kindly make specific references to the sections, paragraph, page or concept within the policy that was being employed in the screening and evaluation criteria.

Response

The Ontario Government policies considered under this heading are the same as those outlined in the Application. Please refer to Exhibit B Tab 6 Schedule 5 Appendix 1 for the OPA's Analysis of Need for Proposed Facilities, where the Ontario Government directives and policies are discussed. Please also refer to the response to Board Staff Interrogatory 1.2.

Ross- INTERROGATORY #4 List 1

Interrogatory

Ref. Exh. B / T6 / S5 / Appendix 5 / Page 3

Issue Number: 2 Project Alternatives

Issue 2.2:
Has an appropriate evaluation methodology been applied to all the alternatives considered?

Request
Please provide the Assessment undertaken by the OPA, HONI, and IESO assessing the technical impacts of the Bruce to Milton Options.

Response

Information respecting the assessment of the technical impacts of the Bruce to Milton Option have been filed in this proceeding. For example, the IESO's System Impact Assessment Report (Exhibit B Tab 6 Schedule 2) assesses the technical impacts of the Bruce to Milton option. For a discussion of the evaluation methodology and screening criteria including technical impacts used to consider the reasonable alternatives identified to address the incremental transfer capability requirement from the Bruce Area, please refer to the Day 1 Technical Conference Presentation (Exhibit KT.1 slides 26-31, transcript pages 23-29). Please also refer to response to Board Staff Interrogatory 2.4.

Ross- INTERROGATORY #5 List 1

Interrogatory

Ref. Exh. B / T6 / S5 / Appendix 5 / Page 48

Issue Number: 2 Project Alternatives

2.1 Have all reasonable alternatives to the project been identified and considered?

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

2.3 For all of the considered alternatives, does the evaluation methodology utilized include a cost benefit comparison as well as a comparison of all quantitative and qualitative benefits?

2.4
a) Have appropriate evaluation criteria and criteria weightings been utilized in the evaluation process for the alternatives and the proposed project and what additional criteria/weightings could be considered?

b) Have appropriate comparisons been carried out on all reasonable alternatives with respect to reliability and quality of electricity service, including stability and transient stability levels, voltage performance and Loss of Load Expectation projections under normal and post-contingency conditions?

Preamble:
"The London reinforcement alternative requires adding major reactive power support devices (series capacitors) as a part of the system reinforcement, just to have sufficient transfer capability for the eight Bruce units and 725 MW of wind generation."

Request
1. What are the costs associated with the indirect path through London utilizing Series Capacitors?

2. Please provide all studies, reports, and opinions prepared, referred to, or relied upon in coming to the above-quoted conclusion.

Response

1.& 2. Please refer to the response to OEB Staff 2.6 (iii).

Ross- INTERROGATORY #6 List 1

Interrogatory

Ref. Exh. B / T6 / S5 / Appendix 5 / Page 51

Issue Number: 1 Project Need and Justification

Issue:

1.3 Have all appropriate project risk factors pertaining to the need and justification (including but not limited to forecasting, technical and financial risks) been taken into consideration in planning this project?

1.4 Is the project suitably chosen and sufficiently scalable so as to meet all reasonably foreseeable future needs of significantly increased or significantly reduced generation in the Bruce area?

Preamble:

"There are a number of considerations that must be well understood as the use of this technology [series compensation] is explored for the Bruce system. As it is being considered for a critical part of the Ontario system, due diligence on the technology and its performance will be conducted, including eliminating potential adverse system effects and potential risks to reliability. As well, major modifications are required to the existing relaying and protection systems in SWO to accommodate the series compensating facilities.

Request:

Please provide all material collected and prepared with regards to the series compensation due diligence on technology and performance and the elimination of potential adverse system effects and potential risks to reliability.

Response

Please refer to the responses to Board Staff Interrogatory 3.2 and Pappas Interrogatory 6.

Ross- INTERROGATORY #7 List 1

Interrogatory

Ref. Exh. B / T6 / S5 / Appendix 5 / Page 52

Issue Number: 1 Project Need and Justification
Issue: 1.4
Is the project suitably chosen and sufficiently scalable so as to meet all reasonably foreseeable future needs of significantly increased or significantly reduced generation in the Bruce area?

Issue Number: 2 Project Alternatives
Issue: 2.1
Have all reasonable alternatives to the project been identified and considered?

Issue Number 3.0 Near Term and Interim Measures
Issue:
3.1 Are the proposed near term and interim measures as outlined in the application appropriate?

3.2 Can the proposed near term and interim measures be utilized longer than the suggested two to three year time frame?

3.3 If these proposed near term and interim measures could be utilized for a longer period than proposed, could they (or some combination of similar measures) be considered an alternative

Preamble:

"The IESO studies indicate that combination of GR and series compensation will provide sufficient capacity for transmitting the committed resources in the Bruce area to the Ontario grid should the new line be delayed. However, there would not be additional transmission capability for adding further resources in the Bruce area until the new Bruce transmission line is in place."

Request:

1. Please provide a list of all potential "further resources" assuming that some of the "further resources" are from wind generation.

2. Kindly provide an explanation as to how the current electricity from wind generation gets on the grid.

3. Kindly provide a list and explanation of all methods for getting wind generated electricity onto the grid.

Response

1. Reference to "further resources" found at Exhibit B Tab 6 Schedule 5 Appendix 5 Page 52 concerns the 1,000 MW of potential wind generation that is forecast to be developed starting in 2013 and continuing until 2015. This topic was discussed at the Technical Conference (see: Day 1 Technical Conference Presentation Exhibit KT.1 slides 16 and 17). Please also refer to the response to Board Staff Interrogatory 2.1.1 for a list of the sites that comprise the planned future wind generation in the Bruce Area.

2. Please refer to the response to Energy Probe Interrogatory 7(a).

3. Please refer to the response to Energy Probe Interrogatory 7(a) for a description of how electricity from transmission connected wind farms access the Ontario power grid.

   For windfarms connected to the distribution system, a windfarm proponent makes an application to connect to distribution facilities. The distributor conducts an assessment to ensure that the proponent can be accommodated without an adverse impact to either the distributors' facilities or to other customers supplied by the distributor.

   If it is found that the proponent can be accommodated, the windfarm is simply connected to an existing distribution line where it will supply the electricity to the other customers of that line.

   If the amount of power generated by the generator(s) exceeds the load on that line, it will supply the needs of other customers connected to the same distributions station (DS) or transformer station (TS).

   If the amount of electricity generated by all generators connected to the distributions station fed from a particular TS exceed the needs of all load customers fed from the same TS, power will be backfed from the TS on the power grid via the same transmission line the supply that TS.

   If the amount of power that can be backfed on to the grid exceeds 10MW, the IESO also conducts an assessment to ensure that there is no adverse impact to the reliability of the grid resulting from the backfed generation.

Ross- INTERROGATORY #8 List 1

Interrogatory

Ref. Exh. B / T6 / S2 / Page 4

Issue Number: 1.0 Project Need and Justification
Issue:
1.3 Have all appropriate project risk factors pertaining to the need and justification (including but not limited to forecasting, technical and financial risks) been taken into consideration in planning this project?

1.4 Is the project suitably chosen and sufficiently scalable so as to meet all reasonably foreseeable future needs of significantly increased or significantly reduced generation in the Bruce area?

Request
If not already disclosed, please disclose all documents and information provided to the IESO for the system impact assessment of the new proposed transmission facility.

Response

The application that was received from Hydro One for a Connection Assessment, together with the Specification for the new transmission line, are attached as attachments 1 and 2 respectively.

Attachment 1

IESO Connection Assessment

System Impact Assessment Application

Transmission Facilities

Submit this form by mail, courier, or fax[1] to the following address:

Independent Electricity System Operator
655 Bay Street, Suite 410
P.O. Box 1
Toronto, ON M5G 2K4

Attn: Connection Assessments – LTF&A

Fax number: (905) 855-6129

www.connection.assessments@ieso.ca

Subject: ***System Impact Assessment Application – Transmission Facilities***

All information submitted in this process will be used by the *IESO* solely in support of its obligations under the *Electricity Act, 1998*, the *Ontario Energy Board Act, 1998*, the *Market Rules* and associated policies, standards and procedures and its licence. All information submitted will be assigned the appropriate confidentiality level upon receipt.

Since complete data may not yet be available for this Project, the accompanying data sheets have been modified to identify those data that are essential for the IESO to be able to undertake the Assessment. The data sheets also identify those data for which the IESO will use appropriate values should the Applicant not provide suitable data.

Whenever it is necessary for the IESO to use typical (generally conservative) values for the Assessment of the Connection Application, then it will be the responsibility of the Applicant to ensure that the equipment that is eventually installed meets or exceeds these values.

PART 1 – GENERAL INFORMATION

Organization Name: Hydro One Networks Inc	
Organization Short Name: (Maximum 12 keystrokes) _Hydro One	
Project Name: Transmission Out of Bruce	
Location of Project: Southwestern Ontario	
Mailing Information: Hydro One Networks, c/o Naren Pattani	
Address: 483 Bay Street, 15th Floor North Tower	
City/Town: Toronto	
Province/State: ON	
Postal/Zip Code: M5G 2P5	Country:
Fax No.:	

[1] A faxed application will only be accepted when the deposit is submitted by electronic wire payment or electronic direct deposit to the *IESO* account.

Email Address: Naren.Pattani@hydroone.com

PART 2 – MAIN CONTACT

Main Contact	
Name: John Sabiston	
Position/Title: Transmission Plans Manager - West	
Telephone No.: (416)345-5390	Fax No.:
E-mail Address: john.sabiston@hydroone.com	

PART 3 – PAYMENT OF $40,000 DEPOSIT

Method of Payment (choose one)

☐ Certified cheque payable to the IESO	☐ Attached
☐ Deposit to IESO Account	☐ Receipt Attached
☐ Electronic Wire Payment to IESO Account	☐ Receipt Attached

For direct deposit or electronic wire payments, reference the following IESO account:

TD Bank, Institution ID # 0004, Transit # 10202, Account # 0690-0429444

PART 4 – CERTIFICATION

The undersigned hereby declares that the information contained in and submitted in support of this document is, to the best of the connection applicant's knowledge, complete and accurate. By signature the connection applicant agrees that information may be provided to the affected transmitter(s) and posted on the *IESO* Web site as stipulated in the applicable Market Manual pertaining to connection assessment and approval.

Naren Pattani	Manager-Transmission System Development
Name (Please Print)	Title
Signature	Date

PART 5 – FOR IESO USE ONLY

Received by:_____	Date Received:_____
Payment Received with Application (Y/N):	CAA ID Number:_____

Generic Information

Bold-Italic	Essential
	Typical values will be assumed if data not provided
	Only required upon request

In-Service Dates	***Initial in-service date (start of commissioning):***	Dec 31, 2011
	Permanent in-service date:	
Protection System Description	***A functional description of all protective schemes shall be provided to allow a detailed analysis of all credible contingencies.*** ***These descriptions shall include, but are not limited to, the following:*** • ***Operating times for protection components (e.g. primary relaying, auxiliary relaying, communication),*** • ***General models for normal and delayed (breaker failure) fault clearing, and*** • ***Exceptions to the general model (e.g. LEO, HIROP).*** ***For all recognized contingencies, the functional description must enable fault clearing times at all terminals to be determined for both normal and delayed clearing.***	Attach File
Detailed Single-Line Diagram(s)	***A detailed single-line diagram showing the equipment and the protection and telemetry points. The locations of the proposed connections on to existing lines, or into existing transformer/ switching stations, are also to be included.*** ***Details are to be included of any existing facilities that are to be replaced or removed from service. Out-of-service dates are to be provided whenever these do not coincide with the in-service dates for the new facilities.***	Attach File
Control Schemes	***Describe any control schemes that are to be used to automatically change the tap positions for any of the transformers, or to switch into-service or out-of-service any capacitors or reactors.*** ***If the Project is to include a generation rejection or load rejection scheme, these should also be described.***	Attach File

See Attached Planning Specification "Bruce Transmission Expansion, Plan SP 13090 – Revision 2" Dated October 10, 2006. Please only consider the Bruce x Milton overhead line alternative.

Transmission Facilities

Bold-Italic	Essential
	Typical values will be assumed if data not provided
	Only required upon request

Overhead Circuits (For each section)	***Identifier***	B-A x M, B-B x M		
	Terminal station(s)	Bruce A TS	Bruce B SS	Milton TS
	Voltage (kV)	500		
	Length (km)	Approximately 176 km		
	Identifier(s) and length of circuit(s) on common towers	B-A x M, B-B x M	Approx. 173 km	
	Positive sequence impedance (R, X, B)	0.001954 pu	0.022176 pu	2.30736 pu
	Zero sequence impedance (Ro, Xo, Bo)	0.018585 pu	0.071738 pu	0.95560 pu
	Winter (10ºC) continuous and 15 minute thermal ratings (A)	3400	4000	
	Summer (30ºC) continuous and 15 minute thermal ratings (A)	2900	3700	
Overhead Circuits (For each segment)	***Identifier***	B-A x M, B-B x M		
	Length (km)	176 km		
	Distance from the "from" terminal (km)			
	Maximum operating temperature (ºC)	127		
	Phase conductor size (kcmil)	585		
	Phase conductor type (ASC,ACSR)*	ASCR		
	Phase conductor stranding (# of Al strands/ # of Steel strands)	26	7	
	Phase conductors per bundle and spacing (m)	4		
	Geometry of all phase and sky wires for each tower type			
	Ground resistivity (ohms)			
	Skywire size (kcmil)			
	Skywire type (Alumoweld, EHS, HS)*			
	Skywire stranding (# of Al strands/ # of Steel strands)			
	Skywire number if more than one			
	Identifier and length of circuits sharing the same right of way	Ccts share common tower for 173 of the 176 km		
	Mutual impedance to other circuits (Z_{zero})			
Underground Circuits	***Identifier***			
	Complete steady state and dynamic electrical and physical parameters of conductors, insulators and surrounding material			
Buses	Identifier			
	Station			
	Maximum operating temperature (ºC)			
	Conductor size (kcmil)			
	Conductor type (ASC,ASCR,Al tube)*			
Surge Arresters	Identifier			
	Station			
	Manufacturer			
	Serial number			
	Voltage rating (kV)			
	Type (e.g. ZnO, SiC)			
	Class (e.g. secondary, distribution, intermediate, station)			

Attachment 2

Hydro One's Specification for the new transmission line

483 Bay Street, Toronto, M5G 2P5

MEMORANDUM

10 October 2006
Files: NK29, NK21, NA18,
NK40, New Station, NAR45,
NKW25, NKW52

Mr. G. Hoglund

SP13090

Manager – Power System Projects
Torbram, Brampton

Bruce Transmission Expansion

Plan SP13090 – Revision 2

Request for Release Estimates

Revision 2: Revision 2, which supersedes Revision 1 issued on April 24, 2006, has been modified to include four alternate destination stations, other than Essa TS, for a new double circuit line emanating from the Bruce complex. These are Milton SS, Crieff TS, Kleinburg TS and Longwood TS. For the Longwood TS option, a single circuit line would also be constructed between Longwood TS and Middleport TS. The specifications also include an underground 3000 MW HVDC bipole option for the Milton alternative.

A. INTRODUCTION

1.0 Background

Since January 2005, Hydro One Networks has been working with stakeholders to explore options to increase the transmission capacity of its network throughout South-western Ontario with the goal of enabling the shutdown of coal-fired generating stations at Nanticoke GS and Lambton GS.

Since October 2005, Hydro One has agreed to provide sufficient transmission capacity to reliably transmit eight Bruce nuclear units plus at least 1000 MW of wind generation in the Bruce area. This transmission capacity is needed by the end of 2011. Six options for the new line are being explored in order to find the most robust solution. The required in-service date for the new circuits is **December 2011**.

2.0 Purpose

The purpose of this memorandum is to provide detailed planning specifications for a double circuit 500 kV line from the Bruce Complex (Bruce B SS and Bruce A TS) to one of five destination stations: Essa TS, Milton SS, Crieff TS, Kleinburg TS, Longwood TS. For the Longwood TS option, a single circuit 500 kV line from Longwood to Middleport would also be build. A 3000 MW underground HVDC bipole option is also included in the Milton option. Study estimates are requested for each of the six options. At this time, Bruce x Essa and Bruce x Milton are considered to be the more probable routes. Hence, priority should be given to Essa TS and Milton SS options.

B. PLANNING SPECIFICATIONS

Work to be performed (Release Estimates Required).

1.0 Line Work

1.1 LINE WORK (BRUCE X MILTON)

Build a 176 km double circuit 500 kV line from the Bruce complex to Milton SS adjacent to the 500 kV ROW of B560V/561M from Bruce A TS and Bruce B SS to Milton SS.

Figure 2shows the overall general route for the new double circuit 500 kV line.

1.1.1 EA AND APPROVAL WORK

Carry out the necessary work for obtaining Environmental Assessment (EA) and other related approvals for building the new line given above.

1.1.2 LINE SPECIFICATION

The ratings of the new lines are specified in Appendix A2 of this document.

1.1.3 LINE GROUNDING SWITCHES

Appendix C specifies the type and rating of line ground switches.

1.1.4 LAND REQUIREMENTS FOR THE TRANSMISSION CIRCUITS

Acquire land rights for the new 500 kV double circuit line.

It is proposed to widen the existing B560V/561M ROW to incorporate the new line. The widening of the ROW must be sensitive to existing developments and environmentally sensitive areas adjacent to them. Deviation from existing ROW's to accommodate sensitive areas is allowed.

2.0 Station Work

2.1 BRUCE A TS

a) 500 kV Facilities

For the Bruce B x Milton SS HVDC cable option, no facilities will be located at Bruce A TS.

- **500 kV Bus Work and Diameters**

The proposed switching arrangement for Bruce A TS is shown in Figure 6. The main buses are to have a continuous summer rating of 8000A. The diameters, including jitney buses and line entrances should have a continuous summer rating of at least 4000A.

The symmetrical fault current capability of all bus work and diameters should be 80 kA for three phase and phase to ground faults.

All 500 kV facilities to be added and modified should be capable of operating at a continuous operating voltage of 550 kV.

- **500 kV -Transmission Line Terminations**

The new 500 kV circuit will terminate at Bruce A TS as shown in Figure 6. It will terminate onto an existing Bruce A TS diameter at the middle position, as per the Bruce A TS ultimate drawing.

- **500 kV Circuit Breakers**

Provide one (1) – 500 kV breaker. The 500 kV circuit breaker is to have a continuous current rating of at least 4000A and a three-phase current interrupting capability of at least 80 kA. Breaker positions are as shown in Figure 6. Planning specifications for the 500 kV circuit breakers are given in Appendix B1.

- **500 kV Disconnect Switches**

Provide one 500 kV 3-phase *line* disconnect switch that has a continuous summer rating of at least 4000A**.** All line switches are to be motorized and capable of being remotely controlled.

Provide two (2) 500 kV 3-phase *breaker* disconnect switches that have a continuous summer rating of at least 4000A. All breaker switches are to be motorized and capable of being remotely controlled.

- **500 kV Ground Switches**

Install 500 kV ground switches with an interrupter on the new 500 kV circuit. Specifications for the interrupter type ground switches are given in Appendix C.

b) 500-230 kV Autotransformers

There will be NO new autotransformers at this time at Bruce A TS and there is NO need to re-locate the existing ones.

c) Protective Relaying & Control Equipment

Bruce A TS is a NPCC impactive station; hence expand the digital fault recorders to incorporate the new lines. As well, physical separation of transmission protection systems is required at Bruce A TS, refer to specification: **PD-20-035 R0**.

Provide necessary 500kV protective relaying equipment to incorporate the new Bruce A TS x Essa TS/Milton SS/Crieff TS/Kleinburg TS circuit. Also provide necessary protective relaying equipment for the new 500 kV breaker, including breaker failure protection, and any new 500 kV bus/jitney sections at Bruce A TS.

d) Metering

Metering quantities should be extracted from protection IED's for operating and statistical metering for the new line terminations. Metering is to be provided in accordance with the requirements of the Network Operating Division and the IESO. Please consult with Network Operating.

e) Telecom Facilities

Modify telecom facilities at Bruce A TS to incorporate the new circuit. Evaluate all viable telecommunication alternatives. Alternatives include leased analogue channels, microwave or wireless solutions that meet Hydro One's requirements, modification and/or use of existing fiber/sonet/microwave infrastructure, acquisition of low cost fiber from Telcos, or hydro owned Optical Groundwire (OPGW).

Note that the new 2 x 500 kV lines will be NPCC impactive.

f) Supervisory Control

Modify SCADA facilities as required to incorporate the new lines as per Ontario Grid Control Centre and SCADA standards. Provide supervisory control facilities from OGCC and the IESO CSCC for all new 500 kV breakers and disconnect switches. Please consult with Network Operating.

g) Real-Time Data Network Facilities

Real-time data network facilities are to be modified to incorporate the new circuits. Real-time data network facilities to transmit the information below to the OGCC in Barrie and the *IESO, (Independent Electricity System Operator, formally the IMO)* at the Clarkson SCC.

- 500 kV Line Flows (MW and MVar)
- 3-Phase, phase-to-phase voltages of 500 kV line
- Status of all 500 kV breakers
- Status of all 500 kV breaker disconnect switches
- Status of all 500 kV line disconnect switches
- Status of all 500 kV line ground switches

The IESO will modify the Real-time data network facilities at CSCC to incorporate the new 500 kV circuit at Bruce A TS. Please review the above quantities and co-ordinate with Network Operating and the IESO to confirm Real-time data requirements.

h) Station Buildings

Maintenance Building: If possible, utilize the existing building.

Control Building: If possible, utilize the existing building.

i) Site/Mechanical

Modify station Grading and Drainage if required.

j) AC Station Service

Upgrade AC station service as required.

k) DC Station Service

Upgrade DC station service as required.

l) Land Requirements for Bruce A TS

There should be no additional land requirement for the work required inside Bruce A TS. The new proposed switching arrangement shown in Figure 6 is as per the ultimate drawing for Bruce A TS 500 kV yard.

2.2 BRUCE B SS

a) 500 kV Facilities

- **500 kV Bus Work and Diameters**

The proposed switching arrangement for Bruce B SS is shown in Figure 7. The main buses are to have a continuous summer rating of at least 8000A. The diameters, including jitney buses and line entrances should have a continuous summer rating of at least 4000A.

The symmetrical fault current capability of all bus work and diameters should be at least 80 kA for three phase and phase to ground faults.

All 500 kV facilities to be added and modified should be capable of operating at a continuous operating voltage of 550 kV.

- **500 kV -Transmission Line Terminations**

The new 500 kV circuit from Bruce B SS to Essa TS/Milton SS/Crieff TS/Kleinburg TS or the HVDC bipole cable from Milton SS will terminate at Bruce B SS as shown in Figure 7.

- **500 kV Circuit Breakers**

Provide two (2) –500 kV breakers. The 500 kV circuit breakers are to have a continuous current rating of at least 4000A and a three-phase current interrupting capability of 80 kA. Breaker position is as shown in Figure 7. Planning specifications for the 500 kV circuit breakers are given in Appendix B2.

- **500 kV Disconnect Switches**

Provide one 500 kV 3-phase *line* disconnect switch that has a continuous summer rating of at least 4000A. All line switches are to be motorized and capable of being remotely controlled.

Provide four (4) 500 kV 3-phase *breaker* disconnect switches that have a summer rating of at least 4000A.

- **500 kV Ground Switches**

Install 500 kV ground switch with an interrupter on the new 500 kV circuit emanating from Bruce B SS. Specifications for the interrupter type ground switches are given in Appendix C.

b) 500-230 kV Autotransformers

There are NO autotransformers at Bruce B SS.

c) Protective Relaying & Control Equipment

Bruce B SS is a NPCC impactive station; hence expand the digital fault recorders to incorporate the new lines. As well, physical separation of transmission protection systems is required at Bruce B SS, refer to specification: **PD-20-035 R0**.

Provide necessary 500kV protective relaying equipment to incorporate the new circuit emanating from Bruce B SS. Also provide necessary protective relaying equipment for the new 500 kV breakers, including breaker failure, and any new 500 kV bus/jitney sections at Bruce B SS.

d) Metering

Metering quantities should be extracted from protection IED's for operating and statistical metering for the new line terminations. Metering is to be provided in accordance with the requirements of the Network Operating Division and the IESO. Please consult with Network Operating.

e) Telecom Facilities

Modify telecom facilities at Bruce B SS to incorporate the new circuits. Evaluate all viable telecommunication alternatives. Alternatives include leased analogue channels, microwave or wireless solutions that meet Hydro One's requirements, modification and/or use of existing fiber/sonet/microwave

infrastructure, acquisition of low cost fiber from Telcos, or hydro owned Optical Groundwire (OPGW). Note that the new 2 x 500 kV lines will be NPCC impactive.

f) Supervisory Control

Modify SCADA facilities as required to incorporate the new lines and autotransformer as per Ontario Grid Control Centre and SCADA standards. Provide supervisory control facilities from OGCC and the IESO CSCC for all new 500 kV breakers and disconnect switches. Please consult with Network Operating.

g) Real-Time Data Network Facilities

Real-time data network facilities are to be modified to incorporate the new circuits. Real-time data network facilities to transmit the information below to the OGCC in Barrie and the *IESO, (Independent Electricity System Operator, formally the IMO)* at the Clarkson SCC.

- 500 kV Line Flows (MW and MVar)
- 3-Phase, phase-to-phase voltages of 500 kV line
- Status of all 500 kV breakers
- Status of all 500 kV breaker disconnect switches
- Status of all 500 kV line disconnect switches
- Status of all 500 kV ground switches

The IESO will modify the Real-time data network facilities at CSCC to incorporate the new 500 kV circuit from Bruce B SS. Please review the above quantities and co-ordinate with Network Operating and the IESO to confirm Real-time data requirements.

h) Station Buildings

Maintenance Building: If possible, utilize the existing building.

Control Building: If possible, utilize the existing building.

i) Site/Mechanical

Modify station Grading and Drainage if required.

j) AC Station Service

Upgrade AC station service as required.

k) DC Station Service

Upgrade DC station service as required.

l) Land Requirements for Bruce B SS

There should be no additional land requirements for the work at Bruce B SS unless the HVDC option is used.

2.4 MILTON SS FOR BRUCE X MILTON LINE

a) 500 kV Facilities

- **500 kV Bus Work and Diameters**

Modify two existing 500 kV GIS diameters as shown in the proposed switching arrangement in Figure 9. The main buses are to have a continuous summer rating of 8000A. The diameters and line entrances should have a continuous summer rating of at least 4000A.

The symmetrical fault current capability of all bus work and diameters should be 80 kA for three phase and phase to ground faults.

All 500 kV facilities to be added and modified should be capable of operating at a continuous operating voltage of 550 kV.

- **500 kV -Transmission Line Terminations**

The new 500 kV circuits from Bruce A TS and Bruce B SS will terminate into Milton SS as shown in Figure 9.

- **500 kV Circuit Breakers**

Provide two (2) –500 kV GIS breakers. All 500 kV circuit breakers are to have a continuous current rating of at least 4000A and a three-phase current interrupting capability of 80 kA. Breaker positions are as shown in Figure 9. Planning specifications for the 500 kV circuit breakers are given in Appendix B4.

- **500 kV Disconnect Switches**

Provide two (2) 500 kV GIS 3-phase *line* disconnect switches that have a continuous summer rating of at least 4000A. All line switches are to be motorized and capable of being remotely controlled.

Provide four (4) 500 kV 3-phase *breaker* disconnect switches that have a continuous summer rating of at least 4000A. All breaker switches are to be motorized and capable of being remotely controlled.

- **500 kV Ground Switches**

Install 500 kV ground switches with an interrupter on the new 500 kV circuits from Bruce. Specifications for the interrupter type ground switches are given in Appendix C.

b) 500-230 kV Autotransformers

There are no autotransformers at Milton SS.

c) Protective Relaying & Control Equipment

Since Milton SS is an NPCC impactive station, extend digital fault recorder to incorporate the new lines. As well, physical separation of transmission protection systems is required at Milton SS, refer to specification: **PD-20-035 R0**.

Provide necessary 500kV protective relaying equipment to incorporate the new Bruce x Milton circuits. Also provide necessary protective relaying equipment for the new 500 kV breakers, including breaker failure protection, and modify existing bus protection at Milton SS.

d) Metering

Metering quantities should be extracted from protection IED's for operating and statistical metering for the new lines. Metering is to be provided in accordance with the requirements of the Network Operating Division and the IESO. Please consult with Network Operating.

e) Telecom Facilities

Modify telecom facilities at Milton SS to incorporate the new circuits. Evaluate all viable telecommunication alternatives. Alternatives include leased analogue channels, microwave or wireless solutions that meet Hydro One's requirements, modification and/or use of existing fiber/sonet/microwave infrastructure, acquisition of low cost fiber from Telcos, or hydro owned Optical Groundwire (OPGW). Note that the new 2 x 500 kV lines will be NPCC impactive.

f) Supervisory Control

Modify SCADA facilities as required to incorporate the new lines as per Ontario Grid Control Centre and SCADA standards. Provide supervisory control facilities from OGCC and the IESO CSCC for all new 500 kV breakers and disconnect switches. Please consult with Network Operating.

g) Real-Time Data Network Facilities

Real-time data network facilities are to be modified to incorporate the new circuits and upgraded station. Real-time data network facilities to transmit the information below to the OGCC in Barrie and the *IESO, (Independent Electricity System Operator, formally the IMO)* at the Clarkson SCC.

- 500 kV Line Flows (MW and MVar)
- 3-Phase, phase-to-phase voltages of 500 kV lines
- Status of all 500 kV breakers
- Status of all 500 kV breaker disconnect switches
- Status of all 500 kV line disconnect switches
- Status of all 500 kV ground switches

The IESO will modify the Real-time data network facilities at CSCC to incorporate the upgraded Essa TS and the new 500 kV circuits. Please review the above quantities and co-ordinate with Network Operating and the IESO to confirm Real-time data requirements.

h) Station Buildings

Maintenance Building: If possible, utilize the existing building.

Control Building: If possible, utilize the existing building.

i) Site/Mechanical

Modify station Grading and Drainage if required.

j) AC Station Service

Upgrade AC station service as required.

k) DC Station Service

Upgrade DC station service as required.

l) Land Requirements for Milton SS

There should be no additional land requirement for the work required inside Milton SS unless the HVDC option is used. The new proposed switching arrangement shown in Figure 9, is as per the ultimate drawing for Milton SS 500 kV yard.

3.0 Environmental Work

Ensure that all work complies with all environmental regulations.

C. GENERAL REQUIREMENTS

1.0 SPECIAL PROTECTION SCHEME

The new circuit(s) emanating from Bruce will be apart of the type 1 Bruce Special Protection Scheme (BSPS). The work associated with adding the status of the new transmission lines will be covered under a separate specification.

2.0 FACILITY REGISTRATION

Please provide necessary information to the IESO and Network Operating to ensure all new facilities to be built under this plan are registered with the IESO under their facility registration process.

3.0 NOMENCLATURE ACCOUNTABILITIES

Ensure revision of all existing and/or install new operating nomenclature to reflect all system configuration changes and/or new additions and shall ensure adherence with the approved T&D Standard OD-20-001. In all cases where existing nomenclature is illegible or missing, new nomenclature shall be installed. This task also includes removal of redundant nomenclature, new purchases, and installation of the same.

4.0 DATABASE INFORMATION ACCOUNTABILITIES

Ensure that all applicable Equipment Data Collection Templates are fully populated prior to the equipment being energized for the first time. The templates are to be populated as early as possible to meet the timelines required for all IESO Registration, Power System Database and Network Management System modeling and Passport maintenance record fields listed and shall be returned to the applicable contacts in the Information Assets Department and (when all Passport fields have been populated) to Program Workforce Management."

D. DELIVERABLES

1.0 Engineering and Construction Services

Please provide a study estimate by October 27, 2006 and proceed to Stage Gate 3 by Spring 2007 for the work specified in Section B and summarized in Table 1. The estimate breakdown is to be as follows:

Estimate: Bruce x Milton 500 kV Circuits

Work	Section	Estimate Type
Line Work	B 1.2 Line Work (excluding 1.2.1, 1.2.4)	Study
Environmental Assessment Work	B 1.2.1 EA Work	Study
Land Acquirement	B 1.2.4 Land Requirement	Study
Station Work (Bruce A TS, Bruce B SS, Milton SS	B 2.1, 2.2, 2.4 Station Work	Study
General Requirements	C	Study

The estimates are to be provided showing year-by-year cash flows and are to separately identify ETI and new money less interest for a **December 2011** in-service date.

D. SCHEDULE

The above work is covered by Schedule SP13090. Project schedule is as follows:

1. Provide Preliminary Estimate to perform work/reach SG2 to TSD October 27, 2006
2. Select Option(s) for Environmental Assessment (EA) Review January, 2007
3. Commence EA Approval Process for Selected Option February, 2007
4. Provide Release Estimate (SG3) for Selected Option TBD
5. Release Documentation Submitted for Approvals TBD
6. EA & OEB Approvals TBD
7. Hydro One Approvals TBD
8. Award Contract TBD
9. In Service December, 2011

Priority 1 has been assigned to this plan.

Prepared by:
Alessia Dawes / Magdalena Stelmach
Assistant Network Engineer,
Transmission System Development (TSD)

Reviewed by:
John Sabiston

J. Sabiston
Transmission Plans Manager - West,
Transmission System Development (TSD)

cc: Distribution List
/dawes-spec13090
/sabiston-spec13090

Table 1: Summary of Estimate Required – Plan 13090 Bruce Transmission Expansion

Work	500/230 kV Autotransformer	New 550kV CB	Number of line terminations	500 kV diameters
Bruce A TS 500 kV Yard	None	1 on existing diameter, as per Figure 6.	1 new line with new Gnd & line disconnect Switches	1 diameter modified
Bruce B SS 500 kV Yard	None	2, as per Figure 7.	1 new line with new Gnd & line disconnect Switches	1 new 500 kV diameter
Milton SS 500 kV Yard	None	2 GIS breakers on existing diameters, as per Figure 9	2 new lines with new Gnd and line disconnect Switches	2 diameters modified to incorporate one new line on each diameter, as per Figure 9

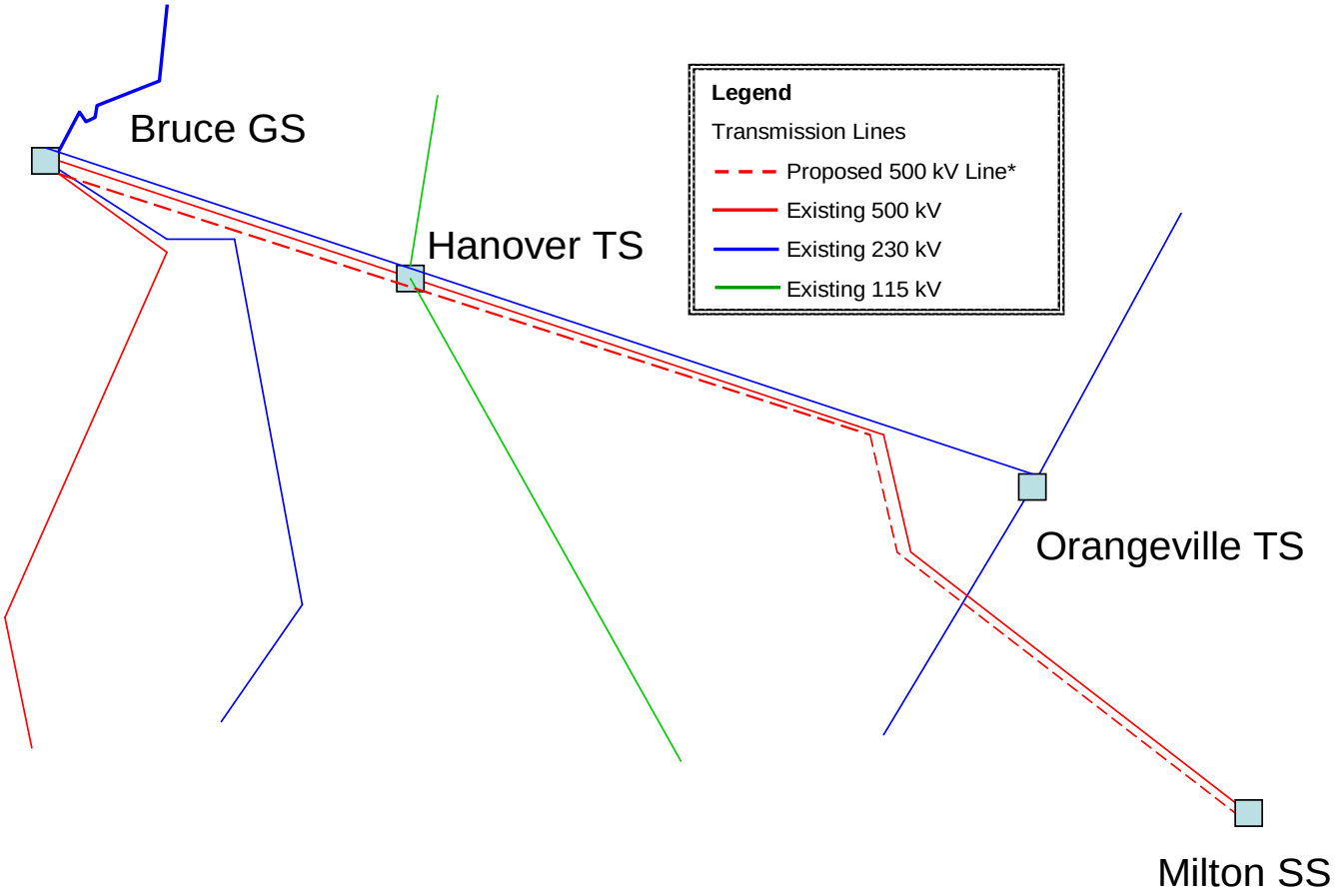
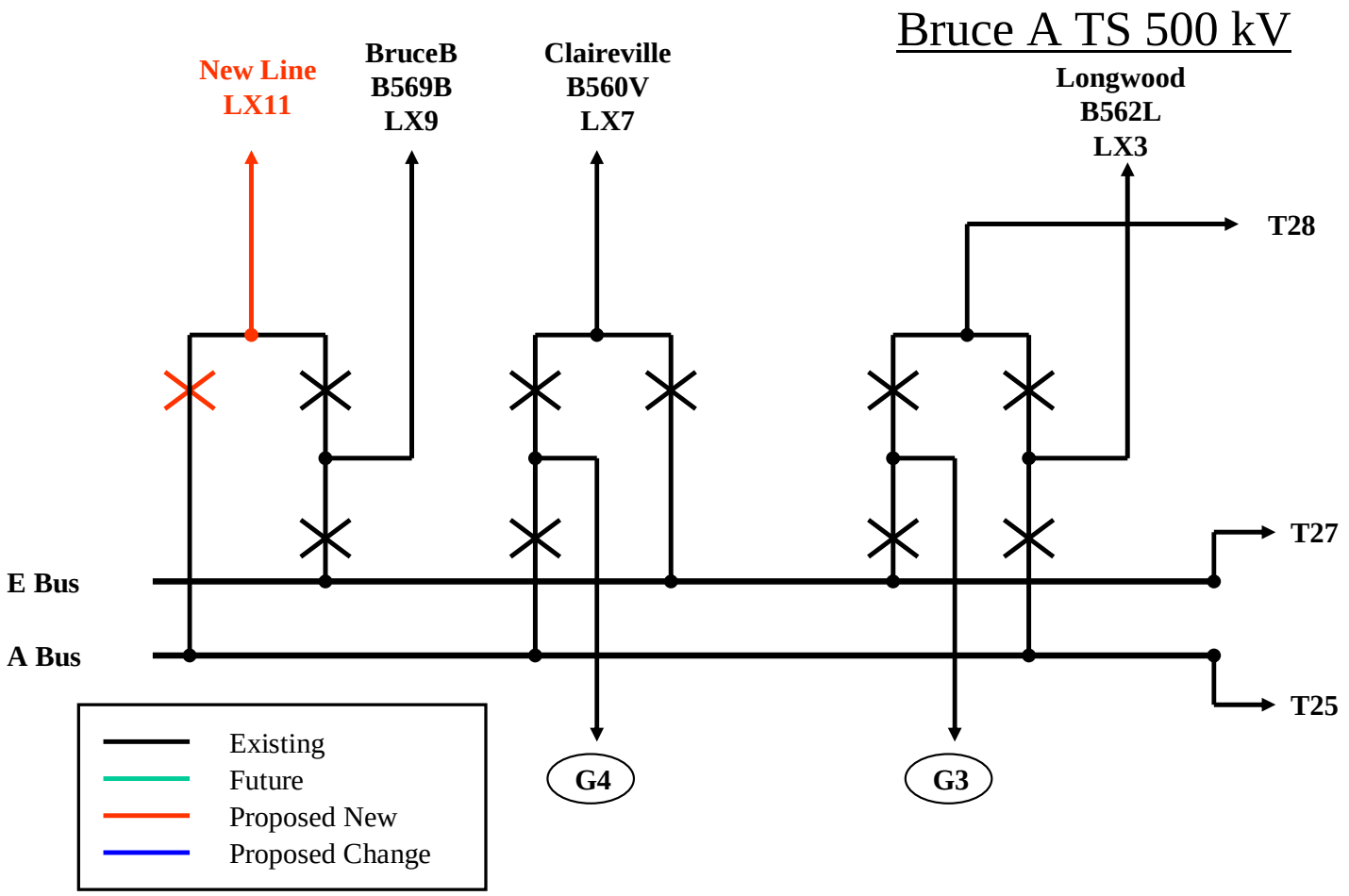


Figure 2: Proposed Transmission Route from the Bruce Complex to Milton SS



May 15, 2006 Alessia Dawes / John Sabiston

Figure 6: New Switching Arrangement for Bruce A TS 500 kV Yard

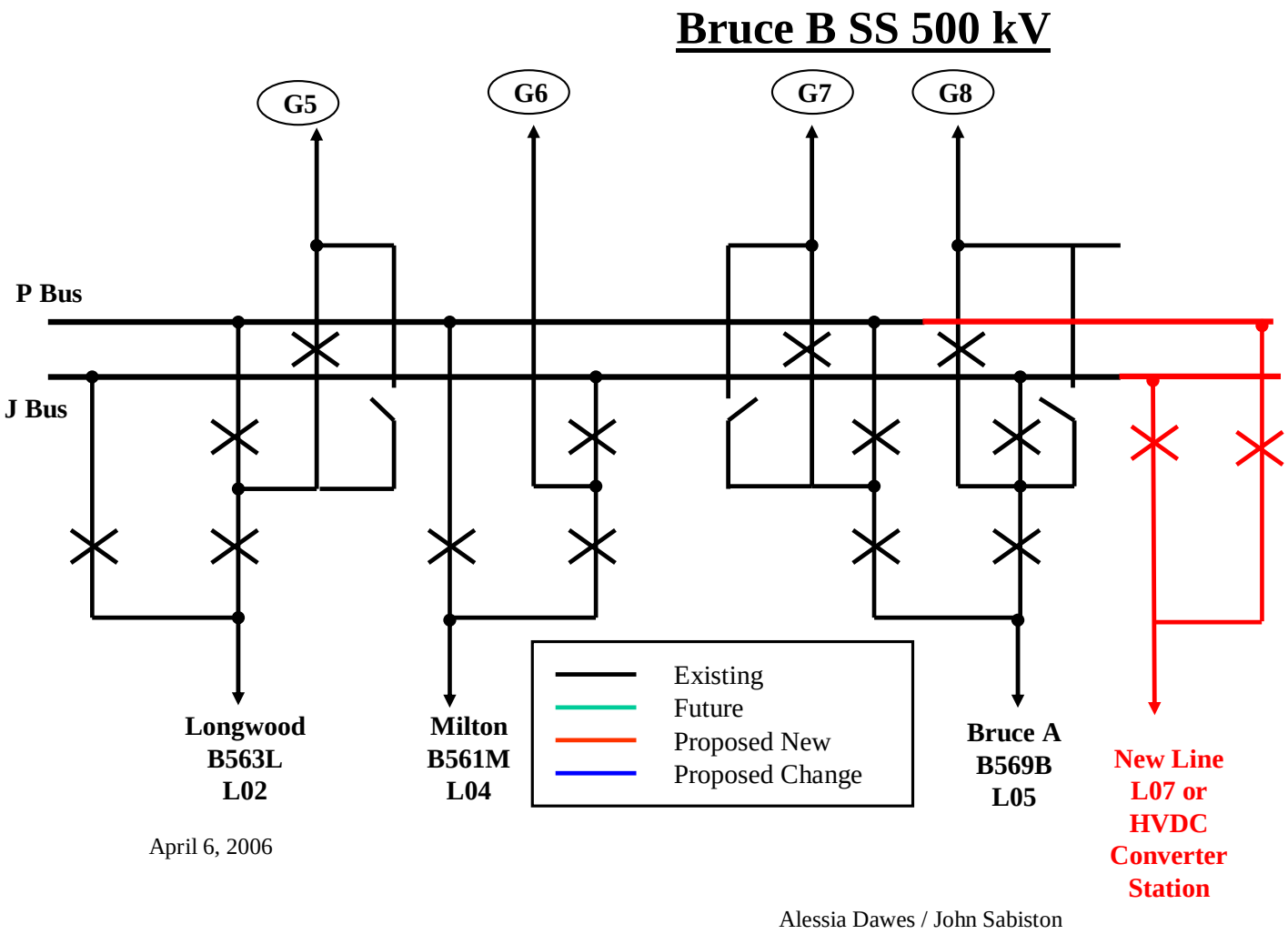


Figure 7: New Switching Arrangement for Bruce B SS 500 kV Yard

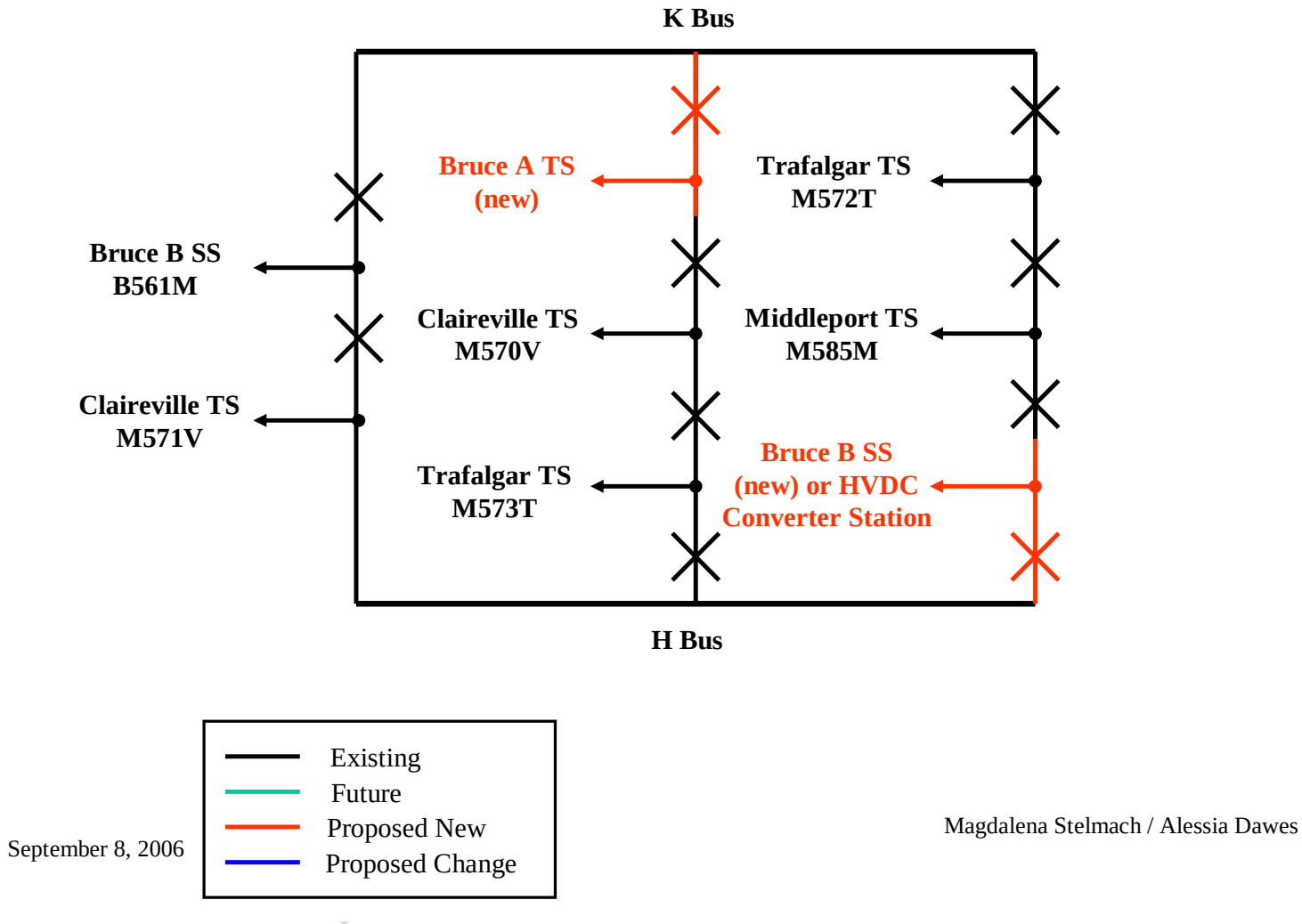


Figure 9: New Switching Arrangement for Milton SS 500 kV Yard

List of Appendices

Plan SP13090 – Bruce Generating Complex by Essa TS 500 kV Double Circuit Line

Appendix A – Planning Specifications for 500 kV Transmission Lines
500 kV Line Bruce x Milton SS

Appendix B – Planning Specifications for Circuit Breakers
B1 – 500 kV Breaker at Bruce A TS
B2 – 500 kV Breakers at Bruce B SS
B4 – 500 kV Breakers at Milton SS

Appendix C – Planning Specifications for 500kV Interrupter Type Ground Switches

Planning Specification for Overhead Transmission Lines Appendix A

<table>
<tr><td rowspan="4">project</td><td colspan="3">Title
Bruce Transmission Expansion
Build new double circuit 500kV transmission line – Bruce Complex by Milton SS</td><td>page
1 of 2</td></tr>
<tr><td colspan="3"></td><td>Date
October 10, 2006</td></tr>
<tr><td>ccp plan & project no.

SP13090</td><td>in service date

December, 2011</td><td rowspan="2">Files
NK40, NK 29, NK21
Milton SS, Bruce B SS,
Bruce A TS</td></tr>
<tr><td>schedule no.
SP13090</td></tr>
<tr><td>description</td><td colspan="4">Terminations & type of construction

<u>Terminations:</u> The new 500V double circuit line will connect the Bruce Complex to Milton SS. One circuit emanating from a station bus at Bruce B SS and terminate onto a Milton SS 500 kV diameter. The second circuit will emanate from an existing diameter at Bruce A TS and terminate onto a different Milton SS 500 kV diameter. See Figures 6, 7, and 9.

<u>Type of Construction:</u> Mixture of 2 cct lattice and steel pole. The majority of the line is expected to be of lattice construction with the locations and amount of steel pole construction to be determined after detailed studies by the Lines Engineering Department.</td></tr>
<tr><td></td><td>Maximum operating voltage
550 kV</td><td>Approximate length
176 km</td><td colspan="2">Operating designation
To be determined</td></tr>
<tr><td rowspan="7">conductors and ampacity</td><td colspan="2">Conductor size –</td><td colspan="2">4 x 585 kcmil (ACSR 26/7)</td></tr>
<tr><td rowspan="2">max. normal current – amperes</td><td>Summer</td><td colspan="2">At least 2900 A</td></tr>
<tr><td>Winter</td><td colspan="2">At least 3400 A</td></tr>
<tr><td rowspan="2">max. emergency current – amperes</td><td>Summer</td><td colspan="2">At least 3700 A</td></tr>
<tr><td>Winter</td><td colspan="2">At least 4000 A</td></tr>
<tr><td colspan="2">Emergency hours/year</td><td colspan="2">As per Transmission Design Method #9</td></tr>
<tr><td colspan="2">loading pattern</td><td colspan="2">Flat loading as per Transmission Design Method #9</td></tr>
<tr><td colspan="4">General</td></tr>
<tr><td>grounding and lightning protection</td><td colspan="4">skywires: number - size - fault current (amp, duration, location) - etc.
The number and size of skywires should be as required to meet the specified lighting classification and to carry the available fault current.
Current per skywire – Ig from Page 2 Table 1 divided by number of skywires. Fault duration = 0.15 sec.</td></tr>
<tr><td>prepared and approved</td><td>prepared by

M. Stelmach / A. Dawes</td><td>approved by

J. K. M. Sabiston</td><td colspan="2">specification no.

SP13090</td></tr>
</table>

Planning Specification for Overhead Transmission Lines A (Contd)

project	Title **Bruce Transmission Expansion** Build new double circuit 500kV transmission line – Bruce Complex by Milton SS				page 2 of 2 Date October 10, 2006	
	ccp plan & project no. SP13090		in service date December, 2011		Files NK40, NK 29, NK21 Milton SS, Bruce B SS, Bruce A TS	
security level	*required security levels*	***Standard security classifications:*** *classes a, b, c and d indicate the susceptibility of a* ***circuit*** *to faults caused by external forces excluding those caused by adjoining circuits.*				
		Nature of occurrence		class a	class b	Class c	class d
	1. class **B**	1. catastrophe damage (tornado, aircraft,		loss of structures directly	loss of structures directly involved plus 2 or 3 on each side		
	2. class **A**	2. ice & wind storms		To withstand 50-year return storms		to withstand 10 to 20 year return storms	
	3. class **a**	3. galloping		virtually outage free		Note 3	outage rate not critical
	4a. class **a**	4. a. total cct outages		less than 1	1 to 3	3 to 7	7 to 20
	4b. class **a**	b. Multi-cct outages		less than 0.3	0.3 to 1	1 to 4	4 to 10
	notes: 1. Total cct outages = long-term average no. of cct outages/100 cct miles/year. *2. Multi-cct outages = long-term average no. of multi-cct outages/100 line miles/year.* *3. Probability of 1 outage per 2 to 3 years for ccts up to about 100 - 125 miles long, and 1.5 to 2 outages per* *2 to 3 years for ccts 150-250 miles long; each outage may comprise a series of outages during one storm.*						
	General						
inter-circuit security requirements	Spacing with respect to other lines on same right-of-way; coincident multi-cct outages from any cause; special features Fall free spacing is not required.						
route and right-of-way	requirements – restrictions – special features - references - etc. Proposing to share B560V/B561M right of way. ROW's to be expanded to accommodate new 2cct 500 kV line Tower heights and route to be sensitive to environmentally sensitive and residential areas.						
miscell-aneous	other requirements - notes – restrictions - references - special insulation - diagrams - etc. **Table 1** Ig = 3Iao=total ground fault current in kA RMS symmetrical (base MVA=100, base kV=500, Prefault kV=550) kM from =Bruce GS Ig in kA kM from =Bruce GS Ig in kA						

	To be provided at a later time Insulation Level – 1800 kV BIL and 1620 kV SIL Transpositions: none required

prepared and approved	prepared by M. Stelmach / A. Dawes	Approved by J. K. M. Sabiston	specification no. SP13090 rev. 1

Planning Specification for 500 kV circuit breakers Appendix B1

<table>
<tr><td rowspan="3">Project</td><td colspan="4">Title

Bruce Transmission Expansion</td><td>File #

Bruce A TS NK21</td><td>Date

October 10, 2006</td></tr>
<tr><td colspan="4">Ccp plan & Project no.

SP13090</td><td colspan="2" rowspan="2">In service date & stage diagrams

December 2011
Figure 6</td></tr>
<tr><td colspan="4">Schedule no.

SP13090</td></tr>
<tr><td>Number required and voltage class</td><td colspan="6">500 kV (1)</td></tr>
<tr><td rowspan="2">Continuous operating requirements</td><td colspan="2">Maximum operating voltage (0201)

550 kV</td><td colspan="2">BIL (0213)

1800 kV</td><td colspan="2">Rated interrupting time (0601)

2 cycles</td></tr>
<tr><td colspan="6">Continuous Current capacity – amperes (0311)

4000 A</td></tr>
<tr><td rowspan="4">Short circuit duties (kA)</td><td rowspan="2">Year</td><td colspan="2">3 phase faults (05)</td><td colspan="2">L-G faults (05)</td><td colspan="2">s.c. assumptions</td></tr>
<tr><td>Symmetrical</td><td>Asymmetrical</td><td>Symmetrical</td><td>Asymmetrical</td><td>Cp time</td><td>kV</td></tr>
<tr><td>2009 (8 Bruce units+ 1000 MW Wind)</td><td>34.6 kA</td><td>47.0 kA</td><td>40 kA</td><td>54.4 kA</td><td>2</td><td>550</td></tr>
<tr><td>Ultimate</td><td>80 kA</td><td></td><td>80 kA</td><td></td><td>2</td><td>550</td></tr>
<tr><td rowspan="3">Transient voltage and line dropping requirements</td><td colspan="6">Transient recovery voltage (0570)

As per ANSI Std. C37.11 – 1979 (Reaffirmed 1988)</td></tr>
<tr><td colspan="3">Closing Resistors – required (08)

<u>Yes</u> Provide for future Yes

No No

Opening Resistors also required</td><td colspan="3">Closing out-of-phase switching – required (0505)

<u>Yes</u>

No</td></tr>
<tr><td colspan="6">Line de-energization (0504)

De-energise up to 250 km of 500 kV line</td></tr>
<tr><td>miscellaneous</td><td colspan="6"></td></tr>
</table>

Prepared and approved	prepared by M. Stelmach / A. Dawes	Approved by J. K. M. Sabiston	Plan no. SP13090	Rev. 1
	Approved as a firm requirement by			

Planning Specification for 500 kV circuit breakers Appendix B2

<table>
<tr><td rowspan="3">Project</td><td colspan="3">Title

Bruce Transmission Expansion</td><td>File #

Bruce B
SS NK29</td><td>Date

October 10, 2006</td></tr>
<tr><td colspan="3">Ccp plan & Project no. SP13090</td><td colspan="2" rowspan="2">In service date & stage diagrams
December 2011
Figure 7</td></tr>
<tr><td colspan="3">Schedule no. SP13090</td></tr>
<tr><td>Number required and voltage class</td><td colspan="5">500 kV (2)</td></tr>
<tr><td rowspan="2">Continuous operating requirements</td><td>Maximum operating voltage (0201)
550 kV</td><td colspan="2">BIL (0213)

1800 kV</td><td colspan="2">Rated interrupting time (0601)

2 cycles</td></tr>
<tr><td colspan="5">Continuous Current capacity – amperes (0311)

4000 A</td></tr>
<tr><td rowspan="3">Short circuit duties (kA)</td><td rowspan="2">Year</td><td colspan="2">3 phase faults (05)</td><td colspan="2">L-G faults (05)</td><td colspan="2">s.c. assumptions</td></tr>
<tr><td>symmetrical</td><td>Asymmetrical</td><td>Symmetrical</td><td>Asymmetrical</td><td>Cp time</td><td>kV</td></tr>
<tr><td>2009 (8 Bruce units+ 1000 MW Wind)</td><td>34.8 kA</td><td>47.3 kA</td><td>40 kA</td><td>54.4 kA</td><td>2</td><td>550</td></tr>
<tr><td></td><td>Ultimate</td><td>80 kA</td><td></td><td>80 kA</td><td></td><td>2</td><td>550</td></tr>
<tr><td rowspan="3">Transient voltage and line dropping requirements</td><td colspan="6">Transient recovery voltage (0570)

As per ANSI Std. C37.11 – 1979 (Reaffirmed 1988)</td></tr>
<tr><td colspan="3">Closing Resistors – required (08)

<u>Yes</u> Provide for future
Yes

No
No

Opening Resistors also required</td><td colspan="3">Closing out-of-phase switching – required (0505)

<u>Yes</u>

No</td></tr>
<tr><td colspan="6">Line de-energization (0504)

De-energise up to 250 km of 500 kV line</td></tr>
<tr><td>miscellaneous</td><td colspan="6"></td></tr>
<tr><td>Prepared and approved</td><td>prepared by

M. Stelmach / A. Dawes</td><td colspan="2">Approved by

J. K. M. Sabiston</td><td>Plan no.

SP13090</td><td colspan="2">Rev.

1</td></tr>
</table>

Planning Specification for 500 kV circuit breakers Appendix B4

<table>
<tr><td rowspan="3">Project</td><td colspan="3">Title
Bruce Transmission Expansion
Build new double circuit 500 kV transmission line</td><td>File #

Milton SS
NK40</td><td>Date

October 10, 2006</td></tr>
<tr><td colspan="3">Ccp plan & Project no. SP13090</td><td colspan="2" rowspan="2">In service date & stage diagrams
December 2011
Figures 9</td></tr>
<tr><td colspan="3">Schedule no. SP13090</td></tr>
<tr><td>Number required and voltage class</td><td colspan="5">500 kV GIS (2)</td></tr>
<tr><td rowspan="2">Continuous operating requirements</td><td>Maximum operating voltage (0201)
550 kV</td><td colspan="2">BIL (0213)

1800 kV</td><td colspan="2">Rated interrupting time (0601)
2 cycles</td></tr>
<tr><td colspan="5">Continuous Current capacity – amperes (0311)

4000 A</td></tr>
<tr><td rowspan="4">Short circuit duties (kA)</td><td rowspan="2">Year</td><td colspan="2">3 phase faults (05)</td><td colspan="2">L-G faults (05)</td><td colspan="2">s.c. assumptions</td></tr>
<tr><td>symmetrical</td><td>Asymmetrical</td><td>Symmetrical</td><td>Asymmetrical</td><td>Cp time</td><td>kV</td></tr>
<tr><td>2009 (8 Bruce units+ 1000 MW Wind)</td><td>28.1 kA</td><td>34.1 kA</td><td>23.4 kA</td><td>28.4 kA</td><td>2.5</td><td>550</td></tr>
<tr><td>Ultimate</td><td>80 kA *</td><td></td><td>80 kA *</td><td></td><td>2.5</td><td>550</td></tr>
<tr><td rowspan="3">Transient voltage and line dropping requirements</td><td colspan="5">Transient recovery voltage (0570)

As per ANSI Std. C37.11 – 1979 (Reaffirmed 1988)</td></tr>
<tr><td colspan="3">Closing Resistors – required (08)

<u>Yes</u> Provide for future
Yes

No
No

Opening Resistors also required</td><td colspan="2">Closing out-of-phase switching – required (0505)

<u>Yes</u>

No</td></tr>
<tr><td colspan="5">Line de-energization (0504)

De-energize up to 250 km of 500 kV line</td></tr>
<tr><td>miscellaneous</td><td colspan="5"></td></tr>
<tr><td rowspan="2">Prepared and approved</td><td>prepared by
M. Stelmach /
A. Dawes</td><td>Approved by

J. K. M. Sabiston</td><td>Plan no.

SP13090</td><td colspan="2">Rev.

1</td></tr>
<tr><td></td><td colspan="3">Approved as a firm requirement by</td><td colspan="2"></td></tr>
</table>

APPENDIX C

SPECIFICATIONS FOR 500kV INTERRUPTER TYPE GROUND SWITCHES

(a) General Requirements

To ensure safe and reliable grounding operations, remote-operated interrupter type ground switches are to be installed on the new circuits at Milton SS as well as on the new 500 kV circuits terminating at Bruce A TS and Bruce B SS.

All ground switches are to be remote *motor*-operated, and are to provide a means of visually checking that the switches are in the open or closed position.

The ground switches are to be designed for operation on a 60 Hz system.

Ross- INTERROGATORY #9 List 1

Interrogatory

Ref. Exh. B / T6 / S2 / Page 5

Issue Number: 2 Project Alternatives

Issue:
2.1 Have all reasonable alternatives to the project been identified and considered?

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

2.3 For all of the considered alternatives, does the evaluation methodology utilized include a cost benefit comparison as well as a comparison of all quantitative and qualitative benefits?

2.4
a) Have appropriate evaluation criteria and criteria weightings been utilized in the evaluation process for the alternatives and the proposed project and what additional criteria/weightings could be considered?

b) Have appropriate comparisons been carried out on all reasonable alternatives with respect to reliability and quality of electricity service, including stability and transient stability levels, voltage performance and Loss of Load Expectation projections under normal and post-contingency conditions?

Preamble:

Power system analysis is an integral part of the transmission and distribution planning process. It is used by Hydro One to evaluate the capabilities of the existing network to deliver power and energy from generating stations to provide a reliable supply to customers. Two types of studies are used:

a. Short-Circuit Studies: Short-Circuit Studies are used to determine of the impact of the Bruce to Milton Area customers at their points of connection to Hydro One.

b. Load Flow Studies: The PTI PSS/E AC Load Flow Program was used to set up detailed base cases with the new 500 kV double circuit.

Request:

1. Kindly provide the two above-noted studies.

2. With regards to PTI PSS/E AC Load Flow Program, kindly provide any models prepared dealing with the increased generation being placed on the existing transmission system, with or without the use of Generation rejection, series compensation or shunt capacitors.

Response

(a) Hydro One has declined to respond to this Interrogatory. Please refer to the letter from Hydro One to the Board dated March 13, 2008, at page 5, with respect to paragraph 3 of Procedural Order 5.

(b) To better utilize the resources available at the IESO and to obtain the maximum benefit from those resources, the IESO has proposed that it should perform a reasonable number of studies for the Ross Group, at their specific direction. The results of these studies would then be provided to the Ross Group in a format suitable for filing as evidence.

Ross IESO INTERROGATORY #1 List 1

Interrogatory

Ref. Exh. B / T 6/ S2 / P3-20
Issue Number: 1 Project Need and Justification
Issue1.3:
Have all appropriate project risk factors pertaining to the need and justification (including but not limited to forecasting, technical and financial risks) been taken into consideration in planning this project?

Preamble:

In the Connection and Assessment – System Impact Assessment Report, the IESO states in the Disclaimer section that the report is created solely "for the purpose of assessing whether the applicant's proposed connection with the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system."

Request:

Kindly identify all conditions which the IESO feels would constitute an adverse impact on the reliability of the IESO-controlled grid.

Response

Reliability of the IESO-controlled grid must conform with the criteria published in the Ontario Resource and Transmission Assessment Criteria. These criteria are publicly available at the following link.

http://www.ieso.ca/imoweb/pubs/marketAdmin/IMO_REQ_0041_TransmissionAssessmentCriteria.pdf

Conditions abrogating mandatory criteria (for example criteria specified in sections 2.7 and 5) would be considered to adversely impact the reliability of the IESO-controlled grid.

Ross IESO INTERROGATORY #2 List 1

Interrogatory

Ref. Exh. B / T 6/ S2 / P3-20
Issue Number: 1 Project Need and Justification
Issue1.3:
Have all appropriate project risk factors pertaining to the need and justification (including but not limited to forecasting, technical and financial risks) been taken into consideration in planning this project?

Preamble:

In the Connection and Assessment – System Impact Assessment Report, the IESO states in the Disclaimer section that the report is created solely "for the purpose of assessing whether the applicant's proposed connection with the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system."

Request:

Does the IESO consider line security to be a factor in assessing potential adverse impacts on the reliability of the IESO-controlled grid?

Response

Please see Hydro One's response to Board Staff interrogatory No. 2.10 (ii) at Exhibit C, Tab 1, Schedule 2.10.

Ross IESO INTERROGATORY #3 List 1

Interrogatory

Ref. Exh. B / T 6/ S2 / P3-20
Issue Number: 1 Project Need and Justification
Issue1.3:
Have all appropriate project risk factors pertaining to the need and justification (including but not limited to forecasting, technical and financial risks) been taken into consideration in planning this project?

Preamble:

In the Connection and Assessment – System Impact Assessment Report, the IESO states in the Disclaimer section that the report is created solely "for the purpose of assessing whether the applicant's proposed connection with the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system."

Request:

Does the IESO consider multi-line proximity to be a factor in assessing potential adverse impacts on the reliability of the IESO-controlled grid? If not, why not?

Response

Please see Hydro One's response to Board Staff interrogatory No. 2.10 (ii) a Exhibit C, Tab 1, Schedule 2.10, page 2 of 3.

Ross IESO INTERROGATORY #4 List 1

Interrogatory

Issue Number: 2 Project Alternatives

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

If the IESO was presented a different or alternative application to the one currently forwarded by HONI, and this alternative was preferable to the current proposal, what would the IESO do? i.e would both be approved, would the preferable application be approved and the inferior application be denied?

Response

Upon receipt of a formal application for a Connection Assessment, the IESO is obligated to assess the impact of any new or modified connection to the IESO-controlled grid, regardless of the source of that application, as stated in the following Clause of the Market Rules:

" Clause 6.1.5 The *IESO* shall, upon receipt of a *request for connection assessment* referred to in section 6.1.6, assess the impact of a new or modified *connection* to the *IESO-controlled grid* on the *reliability* of the *integrated power system* by means of a *connection assessment* conducted in accordance with the provisions of sections 6.1.14 to 6.1.18**.**"

If two submitted proposals are found to satisfy the IESO's requirements of "having no adverse effect on the *reliability* of the *integrated power system*" then on completion of the Connection Assessment both would be considered acceptable and potentially issued a Notification of Conditional Approval to Connect to the IESO-controlled grid. In no part of the process would the IESO express any preference with respect to the merits of one proposal over another. In this regard, the IESO does not determine a "preferable application" and it would not deny an "inferior application".

Ross IESO INTERROGATORY #5 List 1

Interrogatory

Issue Number: 2 Project Alternatives

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

At page 5 of the current SIA Report in this matter, under 'Study Criteria' – bullet point 4 suggests "two fictitious generating units were assumed at the Bruce Complex". Are these 'fictitious' units representing refurbished units, or new generation units not currently in existence?

Response

In Section 2.3.6 of the IPSP Discussion Paper No. 5, the OPA had stated that a recent study had identified the potential for another 1000MW or more of wind generation capacity.

The analysis performed as part of the Connection Assessment was therefore intended to identify the scope that the proposed new 500kV line would provide for incorporating further generating capacity beyond the eight Bruce units and the 675MW of committed wind-turbine projects.

Since the possible location of these new generating facilities was unknown and recognising the limited capability remaining on the existing 230kV transmission facilities in the area to accommodate further generation beyond the committed wind-turbine projects, it was therefore decided to incorporate any new generating facilities directly into the 500kV system at the Bruce Nuclear Complex.

The 'two fictitious generating units' are therefore exactly as stated; fictitious units intended to represent the new wind generation potential that had been previously identified in the Bruce area.

Ross IESO INTERROGATORY #6 List 1

Interrogatory

Issue Number: 2 Project Alternatives

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

Referring to section 8.2 of the current report, kindly explain what would cause 'contingency conditions'. From a practical perspective, provide hypothetical events which could occur and have occurred on the grid in the past.

Response

Transmission design requires an assessment of specific contingencies, which are described in the documents referred to in the response to Pollution Probe Interrogatory 26.

The following are examples of events creating a contingency (e.g., an electrical fault to ground) referred to in the foregoing documents:

- a broken insulator string contacting the ground,
- a conductor or conductors contacting a tower, or
- a piece of equipment such as a transformer failing.

Ross IESO INTERROGATORY #7 List 1

Interrogatory

Issue Number: 2 Project Alternatives

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

Referring to section 9 of the current report, kindly detail what 'new generation' was contemplated by the IESO. Please also provide any suggested 'new generation' provided by HONI when providing you information upon which to prepare your assessment.

Response

The new generation capacity included in the SIA Report analysis was intended to represent new facilities identified in a study commissioned by the OPA and reported in Section 2.3.6 of the IPSP Discussion Paper No. 5. This study concluded that, within the Bruce area, there is approximately 1000 MW of wind generation potential.

There was therefore no new generation identified in the application for a Connection Assessment that was submitted by Hydro One.

Ross IESO INTERROGATORY #8 List 1

Interrogatory

Issue Number: 2 Project Alternatives

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

What is the current transmission capacity onto the IESO-controlled grid from the Bruce complex?

Response

Please refer to Exhibit B, Tab 6, Schedule 5, Appendix 1, page 4 for the existing transmission transfer capability out of the Bruce Area. This matter was discussed at Day One of the Technical Conference presentation (Exhibit KT.1, slide 11).

Ross IESO INTERROGATORY #9 List 1

Interrogatory

Issue Number: 2 Project Alternatives

2.2 Has an appropriate evaluation methodology been applied to all the alternatives considered?

Of this capacity, what actual transmission can be ascribed to each transmission line?

Response

Please refer to the responses to Pappas Interrogatories 12 and 13.

Ross IESO INTERROGATORY #10 List 1

Interrogatory

Ref. Exh. B / T 6/ S4 / P6
Issue Number: 1 Project Need and Justification

Preamble:

In the **Ontario Reliability Outlook** – March 2007, Volume 2 Issue 1 document, the IESO states that "A new 500kV line out of the Bruce area is required as soon as possible to accommodate additional generation expected from new projects and refurbished Bruce nuclear units."

In the **10-YEAR OUTLOOK:** An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario From January 2006 to December 2015 study released in August of 2005, the IESO states at page 27 that, "Hydro One has submitted an application to the IESO for a connection assessment of their proposal to install series capacitors at the approximate mid-points of the following 500 kV circuits, Preliminary analysis shows that this plan has the potential to accommodate the proposed return to service of Bruce A Units 1 and 2, and also intended to reduce the reactive power losses of the existing system, particularly under contingency conditions, and thereby decreasing the dependence on Nanticoke GS for voltage support, so that this generation facility can be removed from service."

Please reconcile these two positions.

Response

The 10-Year Outlook was released shortly after the IESO began consideration of using series compensation on the Bruce to Milton line. The 10-Year Outlook also notes that the IESO has yet to perform its full assessment of the impact of the 500 kV series capacitors at the paragraph immediately following the reference above.

Detailed analyses were subsequently carried out for both series compensation and the Bruce to Milton line by the IESO and were presented in SIA documents. Please see the response to Pappas Interrogatory 1 for the series compensation SIA and Exhibit B, Tab 6, Schedule 2 for the Bruce to Milton line SIA.

Consistent with the conclusion of the series compensation SIA, the installation of series capacitors is sufficient neither to accommodate all of the committed Bruce Area

generation, nor to enable the development of additional potential wind resources in the area. The above references are accordingly consistent with each other.

Ross IESO INTERROGATORY #11 List 1

Interrogatory

Ref. Exh. B / T 6/ S4 / P6
Issue Number: 1 Project Need and Justification

Preamble:

In the **Ontario Reliability Outlook** – March 2007, Volume 2 Issue 1 document, the IESO states that "A new 500kV line out of the Bruce area is required as soon as possible to accommodate additional generation expected from new projects and refurbished Bruce nuclear units."

In the **10-YEAR OUTLOOK:** An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario From January 2006 to December 2015 study released in August of 2005, the IESO states at page 27 that, "Hydro One has submitted an application to the IESO for a connection assessment of their proposal to install series capacitors at the approximate mid-points of the following 500 kV circuits, Preliminary analysis shows that this plan has the potential to accommodate the proposed return to service of Bruce A Units 1 and 2, and also intended to reduce the reactive power losses of the existing system, particularly under contingency conditions, and thereby decreasing the dependence on Nanticoke GS for voltage support, so that this generation facility can be removed from service."

Please provide reports prepared, referred to, or relied upon for the current project which substantiates the need for increased transmission capacity from the Bruce.

Response

Please refer to Exhibit B, Tab 6, Schedule 5, all appendices, Exhibit B, Tab 6, Schedule 2, and the discussion at Day 1 of the Technical Conference (Exhibit KT.1)

Ross IESO INTERROGATORY #12 List 1

Interrogatory

Ref. Exh. B / T 6/ S4 / P6
Issue Number: 1 Project Need and Justification

Preamble:

In the **Ontario Reliability Outlook** – March 2007, Volume 2 Issue 1 document, the IESO states that "A new 500kV line out of the Bruce area is required as soon as possible to accommodate additional generation expected from new projects and refurbished Bruce nuclear units."

In the **10-YEAR OUTLOOK:** An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario From January 2006 to December 2015 study released in August of 2005, the IESO states at page 27 that, "Hydro One has submitted an application to the IESO for a connection assessment of their proposal to install series capacitors at the approximate mid-points of the following 500 kV circuits, Preliminary analysis shows that this plan has the potential to accommodate the proposed return to service of Bruce A Units 1 and 2, and also intended to reduce the reactive power losses of the existing system, particularly under contingency conditions, and thereby decreasing the dependence on Nanticoke GS for voltage support, so that this generation facility can be removed from service."

Please provide a detailed explanation regarding the change in assumptions/realities between the former and current positions of IESO.

Response

Please see the response to Ross Interrogatory 10.

Ross IESO INTERROGATORY #13 List 1

Interrogatory

Ref. Exh. B / T 6/ S4 / P6
Issue Number: 1 Project Need and Justification

Preamble:

In the **Ontario Reliability Outlook** – March 2007, Volume 2 Issue 1 document, the IESO states that "A new 500kV line out of the Bruce area is required as soon as possible to accommodate additional generation expected from new projects and refurbished Bruce nuclear units."

In the **10-YEAR OUTLOOK:** An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario From January 2006 to December 2015 study released in August of 2005, the IESO states at page 27 that, "Hydro One has submitted an application to the IESO for a connection assessment of their proposal to install series capacitors at the approximate mid-points of the following 500 kV circuits, Preliminary analysis shows that this plan has the potential to accommodate the proposed return to service of Bruce A Units 1 and 2, and also intended to reduce the reactive power losses of the existing system, particularly under contingency conditions, and thereby decreasing the dependence on Nanticoke GS for voltage support, so that this generation facility can be removed from service."

Please provide the Connection Assessment Studies referred to at the bottom of page 27 of the August 15, 2005 study.

Response

The Connection Assessment Studies referred to at the bottom of page 27 constitute the Bruce to Milton line and series compensation SIA documents. Please refer to the response to Ross Interrogatory 10.

Ross IESO INTERROGATORY #14 List 1

Interrogatory

Ref. Exh. B / T 6/ S4 / P6
Issue Number: 1 Project Need and Justification

Preamble:

In the **Ontario Reliability Outlook** – March 2007, Volume 2 Issue 1 document, the IESO states that "A new 500kV line out of the Bruce area is required as soon as possible to accommodate additional generation expected from new projects and refurbished Bruce nuclear units."

In the **10-YEAR OUTLOOK:** An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario From January 2006 to December 2015 study released in August of 2005, the IESO states at page 27 that, "Hydro One has submitted an application to the IESO for a connection assessment of their proposal to install series capacitors at the approximate mid-points of the following 500 kV circuits, Preliminary analysis shows that this plan has the potential to accommodate the proposed return to service of Bruce A Units 1 and 2, and also intended to reduce the reactive power losses of the existing system, particularly under contingency conditions, and thereby decreasing the dependence on Nanticoke GS for voltage support, so that this generation facility can be removed from service."

Please provide a copy of the report entitled: IESO_REP_0299 CONNECTION ASSESSMENT & APPROVAL PROCESS SYSTEM IMPACT ASSESSMENT REPORT For the Proposed Installation of Series Capacitors in the 500kV Circuits between the Bruce Complex & Nanticoke GS, Applicant: Hydro One Networks Inc. CAA ID No. 2005-200 Transmission Assessments & Performance Department, FINAL Version. Date: 11th April 2006.

Response

Please see the response to Pappas Interrogatory 1.

Ross IESO INTERROGATORY #15 List 1

Interrogatory

Ref. Exh. B / T 6/ S4 / P6
Issue Number: 1 Project Need and Justification

Preamble:

In the **Ontario Reliability Outlook** – March 2007, Volume 2 Issue 1 document, the IESO states that "A new 500kV line out of the Bruce area is required as soon as possible to accommodate additional generation expected from new projects and refurbished Bruce nuclear units."

In the **10-YEAR OUTLOOK:** An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario From January 2006 to December 2015 study released in August of 2005, the IESO states at page 27 that, "Hydro One has submitted an application to the IESO for a connection assessment of their proposal to install series capacitors at the approximate mid-points of the following 500 kV circuits, Preliminary analysis shows that this plan has the potential to accommodate the proposed return to service of Bruce A Units 1 and 2, and also intended to reduce the reactive power losses of the existing system, particularly under contingency conditions, and thereby decreasing the dependence on Nanticoke GS for voltage support, so that this generation facility can be removed from service."

Referring to page 38, section 16.2 of the study referred to at question 14, please provide the ABB Study that was commissioned by Hydro One, and supplied to the IESO.

Response

Please see the response to Pappas Interrogatory 1.

Ross OPA INTERROGATORY #1 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification

Issue1.2:

Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

Are the directives referred to in the OPA analysis in fact the 'goals' set out to in the Background section of the Analysis?

Response

The Preamble contains incorrect information. The reference to the June 13, 2007 directive should be to the June 13, 2006 directive. Further, the June 13, 2006 directive is not the only directive referred to in section 1.0 Background. There are four different directives referred to in the Background in addition to the June 13, 2006 directive. Additionally, the Minister issued to the OPA a directive dated August 27, 2007 (see Attachement A), which directs the OPA to acquire up to 2,000 MW of new renewable electricity supply from projects that are greater than 10 MW in size. That directive also notes that "in light of the required lead time for consultation with First Nation and Metis people, environmental and municipal approvals, and construction, the procurement of these resources needs to occur by 2011". Objectives of the Government of Ontario are set out in all of these directives.

Attachment A

Letter from the Minister Issued to the OPA Dated August 27, 2007

AUG 2 8 2007

Minister of Energy

Hearst Block, 4th Floor
900 Bay Street
Toronto ON M7A 2E1
Tel.: 416-327-6715
Fax:416-327-6754

Ministre de l'Énergie

Édifice Hearst, 4e étage
900, rue Bay
Toronto ON M7A 2E1
Tél.: 416-327-6715
Téléc.:416-327-6754

AUG 2 7 2007

Dr. Jan Carr
Chief Executive Officer
Ontario Power Authority
1600–120 Adelaide Street West
Toronto, Ontario
M5H 1T1

Dear Dr. Carr:

Re: Procurement of up to 2,000 MW of Renewable Energy Supply

I write in connection with my authority as Minister of Energy in order to exercise the statutory power of ministerial direction that I have in respect of the Ontario Power Authority (the "OPA") under section 25.32 of the *Electricity Act, 1998* (the "Act").

As you are aware, the government has established a series of targets for the addition of new renewable energy supply, culminating with the goal of doubling Ontario's renewable energy capacity to 15,700 megawatts (MW) by 2025. These targets were relayed to the OPA in the Supply Mix Direction of June 2006.

In order to meet the government's renewable supply targets, the Ministry of Energy put in place an initiative to procure new renewable energy supply through competitive procurements that targeted medium- to large-sized renewable energy generation facilities, and a Standard Offer Program for small facilities that are 10 MW and under in size.

Through ministerial directions issued in November 2005, responsibility for administering contracts for over 1,300 MW of new renewable energy supply was assigned to the OPA. These contracts were the result of two completed Requests for Proposals, developed and administered by the Ministry of Energy during 2004 and 2005.

In addition, in a letter of March 21, 2006, then Minister of Energy, the Honourable Donna Cansfield, directed the OPA to assume responsibility for exercising the powers and performing the duties of the Crown under the Standard Offer Program.

I understand that the OPA has identified that there is potential for up to 2,000 MW of additional new renewable generation to come into service by 2015 from projects that are greater than 10 MW in size. In light of the required lead time for consultation with First Nation and Métis peoples, environmental and municipal approvals, and construction, the procurement of these resources needs to occur by 2011.

. . . /cont'd

Pursuant to section 25.32 of the *Electricity Act, 1998*, and with the objectives of ensuring electricity supply and mitigating the environmental impacts of electricity production, I hereby direct the OPA to assume, effective as of the date of this letter of direction, responsibility for exercising the powers and performing the duties of the Crown in regard to the acquisition of up to 2,000 MW of new renewable electricity supply from projects that are greater than 10 MW in size.

The OPA in establishing eligibility requirements may wish to refer to the three earlier procurements by Ontario for renewable energy, the first two of which were also assigned to the OPA in November, 2005. Although the third procurement was suspended, I am providing you with the procurement documents as I believe they provide useful and relevant information that the OPA may wish to consider in the development of the procurement documents.

In the course of the consultation process on the Integrated Power System Plan, the OPA heard from First Nation and Métis peoples their desire to be consulted in the planning of electricity projects.

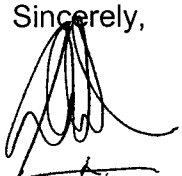
It is my view that First Nation and Métis peoples should be consulted early in the planning and development stages for the new renewable energy projects under this 2,000 MW direction. As such, I direct that the OPA develop guidelines and processes to ensure that appropriate consultation with First Nation and Métis peoples takes place. The Crown will continue to assess the adequacy of the consultation, including whether there is accommodation, where appropriate, for impacts that the specific projects may have on Aboriginal or treaty rights.

I request that the OPA work towards commencing consultation on the design of the first procurement for approximately 500 MW of new renewable energy supply by the end of 2007.

It is expected that, as a consequence of this direction, the OPA will enter into such contracts with suppliers as necessary to implement the initiative.

This Directive shall be effective and binding as of the date hereof.

Sincerely,



Dwight Duncan
Minister

Ross OPA INTERROGATORY #2 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification

Issue1.2:

Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

What is the difference between directives and goals from the perspective of the OPA?

Response

A directive is a legal instrument issued under subsection 25.30(2), subsection 25.32(4), or subsection 25.32(7) of the *Electricity Act, 1998* whereby the Minister of Energy may direct the OPA to plan to meet certain goals in developing the IPSP (ss.25.30(2)), carry out an initiative commenced by the Crown related to the procurement of electricity supply or capacity among other things (ss.25.32(4)) or enter into a contract arising out of an initiative of the Crown (ss.25.32(7)).

Ross OPA INTERROGATORY #3 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification

Issue1.2:

Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

If there is a difference, please distinguish between the goals and the directives. Further, kindly list the goals and the directives forwarded by the Government of Ontario in the June 13, 2006 directive letter as understood by the OPA.

Response

As noted in OPA's response to Ross-OPA Interrogatory 2, the directive is a legal instrument. A directive may contain goals. The goals contained in the June 13, 2006 directive are set out in paragraphs 1 to 7.

Ross OPA INTERROGATORY #4 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification

Issue1.2:

Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

Please isolate and articulate what directives set out in the June 13, 2007 letter, the new 500kV line project meets.

Response

The proposed project is one element of meeting the goals set out in paragraphs 2, 3, 5 and 6 of the June 13, 2006 directive.

Ross OPA INTERROGATORY #5 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification
Issue1.2:
Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

Is the proposed project designed to meet the directives set out in paragraph 6 of the June 13, 2007 letter? If not, why not?

Response

Yes, the Bruce to Milton Project is designed to enable the achievement of the supply mix goals set out in the directive. The Project will facilitate the development and use of renewable energy resources by enabling nuclear capacity to meet base-load electricity requirements, facilitate the development of renewable resources in the Bruce Area as identified in the evidence and contribute to having sufficient resources to permit the replacement of coal-fired generation in Ontario.

The Project also promotes system efficiency by reducing transmission losses and congestion by minimizing undelivered energy in the Bruce Area. It facilitates the integration of new renewable generation and refurbished nuclear generation in the Bruce Area.

All these objectives are being achieved in a manner consistent with the need to maintain system reliability and cost effectiveness.

Ross OPA INTERROGATORY #6 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification
Issue1.2:
Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

If so, would the OPA agree that much of the increased transmission capacity created with the refurbished Bruce Units in mind is not contemplated by the Government directives?

Response

No, the OPA does not agree with that conclusion. Please refer to the Application Exhibit B Tab 6 Schedule 5 Appendix 1, and in particular, the discussion set out in the Background.

Ross OPA INTERROGATORY #7 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification

Issue1.2:

Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

Does the OPA Analysis of Need take into consideration the Government directive of demand reduction from conservation? If not, why not?

Response

Yes. Please refer to the response to Energy Probe Interrogatory 16.

Ross OPA INTERROGATORY #8 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 1 / P4-end
Ref. Exh. B / T 6/ S5 / Appendix 7

Issue Number: 1 Project Need and Justification
Issue1.2:
Does the project qualify as a non-discretionary project as per the OEB's Filing Requirements for Transmission and Distribution Applications and if so what categories of need as referred to in Section 5.2.2 of these Filing Requirements are relevant?

Preamble:

In the OPA Analysis of Need for Proposed Facilities, the document states that the project as proposed by the Applicant is non-discretionary because the "proposed facilities are needed to achieve objectives of the Government of Ontario that are prescribed in the directives referred to in Section 1 – Background", namely the June 13, 2007 directive letter.

If so, how does the OPA factor this into its analysis of need for the project?

Response

Please refer to the response to Energy Probe Interrogatory 16.

Ross OPA INTERROGATORY #9 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 2

What caused the delay between the signing of the contract with Bruce and the letter to HONI advising that "action must be urgently taken to ensure that there is adequate system capacity to permit all available generation in the Bruce area to be transmitted"?

Response

The first Bruce refurbishment contract was executed in October 2005. From that time forward, OPA reviewed the amount and timing of forecast incremental generation from the Bruce Area, which included wind resources. Forecast wind potentials in the Bruce Area were reconsidered between October 2005 and November 2006.

These variations impacted transmission transfer capability requirements from the Bruce Area and the options that could ultimately meet these requirements. For example, the Bruce to Essa Option was considered at one time to be a reasonable alternative in order to meet the increased generation from the Bruce Power refurbished nuclear units and the committed wind (approximately 2200 MW total). However, subsequent studies and directions from the Government of Ontario (i.e. June 13 2006 directive letter) in regard to aggressive development of renewable resources led to the identification and planning for an additional 1000 MW of wind resources from the Bruce Area.

In the fall of 2006 OPA issued its series of Discussion Papers which incorporated the results and directions noted above. Following this process, OPA determined the overall transmission transfer capability requirements out of the Bruce area as outlined in its letter to Hydro One dated December 22, 2006. At this time the IESO was also undertaking technical studies to determine the system capabilities of the identified alternatives. In March 23, 2007 OPA urged Hydro One to initiate and proceed with the necessary planning and approval processes to have the Bruce to Milton Project in-service by December 2011.

Based on the foregoing, there was no delay associated with the process.

Ross OPA INTERROGATORY #10 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 2

What if all available generation in the Bruce area is not required to meet the need of ratepayers?

Response

All generation in the Bruce Area is expected to be lowest marginal cost base load generation and is expected to be transmitted throughout the year regardless of changes in demand.

Ross OPA INTERROGATORY #11 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 2

What happens to the energy generated if question 10 becomes a reality?

Response

Please refer to the response to Ross Firm Group Interrogatory 10.

Ross OPA INTERROGATORY #12 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 2

Isn't a directive of the Government to ensure that question 10 becomes a reality?

Response

The OPA is unaware of any stated Government objective to ensure that "all available generation in the Bruce area is not required to meet the need of ratepayers.

Ross OPA INTERROGATORY #14 List 1

Interrogatory

3.0 Near Term and Interim Measures

3.1 Are the proposed near term and interim measures as outlined in the application appropriate?

Please define the "increased risk to the security and reliability of the power system" created by the long-term use of the interim measures referred to at page 3 of the December 22, 2006 letter to HONI.

Response

Please refer to the response to Board Staff Interrogatory 3.2.

Ross OPA INTERROGATORY #15 List 1

Interrogatory

3.0 Near Term and Interim Measures

3.1 Are the proposed near term and interim measures as outlined in the application appropriate?

Further at page 3, with regard to series compensation, please articulate how the OPA defines "a new technology for Ontario".

Response

This Interrogatory refers to "page 3" but did not indicate the reference document.

Nevertheless, for the purpose of responding to this Interrogatory, the OPA defines "a new technology for Ontario" as pertaining to the use of equipment, systems or applications for which there has been: (a) no similar installation or working experience of such technology in Ontario, (b) no accepted standards developed for such technology and specifically for Ontario conditions and requirements, or (c) an expansion of a technology for a specific application but that has not yet been demonstrated to be commercially viable. OPA's, along with Hydro One's and IESO's concerns with the use and application of "new technology" under these circumstances include matters of reliability and the durability on a sustained basis under Ontario-specific conditions, the feasibility in addressing the need once installed, and the complexity and possible changes required to other facilities in integrating the "new technology" into the Ontario power grid.

Ross OPA INTERROGATORY #16 List 1

Interrogatory

3.0 Near Term and Interim Measures

3.1 Are the proposed near term and interim measures as outlined in the application appropriate?

Please state the significance of the series compensation technology being new for Ontario, in light of its continued and extensive use in other analogous systems throughout North America.

Response

Series compensation has not been used in Ontario to date. However, it has been used in other jurisdictions. The OPA is of the view that the application of series compensation in the Bruce Area must be considered carefully before any implementation, from both equipment and system integration perspectives. This view results from the complexity of the Bruce and Southwestern Ontario transmission system and its criticality to the entire interconnected transmission grid. Please refer to the due diligence study report attached to the response to Pappas Interrogatory 6, and to the response to Board Staff Interrogatory 3.2.

Ross OPA INTERROGATORY #17 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 4
2.0 Project Alternatives
2.1 Have all reasonable alternatives to the project been identified and considered?

Please provide all legal opinions, reports, internal memos and discussion papers dealing with the provincial land use policy referred to at page 3 of the March 23, 2007 letter to HONI.

Response

Hydro One in consultation with the OPA has declined to respond to this Interrogatory. Please refer to correspondence on behalf of Hydro One dated March 13, 2008.

Ross OPA INTERROGATORY #18 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 4
2.0 Project Alternatives
2.1 Have all reasonable alternatives to the project been identified and considered?

In the absence of OPA's interpretation of the provincial land use policy, would other options, on their face, have been acceptable to meet the need as articulated by the OPA? If not, why not?

Response

Yes. If there was no provincial land use policy at all, other reasonable alternatives may have been investigated that considered or met the identified need for incremental transfer capability. However, in terms of evaluating other identified alternatives, the ability and timeliness to meet the level of need, as well as consideration of the other evaluation criteria described during Day 1 of the Technical Conference (see Exhibit KT.1 slide 28) would remain relevant to that exercise.

Ross OPA INTERROGATORY #19 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 4
2.0 Project Alternatives
2.1 Have all reasonable alternatives to the project been identified and considered?

If so, please provide those alternatives.

Response

Hydro One and the OPA do not know of other interpretations of the government's land-use policy. If no land use policy existed, and greenfield rights-of-way were considered equally acceptable to the widening of existing transmission corridors, then the Bruce to Kleinburg to Claireville and the Bruce to Creiff TS alternatives may have been given further consideration. However, timeliness to meet the need (as well as overall cost) would remain as important evaluation criteria. Greenfield projects would likely require longer environmental assessment processes and also the acquisition of more land interests. Please refer to OPA's response to Ross-OPA Interrogatory 18 and Board Staff Interrogatory 2.9(v).

Ross OPA INTERROGATORY #20 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 5

Preamble:
At page 43 of the IPSP discussion paper the OPA takes the position that the maximum current transmission capacity from the Bruce is 5000MW. At page 41 the OPA takes the position that the current generation out of the Bruce is 5060MW.

Is it the position of the OPA that there is currently not enough transmission capacity to meet the current generation capacity from the Bruce?

Response

Current transmission capability just meets the current generation resources from the Bruce Area. Commencing in 2009 there will be insufficient transmission capability to meet the forecast generation resources of the Bruce Area. Please refer to Exhibit B Tab 1 Schedule 1 and the Day 1 Technical Conference Presentation (Exhibit KT.1 slide 23) and the response to Energy Probe Interrogatory 21.

Ross OPA INTERROGATORY #21 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 5

Preamble:
At page 43 of the IPSP discussion paper the OPA takes the position that the maximum current transmission capacity from the Bruce is 5000MW. At page 41 the OPA takes the position that the current generation out of the Bruce is 5060MW.

Has the transmission capacity from the Bruce area decreased over the last 20 years? If so, how?

Response

Please refer to the response to Board Staff Interrogatory 1.3.

Ross OPA INTERROGATORY #22 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 5

Preamble:
At page 43 of the IPSP discussion paper the OPA takes the position that the maximum current transmission capacity from the Bruce is 5000MW. At page 41 the OPA takes the position that the current generation out of the Bruce is 5060MW.

Does the OPA estimate the wind generation to meet the committed targets ever?

Response

Yes, the OPA forecasts that all committed wind generation should be in-service by 2009.

Ross OPA INTERROGATORY #23 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 5

Preamble:
At page 43 of the IPSP discussion paper the OPA takes the position that the maximum current transmission capacity from the Bruce is 5000MW. At page 41 the OPA takes the position that the current generation out of the Bruce is 5060MW.

What percentage output did the OPA estimate wind generation would achieve when making its assumptions regarding generation from the Bruce area?

Response

Please refer to the response to Board Staff Interrogatory 1.6.

Ross OPA INTERROGATORY #24 List 1

Interrogatory

Ref. Exh. B / T 6/ S5 / Appendix 5

Preamble:
At page 43 of the IPSP discussion paper the OPA takes the position that the maximum current transmission capacity from the Bruce is 5000MW. At page 41 the OPA takes the position that the current generation out of the Bruce is 5060MW.

Does the OPA contemplate a new nuclear generating facility in the Bruce area when supporting the need for the new 500kV line?

Response

Please refer to the responses to Energy Probe Interrogatory 6 and Board Staff Interrogatory 1.8.

Ross OPA INTERROGATORY #25 List 1

Interrogatory

2.0 Project Alternatives

2.1 Have all reasonable alternatives to the project been identified and considered?

Preamble:

At page 48 of the IPSP Discussion Paper, the OPA states that the transmission needs could be met by reinforcing "the 'indirect' path through London by building a second line from London to Middleport or Nanticoke".

What would be approximate cost of implementing the 'London option' be?

Response

Please refer to the response to Board Staff Interrogatory 2.6.

Ross OPA INTERROGATORY #26 List 1

Interrogatory

2.0 Project Alternatives

2.1 Have all reasonable alternatives to the project been identified and considered?

Preamble:

At page 48 of the IPSP Discussion Paper, the OPA states that the transmission needs could be met by reinforcing "the 'indirect' path through London by building a second line from London to Middleport or Nanticoke".

What are the technical complications of the 'London option'?

Response

The 'London Option' does not meet the identified transfer capability need. In addition, it increases flow on a path that is also utilized to transfer power between the areas east and west of London. Please refer to Day 1 Technical Conference Presentation (Exhibit KT.1 slides 4 to 10 and 29 to 31 as well as Transcript pages 9 to 14 and 27 to 28).

Ross OPA INTERROGATORY #27 List 1

Interrogatory

Preamble:

"The London reinforcement alternative requires adding major reactive power support devices (series capacitors) as a part of the system reinforcement, just to have sufficient transfer capability for the eight Bruce units and 725 MW of wind generation."

Please provide all studies, reports, and opinions prepared, referred to, or relied upon in coming to the above-quoted conclusion.

Response

The statement quoted in the Preamble is from the OPA's Discussion Paper #5. That Discussion Paper considered a "London" option that duplicates the existing 500 kV transmission along this path, i.e. a double-circuit 500 kV line from Bruce to Longwood and a single-circuit 500 kV line from Longwood to Nanticoke. That option was found to have insufficient transfer capability for the eight Bruce units and 725 MW of committed wind generation in the Bruce Area. OPA judged that employing series compensation could increase the transfer capability of this option to that generation level, but that would still be 1,000 MW short of the transfer capability required to address the need identified. For this reason, technical studies were not performed to assess this option further.

The "London" option under consideration in the current proceeding now assumes a double-circuit 500 kV between Longwood and Middleport rather than a single-circuit line. Even with the additional circuit between Longwood and Middleport, this option does not have the transfer capability to meet the need. The technical assessment of this "London option" is summarized in the responses to Board Staff Interrogatory 2.6 and Pollution Probe Interrogatory 39.

Ross OPA INTERROGATORY #28 List 1

Interrogatory

3.0 Near Term and Interim Measures

3.1 Are the proposed near term and interim measures as outlined in the application appropriate?

Preamble:

At page 52 of the IPSP Discussion Paper, the OPA suggests that a "third interim measure is to restrict further generation development in the Bruce area".

In light of the proposal for further nuclear generation in the Bruce area, is the above interim measure still considered viable to OPA?

Response

The third interim measure is an interim measure meant to only be used as a stop-gap measure to prevent congestion until the proposed Bruce to Milton line is in-service. Only generation resources beyond those already committed (e.g. Bruce A refurbishment, committed wind generation from RES I and RES II) are restricted by this interim measure. Please refer to Day 1 Technical Conference Presentation (Exhibit KT.1 slides 40 and 41 and Transcript pages 33 to 35).

Ross OPA INTERROGATORY #29 List 1

Interrogatory

3.0 Near Term and Interim Measures

3.1 Are the proposed near term and interim measures as outlined in the application appropriate?

Preamble:

At page 52 of the IPSP Discussion Paper, the OPA suggests that a "third interim measure is to restrict further generation development in the Bruce area".

Was the OPA aware of the Bruce application for new generation facilities at the time of preparing the IPSP report?

Response

No.