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Susan Frank

Vice President and Chief Regulatory Officer
Regulatory Affairs



BY COURIER

April 8, 2009

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

Dear Ms. Walli:

EB-2009-0078 – Hydro One Networks' Section 92 Bruce – Lower Mattagami Transmission Reinforcement Project– Application and Evidence Filing

I am attaching three (3) copies of the Hydro One Networks' Application and Prefiled Evidence in support of an Application pursuant to Section 92 of the Ontario Energy Board Act for leave to construct a second 230 kV transmission line from Harmon Junction to Kipling GS.

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

Hydro One Networks' contacts for service of documents associated with this Application are listed in Exhibit A, Tab 2, Schedule 1.

Sincerely,

ORIGINAL SIGNED BY SUSAN FRANK

Susan Frank

Attach.

EXHIBIT LIST

1
2

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ONTARIO ENERGY BOARD

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

And in the matter of an Application by Hydro One Networks Inc. for an Order or Orders granting leave to construct a transmission line addition in the Lower Mattagami region of Ontario (the “Lower Mattagami Generation Connection Project” or the “Project”).

APPLICATION

1. The Applicant is Hydro One Networks Inc. (“Hydro One”), a subsidiary of Hydro One Inc. The Applicant is an Ontario corporation with its head office in the City of Toronto. Hydro One carries on the business, among other things, of owning and operating transmission facilities within Ontario.
2. Hydro One hereby applies to the Ontario Energy Board (the Board) pursuant to section 92 of the *Ontario Energy Board Act, 1998* for an order or orders granting leave to construct a second transmission circuit as an addition to the existing single circuit transmission line in the Lower Mattagami region. This addition is required to improve the reliability and quality of electricity service by adding a second 230 kV three phase transmission circuit to the same 4.56 kilometer section of line H22D from Harmon Junction to Kipling GS. Currently there is only one radial circuit from Harmon Junction to Kipling GS; loss of this circuit will result in loss of power supply from Kipling GS. The additional circuit also increases the capacity of the existing circuit to add new generation to the system.

1 3. The need for the proposed addition of a second 230 kV three phase transmission
2 circuit in the Lower Mattagami region arises from the planned addition of new
3 hydraulic generation at Kipling GS and the need to improve the reliability and quality
4 of electricity service in the area. A single contingency on the existing line section
5 would result in generation supply loss, since the existing line section is the only
6 single element on the local transmission system. The need for the project is described
7 in detail in Exhibit B, Tab 1, Schedule 4. The proposed addition is to be financially
8 supported by Ontario Power Generation ("OPG") by means of a capital contribution
9 consistent with the *Transmission System Code*. The target in-service date is June
10 2013. Although construction is not scheduled to begin until September 2012, Hydro
11 One is seeking approval at this time in order to facilitate timely and orderly planning
12 of the project. For that reason, and to allow for minor schedule delays, Hydro One is
13 requesting that the standard Condition of Approval related to the start of construction
14 be dated to December 2012.

15
16 4. In addition to the planned expansion of Kipling GS, OPG is also planning to install
17 additional generation at the Harmon, Little Long, and Smokey Falls generating
18 stations on the Lower Mattagami system. As part of these additional generation
19 projects OPG plans to construct 4 kilometres of 230 kV line. It is Hydro One's
20 understanding that OPG will file a Leave to Construct application with the Ontario
21 Energy Board for this project at a later date. It should be noted that the two Leave to
22 Construct projects (Hydro One's and OPG's) are independent projects. Information
23 about OPG's plan is provided for information purposes only.

24
25 5. The IESO has carried out its System Impact Assessment (SIA) of the proposed
26 addition in accordance with the Grid Connection Requirements of the Market Rules
27 and the associated IESO Connection Assessment and Approval Process. The IESO's

1 SIA indicates that Hydro One's proposed transmission solution is adequate and does
2 not adversely impact the IESO-controlled grid.

3
4 6. Hydro One has completed a Customer Impact Assessment ("CIA") in accordance
5 with its customer connection procedures, and preliminary results confirm there are no
6 adverse impacts on transmission customers as a result of this project. The document
7 is filed as Exhibit B, Tab 6, Schedule 4.

8
9 7. The necessary land rights (easements) for the project consist of existing easement
10 rights Hydro One holds on the provincially-owned corridor lands, as well as
11 permanent easements rights on private property. No new land rights beyond
12 temporary access rights are needed to construct the required line and station facilities.
13 A map showing the general location of the proposed transmission facilities may be
14 found in Exhibit B, Tab 2, Schedule 2.

15
16 8. Based on an Environmental Assessment Report for a predecessor project that was
17 filed with the Ministry of Environment in 1990 and approved in 1994, there are no
18 requirements for the current project under the Environmental Assessment Act.
19 However, Hydro One will complete an environmental screening for due diligence
20 purposes for this project. This screening is being undertaken and will be completed
21 in April 2009 at which time the Ministry of Environment will be notified.

22
23 9. Hydro One has notified stakeholders and local First Nations and Metis communities
24 that may have an interest in this proposed line addition. Hydro One will ensure
25 stakeholders' issues are addressed. Hydro One will continue to inform area elected
26 officials, and relevant provincial government ministries and agencies of the project
27 status. During the construction and commissioning stages of the proposed addition,

1 Hydro One will consult with the local community and other interested stakeholders to
2 ensure potential concerns are addressed.

3
4 10. This Application is supported by written evidence. This evidence includes details of
5 the Applicant's proposal for the construction of the proposed transmission line
6 facilities. The written evidence is pre-filed as attached and may be amended from
7 time to time, prior to the Board's final decision on this Application. Further, the
8 Applicant may seek meetings with Board Staff and intervenors in an attempt to
9 identify and reach agreements to settle issues arising out of this Application.

10
11 11. Hydro One requests a written hearing for this proceeding.

12
13 12. Hydro One requests that a copy of all documents filed with the Board be served on
14 the Applicant and the Applicant's counsel, as follows:

15
16
17 a) The Applicant:

18
19 Mr. Glen MacDonald
20 Senior Advisor - Regulatory Research and Administration
21 Hydro One Networks Inc.

1 Mailing Address: 8th Floor, South Tower
2 483 Bay Street
3 Toronto, Ontario
4 M5G 2P5
5
6 Telephone: (416) 345-5913
7 Fax: (416) 345-5866
8 Electronic access: glen.e.macdonald@HydroOne.com
9

10 b) The Applicant's counsel:

11
12 Michael Engelberg
13 Assistant General Counsel
14 Hydro One Networks Inc.
15

16 Mailing Address: 15th Floor, North Tower
17 483 Bay Street
18 Toronto, Ontario
19 M5G 2P5
20

21 Telephone: (416) 345-6305
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23 Electronic access: mengelberg@Hydroone.com

SUMMARY OF PREFILED EVIDENCE

Hydro One Networks Inc. (“Hydro One”) has applied to the Board for an order granting leave to construct a second circuit on an existing transmission line in the Lower Mattagami region of Ontario pursuant to Section 92 of the *OEB Act, 1998* (the “*OEB Act*”).

The proposed addition to be constructed, owned and operated by Hydro One includes:

Line Facilities

- Install a second approximately 4.56 km 230 kV three phase transmission circuit and support arms from Harmon Junction to Kipling GS on existing structures
- Modify 11 existing towers and rebuild 2 anchor towers

The planned in-service date for the proposed facilities is June 2013. A map showing the location of the proposed addition is provided in Exhibit B, Tab 2, Schedule 2.

The proposed addition is in the public interest because it satisfies the needs summarized below:

- it will maintain and improve reliability of electricity supply from Kipling GS with the availability of a second circuit.
- it will not have a material impact on the price of electricity as the project is being undertaken at Ontario Power Generation’s (“OPG”) request and OPG is expected to pay for all costs of the project via a capital contribution as per the requirements of the Transmission System Code.

- as a secondary benefit it will provide additional transmission capacity for added generation from the Lower Mattagami region.

The Independent Electricity System Operator (“IESO”) carried out a System Impact Assessment (“SIA”) of the proposed addition in accordance with the Grid Connection Requirements of the Market Rules and the associated IESO Connection Assessment and Approval Process. The IESO’s SIA for this project, filed as Exhibit B, Tab 6, Schedule 3, confirms the need for this project. The report states that this project meets the objective of the SIA and that Hydro One’s proposed transmission solution is adequate and will not adversely impact the IESO Controlled Grid.

Hydro One has completed a Customer Impact Assessment (“CIA”) in accordance with its customer connection procedures, and preliminary results confirm there are no adverse impacts on transmission customers as a result of this project. The document is filed as Exhibit B, Tab 6, Schedule 4.

The total cost of the project is estimated to be \$4.3 million. The proposed second circuit is a Line Connection pool asset with the cost to be funded by customer capital contributions as required. Details of the project economics are filed in Exhibit B, Tab 4, Schedule 3.

The second circuit is being installed on existing structures and is designed in accordance with good utility practice and meets the requirements of the Transmission System Code for licensed transmitters in Ontario.

Hydro One has notified stakeholders in the Lower Mattagami region of the proposed addition. Hydro One will hear stakeholder concerns and ensure they are addressed, as

1 well as ensure that public authorities are kept informed of the project status. Details
2 regarding the consultation process are filed in Exhibit B, Tab 6, Schedule 7.

3
4 An Environmental Assessment Report was submitted to the Ministry of the Environment
5 for the predecessor “Hydroelectric Generating Station Extensions Mattagami River” and
6 approved in 1994. There was no expressed opposition to the project and all concerns
7 were satisfactorily resolved. There are no requirements under the *Environmental*
8 *Assessment Act*; however, Hydro One is undertaking an environmental screening for due
9 diligence purposes. This screening will be completed in April 2009 at which time it will
10 be submitted to the Ministry of Environment.

11
12 A letter of support for the proposed addition, including a commitment of the required
13 capital contribution, has been obtained from Ontario Power Generation Inc. (“OPG”) and
14 is filed as Exhibit B, Tab 6, Schedule 2.

15
16 A detailed construction schedule is filed as Exhibit B, Tab 5, Schedule 2. This schedule
17 assumes Board leave to construct under Section 92 of the *OEB Act* by December 2009.
18 Although construction is not scheduled to begin until Sept. 2012, Board approval is being
19 sought at this time to facilitate timely and orderly planning of the project. Given the
20 timing of construction, Hydro One is requesting that the standard Condition of Approval
21 related to the start of construction be dated to Dec.2012.

22
23 Hydro One requests a written hearing for this proceeding and submits that the evidence
24 supports granting the requested Order based on the following grounds:

- 25
26 • The need for an additional circuit has been established;
27 • The project is supported by and will be funded by OPG;
28 • The need for the project is endorsed by the IESO;

- 1 • The project will increase the capacity of the transmission system and enhance
- 2 reliability and adequacy of supply;
- 3 • There are no adverse system or customer impacts from the project;
- 4 • The project is fully compliant with the relevant codes, rules and licences.

5

6 For the reasons provided in support of this Application, Hydro One respectfully submits
7 that the proposed addition is in the public interest and should be approved under Section
8 92 of the *OEB Act*. Accordingly, Hydro One requests an Order from the Board pursuant
9 to Section 92 of the *OEB Act* by December 2009, granting leave to construct the proposed
10 transmission line addition.

Filed: April 8, 2009
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Exhibit A
Tab 4
Schedule 1
Page 1 of 1

1 **PROCEDURAL ORDERS / AFFIDAVITS / CORRESPONDENCE**

Filed: April 8, 2009
EB-2009-0078
Exhibit A
Tab 5
Schedule 1
Page 1 of 1

NOTICES OF MOTION

PROJECT LOCATION AND EXISTING TRANSMISSION SYSTEM

1.0 PROJECT LOCATION

The study area addressed by this project is located in the Cochrane District approximately 65 km North-East of the town of Kapuskasing. The four existing generating plants, Kipling GS, Harmon GS, Smokey Falls GS, and Little Long GS, which are part of the project and the associated transmission lines are located within an area of roughly 17 km (North-South) by 5 km. The four generating stations are part of the Lower Mattagami river system. The capacity of these generating stations is being expanded giving rise to the need for additional transmission capacity.

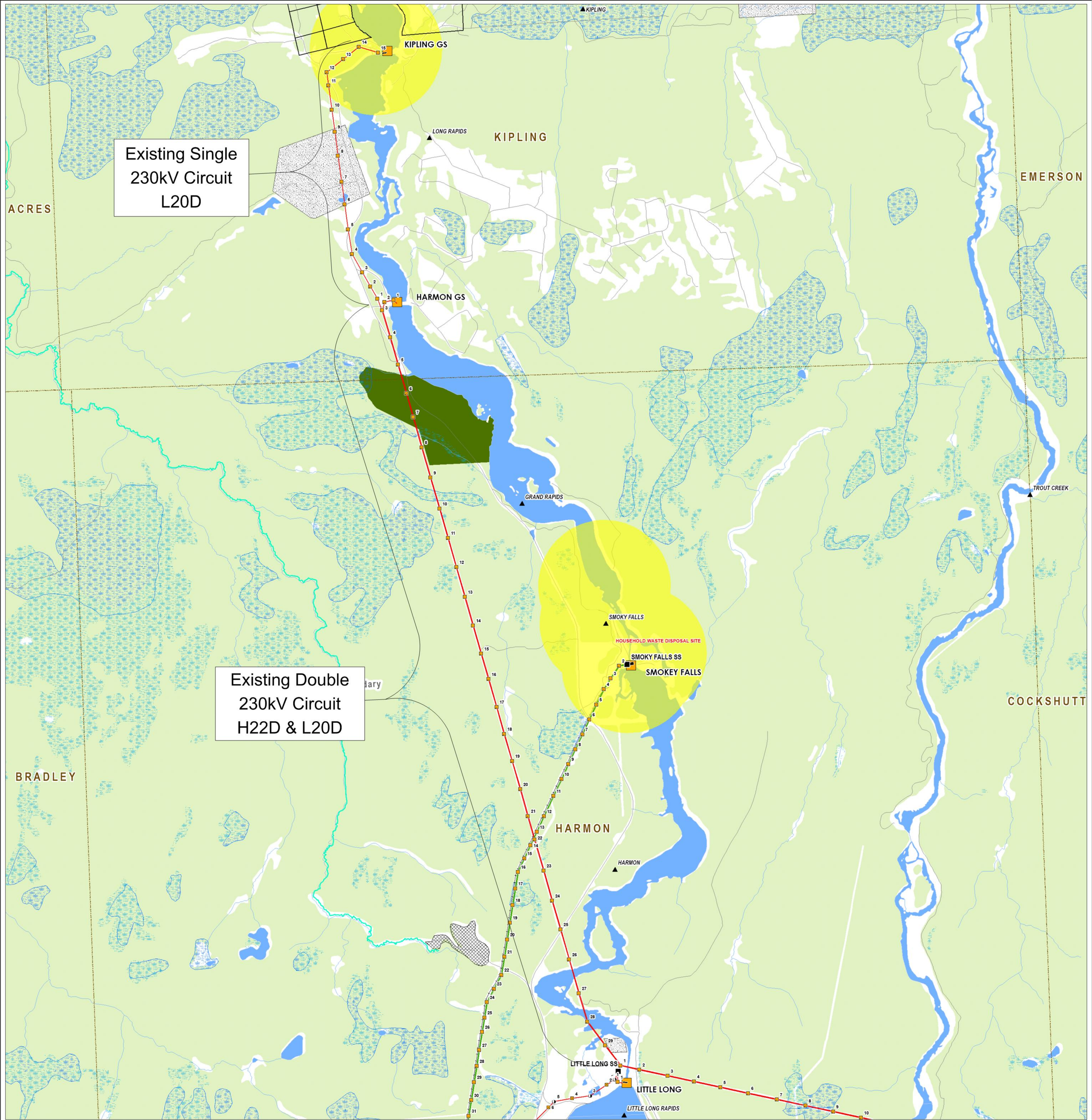
A map of the existing transmission facilities is provided in Exhibit B, Tab 1, Schedule 2, and a schematic electrical diagram of the existing facilities is provided in Exhibit B, Tab 1, Schedule 3.

2.0 EXISTING TRANSMISSION FACILITIES

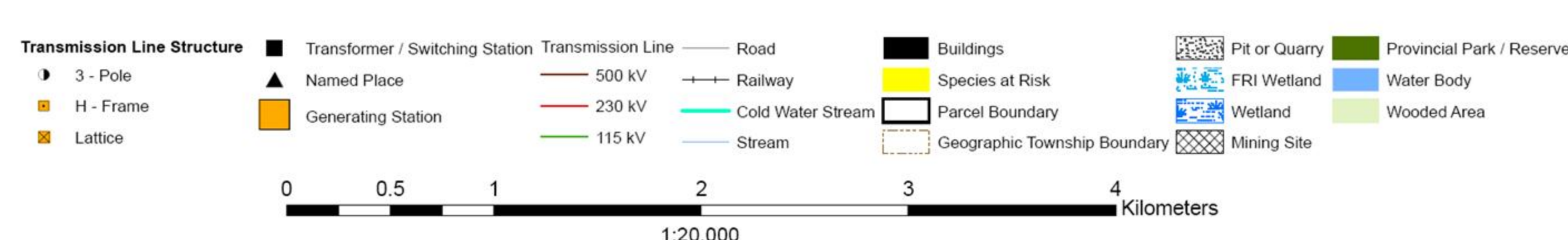
There are no load customers in the area covered by this project. There is a single circuit 230 kV line (L20D) from Kipling GS to Harmon JCT. Little Long GS and Harmon Junction GS are currently connected to the system via the L20D and H22D. Two 115 kV lines (S3S and S4S) connect Smoky Falls GS to Tembec Kapuskasing CTS.

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Exhibit B
Tab 1
Schedule 2
Page 1 of 2

MAP OF EXISTING FACILITIES



Mattagami Extension - Site District 3E -



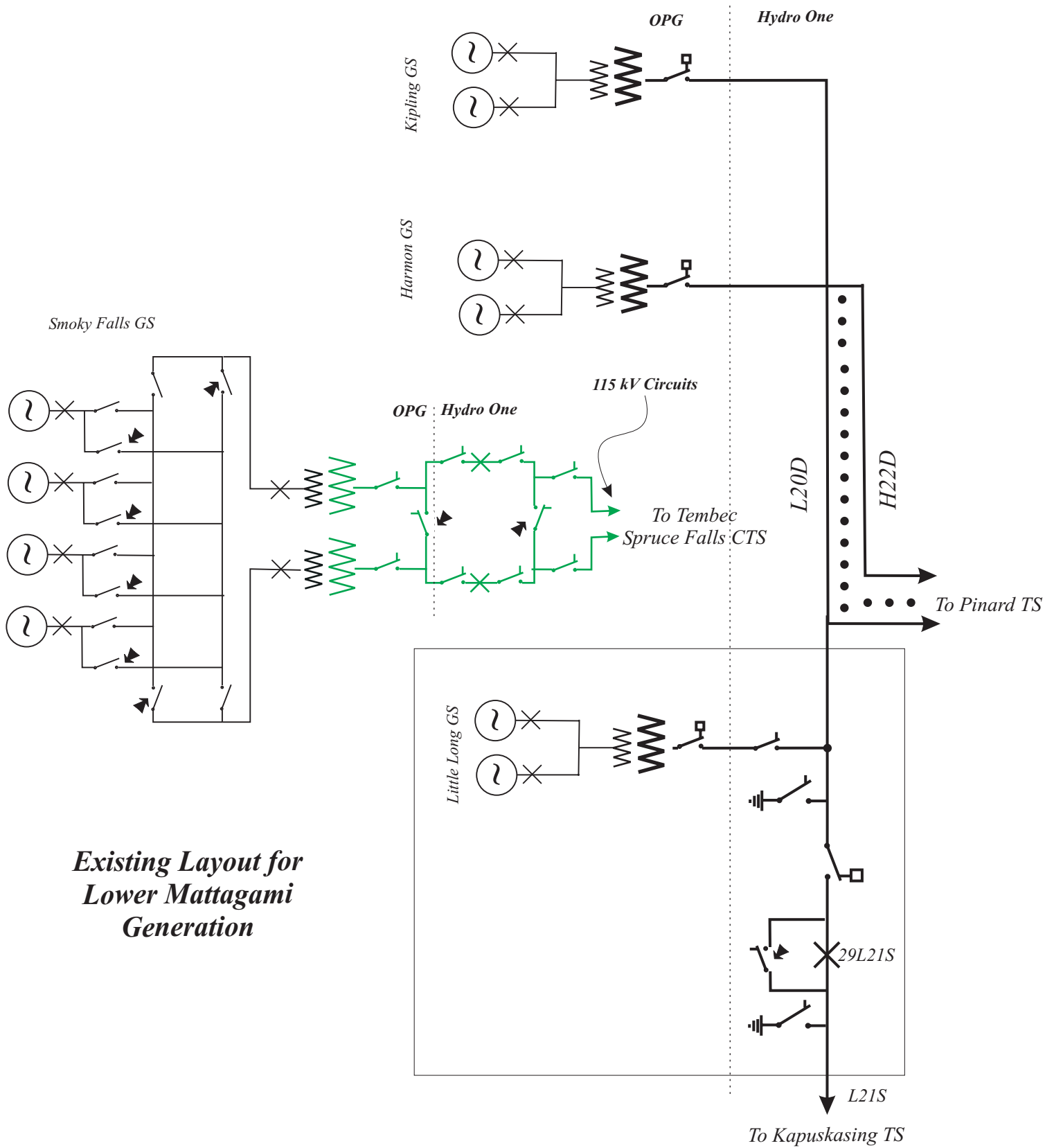
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Inergi LP
Date: February 2007
File #: Map07-36_v4

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SCHEMATIC DIAGRAM OF EXISTING FACILITIES



NEED FOR THE PROPOSED FACILITIES

1.0 BACKGROUND

This Schedule describes the need to reinforce transmission system along the Lower Mattagami to meet the increased electricity generation in the area. The existing facilities are described in Exhibit B, Tab 1, Schedule 1.

Ontario Power Generation is planning to expand its generation facilities in the Lower Mattagami to the levels provided in Table 1.

Table 1: Existing and Proposed Lower Mattagami Generation Facilities

Station	Existing		Proposed		Increase
	Number of Units	Total Output (MW)	Number of Units	Total Output (MW)	Total Output (MW)
Little Long GS	2	136	3	210	74
Harmon GS	2	140	3	234	94
Kipling GS	2	158	3	237	79
Smoky Falls GS	4	52	3	258	206
Total		486		939	453

The purpose of the subject project is to provide additional capacity and reliability for the additional generation of 79 MW at Kipling G.S. Although the existing single circuit 230 kV L20D line can accommodate the additional generation, OPG has requested the second circuit to be added for improved supply reliability. As indicated in Exhibit B, Tab 4,

Schedule 3, OPG is expected to provide a 100% capital contribution towards the cost of the project as per the Transmission System Code requirements.

2.0 INVESTMENT CLASSIFICATION

This is a non-discretionary connection project as per the Board's *Minimum Filing Requirements for Transmission and Distribution Rate Applications and Leave to Construct Projects EB-2006 0170*. The project is being undertaken at the generation customer's (OPG) request.

PROPOSED FACILITIES

In order to meet the need described previously in Exhibit B, Tab 1, Schedule 4, Hydro One facilities will be reinforced to increase the transmission capability and improving the reliability and operational flexibility of the power system.

Circuit H22D will be extended from Harmon Junction to Kipling Junction a distance of 4.56 km to allow the double circuit connection for Kipling GS.

The following is the specific work and facilities required by Hydro One to meet the new requirements:

Line Facilities

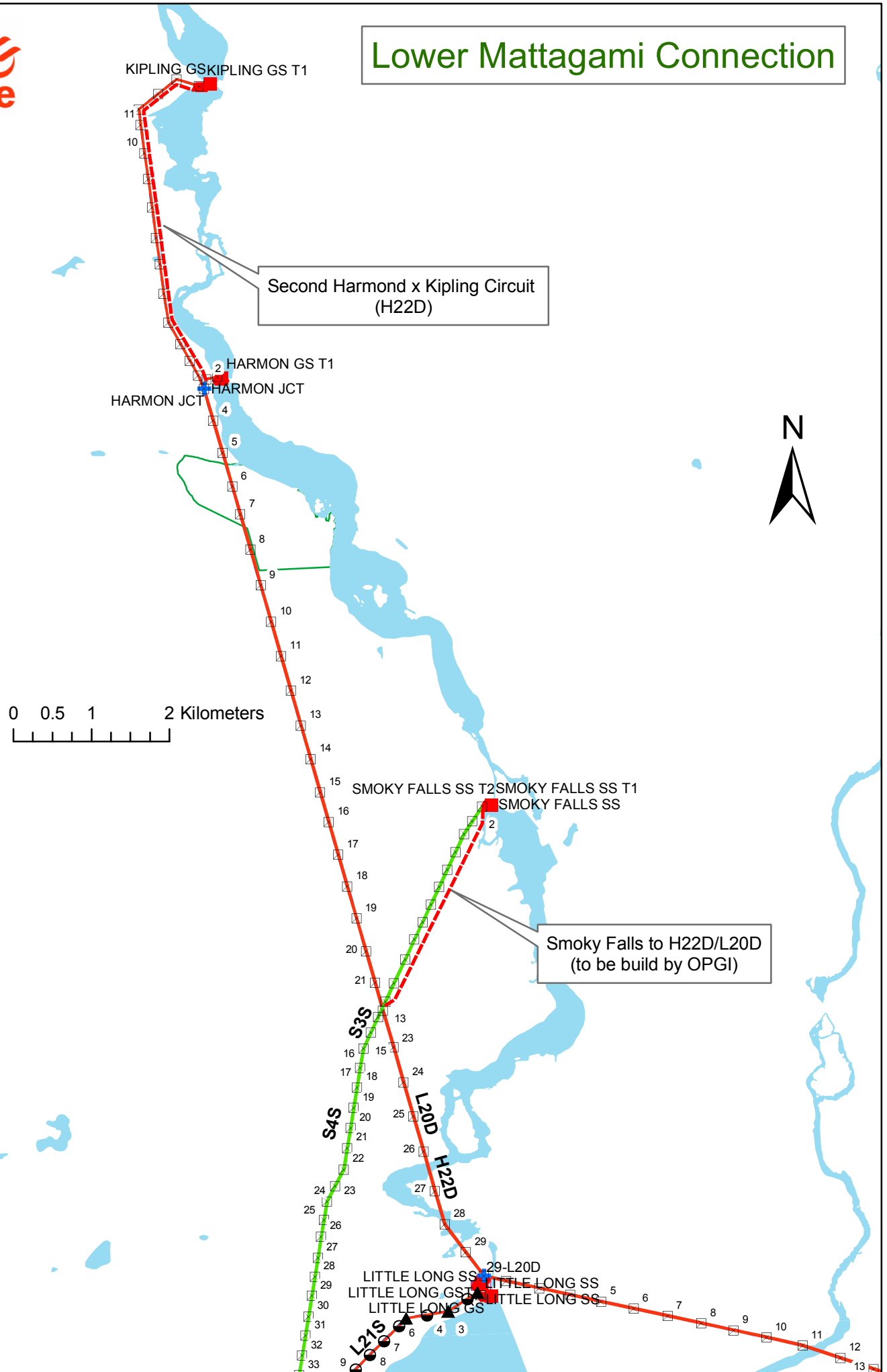
- Extend the 230 kV circuit H22D by 4.56 km from Harmon Junction to Kipling GS on the existing Right of Way. This would make the 230 kV line a double circuit from Kapuskasing TS to Kipling GS
- Modify 11 existing towers and rebuild 2 anchor towers

Station Work

- There are no network modifications or Hydro One owned station work required for this project. The new line will terminate in OPG owned facilities.

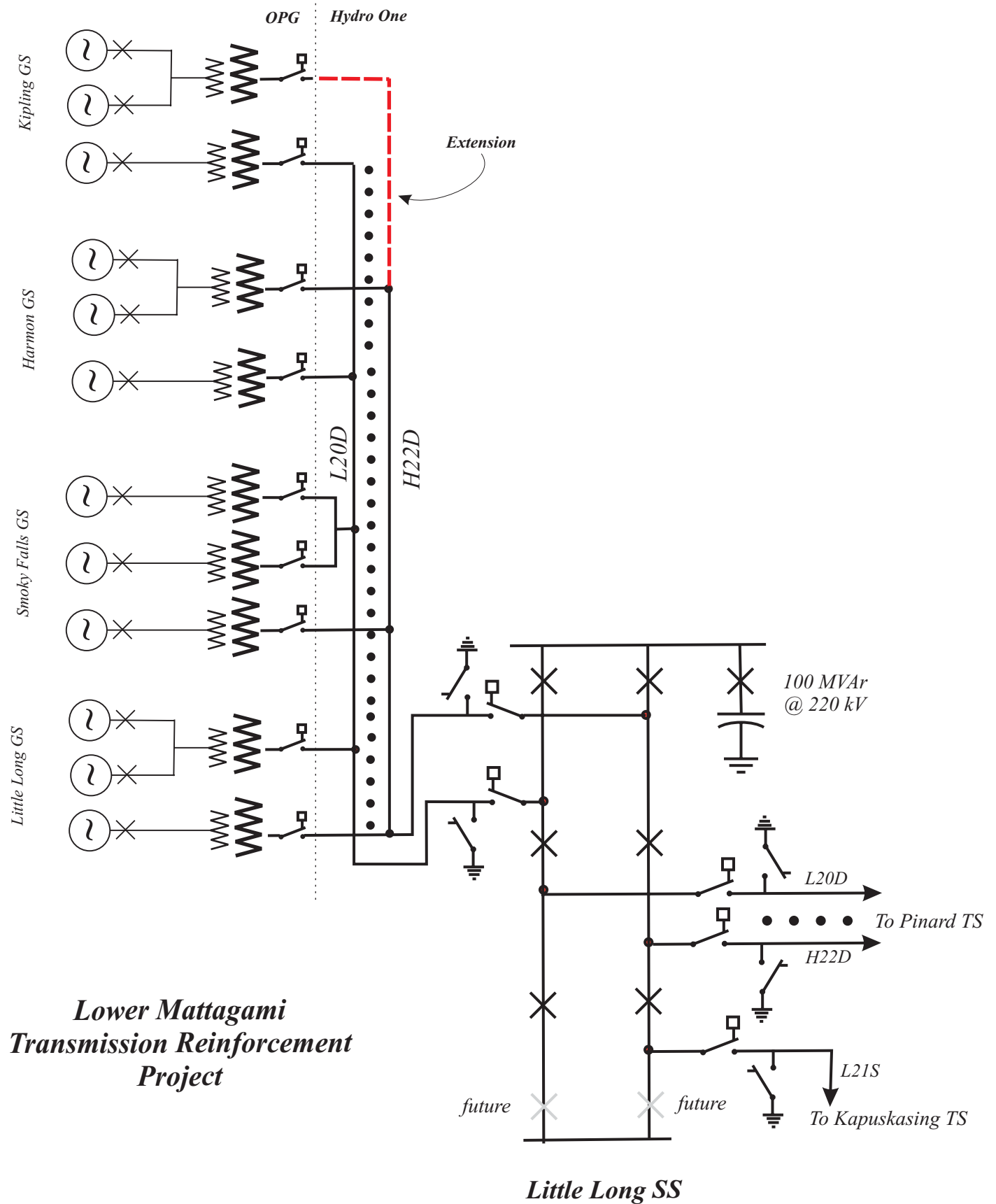
Filed: April 8, 2009
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Exhibit B
Tab 2
Schedule 2
Page 1 of 2

MAP OF PROPOSED FACILITIES



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Tab 2
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Page 1 of 2

SCHEMATIC OF PROPOSED FACILITIES



CROSS SECTION OF THE TOWER TYPES
(Existing and Proposed)

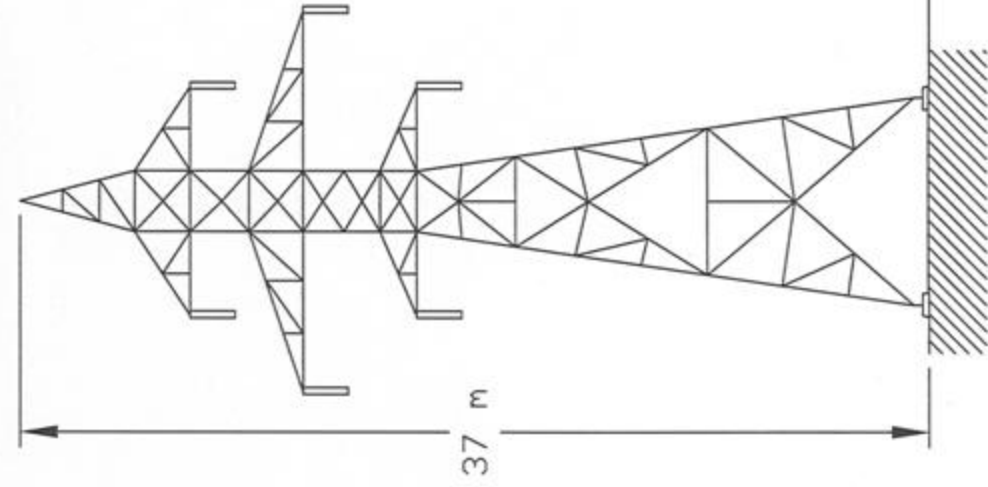
1
2
3
4
5
6

- Figure A: Two W1H towers to be replaced by X2H towers
Figure B: One W1M tower to be modified
Figure C: Ten W1S towers to be modified

FIGURE A

2 W1H TOWERS TO BE REPLACED BY X2H TOWERS

NEW X2H TOWER



W1H TOWERS
TO BE REMOVED

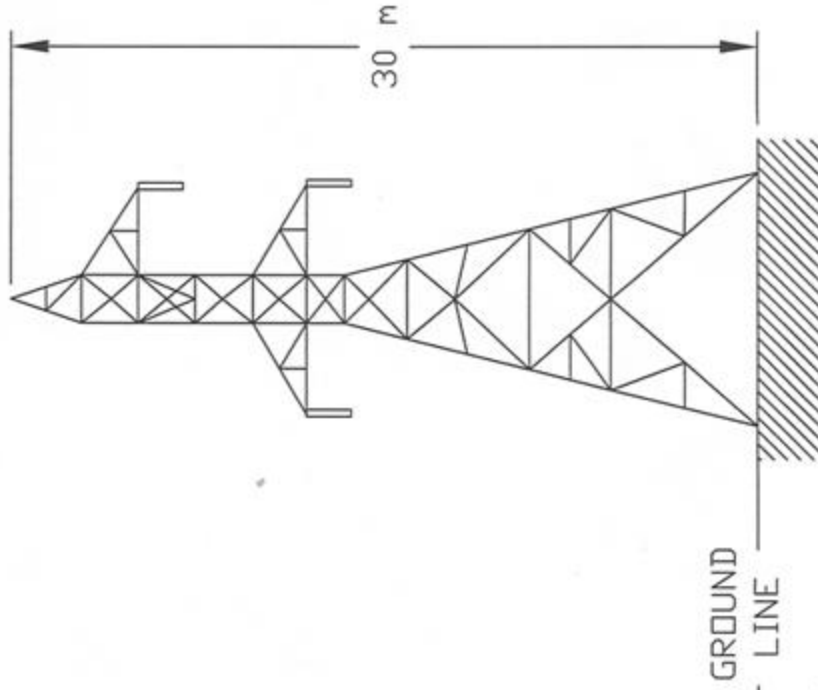
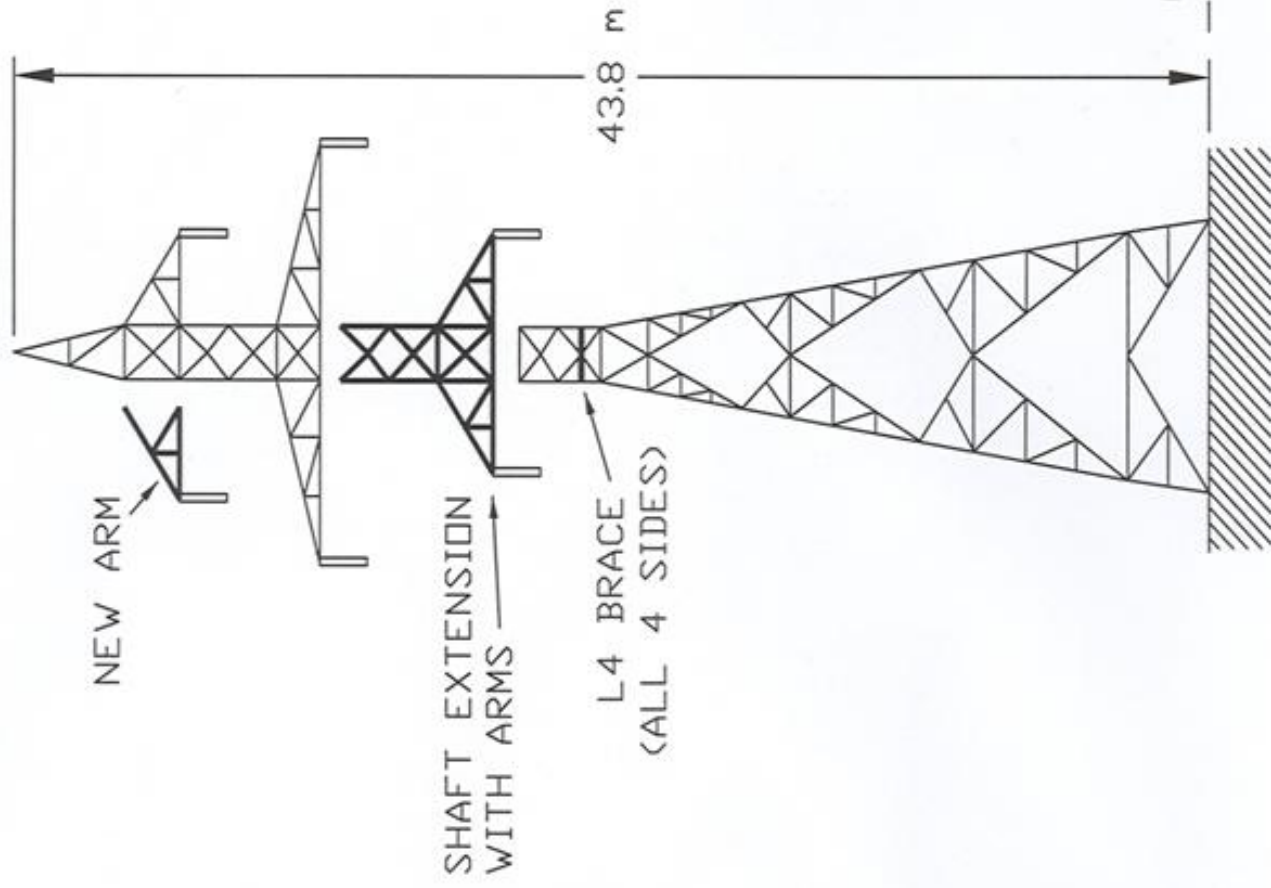


FIGURE B

ONE W1M TOWER TO BE MODIFIED

MODIFIED W1M TOWER



W1M TOWER
EXISTING DESIGN

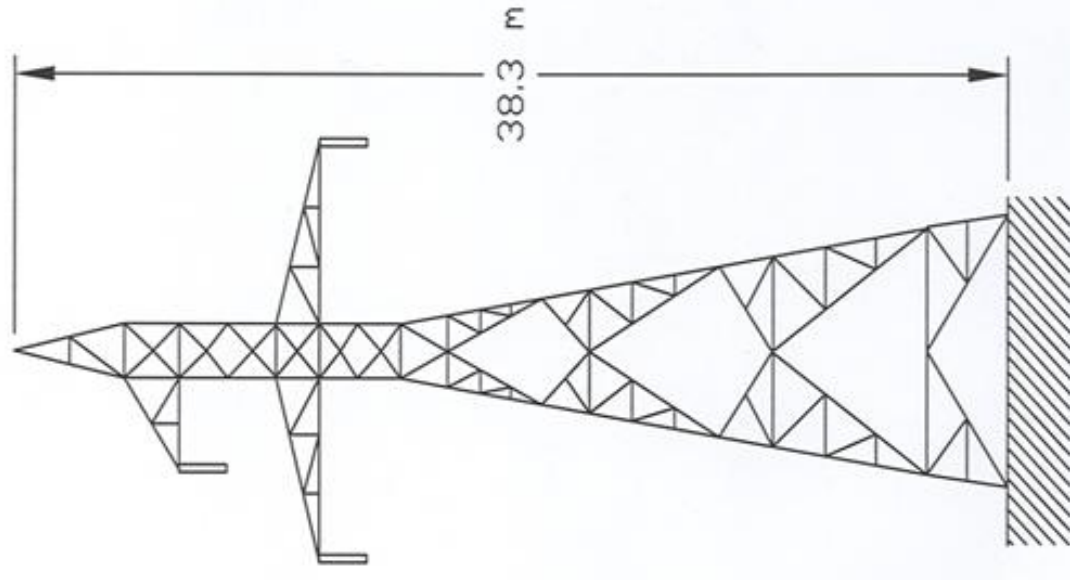
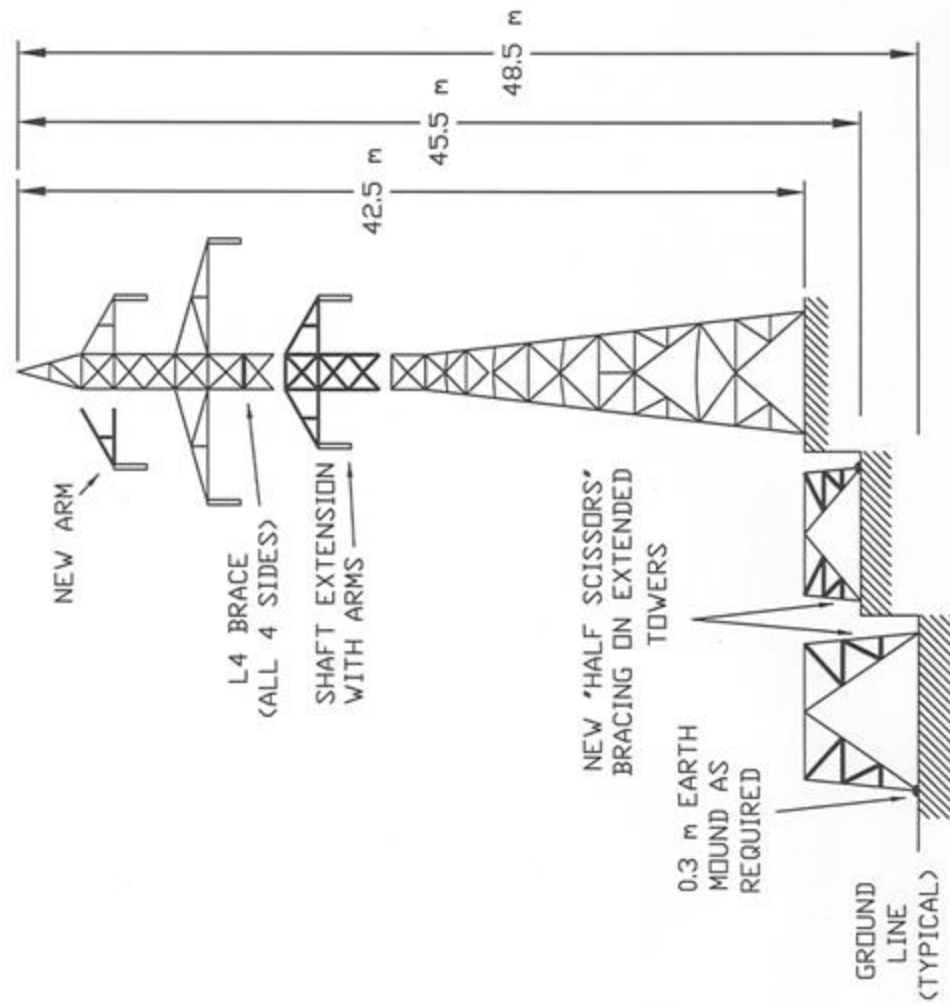
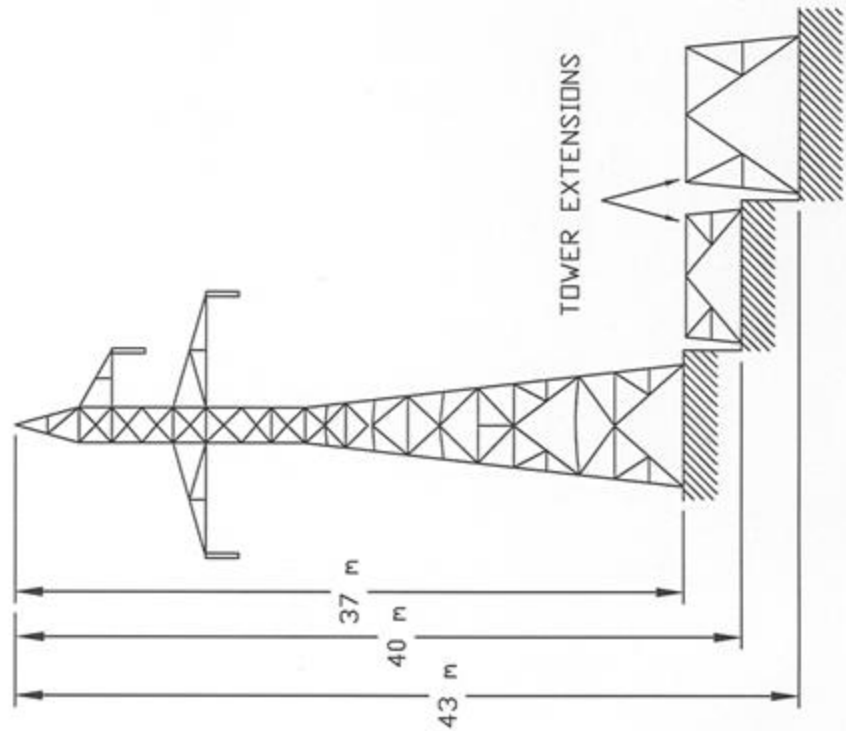


FIGURE C

TEN W1S TOWERS TO BE MODIFIED
 (SOME EXISTING FIELD DESIGNS INCORPORATE 3M OR 6M EXTENSIONS)
 MODIFIED W1S TOWER



W1S TOWER
 EXISTING DESIGNS



TRANSMISSION ALTERNATIVES CONSIDERED

1.0 TRANSMISSION ALTERNATIVES

Given that there is space on the existing single circuit 230 kV towers to accommodate a second circuit, there are two possible and practical alternatives available to transmit the additional Kipling GS generation to the network:

Alternative 1 – “Do Nothing” alternative, i.e., use the existing 230 kV single circuit connection (L20D) to accommodate the increased capacity of Kipling GS. As discussed in Exhibit B, Tab 1, Schedule 4, the existing circuit can accommodate the planned additional generation.

Alternative 2 – Extend H22D from Harmon Junction to Kipling Junction along the L20D corridor so that the Kipling GS is connected via two circuits.

OPG has opted for Alternative 2 in order to achieve a greater operational flexibility and to increase the reliability of the connection, and has agreed to pay 100% of the associated costs.

**PROJECT COSTS, ECONOMICS, AND OTHER
PUBLIC INTEREST CONSIDERATIONS**

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

Under the *OEB Act, 1998*, “public interest” is defined to mean the interest of consumers with respect to prices and the adequacy, reliability and quality of electricity service. Consumers are defined as those who use electricity that was not self-generated for their own consumption.

PROJECT COSTS

The total estimated capital cost for installing a second (new) 230 kV three-phase transmission circuit between Kipling GS and Harmon Junction, including overheads and an Allowance for Funds Used During Construction ("AFUDC"), is summarized as follows:

Table 1
Total Estimated Project Costs

		<i>Estimated Cost</i>
		<i>(\$000's)</i>
Project Management		\$65
Engineering		\$367
Procurement (materials)		\$1,267
Construction		\$1,732
Other		\$12
Suggested Risk*		\$0
Removals		\$97
Total Line Work		<u>\$3,540</u>
Overhead**		\$438
AFUDC***		<u>\$289</u>
Total Cost		<u>\$4,267</u>

* Zero contingency is included in the project's estimated costs as the customer is expected to pay actual costs of construction.

** All overhead costs allocated to the project are for asset management and corporate services costs. These costs are charged to capital projects through a standard overhead. As such they are considered "Indirect Overheads." Hydro One does not allocate any

project activity to “Direct Overheads” but rather charges all other costs directly to the project. The projected overhead rates for 2011, 2012 and 2013 are 11%, 12% and 11% respectively.

*** The AFUDC amount is derived by applying Hydro One’s forecast of interest (on straight-line project cash flow in this scenario) using the OEB’s prescribed CWIP interest rates. The forecast AFUDC rates are:

2011	8.00%
2012	8.30%
2013	8.30%

There are no network modifications or Hydro One owned stations work required as the new line will terminate at both ends at OPG owned facilities.

Cost of Comparable Projects

This is not relevant as the entire project capital cost is to be recovered through the capital contribution resulting in zero net cost to the pool.

PROJECT ECONOMICS

1.0 ECONOMIC FEASIBILITY

The proposed transmission reinforcement facilities for the Lower Mattagami River comprise line assets. The line assets, which include the addition of a new 230 kV circuit to the L20D corridor from Kipling GS to Harmon Junction, will be included in the Line Connection Pool for rate-making purposes. The line asset will be 100% customer funded as the requirement is directly related to Ontario Power Generation's upgrade to the various generating stations on the Lower Mattagami River. Hydro One is requiring Ontario Power Generation to pay the fully allocated cost of the line excluding incremental operating and maintenance costs, consistent with the economic evaluation requirements of Section 6.5.1 of the Transmission System Code concerning generation connections. Also, there is no incremental cost associated with verification and testing of fault protection equipment of the generation facility. Therefore, for the Line Connection Pool and removal costs, a capital contribution of \$4.3 million, excluding GST, is required.

<u>Capital Contribution Required</u> <i>in \$ millions, excluding GST</i>	Line Pool	Transformation Pool	Total
Ontario Power Generation	4.3	-	4.3
Total	4.3	-	4.3

1.1 COST RESPONSIBILITY

Line Connection Pool

In determining the capital contribution regarding the line connection assets, the costs assigned to customers for cost responsibility purposes are \$4.3 million. This amount covers the cost of the addition of a 230 kV circuit installed on the existing L20D line by modifying the 11 existing W1S towers and replacing two anchor towers, as well as the present value of any periodic verification and testing costs. This work is being done for a generator connection, and as such, it has been assigned to the customer for cost responsibility purposes. The table below indicates the cost responsibility for the elements of work to be done on the project.

<u>Cost Responsibility</u> <i>in \$ million, excluding GST</i>	Connection Pool	Cost of Work (per B-4-2)	Cost Responsibility		Capital Contribution
			Customers	Pool	
Transmission Line Facilities	Line	4.3	4.3	-	4.3
Total		4.3	4.3	-	4.3

1.2 Line Pool Connection

A 25-year discounted cash flow analysis for the Line Connection facilities is provided in Table 1. The capital contribution, based on Transmission System Code requirements will be \$4.3 million.

2.0 RATE IMPACT ASSESSMENT

The analysis of the Line Connection Pool rate impact has been carried out on the basis of Hydro One's OEB-approved transmission revenue requirement for the year 2008, and the most recently approved Ontario Transmission Rate Schedules. The line pool revenue requirement would be unaffected by the new facilities, based on the criteria used to allocate transmission costs to the three pools as approved by the Board in its RP-1999-0044 decision.

Line Connection Pool

Based on the Line Connection Pool incremental cash flows associated with the project, and after setting the capital contribution against the project's capital cost, there will be only a minor change in the Line Connection pool revenue requirement once the project's impacts are reflected in the transmission rate base at the projected in-service date in June of 2013. The maximum revenue deficiency related to the proposed Line Connection facilities will be \$67 k in any given year, which will result in a 0% (after rounding) impact on the provincial Line Connection pool rates. The revenue deficiency is related to the incremental annual operating and maintenance costs, which are included in the rate impact analysis in Table 2. These costs are excluded from the DCF analysis used to determine the project's capital contribution requirement and shown in Table 1, as they are not subject to recovery from generator customers per TSC section 6.5.1. The detailed analysis illustrating the calculation of the incremental Line Connection revenue deficiency and rate impact is provided in Table 2 below.

As noted above, adding the costs of the new facilities will cause no change to the Line Connection pool rate after rounding, and therefore there will be no impact on a typical residential bill. The table below shows this result for a typical residential customer.

Impact on Typical Residential Customer

A. Typical monthly bill (12¢ per kWh x 1,000 kWh per month)	\$120 per month
B. Transmission component of monthly bill (A x 8%)	\$9.60 per month
C. Line Connection Pool and Transformation Connection Pool share of Transmission component (B x 42%)	\$4.03 per month
D. Impact on Line Connection Pool and Transformation Connection Pool Provincial Uniform Rates (as shown in Table 2)	0.0%
E. Increase in Transmission costs for typical monthly bill (C x D)	\$0.00 per month or \$0.00 per year*
F. Net increase on typical residential customer bill (E / A)	0.00 %*

* after rounding

Table 1 – DCF Analysis, Hydro One, Line Connection Pool, page 1

Date: 26-Mar-09		SUMMARY OF CONTRIBUTION CALCULATIONS															
Project # 13968		Planner's estimate															
Facility Name:		Mattegami Line - Kipling GS to Harmon Jct additional 230kV cct															
Scope:		add new cct on existing W1S twr's by modifying 10 twr's & replacing 2 anchors,resting existing															

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

Revenue Requirement and Line Pool Rate Impact

		Project YE 1-Jun 2014	Project YE 1-Jun 2015	Project YE 1-Jun 2016	Project YE 1-Jun 2017	Project YE 1-Jun 2018	Project YE 1-Jun 2019	Project YE 1-Jun 2020	Project YE 1-Jun 2021	Project YE 1-Jun 2022	Project YE 1-Jun 2023	Project YE 1-Jun 2024	Project YE 1-Jun 2025
<i>Matagami Line - Kipling GS to Harmon Jct additional 230kV cct</i>		1	2	3	4	5	6	7	8	9	10	11	12
Calculation of Incremental Revenue Requirement (\$000)													
In-service date	1-Jun-13												
Capital Cost	4,160												
Removal Cost	107												
Less: Capital Contribution Required	(4,266)												
Net Project Cost	-												
Average Rate Base		-	-	-	-	-	-	-	-	-	-	-	-
Incremental OM&A Costs		67	67	67	67	67	67	67	67	67	67	67	67
Ontario Capital Tax	0.225%	-	-	-	-	-	-	-	-	-	-	-	-
Grants in Lieu of Municipal tax	0.625%	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation	2.0%	-	-	-	-	-	-	-	-	-	-	-	-
Interest and Return on Rate Base	6.71%	-	-	-	-	-	-	-	-	-	-	-	-
Income Tax Provision	33.00%	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Large Corporations Tax	0.000%	-	-	-	-	-	-	-	-	-	-	-	-
REVENUE REQUIREMENT PRE-TAX		67	67	67	67	67	67	67	67	67	67	67	67
Incremental Revenue		-	-	-	-	-	-	-	-	-	-	-	-
SUFFICIENCY/(DEFICIENCY)		(67)	(67)	(67)	(67)	(67)	(67)	(67)	(67)	(67)	(67)	(67)	(67)
Line Pool Revenue Requirement including sufficiency/(deficiency)	Base Year 172,518	172,584	172,584	172,584	172,584	172,584	172,584	172,584	172,584	172,584	172,584	172,584	172,584
Line MW	245,954	245,954	245,954	245,954	245,954	245,954	245,954	245,954	245,954	245,954	245,954	245,954	245,954
Line Pool Rate (\$/kw/month)	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Increase/(Decrease) in Network Pool Rate (\$/kw/month), relative to base year		-	-	-	-	-	-	-	-	-	-	-	-
RATE IMPACT relative to base year		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Assumptions

Ontario Capital Tax	0.225%	2009 Ontario capital tax rate
Grants in Lieu of Municipal tax	0.625%	Transmission system average
Depreciation	2.0%	Reflects 50 year average service life for towers, conductors and station equipment, excluding land
Interest and Return on Rate Base	6.71%	Includes OEB-approved ROE of 8.35% and 4% on short-term debt, 5.85% forecast cost of long-term debt and 40/60 equity/debt split
Income Tax Provision	33.00%	2009 federal and provincial corporate income tax rate including surtax
Large Corporations Tax	0.000%	2009 large corporations tax rate
Capital Cost Allowance	8.0%	100% Class 47 assets
Incremental OM&A	1.6%	1.6% of Initial Capital per year

Table 3 – DCF Assumptions

**Hydro One Networks – Transmission Connection Economic Evaluation Model
2009 Parameters and Assumptions**

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

Monthly Rate (\$ per kW)	
Network	2.5673
Transformation	1.62
Line	0.7014

Grants in lieu of Municipal tax (% of up-front capital expenditure, a proxy for property value):

0.63%

Based on Transmission system

Ontario Capital tax (% of UCC, a proxy for taxable capital):

0.225%

2009 provincial rate

Overhead rate:

Varies from year to year; latest forecast as follows:

2009	12.0%
2010	10.0%
2011	11.0%
2012	12.0%
2013	11.0%
2014	11.0%

Fully allocated overheads per TSC section 6.5.2 (c) using Hydro One Networks forecast Transmission capitalized overhead rate

AFUDC rate:

Varies from year to year; latest forecast as follows:

2009	6.4%
2010	6.4%
2011	6.3%
2012	6.5%
2013	6.4%
2014	6.4%

Based on Hydro One Networks Transmission forecast embedded cost of debt. Charged on construction work in progress to in-service date of capital.

Income taxes:

Basic Federal Tax Rate (before surtax) -
% of taxable income:

2009 19.00%

Current rate

Federal Surtax - % of taxable income:

2009 0.00%

Current rate

Ontario corporation income tax -
% of taxable income:

2009 14.00%

Current rate

Large Corporation Tax - % of UCC (a proxy for taxable capital)

2009 0.000%

Current rate

Capital Cost Allowance Rate, Class 47:

**Rate change retroactively enacted in 2006 to 8% for assets added after Feb. 22/05; formerly Class 1*

2009 8.0%

Current rate *

After-tax Discount rate:

5.60%

Based on OEB-approved ROE of 8.35% on common equity and 4% on short-term debt, 5.85% forecast cost of long-term debt and 40/60 equity/debt split, and current enacted income tax rate of 33%

OTHER PUBLIC INTEREST CONSIDERATIONS

1
2
3
4

There are no other customers in the area. This project is being executed at the request of
a single generator customer (OPG).

CONSTRUCTION AND PROJECT ADMINISTRATION

Hydro One can achieve a June 2013 in-service date for the proposed line additions, assuming that the Board grants leave to construct the proposed facilities by about December 2009.

To complete the project Hydro One will undertake the following tasks:

- Install two new two-circuit heavy anchor towers to replace two existing towers (positions 12 and 14) on the Harmon GS to Kipling Junction Line. Upgrade structural steel and conductor arms on the remaining towers to accommodate a second 230 kV 3-phase transmission circuit. Install required additional insulators, conductor and ancillary hardware upon the upgraded tower line.
- Carry out line construction activities that include setting up construction yards, building access roads on the right-of-way (if required), clearing trees and brush from the right-of-way, inspecting existing foundations and installing new foundations, erecting new structures, upgrading existing structures, stringing new conductor, removing redundant structures and unused/waste construction materials from the site plus restoration of the area including de-commissioning of construction roads (if required).
- These construction activities will involve significant line outages which will require close coordination with generation production schedules and other construction work in the area. The longest outage requirement will be to enable upgrading of the towers for two-circuit use. This will be followed by a further significant outage to re-string the existing conductors onto the newly configured towers.

Filed: April 8, 2009

EB-2009-0078

Exhibit B

Tab 5

Schedule 1

Page 2 of 2

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

CONSTRUCTION AND IN-SERVICE SCHEDULE

1

2

TASK	START	FINISH
Submit Section 92		Apr-2009
Projected Section 92 Approval		Dec-2009
Projected ESR Submission		Apr-2009
Projected Access to Property under Expropriations Act Approval	N/A	N/A
LINES		
Detailed Engineering	July-2011	Jan-2012
Tender & Award Structural Steel	Feb-2012	May-2012
Receive Structural Steel	June-2012	Aug-2012
Construction *	Sept-2012	Feb-2013
Road Removal, Site Restoration)	March-2013	May-2013
In-Service		Jun-2013

3

4 * As the timing of construction is 21 months after Board approval, Hydro One is
5 requesting a Condition of Approval related to the start of construction dated to Dec.2012.

OTHER MATTERS / AGREEMENTS / APPROVALS

1.0 SYSTEM IMPACT ASSESSMENT

Under the market rules, any party planning to construct a new or modified connection to the IESO-controlled grid must allow for an IESO assessment of these facilities. The IESO has completed the System Impact Assessment (SIA) of the proposed facilities included in the Lower Mattagami Generation Connection under the IESO Connections Assessment and Approval process.

The IESO assessment addresses the impact of the proposed facilities on system operating voltage, system operating flexibility, and on the ability of other connections to deliver or withdraw power supply from the IESO-controlled grid. The IESO's SIA filed at Exhibit B, Tab 6, Schedule 3 confirms the need for this project and indicates that Hydro One's proposed transmission solution is adequate and does not adversely impact the IESO-controlled grid.

2.0 CUSTOMER IMPACT ASSESSMENT

Hydro One has carried out a CIA in accordance with its customer connection procedures to determine the impact of the proposed facilities on other customers. The CIA provided in Exhibit B, Tab 6, Schedule 4 confirms that the Lower Mattagami Generation Project (including the addition of a second circuit between Harmon Junction and Kipling Junction) will not adversely impact the reliability or the performance of the power system.

1 **3.0 STAKEHOLDER AND COMMUNITY CONSULTATION**

2
3 Hydro One has notified stakeholders and local First Nations and Metis communities that
4 may have an interest in this proposed line addition. Hydro One will ensure stakeholders'
5 issues are addressed. Hydro One will continue to inform area elected officials, and
6 relevant provincial government ministries and agencies of the project status. During the
7 construction and commissioning stages of the proposed addition, Hydro One will consult
8 with the local community and other interested stakeholders to ensure potential concerns
9 are addressed. See Exhibit B, Tab 6, Schedule 7, for details.

10
11 **4.0 ENVIRONMENTAL ASSESSMENT APPROVAL**

12
13 An Environmental Assessment Report was submitted to the Ministry of the Environment
14 for the predecessor "Hydroelectric Generating Station Extensions Mattagami River" and
15 approved in 1994. There was no expressed opposition to the project and all concerns
16 were satisfactorily resolved. There are no requirements under the *Environmental*
17 *Assessment Act* for the current project; however, Hydro One is undertaking an
18 environmental screening for due diligence purposes. This screening will be completed in
19 April 2009 at which time it will be submitted to the Ministry of Environment.

20
21 **5.0 COMPLIANCE WITH INDUSTRY STANDARDS AND CODES**

22
23 The proposed facilities will be constructed, owned and operated by Hydro One. The
24 design and maintenance of these facilities will be in accordance with good utility
25 practice, as established in the Transmission System Code and in accordance with
26 Northeast Power Coordinating Council (NPCC) and North American Electric Reliability
27 Council (NERC) planning and operating standards.

1 **CUSTOMER LETTERS OF ENDORSEMENT FOR THE PROJECT**

ONTARIOPOWER GENERATION

700 University Avenue Toronto, ON M5G 1X6

BURROUGHS Paul

Project Manager
Hydroelectric Development

Tel: 416-592-6817 Fax: 416-592-3489
Email address: paul.j.burroughs@opg.com

March 27, 2009

Mr. Ibrahim El Nahas
Transmission Planning Manager
Hydro One Networks Inc.
483 Bay Street, 15th Floor
Toronto, Ontario, M5G 2P5

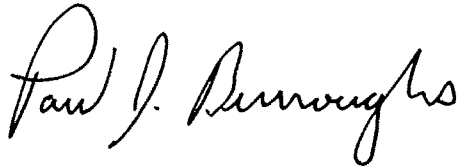
RE: Lower Mattagami River Project

Dear Ibrahim,

This letter will signify to Hydro One Networks, Ontario Power Generation (OPG) Inc's need for a second 230 kV circuit between Harmon Junction and Kipling GS as part of the Lower Mattagami River Project. The second 230 kV circuit on the existing right of way and primarily on existing structures would provide added reliability for supplying a proposed 237 MW (presently 158 MW) of generation due to the expansion of Kipling GS. The planned in-service date of this generation is 2013.

If you have any questions, regarding this project please feel free to contact me. We look forward to working with you on this project.

Regards,



Paul Burroughs
Project Manager
Hydroelectric Development

Filed: April 8, 2009
EB-2009-0078
Exhibit B
Tab 6
Schedule 3
Page 1 of 1

SYSTEM IMPACT STUDY



System Impact Assessment Report

**Lower Mattagami
Generation Development**

CONNECTION ASSESSMENT & APPROVAL PROCESS

CAA ID 2006-239

Applicant: Ontario Power Generation Inc.

Transmission Assessments & Performance
Department

2008 Nov 1

REPORT

System Impact Assessment Report – Disclaimer

Document ID	IESO_REP_0517
Document Name	System Impact Assessment Report
Issue	Issue 1.0
Reason for Issue	Draft Issue
Effective Date	Nov 1, 2008

System Impact Assessment Report

Lower Mattagami Generation Development Project

Disclaimers

IESO

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

Approval of the proposed connection is based on information provided to the IESO by the connection applicant and the transmitter(s) at the time the assessment was carried out. The IESO assumes no responsibility for the accuracy or completeness of such information, including the results of studies carried out by the transmitter(s) at the request of the IESO. Furthermore, the connection approval is subject to further consideration due to changes to this information, or to additional information that may become available after the approval has been granted. Approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed facility to the IESO-controlled grid. However, connection approval does not ensure that a project will meet all connection requirements. In addition, further issues or concerns may be identified by the transmitter(s) during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with physical or equipment limitations, or with the Transmission System Code, before connection can be made.

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

HYDRO ONE

Special Notes and Limitations of Study Results

The results reported in this study are based on the information available to Hydro One, at the time of the study, suitable for a preliminary assessment of a new generation or load connection proposal.

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

This study does not assess the short circuit or thermal loading impact of the proposed connection on facilities owned by other load and generation (including OPG) customers.

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

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

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

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LOWER MATTAGAMI GENERATION DEVELOPMENT IESO SYSTEM IMPACT ASSESSMENT

SIA Findings

Summary

The Ontario Power Generation (OPG) is proposing to do following generation expansion.

Existing Generating Facilities					
Little Long GS		Two units:	68 MW	Σ 136 MW	Σ 486 MW
Harmon GS		Two units:	70 MW	Σ 140 MW	
Kipling GS		Two units:	79 MW	Σ 158 MW	
Smoky Falls GS		Four units:	13 MW	Σ 52 MW	
Generating Facilities after expansion					
Little Long GS	(I/S date 2012)	Three units:	70 MW	Σ 210 MW	Σ 945 MW
Harmon GS	(I/S date 2012)	Three units:	78 MW	Σ 234 MW	
Kipling GS	(I/S date 2013)	Three units:	79 MW	Σ 237 MW	
Smoky Falls GS	(I/S date 2013)	Three units:	88 MW	Σ 264 MW	
Increase from present level					459 MW

In order to carry out above expansion,

(a) The OPG intends to do following modifications.

- Upgrade turbine runners in existing generators at Little Long and Harmon GS
- Install second 13.8/230 kV transformer at Little Long, Harmon and Kipling GS
- Install three new 13.8/230 kV transformers at Smoky Falls GS
- Decommission existing four generators at Smoky Falls GS
- Remove Smoky Falls GS connection to Spruce Falls

(b) The Hydro One intends to do following modifications.

- Install series capacitors at Nobel SS to provide 50 % compensation to X503E and X504E
- Install a +300/-100 Mvar SVC at Porcupine 230 kV bus
- Install a +200/-100 Mvar SVC at Kirkland Lake 115 kV bus
- Install a 100 Mvar shunt capacitor bank at Pinard 230 kV bus
- Install a 100 Mvar shunt capacitor bank at Little Long SS 230 kV bus
- Install 2 $\times$ 125 Mvar shunt capacitor banks at Porcupine 230 kV bus
- Install second 149 Mvar shunt capacitor bank at Hanmer 230 kV bus
- Install second 182 Mvar shunt capacitor bank at Essa 230 kV bus
- Extend H22D from Harmon GS to Kipling GS to incorporate two Kipling units.
- Extend L20D and H22D approximately 4 km to incorporate Smoky Falls GS

Conclusions

The IESO carried out the System Impact Assessment in order to identify the effect of this redevelopment plan on the IESO controlled grid. Based on the analysis, following conclusions were made.

- (1) The proposed project will not cause an adverse material impact on the reliability of the IESO-controlled grid provided the connection requirements given below are met.
- (2) When all elements are in service, the transfer capability of Flow-South interface can be increased up to 2050 MW with no generation rejection armed.
- (3) If existing relay settings of D3K@K remain unchanged, D3K will trip for the loss of P502X.
- (4) The automatic excitation systems proposed for new generators meet IESO standards.
- (5) The post-contingency steady-state voltage changes are within accepted levels.
- (6) The pre-contingency flows are within continuous rating of equipment. The generation rejection may require to mitigate post-flow overloads.

IESO's Requirements for Connection

For Ontario Power Generation:

1. Each generator must have the capability to supply reactive power at its terminal within the range between 0.9 lag and 0.95 lead power factor based on rated active power at rated voltage.
2. The generator under-frequency settings should be set such that the generators do not trip for frequency variations that are above the curve given in Figure 2.
3. The real-time monitoring of following quantities from new generators must be provided to the IESO.
 - Active power generation
 - Reactive power generation
 - Terminal breaker status
 - Terminal voltage
 - AVR and PSS status
4. The performance of equipment must meet or exceed the predicted performance observed in the SIA.
5. The registration of the new facilities will need to be completed through the IESO's *Market Entry* process before any part of the facility can be placed in-service. If the data or assumptions supplied during the *Market Entry* process materially differ from those that were used for the assessment, then the analysis may need to be repeated.
6. The commissioning reports must be submitted to the IESO within three months of the conclusion of commissioning. The field test results should agree simulations done using PSS/E models and data.

For Hydro One:

1. Following must be installed.
 - Series capacitors at Nobel SS to provide 50 % compensation to X503E and X504E
 - +300/-100 Mvar SVC at Porcupine 230 kV bus
 - +200/-100 Mvar SVC at Kirkland Lake 115 kV bus
 - 100 Mvar shunt capacitor at Pinard 230 kV bus
 - 100 Mvar shunt capacitor at Little Long SS 230 kV bus
 - 149 Mvar second shunt capacitor at Hanmer 230 kV bus
 - 182 Mvar second shunt capacitor at Essa 230 kV bus
 - 2 × 125 Mvar shunt capacitor banks at Porcupine 230 kV bus
 - Extension of H22D from Harmon GS to Kipling GS to incorporate two Kipling units.
 - Extension of L20D and H22D to incorporate Smoky Falls GS
 - Little Long SS as per Figure 1.
2. Northeast Generation Rejection Scheme must be modified.
 - All six new generators must be included in the scheme such that they can be rejected as response to contingencies similar to existing Lower Mattagami units.
 - The loss of L20D and H22D (Little Long SS to Pinard TS) must be added as new contingencies, and all Lower Mattagami units must be selectable for loss of those circuits.
 - The Facility Description Document FDD-1025 must be revised.
3. The real-time monitoring of following quantities must be provided to the IESO.
 - The status of circuit breakers and disconnect switches at Little Long SS
 - The active and reactive power flow in H22D and L20D between Little Long SS and Pinard TS
4. The relay settings of D3K must be modified.
5. The short-circuit currents should not exceed new and existing equipment ratings.
6. All elements must be protected by two fully independent and redundant protection systems.
7. New or modified syncho-check and auto-reclosure settings must be provided to the IESO.
7. The performance of the equipment must meet or exceed the predicted performance observed in the SIA.
8. The registration of the new facilities will need to be completed through the IESO's *Market Entry* process before any part of the facility can be placed in-service. If the data or assumptions supplied during the *Market Entry* process materially differ from those that were used for the assessment, then the analysis may need to be repeated.
9. The commissioning reports must be submitted to the IESO within three months of the conclusion of commissioning. The field test results should agree simulations done using PSS/E models and data.

Notification of Conditional Approval

From the information provided, our review concludes that the proposed changes will not result in a material adverse effect on the reliability of the IESO-controlled grid. It is recommended that a Notification of Conditional Approval be issued for Lower Mattagami generation redevelopment project subject to the IESO receiving written acknowledgement that the requirements listed in this report will be implemented.

1. Project Description

The northeastern Ontario power system covers the area north of Sudbury and east of Wawa stretching all the way to the Quebec border. The northeastern transmission system incorporates many generation resources that are used to supply local demand and demand in southern Ontario.

Among many hydraulic power plants located in northeastern Ontario, there are four generating plants that are located along the Lower Mattagami River. They are Little Long, Kipling, Harmon and Smoky Falls. Due to study revelations that each of these power generating stations has enough water flow to support additional power production, the Ontario Power Generation Inc is proposing to expand those stations to following levels.

<i>Capacity of the Generating Facilities following expansion</i>			
Little Long GS	Three units: 70 MW	Σ 210 MW	Σ 945 MW
Harmon GS	Three units: 78 MW	Σ 234 MW	
Kipling GS	Three units: 79 MW	Σ 237 MW	
Smoky Falls GS	Three units: 88 MW	Σ 264 MW	
<i>Increase from present level</i>			<i>459 MW</i>

While the existing generators will produce more power at Little Long, Harmon and Kipling stations, each of those stations will also be equipped with a new third generator. While the runners at existing Kipling turbines can handle the increased power production, the runners at existing turbines at Little Long and Harmon units require upgrading. The electrical equipment including generators requires no significant upgrades to produce the added power. The new unit at each station will be connected to L20D or H22D using a new 13.8/230 kV transformer. The existing units at Smoky Falls will be fully retired, and three new larger units will be installed and will be connected to H22D or L20D via two 4 km 230 kV transmission lines. The proposed connection arrangement is shown in Figure 1.

(a) Generation Connection Arrangement

The IESO proposed connection arrangement is shown in Figure 1. This has been discussed with OPG and Hydro One. The resulting distribution of the generating facilities are shown below and will ensure approximately even flows on H22D and L20D circuits that will respect their continuous ratings.

Circuit	Kipling	Harmon	Smoky Falls	Little Long	Total Capacity connected
L20D	1 × 79 MW	1 × 78 MW	2 × 88 MW	2 × 70 MW	473 MW
H22D	2 × 79 MW	2 × 78 MW	1 × 88 MW	1 × 70 MW	472 MW

This arrangement will require extension of the

- 230 kV circuit H22D from Harmon GS to Kipling GS to incorporate two Kipling units to H22D.
- 230 kV circuits from L20D and H22D to incorporate Smoky Falls GS

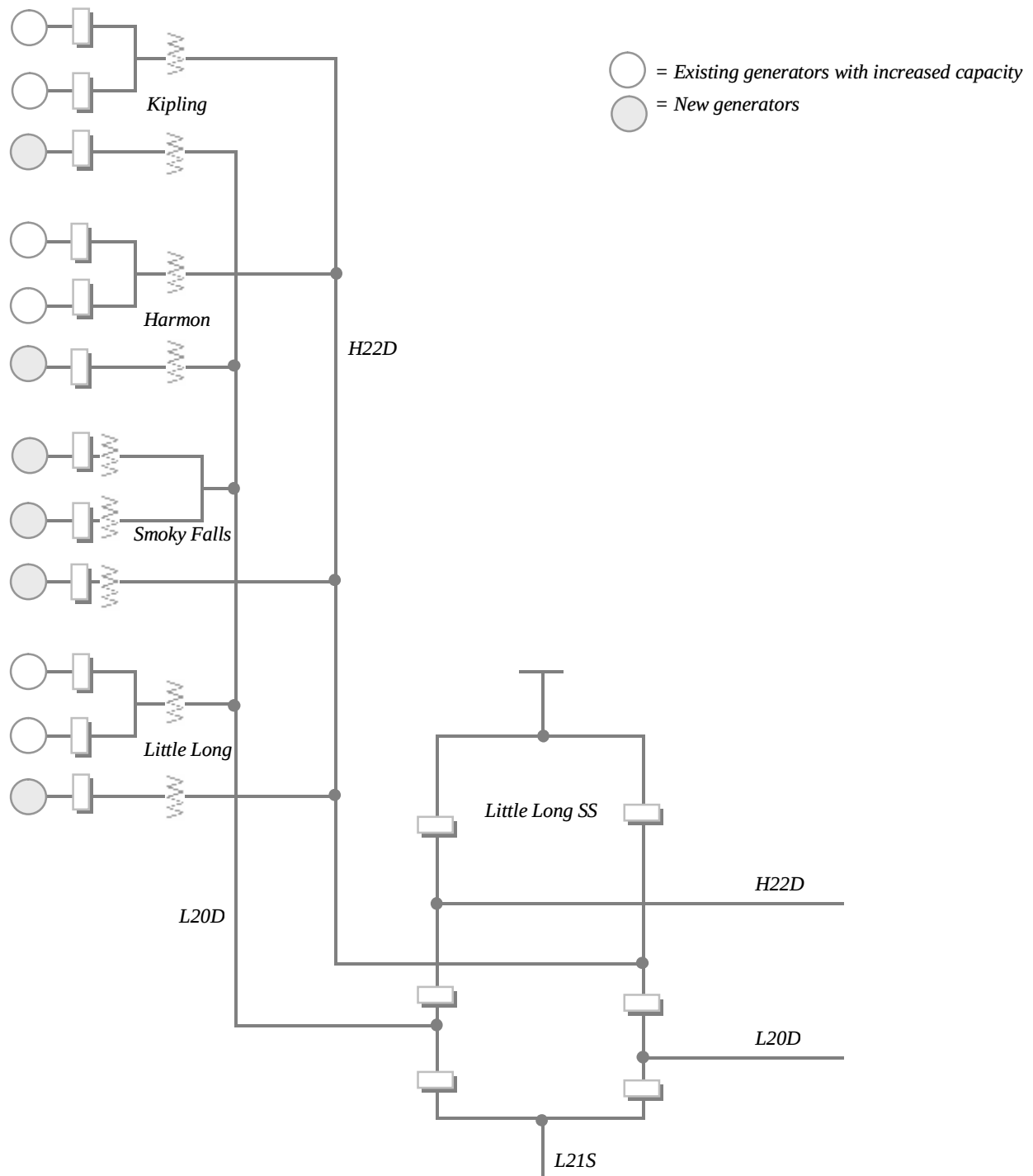
The proposed incorporation arrangement at Little Long SS is also shown to include a shunt capacitor bank with a nominal rating of 100 Mvar. This is required to supply the increased reactive power losses and thereby ensure that the generating units will be able to operate at a higher power factor at their HV terminals under normal system conditions with all elements in-service.

(b) Little Long SS bus Arrangement

This arrangement was selected to meet the following requirements:

- To obtain approximately equal flow distribution on the two 230 kV circuits between Little Long SS and Pinard TS.
- To obtain approximately equal flow distribution on the two 230 kV circuits incorporating the generating plants into Little Long SS.
- To avoid isolation of all three generating units at any of the four generating stations in the event of a contingency or outage, involving either of the 230 kV incorporation circuits between the generating plants and Little Long SS.
- To allow limited generation capacity to continue to operate in support of the 230 kV circuit L21S in the event of a double-circuit contingency/outage involving the 230 kV circuits between Little Long SS and Pinard TS.
- To maintain a connection from Pinard TS to support the load supplied from circuit L21S in the event of a double-circuit contingency/outage involving the 230 kV circuits between Little Long SS and the generating plants.

In order to incorporate the additional generation, it would be necessary that other supplementary measures are developed to maintain the stability of the new and existing generators, respect equipment ratings, maintain adequate voltages and to expand the Flow-South interface. These may require modifications to bus arrangements, identification of new generation rejection requirements, re-arrangement of station connections to transmission lines, series compensation, supply of reactive power compensation to cater increased losses etc.

**FIGURE 1 : PROPOSED CONNECTION ARRANGEMENT**

– End of Section –

2. General Requirements

Models & Data

1. The Connection Applicant must complete the IESO Market Entry process before IESO final approval for connection is granted. Final models and data, including any controls that would be operational must be provided to the IESO prior to the first energization.
2. During commissioning, the Connection Applicant must provide evidence to the IESO that the equipment installed meets the *Market Rules* and matches or exceeds the performance predicted. This evidence shall be either type tests done in a controlled environment or commissioning tests done on-site. In either case, the testing must be done not only in accordance with widely recognized standards, but also to the satisfaction of the IESO. Until this evidence is provided, the Applicant must accept any restrictions the IESO may impose upon their participation in IESO-administered market or connection to the IESO-controlled grid.

Generators

1. The generators must satisfy the Generator Facility requirements in Appendix 4.2 of *Market Rules*.

The generators must have the capability to operate $\pm 5\%$ of the nominal voltage.

The generators must have the dynamic reactive power capability to supply reactive power continuously at all active power outputs in the range of 0.9 lag to 0.95 lead power factor based on rated active power at its generator terminals for at least one constant 230 kV system voltage.

If necessary, shunt capacitors must be installed to offset the reactive power losses within the facility in excess of the maximum allowable losses. If generators do not have dynamic reactive power capabilities as described above, dynamic reactive compensation devices must be installed to make up the deficient reactive power.

2. The generators must not trip for recognized contingencies on the IESO-controlled grid that does not disconnect generators by configuration.
3. The connection and disconnection of the generators must minimize any adverse effects on the IESO-controlled grid.

Connection Equipment (Breakers, Disconnects, Transformers, Buses)

1. The 230 kV equipment connected to terminal stations must be capable of continuously operating in the range between 260 kV and 220 kV as per Appendix 4.1 of *Market Rules*.

Some recognized contingencies (e.g. load shedding, open line end) can cause a temporary voltage increase above the maximum continuous limit of 230 kV. For these conditions, connection equipment may be exposed to voltages slightly above its maximum continuous rating for the short period of time that it takes the IESO to direct operations to restore a normal voltage and to prepare for the next contingency. This re-preparation period will be as short as possible, but it will not take longer than 30 minutes.

The 230 kV equipment must be able to interrupt rated fault current for voltages up to the maximum continuous rating. They must remain in service, and not automatically trip for voltages up to 5% above the maximum continuous rating for up to 30 minutes to allow the system to be re-dispatched to return voltages within their normal range.

2. The Transmission System Code states that 230 kV connection equipment should have a rated 3-phase symmetrical short circuit capability of 63 kA and a rated single line to ground short circuit capability of 63 kA. It also requires that 230 kV breakers have a rated interrupting time of three cycles or less.

3. The connection equipment must be designed so that the adverse effects of their failure on the IESO-controlled grid are mitigated.

4. The connection equipment must be designed so that it will be fully operational in all reasonably foreseeable ambient temperature conditions. This includes ensuring that SF6 breakers are equipped with heaters to prevent freezing.

IESO Monitoring and Telemetry Data

The Appendix 4.15 and Appendix 4.19 of *Market Rules* list the requirements with respect to the telemetry that must be provided to the IESO and to the standards that must be achieved on a continual basis by all generators.

In accordance with the requirements for a *major generation facility*, Connection Applicant must ensure that all the equipment needed to provide the telemetry data and meet the performance standards will be installed.

The IESO will finalize items to be telemetered during the IESO Market Entry Process.

Protection Systems

1. Faults within generation facility must not trip 230 kV circuits except for the failure of 230 kV connection breakers. After the facility begins operation, if the tripping of circuits occurs due to events within generation facility, the facility may be required to be disconnected until the problem is solved.

2. Protection systems must be designed to meet all the requirements of the Transmission System Code and any additional requirements identified by Hydro One.

3. The facility must be capable of operating at full active power for a limited period of time for frequencies as low as 58.8 Hz. The generators must not trip for under-frequency system conditions that are below 60 Hz but above 57.0 Hz and above the curve shown in Figure 2.

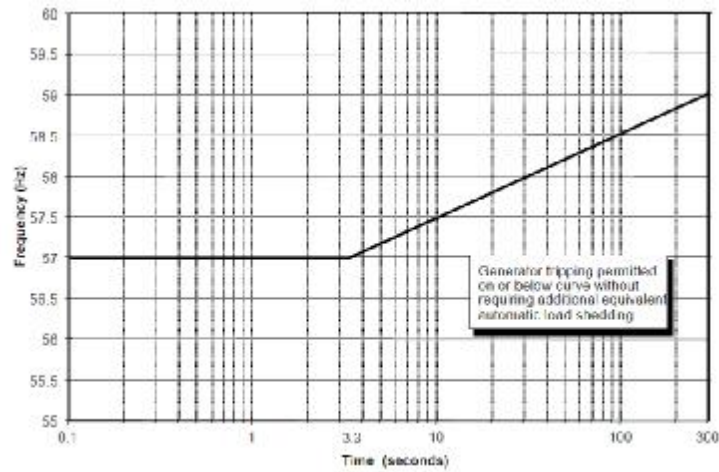


FIGURE 2: STANDARDS FOR SETTING UNDER-FREQUENCY TRIP PROTECTION FOR GENERATORS

Miscellaneous

1. The generators must be capable of operating continuously in the range between 59.4 Hz and 60.6 Hz as specified in Appendix 4.1 of *Market Rules*.
2. The generators must operate in the voltage control mode. Operation of the facility in power factor control or reactive power control is not acceptable.
3. All plant auxiliaries must be capable of operating continuously within the voltage range of 220 kV to 250 kV.

– End of Section –

3. Data Verification

The data for existing generators, excitation systems, power system stabilizers and governors are assumed remain unchanged. The data for these facilities used for the analysis are the data available in the IESO database which were provided by OPG at the time of their registration. Followings are for new generators.

(a) Generators

Following are the data for the **GENSAL** models used in the analysis.

Kipling G3

$T'_{do} = 5.0$	$T''_{do} = 0.025$	$T''_{qo} = 0.035$	$H = 3.1$	$D = 0.0$	$X_d = 0.7$
$X_q = 0.3$	$X'_d = 0.25$	$X''_d = 0.2$	$X_l = 0.1$	$S(1.0) = 0.15$	$S(1.2) = 0.8$

Little Long G3

$T'_{do} = 6.0$	$T''_{do} = 0.045$	$T''_{qo} = 0.035$	$H = 3.1$	$D = 0.0$	$X_d = 0.6$
$X_q = 0.3$	$X'_d = 0.2$	$X''_d = 0.15$	$X_l = 0.1$	$S(1.0) = 0.23$	$S(1.2) = 0.9$

Harmon G3

$T'_{do} = 5.0$	$T''_{do} = 0.025$	$T''_{qo} = 0.035$	$H = 3.1$	$D = 0.0$	$X_d = 0.7$
$X_q = 0.3$	$X'_d = 0.25$	$X''_d = 0.2$	$X_l = 0.1$	$S(1.0) = 0.25$	$S(1.2) = 0.8$

Smoky Falls G1, G1, G3

$T'_{do} = 7.0$	$T''_{do} = 0.04$	$T''_{qo} = 0.035$	$H = 3.1$	$D = 0.0$	$X_d = 0.9$
$X_q = 0.6$	$X'_d = 0.35$	$X''_d = 0.25$	$X_l = 0.1$	$S(1.0) = 0.15$	$S(1.2) = 0.8$

(b) Automatic Excitation Systems

Following are the data for the **ESST1A** models used in the analysis.

Kipling G3, Harmon G3

$T_R = 0.01$	$T_C = 0.0$	$T_B = 0.0$	$T_{C1} = 0.0$	$T_{B1} = 0.0$	$K_A = 250.0$
$T_A = 0.0$	$K_C = 0.121$	$VI_{MAX} = 999.0$	$VI_{MIN} = -999.0$	$VR_{MAX} = 5.06$	$VR_{MIN} = -5.06$
$K_F = 0.0$	$T_F = 1.0$	$K_{LR} = 0.0$	$I_{LR} = 0.0$	$VA_{MAX} = 999.0$	$VA_{MIN} = -999.0$
$UEL = 1$	$VOS = 1$				

Little Long G3

$T_R = 0.02$	$T_C = 0.0$	$T_B = 0.0$	$T_{C1} = 0.0$	$T_{B1} = 0.0$	$K_A = 200.0$
$T_A = 0.0$	$K_C = 0.05$	$VI_{MAX} = 999.0$	$VI_{MIN} = -999.0$	$VR_{MAX} = 3.65$	$VR_{MIN} = -3.54$
$K_F = 0.0$	$T_F = 1.0$	$K_{LR} = 9.7$	$I_{LR} = 1.75$	$VA_{MAX} = 999.0$	$VA_{MIN} = -999.0$
$UEL = 1$	$VOS = 1$				

Smoky Falls G1, G2, G3

$T_R = 0.01$	$T_C = 0.0$	$T_B = 0.0$	$T_{C1} = 0.0$	$T_{B1} = 0.0$	$K_A = 275.0$
$T_A = 0.0$	$K_C = 0.13$	$VI_{MAX} = 999.0$	$VI_{MIN} = -999.0$	$VR_{MAX} = 5.5$	$VR_{MIN} = -5.5$
$K_F = 0.0$	$T_F = 1.0$	$K_{LR} = 0.0$	$I_{LR} = 0.0$	$VA_{MAX} = 999.0$	$VA_{MIN} = -999.0$
$UEL = 1$	$VOS = 1$				

(c) Power System Stabilizers

Following are the data for the **PSS2A** models used in the analysis.

Kipling G3, Harmon G3

$T_{W1} = 10.0$	$T_{W2} = 10.0$	$T_6 = 0.0$	$T_{W3} = 10.0$	$T_{W4} = 0.0$	$T_7 = 10.0$
$K_{S2} = 1.38$	$K_{S3} = 1.0$	$T_8 = 0.5$	$T_9 = 0.1$	$K_{S1} = 30.0$	$T_1 = 1.5$
$T_2 = 5.0$	$T_3 = 0.08$	$T_4 = 0.02$	$VST_{MAX} = 0.2$	$VST_{MIN} = -0.05$	$N = 1$
$IC1 = 1$	$IC2 = 3$	$M = 5$			

Little Long G3

$T_{W1} = 5.0$	$T_{W2} = 5.0$	$T_6 = 0.0$	$T_{W3} = 5.0$	$T_{W4} = 0.0$	$T_7 = 5.0$
$K_{S2} = 0.57$	$K_{S3} = 1.0$	$T_8 = 0.25$	$T_9 = 0.125$	$K_{S1} = 15.0$	$T_1 = 0.04$
$T_2 = 0.02$	$T_3 = 0.04$	$T_4 = 0.02$	$VST_{MAX} = 0.2$	$VST_{MIN} = -0.066$	$N = 2$
$IC1 = 1$	$IC2 = 3$	$M = 4$			

Smoky Falls G1, G2, G3

$T_{W1} = 10.0$	$T_{W2} = 10.0$	$T_6 = 0.0$	$T_{W3} = 10.0$	$T_{W4} = 0.0$	$T_7 = 10.0$
$K_{S2} = 1.38$	$K_{S3} = 1.0$	$T_8 = 0.5$	$T_9 = 0.1$	$K_{S1} = 30.0$	$T_1 = 1.5$
$T_2 = 5.0$	$T_3 = 0.08$	$T_4 = 0.02$	$VST_{MAX} = 0.2$	$VST_{MIN} = -0.05$	$N = 1$
$IC1 = 1$	$IC2 = 3$	$M = 5$			

(d) Governor

Following are the data for the **WEHGOV** models used in the analysis.

Kipling G3, Harmon G3

$R_{GATE} = 0.04$	$R_{PE} = 0.0$	$T_{PE} = 1.0$	$K_p = 2.03$	$K_I = 1.19$	$K_D = 0.77$
$T_D = 0.1$	$T_p = 0.15$	$T_{DV} = 0.1$	$T_G = 0.15$	$GT_{MXOP} = 0.09$	$GT_{MXCL} = -0.17$
$G_{MAX} = 1.0$	$G_{MIN} = 0.0$	$D_{TURB} = 0.0$	$T_W = 0.68$	$D_{BAND} = 0.0$	$D_{PV} = 0.0$
$D_{ICM} = 0.04$	$G_1 = 0.0$	$G_2 = 1.0$	$G_3 = 1.0$	$G_4 = 1.0$	$G_5 = 1.0$
$FG_1 = 0.00$	$FG_2 = 1.0$	$FG_3 = 1.0$	$FG_4 = 1.0$	$FG_5 = 1.0$	$FP_1 = 0.0$
$FP_2 = 0.18$	$FP_3 = 0.36$	$FP_4 = 0.54$	$FP_5 = 0.72$	$FP_6 = 0.8$	$FP_7 = 0.85$
$FP_8 = 0.9$	$FP_9 = 0.95$	$FP_{10} = 1.0$	$P_1 = -0.16$	$P_2 = 0.0$	$P_3 = 0.2504$
$P_4 = 0.4984$	$P_5 = 0.7456$	$P_6 = 0.84$	$P_7 = 0.88$	$P_8 = 0.912$	$P_9 = 0.936$
$P_{10} = 0.955$					

Little Long G3

$R_{GATE} = 0.04$	$R_{PE} = 0.0$	$T_{PE} = 0.0$	$K_p = 3.7$	$K_I = 0.85$	$K_D = 0.86$
$T_D = 0.1$	$T_p = 0.1$	$T_{DV} = 0.15$	$T_G = 0.4$	$GT_{MXOP} = 0.12$	$GT_{MXCL} = -0.23$
$G_{MAX} = 1.0$	$G_{MIN} = 0.0$	$D_{TURB} = 0.0$	$T_W = 0.64$	$D_{BAND} = 0.0$	$D_{PV} = 0.0$
$D_{ICM} = 0.04$	$G_1 = 0.0$	$G_2 = 1.0$	$G_3 = 0.0$	$G_4 = 0.0$	$G_5 = 0.0$
$FG_1 = 0.0$	$FG_2 = 1.0$	$FG_3 = 0.0$	$FG_4 = 0.0$	$FG_5 = 0.0$	$FP_1 = 0.0$
$FP_2 = 0.18$	$FP_3 = 0.42$	$FP_4 = 0.6$	$FP_5 = 0.75$	$FP_6 = 0.83$	$FP_7 = 0.91$
$FP_8 = 0.99$	$FP_9 = 1.05$	$FP_{10} = 1.1$	$P_1 = -0.222$	$P_2 = 0.0$	$P_3 = 0.3$
$P_4 = 0.52$	$P_5 = 0.7$	$P_6 = 0.8$	$P_7 = 0.9$	$P_8 = 1.0$	$P_9 = 1.07$
$P_{10} = 1.1$					

Smoky Falls G1, G2, G3

$R_{GATE} = 0.04$	$R_{PE} = 0.0$	$T_{PE} = 1.0$	$K_P = 2.03$	$K_I = 1.19$	$K_D = 0.77$
$T_D = 0.1$	$T_P = 0.15$	$T_{DV} = 0.1$	$T_G = 0.15$	$GT_{MXOP} = 0.09$	$GT_{MXCL} = -0.17$
$G_{MAX} = 1.0$	$G_{MIN} = 0.0$	$D_{TURB} = 0.0$	$T_W = 0.68$	$D_{BAND} = 0.0$	$D_{PV} = 0.0$
$D_{ICM} = 0.04$	$G_1 = 0.0$	$G_2 = 1.0$	$G_3 = 1.0$	$G_4 = 1.0$	$G_5 = 1.0$
$FG_1 = 0.0$	$FG_2 = 1.0$	$FG_3 = 1.0$	$FG_4 = 1.0$	$FG_5 = 1.0$	$FP_1 = 0.0$
$FP_2 = 0.18$	$FP_3 = 0.36$	$FP_4 = 0.54$	$FP_5 = 0.72$	$FP_6 = 0.8$	$FP_7 = 0.85$
$FP_8 = 0.9$	$FP_9 = 0.95$	$FP_{10} = 1.0$	$P_1 = -0.16$	$P_2 = 0.0$	$P_3 = 0.2504$
$P_4 = 0.4984$	$P_5 = 0.7456$	$P_6 = 0.84$	$P_7 = 0.88$	$P_8 = 0.912$	$P_9 = 0.936$
$P_{10} = 0.955$					

(e) Thermal Capacity

Following ratings were obtained from official Hydro One network web site. The lower of the sag temperature or 93 °C has been used to calculate the rating. The OPG must verify these ratings with Hydro One.

Circuit	Wind km/hr	Max Operating Temp	Ambient Temp.	Conductor size (kcmil), Strands, CPB	Continuous Rating
L20D	4	93 °C, 127 °C	35 °C	1277.5, 42/7, 1	1090 A
H22D	4	93 °C, 120 °C	35 °C	1277.5, 42/7, 1	1090 A
X503E	4	93 °C, 79 °C	35 °C	495.0, 22/7, 4	2120 A
X504E	4	93 °C, 73 °C	35 °C	495.0, 22/7, 4	1920 A
D5H	4	93 °C, 100 °C	35 °C	795.0, 26/7, 1	840 A
Pinard T1 (ONAN,ODAF,ODAF)					450,600,750 MVA
Pinard T2 (ONAN,OFAF,OFAF)					450,600,750 MVA

- CPB is conductors per bundle.
- For L20D and H22D, 15-min-LTR is 1260 A and 5-min-LTR is 1680 A with 75% pre-flow.
- For X503E and X504E, the lowest section rating is given.

(g) Line Impedance

The impedances per unit length for the new extensions to be built from Harmon GS to Kipling GS, and from L20D/H22D to Smoky Falls GS are assumed same as for existing conductors L20D/H22D.

(f) Generator step-up transformers

The following summarises the data for the new step-up transformers.

Station	Transformer Data		
	Voltage	1 ph Rating	Impedance
Harmon GS	255/13.8 kV	32/43/54 MVA	0.1198 pu on 54 MVA
Kipling GS		56/64 MVA	0.1322 pu on 60 MVA
Smoky Falls GS		100 MVA	0.13 pu on 100 MVA
Little Long GS		30/40/50 MVA	0.1151 pu on 50 MVA

4. System Impact Studies

4.1 Assumptions

The following are the default assumptions unless specified.

- (1) All transmission elements are in service.
- (2) The 2008 summer base case is used. Then, Lower Mattagami redevelopment is incorporated to result following conditions. The Flow South is tested at 2262 MW. This gives an operating limit of $2262/1.1 = 2056$ MW

Ontario Primary Demand	Northeast Generation	Northeast Load	Flow South	Mississagi East Flow	East-West Flow East
28,325 MW	3413 MW	1200 MW	2262 MW	723 MW	344 MW

- (3) The new or up-rated generators have the capability to operate from 0.9 lag to 0.95 lead power factor. The reactive power capability used in the analysis for each new or up-rated generator in the Lower Mattagami re-development is given below which are calculated based on above power factors.

Generator ID	Max. reactive power generation	Max. reactive power absorption
Kipling G1,G2,G3	38 Mvar	27 Mvar
Little Long G1,G2,G3	33 Mvar	24 Mvar
Harmon G1,G2,G3	38 Mvar	27 Mvar
Smoky Falls G1,G2,G3	40 Mvar	28 Mvar

- (4) Followings are in service and included in the system model.
 - (a) Series capacitors at Nobel SS to provide 50 % compensation to X503E and X504E
 - (b) SVC at Porcupine 230 kV bus (+300/-100 Mvar)
 - (c) SVC at Kirkland Lake 115 kV bus (+200/-100 Mvar)
 - (d) Shunt Capacitor Bank at Pinard 230 kV bus (100 Mvar)
 - (e) Shunt Capacitor Bank at Little Long SS 230 kV bus (100 Mvar)
 - (f) Second Shunt Capacitor Bank at Hanmer 230 kV bus (149 Mvar)
 - (g) Second Shunt Capacitor Bank at Essa 230 kV bus (182 Mvar)
 - (h) Shunt Capacitor Bank at Porcupine 230 kV bus (2×125 Mvar)

4.2 Flow-South Interface

The northeastern Ontario power system extends up to north of Sudbury and east of Wawa stretching all the way to the Quebec border. One of the key interfaces governing the operation of this section of the IESO-controlled grid is the North-South interface. The transfer across the North-South Interface is represented by the combined flow on the 230kV circuit D5H, measured at Otto Holden GS, and on the 500kV circuits X503E and X504E, measured at Essa TS. The maximum transfer capability of Flow-South interface depends on the maintenance of transient stability of units north of North-South interface. Presently, this capability is 1300 MW with no generation rejection and 1400 MW with 100 MW of post-contingency generation rejection.

In order to accommodate all of the existing and committed generating facilities in the north-east, together with the expanded capacity at the Lower Mattagami River plants, it is required that the maximum transfer capability of the Flow-South interface be increased. The analysis done by Hydro One and the IESO has demonstrated that with the installation of following facilities, the transfer capability of the Flow-South interface could be increased up to approximately 2050 MW pre-contingency.

- Series capacitors at Nobel SS to provide 50 % compensation to X503E and X504E
- SVC at Porcupine TS (+300/-100 Mvar)
- SVC at Kirkland Lake TS (+200/-100 Mvar)

While the series compensation at Nobel SS which is approximately the mid-point of X503E/X504E circuits improves the transient stability under high Flow-South conditions by adding the effect of doubling the parallel transmission lines between Hanmer TS and Essa TS. The SVC at Porcupine and Kirkland Lake TS is mainly for the maintenance of post-contingency voltages such as for the loss of P502X.

With the increase of Flow-South interface up to 2050 MW, it will not require generation rejection with all elements in-service in order to maintain the transient stability for various contingencies including the loss of X503E or X504E circuits if sufficient reactive power supply is available. However, it is required to expand the northeast generation rejection scheme to include new generators to deal with various outage situations.

4.3 Compensation for Reactive Power Losses

With the addition/expansion of Lower Mattagami generation, the flow of current would increase. As a result, the reactive power losses would increase, and this must be compensated. Thus, it was determined that followings need to be installed.

- Shunt Capacitor Bank at Pinard 230 kV bus (100 Mvar)
- Shunt Capacitor Bank at Little Long SS 230 kV bus (100 Mvar)
- Second Shunt capacitor bank at Hanmer 230 kV bus (149 Mvar)
- Second Shunt capacitor bank at Essa 230 kV bus (182 Mvar)
- Shunt Capacitor Bank at Porcupine 230 kV bus (2×125 Mvar)

In addition, the Hydro One business plan includes several other shunt capacitor installations in the transmission system within northeastern Ontario which is not included in the current system model used for this analysis. Identification of appropriate locations to install those facilities will require further analysis; however in overall those will enhance the compensation of reactive losses further.

4.4 Mississagi Flow East

The Mississagi Flow east is based on post-contingency voltage limit at Mississagi TS and Algoma TS following the loss of Mississagi-Hanmer 230 kV circuit. The current limit on Mississagi East Flow is 550 MW. With the addition of new generation resources to various parts of northeastern Ontario, it is possible that the Mississagi East transfer will increase beyond 550 MW under normal conditions. In order to maintain sufficient post-contingency voltages, more generation rejection than presently selected will be required including for single contingencies. This will be addressed under a different SIA by the IESO.

4.5 Modifications to Northeast G/R Scheme

The northeast G/R scheme must be modified to include the new generators as shown below in Figure 3.

Contingency is Loss of								
L20D ¹	H22D ¹	P502X	D501P	X503E	X504E	X503E+X504E	E510V+E511V	
x	x	x	x	x	x	x	x	Kipling G1
x	x	x	x	x	x	x	x	Kipling G2
x	x	x	x	x	x	x	x	Kipling G3
x	x	x	x	x	x	x	x	Little Long G1
x	x	x	x	x	x	x	x	Little Long G2
x	x	x	x	x	x	x	x	Little Long G3
x	x	x	x	x	x	x	x	Harmon G1
x	x	x	x	x	x	x	x	Harmon G2
x	x	x	x	x	x	x	x	Harmon G3
x	x	x	x	x	x	x	x	Smoky Falls G1
x	x	x	x	x	x	x	x	Smoky Falls G2
x	x	x	x	x	x	x	x	Smoky Falls G3
	x	x	x	x	x	x	x	Otter Rapids G1
	x	x	x	x	x	x	x	Otter Rapids G2
	x	x	x	x	x	x	x	Otter Rapids G3
	x	x	x	x	x	x	x	Otter Rapids G4
	x	x	x	x	x	x	x	Abitibi Canyon G1
	x	x	x	x	x	x	x	Abitibi Canyon G2
	x	x	x	x	x	x	x	Abitibi Canyon G3
	x	x	x	x	x	x	x	Abitibi Canyon G4
	x	x	x	x	x	x	x	Abitibi Canyon G5
		x						D501P

x New additions

Rejectable Element

FIGURE 3 : GENERATION REJECTION REQUIREMENTS

1: The L20D and H22D are between Little Long SS and Pinard TS.

4.6 Thermal Loading

Following is the summary of pre-contingency loading of equipment. The loading of Lower Mattagami units are as per MW ratings given in Section 1 of the report.

Circuit	Loadability
H22D or L20D (radial at Little Long SS)	$1063/1090 = 0.97$
H22D or L20D (between Little Long SS to Pinard TS)	$1027/1090 = 0.94$
Pinard T1, T2	$628/750 = 0.84$
X503E	$1045/2120 = 0.49$
X504E	$1048/1920 = 0.54$
D5H	$721/840 = 0.86$

Loadability = Current Flow/Cont. Amp Rating for circuits or MVA/maximum MVA rating for transformers.

The steady-state loadings are within equipment ratings. However, if L20D or H22D between Little Long SS and Pinard TS is lost, the companion circuit will be loaded up to $2012/1260 = 1.59$ times 15-min LTR. Thus, generation rejection will need to be armed.

4.7 Post-Contingency Voltage Decline

Following is the percentage steady-state voltage decline for the loss of radial circuit L20D from Little Long SS. For the loss of H22D, similar results are expected. The loads are not converted to voltage dependant loads.

Loss of	Gen Terminal Power Factor	Lost MW Generation	Kapuskasing 230 kV	Pinard 500 kV	Pinard 230 kV	Little Long SS 230 kV
L20D	1.05 pu	496 MW	- 3.8	- 7.0	- 5.8	- 4.6

The voltage changes are within IESO standards.

4.8 Transient Stability

Transient stability simulation is performed for following contingencies. The generators are loaded up to 1.1 times of their MW rating. The Flow South is tested at 2262 MW. This gives an operating limit of $2262/1.1 = 2056$ MW

ID	Pre-contingency power flow			Contingency (3ph fault)	Fault clearance		G/R	
	Flow South	P502X@P + A8K+A9K@A	D501P@D+ H9K@H		Local	Remote	Moose	NUG
C1	2262 MW	1460 MW	1360 MW	X503E@X	66 ms	91 ms	-	-
C2				D501P@P	66 ms	108 ms	180 ms	230 ms
C3				P502X@X	66 ms	91 ms	180 ms	230 ms
C4				L20D@L	66 ms	108 ms	-	-
C5				R21D@R	66 ms	108 ms	-	-
C6				L21S@L	66 ms	108 ms	-	-

(a) X503E contingency

No generation rejection is required. The transient performance is shown in Figure 4A.

(b) D501P contingency

With the 500 kV circuit D501P lost, the net generation from Moose River plants and units supplying circuits H9K/F1E/L21S/K38S flows into Hunta SS via H9K. This would result transient instability as well as overloading of H9K and Spruce Falls T7. Thus, approximately 1400 MW generation is rejected followed by cross tripping of L21S and K38S circuits (and loads connected to those circuits) to control the voltage. Following is the list of elements rejected.

<i>Generation</i>	Harmon G1,G2, G3, Kipling G1,G2,G3, Smoky G1,G2, G3, Little Long G1,G2,G3 Kapuskasing G1,G2, Canyon G1,G4,G5, Otter Rapid G1,G2,G3,G4 Total = 1400 MW
<i>Circuits</i>	L21S, K38S
<i>Load</i>	Kapuskasing, Spruce Falls Total = 75 MW

The post-flow on H9K is 57 MW into Hunta. The transient performance is shown in Figure 4B.

(c) P502X contingency

The power system section north of Porcupine/Ansonville is connected to the rest by one 500 kV circuit P502X and two 115 kV circuits A9K and A8K. The loss of the P502X circuit results large power flow in A8K+A9K circuits and in D3K where the latter might possibly trip. Thus, as a response to the loss of P502X, generation is rejected to result-in post-flow on A9K+A8K below ± 40 MW followed by the cross tripping of L21S, K38S (and loads connected to those circuits) and D501P circuit to control the voltage. Following is the list of elements rejected.

<i>Generation</i>	Harmon G1,G2, G3, Kipling G1,G2,G3, Smoky G1,G2, G3, Little Long G1,G2,G3 Kapuskasing G1,G2, Otter Rapid G1,G2,G3,G4, Northland Power Iroquois Falls G1,G2,G3 Canyon G1,G4,G5, Northland Power Kirkland Lake G6 Total = 1580 MW
<i>Circuits</i>	L21S, K38S, D501P
<i>Load</i>	Kapuskasing, Spruce Falls Total = 75 MW

The post-flow on (A9K+A8K)@A is 23 MW southbound. The transient performance is shown in Figure 4C.

(d) L20D contingency

With the loss of L20D between Pinard TS and Little Long SS, the power from Lower Mattagami development would flow in L21S and a single circuit between Pinard TS and Little Long SS. No generation rejection is required for this contingency for stability reasons. The transient performance is shown in Figure 4D.

(e) R21D contingency

With the loss of R21D, Otter Rapid GS and Abitibi Canyon G1, G4, G5 will be lost by configuration. No further generation rejection is required for this contingency. The transient performance is shown in Figure 4E.

(f) L21S contingency

With the loss of L21S, the power from Lower Mattagami development would flow into Pinard via H22D and L20D. No generation rejection is required for this contingency. The transient performance is shown in Figure 4F.

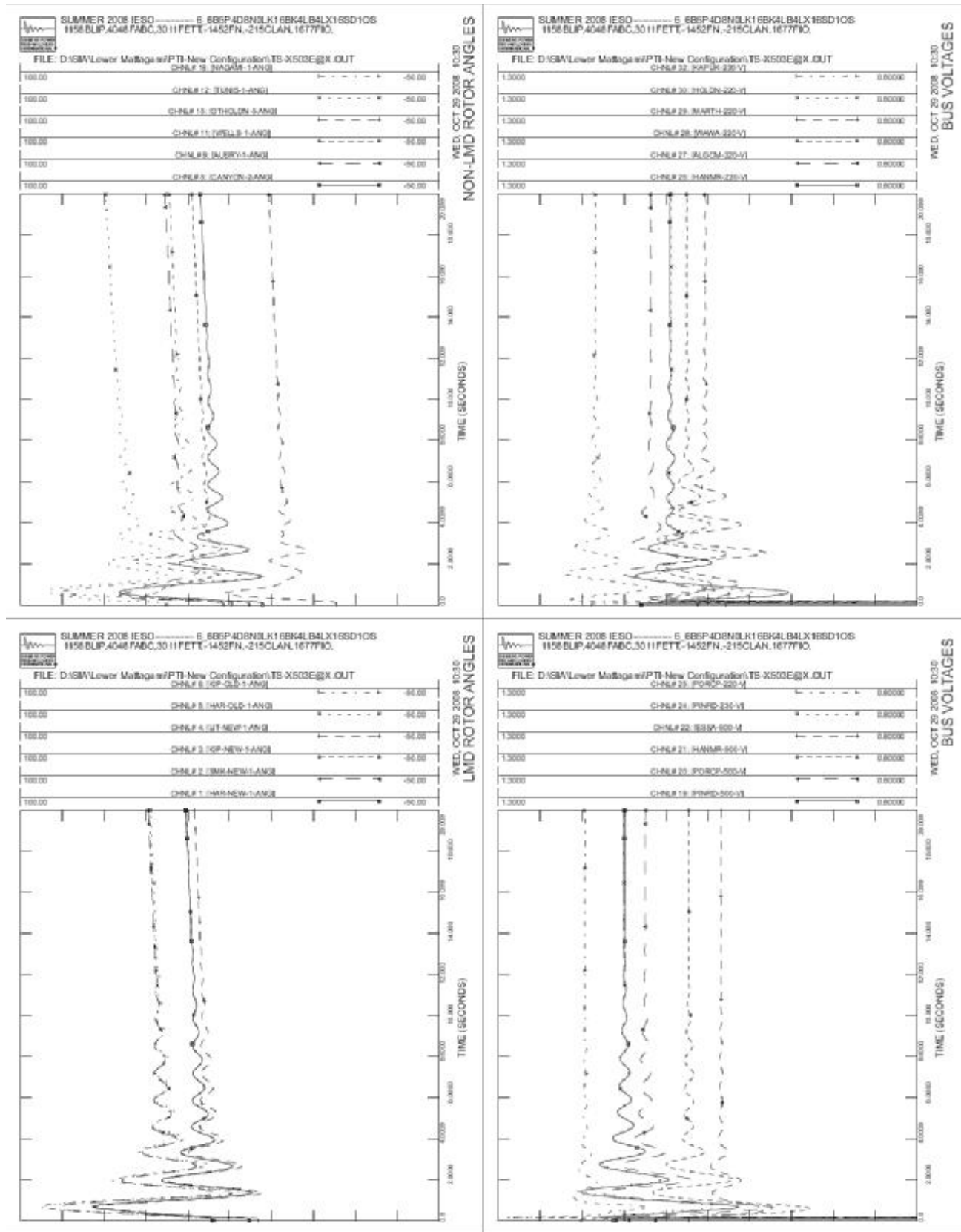


FIGURE 4A : RESPONSE TO LOSS OF X503E (CONTINGENCY C1)

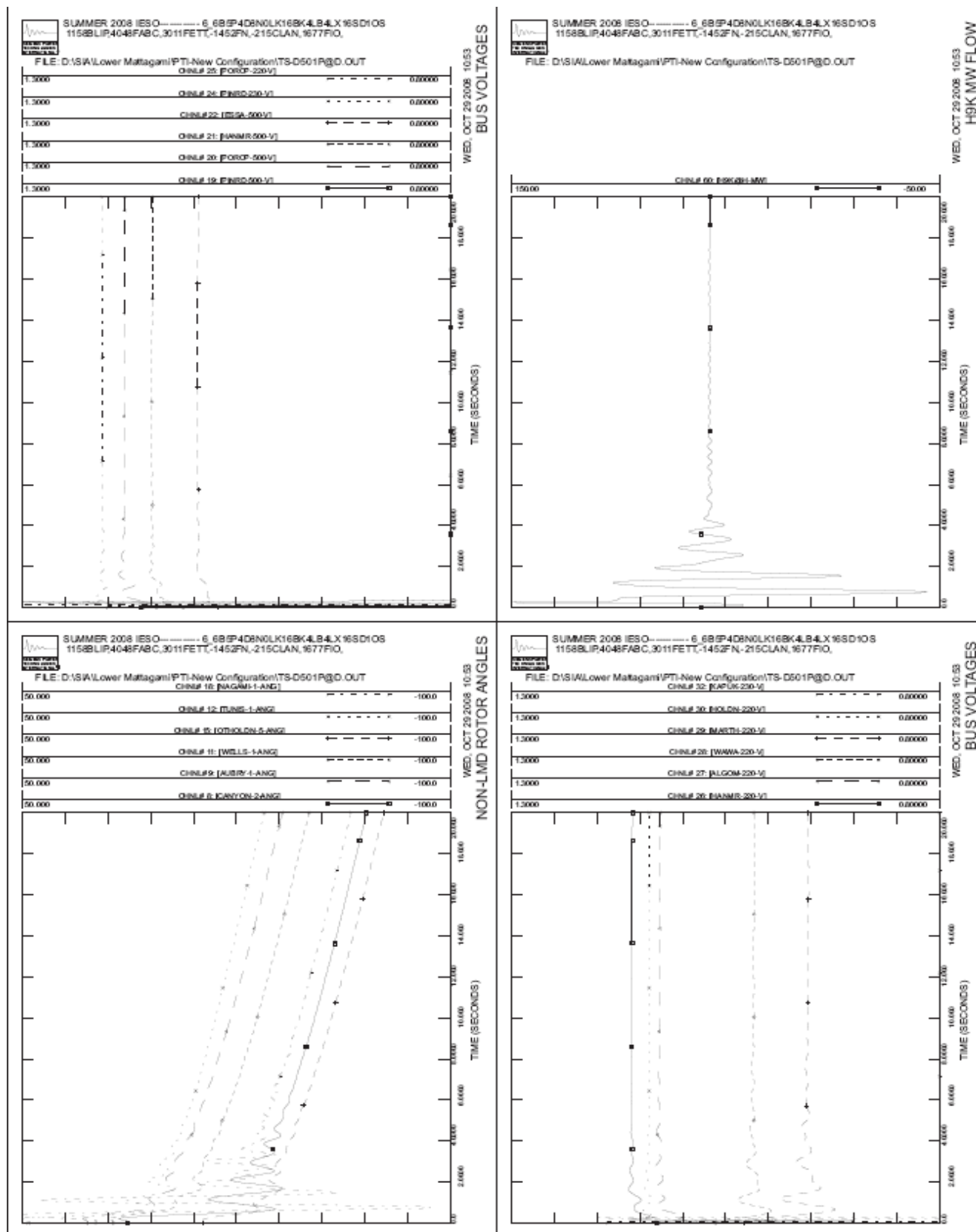


FIGURE 4B : RESPONSE TO LOSS OF D501P (CONTINGENCY C2)

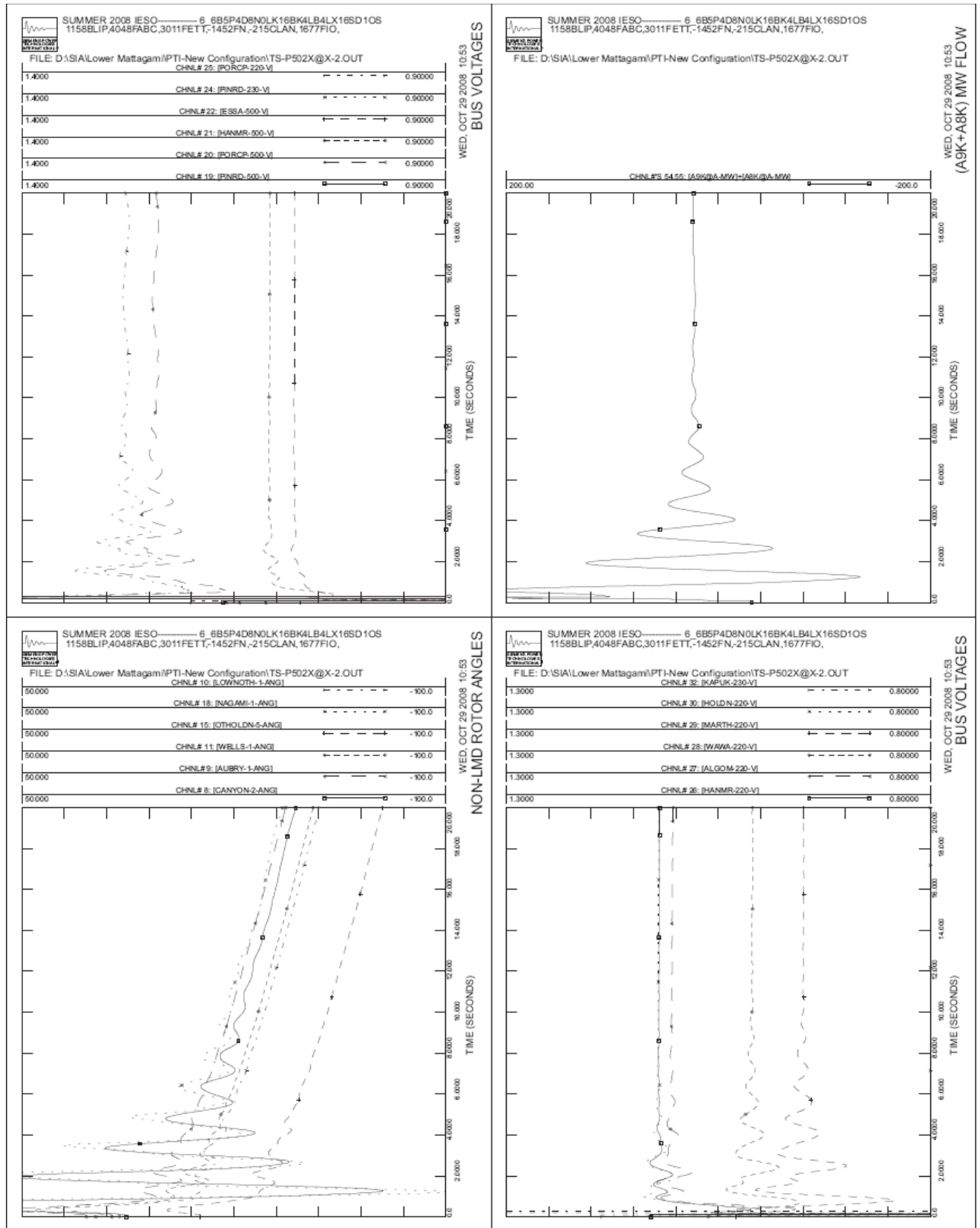


FIGURE 4C : RESPONSE TO LOSS OF P502X (CONTINGENCY C3)

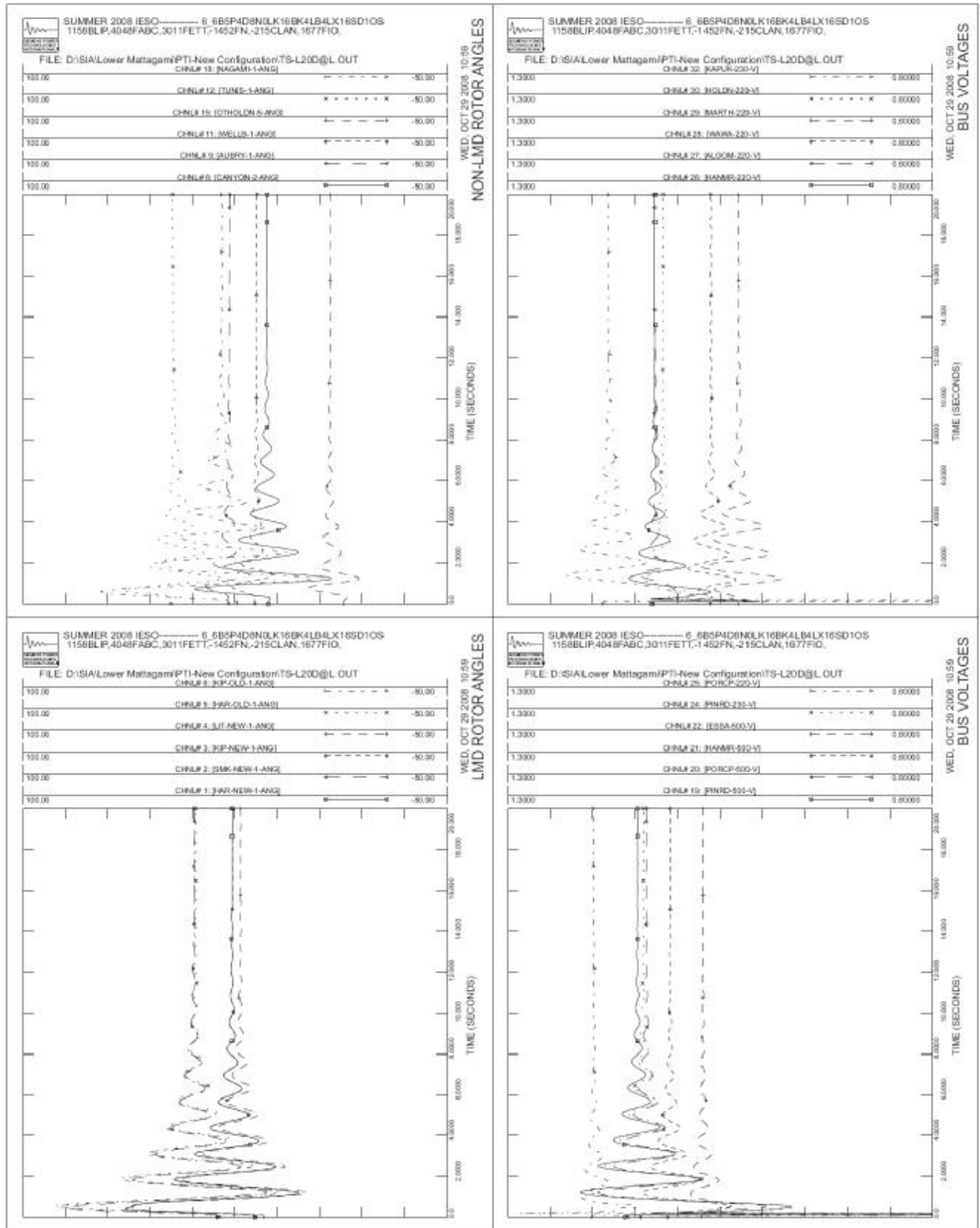


FIGURE 4D : RESPONSE TO LOSS OF L20D (CONTINGENCY C4)

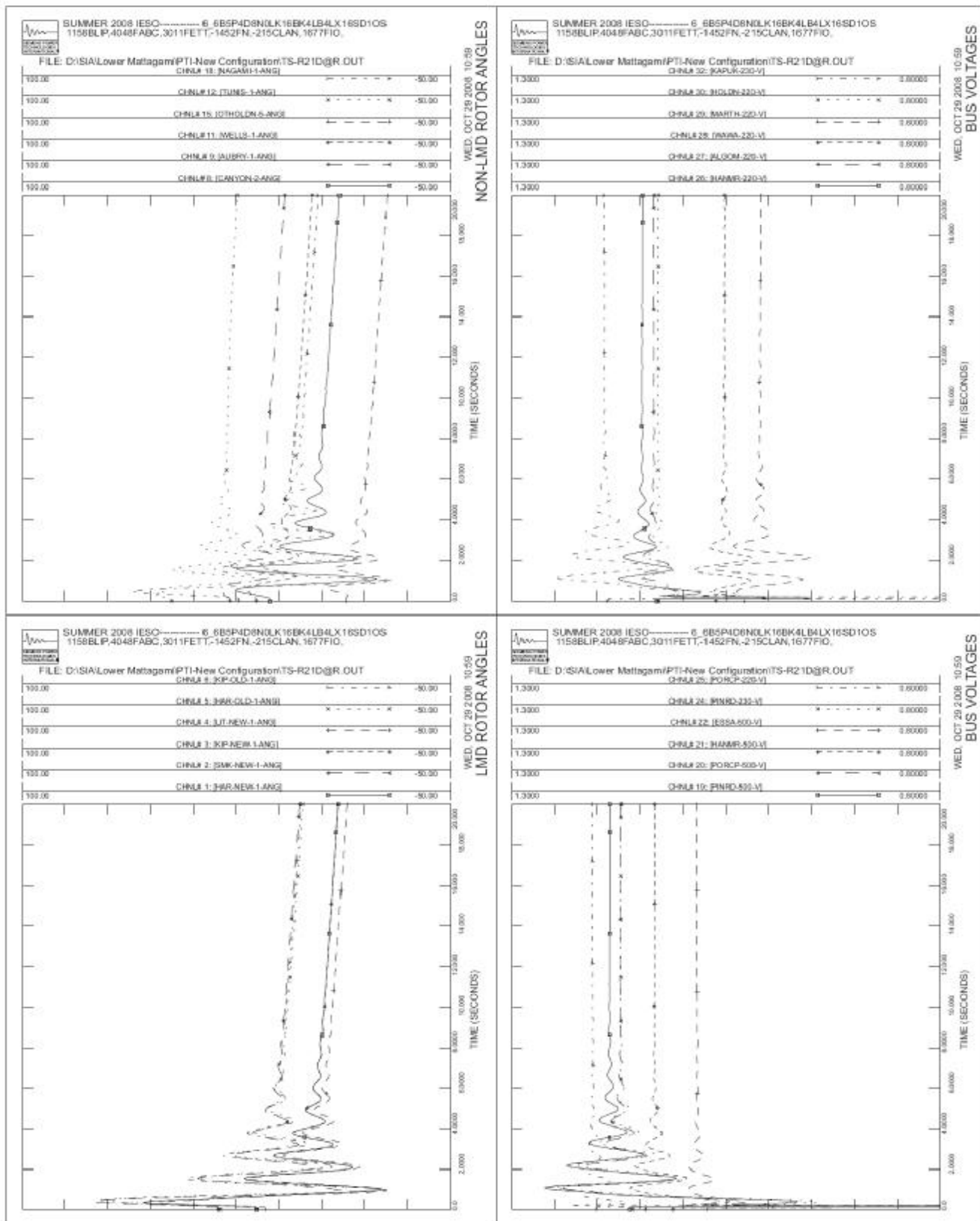


FIGURE 4E : RESPONSE TO LOSS OF R21D (CONTINGENCY C5)

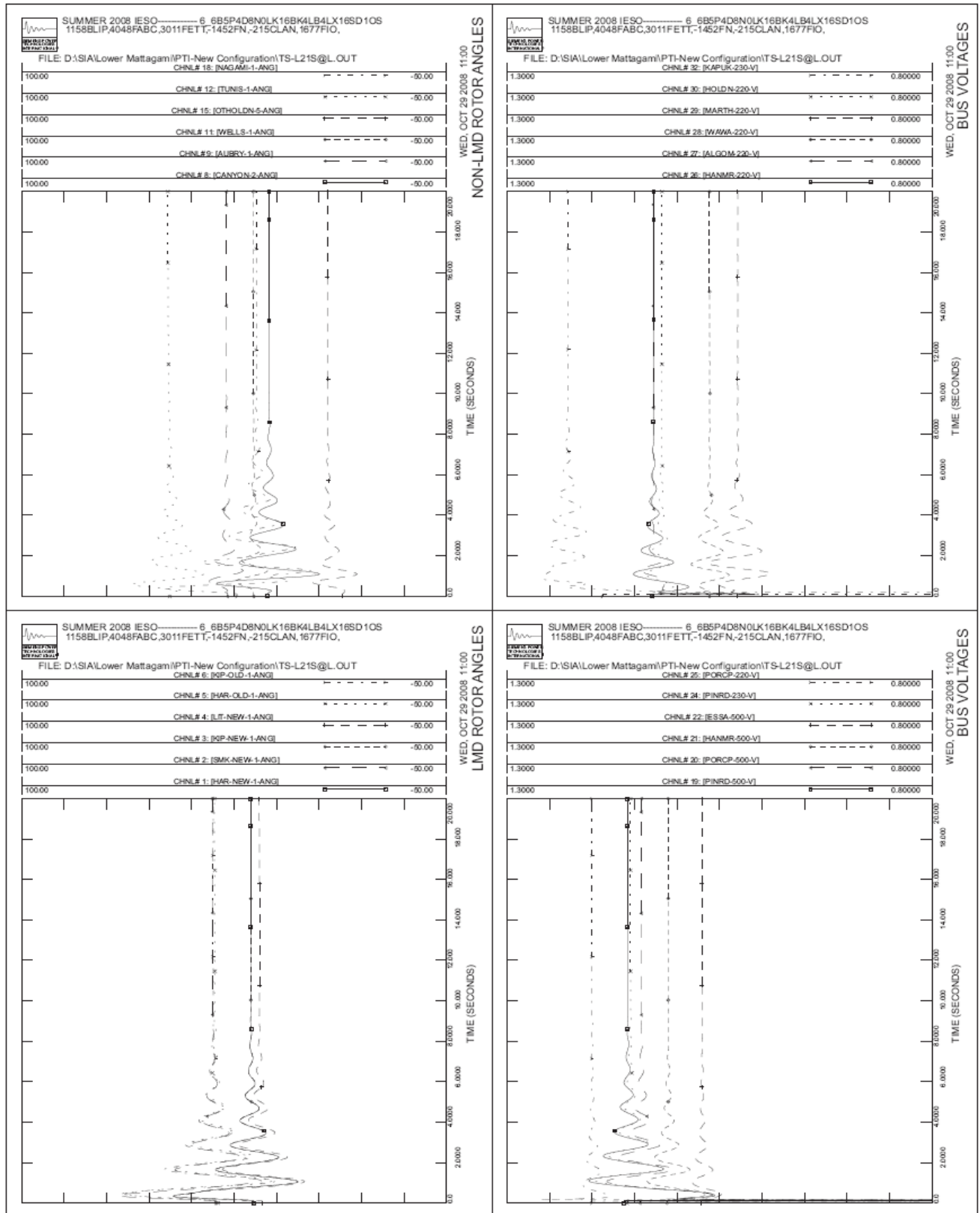


FIGURE 4F: RESPONSE TO LOSS OF L21S (CONTINGENCY C6)

4.9 Relay Margin

It is necessary that sufficient margin is maintained between apparent impedance trajectory of relays at each terminal of un-faulted circuits and the relay characteristics during transients in order to ensure those circuits are not tripped. The IESO requires that the relay margin for 115 kV circuits to be minimum 15 percent on all instantaneous relays and zero percent on all timed relays having a time delays less than or equal to 0.4 sec.

The Figure 5 shows the relay characteristics and the apparent impedance trajectory of the 115 kV circuit D3K for the loss of P502X. The trajectory for Kirkland Lake terminal of D3K enters the zone 2 characteristics. Thus, the existing relay settings will not be acceptable. If the settings are not revised, the D3K will have delayed trip which makes the portion of the power system north of Kirkland Lake and Porcupine an electrical island.

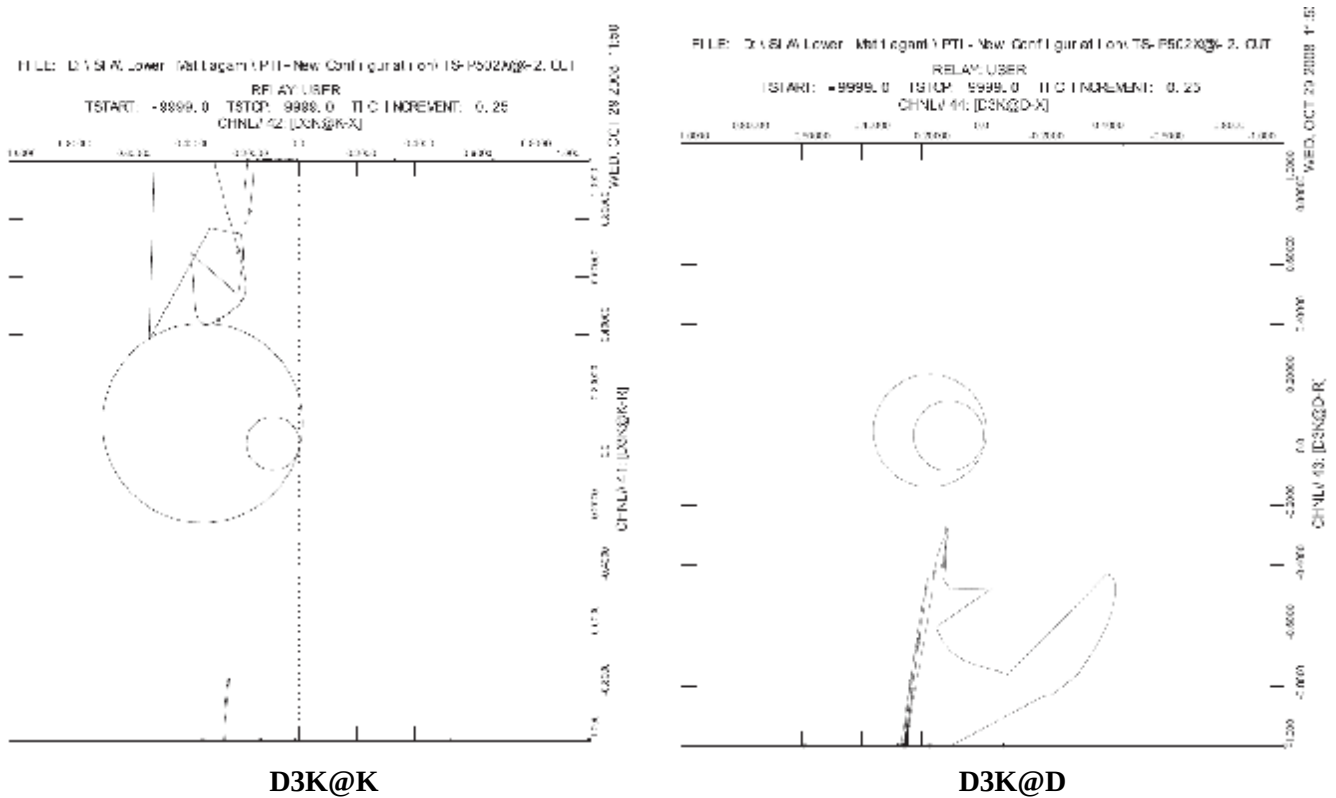


FIGURE 5 : D3K RELAY RESPONSE TO LOSS OF P502X

4.10 Excitation System Performance

The dynamic performance of the generator excitation system was simulated to check the compliance of the automatic excitation system behavior in terms of the ceiling and the speed of response to IESO standards.

- *Response Ratio Test*

During this particular test, the generator produces rated MW and MVAR according to the rated power factor. The rated power factor for Kipling, Little Long, Harmon and Smoky Falls generators are 0.95 lag. The disturbance simulated is a rapid increase of exciter reference to a large value. This drives the excitation to its ceiling as rapidly as possible, allowing us to estimate the exciter positive ceiling.

The IESO *Market Rule* requirement is to have a *positive excitation ceiling* twice the nominal excitation. Following is the summary of results.

Generator	Power Factor	Terminal voltage	(a) Nominal Excitation	(b) Excitation Ceiling	(b)/(a)
Kipling G3	0.95 lag	1.0 pu	1.8399 pu	4.8374 pu	2.6
Little Long G3	0.95 lag	1.0 pu	1.7870 pu	3.5607 pu	2.0
Harmon G3	0.95 lag	1.0 pu	1.9175 pu	4.8280 pu	2.5
Smoky Falls G1	0.95 lag	1.0 pu	2.2034 pu	5.2136 pu	2.3

- *Open Circuit Test*

During this particular test, the generator operates effectively in an island. The output of the generator is zero. The terminal voltage is 1.0 pu. The disturbance simulated is an increase of the exciter reference by 5 %. The IESO *Market Rule* requirement is the *excitation response time*, i.e. the time taken for the exciter output to reach 95 % of the difference between the positive ceiling field voltage and the nominal field voltage for 5 % change in exciter reference not to exceed 50 ms. Following is the summary of results.

Generator	MW, Mvar output	Terminal voltage	$0.95 \times [(b) - (a)]$	ΔV_{ref} for Exciter	Response Time
Kipling G3	0	1.0 pu	2.8476	0.05 pu	< 5 ms
Little Long G3	0	1.0 pu	1.6850	0.05 pu	< 5 ms
Harmon G3	0	1.0 pu	2.7649	0.05 pu	< 5 ms
Smoky Falls G1	0	1.0 pu	2.8597	0.05 pu	< 5 ms

The above method of finding the *Response Time* is approximate due to the operation of the generator in an island. This is a limitation of the PSS/E tool. However, since the above *Response Time* is less than 5 ms, the excitation systems would likely comply with the *Response Time* requirement if operated connected to the grid.

Following is the summary of the compliance of excitation systems to IESO *Market Rules*.

Generator	Comply with Ceiling Requirement	Comply with Response Time Requirement
Kipling G3	Yes	Yes
Little Long G3	Yes	Yes
Harmon G3	Yes	Yes
Smoky Falls G1	Yes	Yes

4.11 Short Circuit Level

Following is the summary of short circuit currents (kA) before and after Lower Mattagami Development new facilities are incorporated.

Bus	Before LMD				After LMD			
	Symmetrical Fault Current		Asymmetrical Fault Current		Symmetrical Fault Current		Asymmetrical Fault Current	
	3ph	LG	3ph	LG	3ph	LG	3ph	LG
Pinard 230 kV	10.96	13.86	12.70	17.34	12.97	15.99	14.79	19.84
Little Long SS 230 kV	-	-	-	-	13.44	15.20	16.82	19.19
Smoky Falls GS 230 kV	-	-	-	-	10.75	10.88	12.84	13.45
Little Long GS 230 kV	7.71	7.83	8.97	9.29	13.33	14.94	16.60	18.72
Kipling GS 230 kV	6.15	6.22	7.13	7.45	8.13	7.64	9.36	9.00
Harmon GS 230 kV	4.50	4.66	5.36	5.83	9.29	9.30	10.97	11.24
Kapuskasing 230 kV	4.96	5.20	5.98	6.43	5.46	5.58	6.49	6.81

The values given for Lower Mattagami GS 230 kV buses are for the greater of the L20D and H22D connection. The equipment ratings must be greater than above levels.

4.12 Real Time Monitoring

The Kipling, Harmon, Little Long and Smoky Falls generation facilities include generators that are between 20 MVA and 100 MVA. The IESO *Market Rules* defines such stations as *significant generating facilities*. The proponent must provide real-time monitoring for following quantities for each generator.

- (a) Active power generation
- (b) Reactive power generation
- (c) Terminal breaker status
- (d) Terminal voltage
- (e) AVR and PSS status

In addition, circuit breaker and disconnect switch status of Little Long SS and the MW and MVAR flow on circuits between Little Long SS and Pinard TS must be provided.

4.13 References

- [1] SIA Report produced by IESO titled “Installation of Series Capacitors in 500 kV circuits X503E and X504E at Nobel TS and SVCs at Porcupine TS and Kirkland Lake TS”, IESO_Rep_0379, May 15, 2007.

Filed: April 8, 2009
EB-2009-0078
Exhibit B
Tab 6
Schedule 4
Page 1 of 1

CUSTOMER IMPACT STUDY



Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

Customer Impact Assessment

Lower Mattagami Generation Connection Plan

Revision: Final

Date: January 20, 2009

Issued by: **System Investment Division**
 Hydro One Networks Inc.

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DISCLAIMER

This Customer Impact Assessment was prepared based on information available about the Lower Mattagami Generation Connection Plan. It is intended to highlight significant impacts, if any, to affected transmission customers early in the project development process and thus allow an opportunity for these parties to bring forward any concerns that they may have. Subsequent changes to the required modifications or the implementation plan may affect the impacts of the proposed connection identified in Customer Impact Assessment. The results of this Customer Impact Assessment are also subject to change to accommodate the requirements of the IESO and other regulatory or municipal authority requirements.

Hydro One shall not be liable to any third party which uses the results of the Customer Impact Assessment under any circumstances whatsoever for any indirect or consequential damages, loss of profit or revenues, business interruption losses, loss of contract or loss of goodwill, special damages, punitive or exemplary damages, whether any of the said liability, loss or damages arises in contract, tort or otherwise.

1.0 INTRODUCTION

1.1 Background

This Customer Impact Assessment (CIA) study assesses the potential impacts of the proposed Lower Mattagami Expansion Project on the load customers and generators in the local vicinity. This study is intended to supplement the System Impact Assessment “CAA ID 2006-239” issued November 1st, 2008 by the IESO.

Ontario Power Generation Inc (OPGI) is proposing to upgrade the existing hydroelectric generating stations in the Lower Mattagami River area. The Lower Mattagami River area is located approximately 70km north of the Town of Kapuskasing. The increase in generation for the four (4) hydroelectric generating stations is as follows in Table 1 below.

OPGI Generating Station	Existing		Proposed		Approximate Increase in Generation
	Output Per Unit	Total Output	Output Per Unit	Total Output	
Little Long SS	2 Units @ 68 MW	136 MW	3 Units @ 70 MW	210 MW	74 MW
Kipling GS	2 Units @ 79 MW	158 MW	3 Units @ 79 MW	237 MW	79 MW
Harmon GS	2 Units @ 70 MW	140 MW	3 Units @ 78 MW	234 MW	94 MW
Smoky Falls GS	4 Units @ 13 MW	52 MW	3 Units @ 88 MW	264 MW	212 MW
Total Increase in Area					~459 MW

Table 1: OPGI Proposed Generation Increases in Lower Mattagami Area

These upgrades will result in a net generation increase of approximately 459 MW.

To accommodate these upgrades Hydro One Inc will have to upgrade and modify transmission facilities in the Lower Mattagami Area.

1.2 Lower Mattagami Area Transmission System Upgrades

1.2.1 Transmission Station Work

Little Long SS

Build a new 230kV switching station near Little Long GS to accommodate the additional generation. The switching station will initially consist of two (2) 230kV diameters with six (6) circuit breakers for the switching operations. Figure 2 shows the proposed new station arrangement.

The proposed arrangement will allow the existing 230kV circuits H22D, L20D and L21S from the Harmon GS, Pinard TS, and Kapuskasing TS will be connected to the new station.

1.2.2 230kV Transmission Line Work

New 230 kV line from Smoky Falls GS to H22D/L20D

Smoky Falls GS currently connects to the 115kV system via circuits S3S/S4S. As part of OPGI's generation station upgrades, Smoky Falls is proposed to connect to the 230kV transmission system. This will be accomplished by constructing approximately 5km of new 230kV line from Smoky Falls GS to connect to H22D and L20D. S3S/S4S will become idle circuits.

H22D Circuit Extension

The 230 kV circuit H22D will be extended from the Harmon GS to the Kipling GS (approximately 4 km) where it will be used as one of the tap points for the upgraded Kipling GS.

Tap Points for H22D/L20D Connections

The Kipling GS, Harmon GS, Smoky Falls GS, and the Little Long GS will terminate/re-terminate to H22D and L20D via tap points.

1.2.3 Additional Connection Work

1) Capacitor Banks

Three (3) new capacitor banks are proposed to be installed near the Lower Mattagami region. These include the following

Station	Voltage Level	Capacity (Approx)
Kapuskasing TS	27.6kV	20 MVar @ 28.8kV
Little Long SS	230kV	100 MVar @ 250kV
Pinard TS	230kV	100 MVar @ 250kV

2) 115kV Circuit Upgrading

The 115 kV circuits H6T and H7T between La Forest Junction and Timmins TS will be upgraded. The NE Load & Generation Rejection Scheme will be modified. The Under-Frequency Load-Shedding Scheme will be modified.

1.3 Customer Connections

The purpose of this CIA is to assess the potential impacts on the existing transmission connected customer(s) in the vicinity of the Mattagami generation expansion. The primary focus of this study was on customers supplied by stations connected to the 230 kV, 115 kV systems between Kapuskasing TS and Huntla TS. The following load connected transmission station buses were monitored:

- Kapuskasing
- O'Brien
- Calstock DS
- Nagagami CGS
- Nagagami SS
- Epcor Calstock
- Tembec Spruce Falls
- Carmichael Falls
- Fauquier DS
- Tembec Smooth Rock
- Smooth Rock DS

2.0 METHODOLOGY & CRITERIA

2.1 Planning Criteria

To establish the adequacy of Hydro One transmission system incorporating the proposed additional generation facilities, the following post-fault voltage decline criteria were applied as per “IESO Transmission Assessment Criteria”:

http://www.theimo.com/imoweb/pubs/marketAdmin/IMO_REQ_0041_TransmissionAssessmentCriteria.pdf

- The loss of a single transmission circuit should not result in a voltage decline greater than 10% for pre-transformer tap-changer action (including station loads) and 10% post-transformer tap-changer action (5% for station loads);
- The loss of a double transmission circuit should not result in a voltage decline greater than 10% for pre-transformer tap-changer action (including station loads) and 10% post-transformer tap-changer action (5% for station loads);
- Voltages below 50 kV shall be maintained in accordance with CSA 235.

2.2 Study Assumptions

The following proposed generator modifications are modeled at maximum capacity and used for power flow analysis:

- Little Long GS upgraded to a maximum capacity of 235 MW and connects to both H22D and L20D
- Smoky Falls GS upgraded to a maximum capacity of 265 MW and connects to both H22D and L20D
- Harmon GS upgraded to a maximum capacity of 235 MW and connects to both H22D and L20D
- Kipling GS upgraded to a maximum capacity of 235 MW and connects to both H22D and L20D
- All loads modeled as constant MVA loads
- 300MV/-100MVar SVC on 230 kV Porcupine TS bus in-service
- Series capacitors between Hanmer TS and Essa TS in-service
- 20 MVar capacitor bank at 27.6 kV Kapuskasing TS bus in-service
- Tembec Spruce Falls Load is approximately 100MW
- Northeastern GR/LR/Cross-Tripping Special Protection Scheme enabled

2.3 Power System Analysis

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

- a. Short-Circuit Studies: Short circuit studies are used to determine the impact of the new facilities to 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.

3.0 ASSESSMENT OF HYDRO ONE NETWORKS SHORT CIRCUIT LEVELS AT CUSTOMER CONNECTION

Short circuit studies were carried out to assess the fault contribution of the new Lower Mattagami Generation connection project. The study area encompasses the Smoky Falls SS and Kapuskasing TS surrounding regions. The following assumptions are made from:

- Base case assumes existing and committed generating facilities in-service.
- Pre-fault voltage of 250.00 kV at 220 kV stations is assumed.
- Pre-fault voltage of 127.00 kV at 115 kV stations is assumed.

The study results are summarized in Table 2 below showing both symmetric and asymmetric (3-cycle) fault levels. The study also assumes maximum contribution from the addition of the Lower Mattagami Generation connection from the present Hydro One system arrangement.

	Pre-Fault Voltage Level	Existing			
		Symmetrical (kA)		Asymmetrical (kA)	
		3Ph Fault	LG Fault	3Ph Fault	LG Fault
Kapuskasing Jct	250kV	5.372	5.702	7.788	8.242
O'Brien Jct	250kV	5.366	5.720	7.795	8.287
Calstock DS Jct	127kV	1.792	1.591	2.098	1.793
Nagagami CGS	127kV	1.472	1.489	1.881	1.947
Nagagami SS	127kV	2.345	2.074	2.729	2.312
Epcor Calstock Jct	127kV	2.346	2.075	2.730	2.313
Tembec Spruce Falls Jct	127kV	5.668	6.086	7.658	7.483
Carmichael Fals Jct	127kV	4.863	3.147	5.157	3.329
Fauquier DS Jct	127kV	4.872	3.107	5.152	3.283
Tembec Smooth Rock Jct	127kV	6.240	3.456	6.743	3.713
Smooth Rock DS Jct	127kV	5.975	3.406	6.352	3.633
Kapuskasing EZ Bus	24.9kV	13.4	11.979	18.284	16.116

	Pre-Fault Voltage Level	with Lower Mattagami Expansion			
		Symmetrical (kA)		Asymmetrical (kA)	
		3Ph Fault	LG Fault	3Ph Fault	LG Fault
Kapuskasing Jct	250kV	5.560	5.850	8.031	8.435
O'Brien Jct	250kV	5.547	5.863	8.029	8.472
Calstock DS Jct	127kV	1.794	1.592	2.101	1.794
Nagagami CGS	127kV	1.474	1.490	1.882	1.948
Nagagami SS	127kV	2.351	2.077	2.734	2.314
Epcor Calstock Jct	127kV	2.351	2.078	2.735	2.315
Tembec Spruce Falls Jct	127kV	5.737	6.140	7.731	7.537
Carmichael Fals Jct	127kV	4.897	3.156	5.192	3.339
Fauquier DS Jct	127kV	4.907	3.117	5.187	3.293
Tembec Smooth Rock Jct	127kV	6.285	3.465	6.788	3.721
Smooth Rock DS Jct	127kV	6.016	3.416	6.392	3.642
Kapuskasing EZ Bus	24.9kV	13.561	12.066	18.48	16.218

Table 2

These results to show that existing fault levels meet the maximum symmetrical three-phase and single line-to-ground faults (kA) of 230 kV, 115 kV, and 27.6 kV for all equipment connected to Hydro One transmission system. The requirements are set out in 'Appendix 2' of the *Transmission System Code* (TSC) and summarized below.

- The maximum symmetrical three-phase and single line-to-ground faults given in the TSC may be summarized as follows:

Nominal Voltage (kV)	Max. 3-Phase Fault (kA)	Max. SLG Fault (kA)
230	63	80
115	50	50
44	20	19
27.6	17	12
13.8 and under	21	10

Table 2 also shows that there is very limited increase in short circuit level at other locations. Although the Kapuskasing LV EZ bus shows the single line-ground fault reaching the TSC threshold, Hydro One is aware of the situation and will continue monitoring for any new future projects in the area which may impact

the single line to ground fault level. Overall, the increased short circuit level is significantly below the TSC limit and the existing equipment rating.

4.0 ASSESSMENT OF HYDRO ONE NETWORKS VOLTAGE PERFORMANCE AT CUSTOMER CONNECTIONS

Load flow studies were carried out for the incorporation of the Lower Mattagami Generation Connection Plan. The studies reviewed performance on the local 230 kV and 115kV system and customer stations in the vicinity. The area under study encompasses stations connected to North Eastern Ontario grid (lines D501P, L20D, H22D, K38S, and H9K).

This section compares present day conditions (2008) with the addition of the Lower Mattagami Expansion. Also, this section will analyze how specific circuit contingencies impacted the voltage performance on key buses in the area. The impact was assessed using post-contingency load flows. Key 500 kV/230 kV/115 kV buses were monitored as well as customer buses represented as load buses that are connected to any of the aforementioned circuits.

The IESO has included the need to modify the existing Northeast G/R to include the new generators associated with the Lower Mattagami Expansion. Please refer to Section 4.4 of IESO's System Impact Assessment Report on the Lower Mattagami Generation Development IESO_REP_0517.

The following assumptions were made:

2008 Present Day Condition

- Smoky Falls GS is connected to Kapuskasing TS via the 115kV circuit S3S/S4S. This 115kV connection bypasses the Tembec Spruce Falls customer facilities.
- Tembec Spruce Falls load is modeled at 100MW
- Model is based on full generation and loading.
- Northeast Load and Generation Rejection Limits are applied during contingencies (L20D/H22D, L21S)

Lower Mattagami Expansion

- System configured as described in Section 2.2
- Capacitor banks at Kapuskasing TS, Pinard TS, Porcupine TS, and Little Long SS (installed with Mattagami expansion)
- Northeast Load and Generation Rejection Limits are applied during contingencies (L20D/H22D, L21S)

4.1. Contingency Analysis

Four (4) contingency scenarios were analyzed for voltage impact:

	Contingency (Loss of)	Line Section
a)	H22D/L20D	Little Long SS to Pinard TS
b)	H22D	Kipling GS to Little Long SS
c)	L20D	Kipling GS to Little Long SS
d)	L21S	Little Long SS to Kapuskasing TS

Voltage impact results for these scenarios are shown are summarized in Appendix A.

Following the worst contingencies, the worst voltage changes summarized in Appendix A are well within the voltage decline requirements given in the IESO's Transmission Assessment Criteria (summarized below in Table 2) and Canadian Standard Association document CAN-3-C235-83. IESO will control the amount of generation production to limit voltage levels.

Contingency Voltage Change Limits						
Nominal Bus Voltage (kV)	500	230	115	Transformer Station Voltages		
				44	27.6	13.8
% voltage change <i>before</i> tap changer action	10%	10%	10%	10%	10%	10%
% voltage change <i>after</i> tap changer action	10%	10%	10%	5%	5%	5%
AND within the range						
Maximum* (kV)	550	250	127	112% of nominal		
Minimum* (kV)	470	207	108	88% of nominal		

Table 2

*The maximum and minimum voltage ranges are applicable following a contingency. Certain buses can be assigned specific maximum and minimum voltages as required for operations. In northern Ontario, the maximum continuous voltage for the 230 and 115 kV systems can be as high as 260 kV and 132 kV respectively. After the system is re-dispatched and generation and power flows are adjusted the system must return to within the maximum and minimum continuous voltages [from IESO document IMO_REQ_0041 Issue 5.0]

Load flow studies thus confirmed that incorporation of the Lower Mattagami Generation Connection Plan will not degrade the voltage performance at any customer delivery points. Following the worst single contingency, the voltage changes are well within the voltage decline guideline for customer buses of less than 10% voltage drop before transformer tap-changer operation. It should be noted Smoky Falls GS and the new Harmon, Kipling and Little Long generators will need to be included into the Northeast G/R Scheme to provide operating flexibility during contingencies.

5.0 Connection Line Reliability

By providing two circuit connections to Kipling GS, Harmon GS, Smoky Falls GS and Little Long GS, the reliability of the supply from these generators will improve. Little Long SS will provide additional operational flexibility to the area.

The proposed construction of Little Long SS is expected to improve the reliability of supply to electricity consumers in the Kapuskasing area. Presently, the L20D contingency will require the arming of load for rejection. After the completion of the Mattagami project, this will not be needed.

6.0 Preliminary Outage Impact Assessment

Outages associated with the construction work to connect the Little Long SS expansion to Hydro One's system will be identified when a detailed construction schedule is established in consultation with Ontario Power Generation Inc and the load customers in the Kapuskasing Area. The line work associated with the Little Long SS expansion is not expected to result in load customer outages. Exact outage schedule will be made available during the detailed engineering phases of the project development. The outage duration will be minimized and risk managed with proper outage planning and co-ordination.

7.0 Conclusions and Recommendations

This Customer Impact Assessment (CIA) presents results of short-circuit and voltage performance study analysis.

The overall findings of this CIA provided that the above recommendations are implemented are:

- The results of the short circuit analysis showed that some area's stations encountered small (insignificant) increases in fault level at the connection points. These increases were within the capability of the existing facilities. However, the customers connected in the area should review the fault levels at their connection points to confirm their equipment is capable of withstanding the increased fault and voltage levels.
- When in operation, the Lower Mattagami expansion will assist in supporting the voltages seen by the connected customers under system disturbances and will not adversely impact the local voltage performance in the Kapuskasing area
- The connection of the Lower Mattagami expansion with the proposed changes at Little Long SS is expected to enhance the reliability of supply to the Kapuskasing area connected customers
- It is not possible to assess the impact of outages during construction at this time because the required outages have yet to be defined.

FIGURE 1 – EXISTING LAYOUT FOR LOWER MATTAGAMI GENERATION

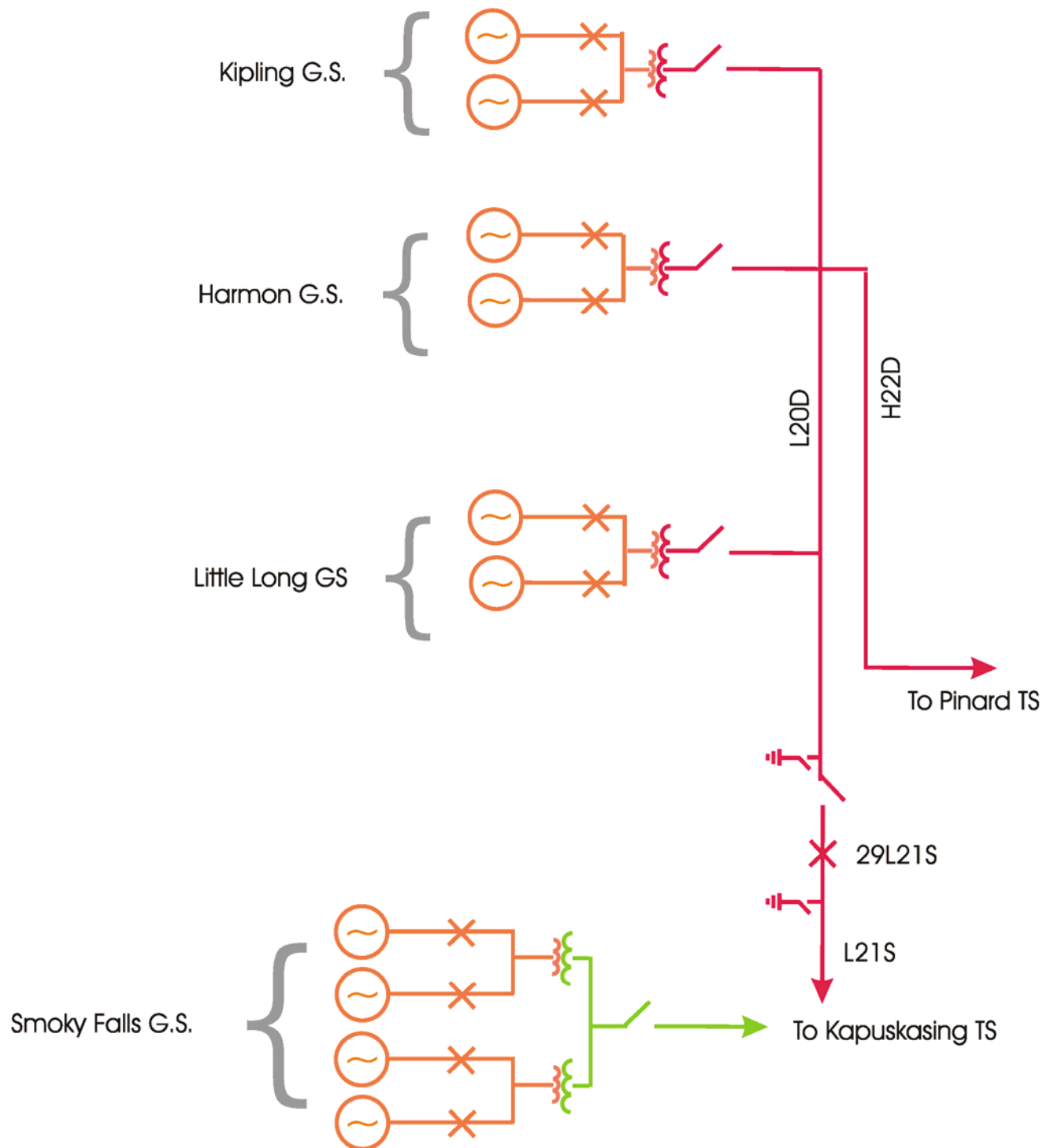
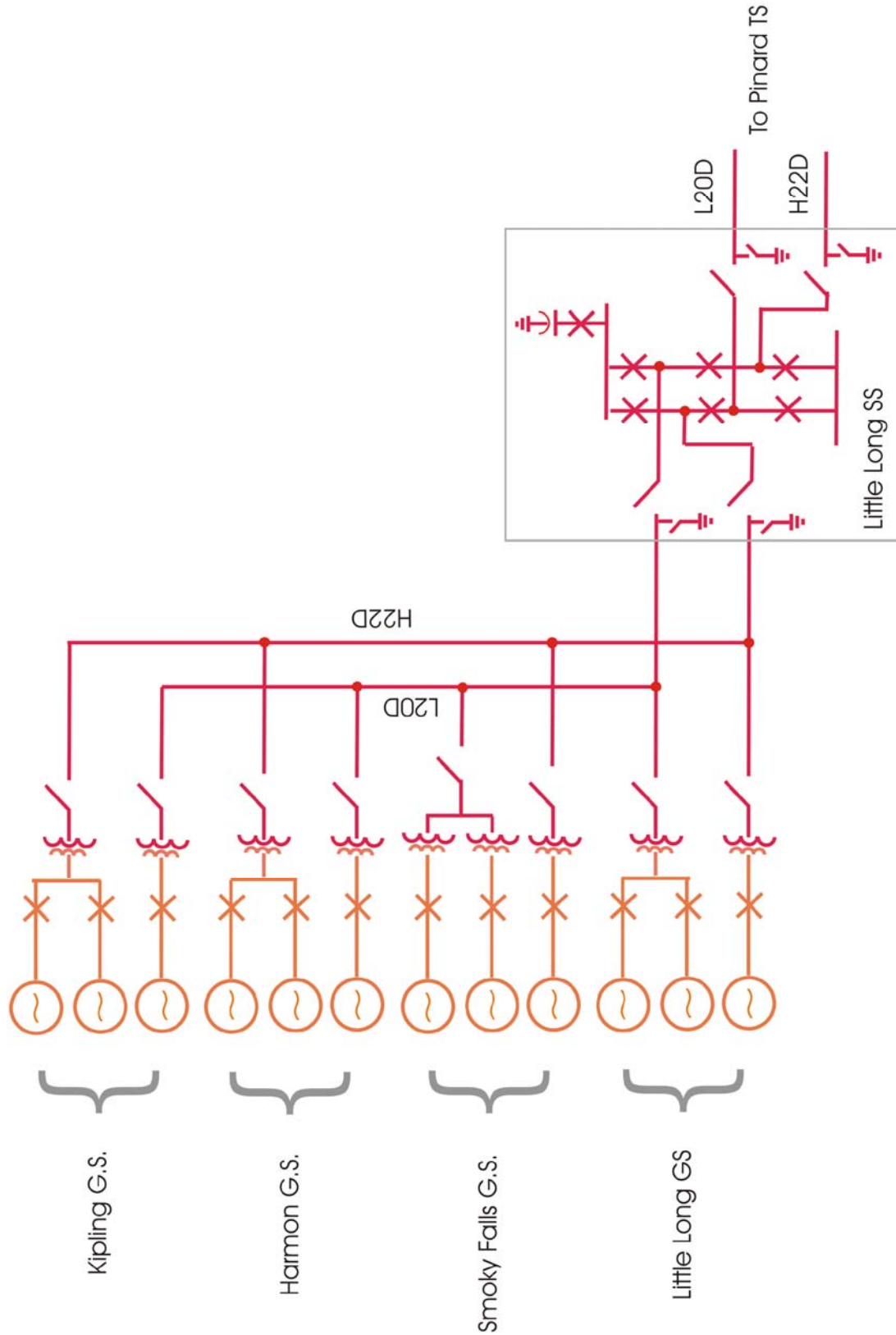


FIGURE 2 – PROPOSED LAYOUT FOR LOWER MATTAGAMI GENERATION CONNECTION



APPENDIX A – PSS/E LOAD FLOW RESULTS

	Present Day Pre-C Voltages	With Lower Mattagami Pre-C Voltage	w/o L. Mattagami		with L. Mattagami			
			After ULTC Post-C Voltage		Before ULTC Post-C Voltage		After ULTC Post-C Voltage	
			kV	Δ%	kV	Δ%	kV	Δ%
Loss of H22D/L20D Little Long SS to Pinard TS								
Kipling Junction H22D	244.67	247.83	244.77	0.04%	248.87	0.42%	249.05	0.49%
Kipling Junction L20D	244.67	247.94	244.77	0.04%	249.48	0.62%	249.70	0.71%
Harmon Junction H22D	243.34	247.85	*OOS*	*OOS*	248.93	0.44%	249.11	0.51%
Harmon Junction L20D	244.14	247.96	*OOS*	*OOS*	249.48	0.61%	249.70	0.70%
Smoky Falls Junction H22D	n/a	247.92	n/a	n/a	249.15	0.50%	249.36	0.58%
Smoky Falls Junction L20D	n/a	248.02	n/a	n/a	249.46	0.58%	249.68	0.67%
Little Long Junction H22D	244.14	248.06	244.25	0.04%	249.46	0.56%	249.70	0.66%
Little Long Junction L20D	244.14	248.07	244.25	0.04%	249.50	0.58%	249.73	0.67%
Tembec Spruce Falls	240.49	245.81	238.21	-0.95%	246.72	0.37%	246.73	0.38%
Nagagami CGS	128.30	128.97	127.92	-0.30%	129.06	0.07%	129.05	0.06%
Calstock DS	127.14	127.95	126.68	-0.36%	128.05	0.08%	128.04	0.07%
Hearst TS	126.09	127.02	125.56	-0.42%	127.14	0.10%	127.12	0.08%
Calstock CGS	127.46	128.13	127.08	-0.30%	128.21	0.07%	128.20	0.06%
Carmichael Falls CGS	128.01	129.11	127.59	-0.33%	129.47	0.28%	129.34	0.18%
Fauquier DS	127.33	128.62	126.86	-0.37%	129.06	0.34%	128.90	0.22%
Tembec Smooth Rock Falls	128.65	130.01	128.54	-0.08%	130.52	0.39%	130.23	0.17%
Smooth Rock Falls DS	128.69	130.10	128.62	-0.06%	130.61	0.39%	130.30	0.15%
Kapuskasing TS EZ Bus	26.33	26.72	26.37	0.15%	26.82	0.38%	26.54	-0.67%
Loss of H22D Kipling GS to Little Long SS								
Kipling Junction H22D	244.67	247.83	n/a	n/a	*OOS*	*OOS*	*OOS*	*OOS*
Kipling Junction L20D	244.67	247.94	244.77	0.04%	250.84	1.17%	251.74	1.53%
Harmon Junction H22D	243.34	247.85	*OOS*	*OOS*	*OOS*	*OOS*	*OOS*	*OOS*
Harmon Junction L20D	n/a	247.96	n/a	n/a	250.96	1.21%	251.90	1.59%
Smoky Falls Junction H22D	n/a	247.92	n/a	n/a	*OOS*	*OOS*	*OOS*	*OOS*
Smoky Falls Junction L20D	n/a	248.02	n/a	n/a	251.42	1.37%	252.49	1.80%
Little Long Junction H22D	244.14	248.06	n/a	n/a	*OOS*	*OOS*	*OOS*	*OOS*
Little Long Junction L20D	244.14	248.07	244.25	0.04%	252.19	1.66%	253.48	2.18%
Tembec Spruce Falls	240.49	245.81	238.21	-0.95%	248.27	1.00%	248.68	1.17%
Nagagami CGS	128.30	128.97	127.92	-0.30%	129.13	0.13%	129.13	0.12%
Calstock DS	127.14	127.95	126.68	-0.36%	128.14	0.15%	128.14	0.15%
Hearst TS	126.09	127.02	125.56	-0.42%	127.24	0.17%	127.23	0.17%
Calstock CGS	127.46	128.13	127.08	-0.30%	128.28	0.12%	128.28	0.12%
Carmichael Falls CGS	128.01	129.11	127.59	-0.33%	130.75	1.27%	130.09	0.76%
Fauquier DS	127.33	128.62	126.86	-0.37%	130.48	1.45%	129.78	0.90%
Tembec Smooth Rock Falls	128.65	130.01	128.54	-0.08%	132.58	1.98%	131.36	1.04%
Smooth Rock Falls DS	128.69	130.10	128.62	-0.06%	132.72	2.01%	131.43	1.02%
Kapuskasing TS EZ Bus	26.33	26.72	26.37	0.15%	27.39	2.51%	26.73	0.05%
Loss of L20D Kipling GS to Little Long SS								
Kipling Junction H22D	244.67	247.83	n/a	n/a	250.80	1.20%	251.79	1.60%
Kipling Junction L20D	244.67	247.94	*OOS*	*OOS*	*OOS*	*OOS*	*OOS*	*OOS*
Harmon Junction H22D	243.34	247.85	245.09	0.72%	250.94	1.25%	251.96	1.66%
Harmon Junction L20D	n/a	247.96	n/a	n/a	*OOS*	*OOS*	*OOS*	*OOS*
Smoky Falls Junction H22D	n/a	247.92	n/a	n/a	251.43	1.41%	252.60	1.88%
Smoky Falls Junction L20D	n/a	248.02	n/a	n/a	*OOS*	*OOS*	*OOS*	*OOS*
Little Long Junction H22D	244.14	248.06	n/a	n/a	252.17	1.66%	253.54	2.21%
Little Long Junction L20D	244.14	248.07	*OOS*	*OOS*	*OOS*	*OOS*	*OOS*	*OOS*
Tembec Spruce Falls	240.49	245.81	232.33	-3.39%	248.26	1.00%	248.73	1.19%
Nagagami CGS	128.30	128.97	128.10	-0.16%	129.13	0.12%	129.14	0.13%
Calstock DS	127.14	127.95	126.90	-0.19%	128.14	0.15%	128.14	0.15%
Hearst TS	126.09	127.02	125.81	-0.22%	127.24	0.17%	127.24	0.18%
Calstock CGS	127.46	128.13	127.26	-0.16%	128.28	0.12%	128.29	0.13%
Carmichael Falls CGS	128.01	129.11	127.53	-0.37%	130.75	1.27%	130.11	0.77%
Fauquier DS	127.33	128.62	126.77	-0.44%	130.48	1.44%	129.79	0.91%
Tembec Smooth Rock Falls	128.65	130.01	128.44	-0.16%	132.58	1.97%	131.36	1.04%
Smooth Rock Falls DS	128.69	130.10	128.56	-0.10%	132.71	2.01%	131.44	1.03%
Kapuskasing TS EZ Bus	26.33	26.72	26.33	0.00%	27.38	2.48%	26.71	-0.05%
Loss of L21S								

Kipling Junction H22D	n/a	247.83	n/a	n/a	246.96	-0.35%	246.96	-0.35%
Kipling Junction L20D	244.67	247.94	244.88	0.09%	247.09	-0.34%	247.10	-0.34%
Harmon Junction H22D	243.34	247.85	242.89	-0.19%	246.94	-0.37%	246.95	-0.36%
Harmon Junction L20D	n/a	247.96	n/a	n/a	247.08	-0.35%	247.08	-0.35%
Smoky Falls Junction H22D	n/a	247.92	n/a	n/a	246.90	-0.42%	246.90	-0.41%
Smoky Falls Junction L20D	n/a	248.02	n/a	n/a	247.02	-0.40%	247.02	-0.40%
Little Long Junction H22D	n/a	248.06	n/a	n/a	246.85	-0.49%	246.86	-0.49%
Little Long Junction L20D	244.14	248.07	244.40	0.11%	246.86	-0.49%	246.87	-0.48%
Tembec Spruce Falls	240.49	245.81	231.89	-3.58%	249.03	1.31%	250.51	1.91%
Nagagami CGS	128.30	128.97	128.01	-0.23%	129.37	0.30%	129.09	0.09%
Calstock DS	127.14	127.95	126.79	-0.28%	128.41	0.37%	128.09	0.11%
Hearst TS	126.09	127.02	125.68	-0.32%	127.56	0.42%	127.18	0.12%
Calstock CGS	127.46	128.13	127.17	-0.23%	128.51	0.30%	128.24	0.09%
Carmichael Falls CGS	128.01	129.11	127.11	-0.70%	129.63	0.40%	129.26	0.12%
Fauquier DS	127.33	128.62	126.24	-0.85%	129.21	0.46%	128.79	0.13%
Tembec Smooth Rock Falls	128.65	130.01	127.61	-0.81%	130.15	0.11%	129.92	-0.07%
Smooth Rock Falls DS	128.69	130.10	127.67	-0.79%	130.18	0.06%	129.98	-0.10%
Kapuskasing TS EZ Bus	26.33	26.72	26.33	0.00%	27.38	2.48%	26.71	-0.05%

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ONTARIO RELIABILITY OUTLOOK

THE ONTARIO RELIABILITY OUTLOOK

DECEMBER

2008



Power to Ontario. On Demand.



IESO Control Room

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EXECUTIVE SUMMARY

The balance between demand and available supply in Ontario has improved considerably over the last number of years. Efforts to renew Ontario's electricity infrastructure and achieve the province's environmental targets have challenged the industry – yet these efforts are already providing tangible results with an improved reliability outlook in the near term.

In this Outlook, the IESO has identified three priority areas for reliability – the changing supply picture, the challenges of operating a greener electricity system and the continuing need for transmission enhancements. While significant progress has been achieved on all these fronts, other new challenges are emerging.

PRIORITY AREA #1: THE CHANGING SUPPLY PICTURE

Ontario is well positioned for the phase-out of coal-fired generation by the end of 2014. Replacement capacity is either on-line or on schedule. In the years following the coal phase-out, the province's next reliability challenge will be to carefully manage the renewal of its existing nuclear fleet.

From today's perspective, the successful phase-out of all coal production in the province is achievable.

Overall, almost 10,000 MW of new generation or demand management is in service or planned, comprising nuclear refurbishment, new natural gas generation, conservation and more than 1,400 MW of renewable generation projects. Together, these resources will aid in the balancing of the provincial supply mix and support the reduction and eventual phase-out of existing coal generation.

Progress toward these milestones has enabled the implementation of further emission restrictions for coal-powered generation at the beginning of 2009. By 2011, these limitations will significantly reduce coal-plant emissions and are structured so that the IESO can manage potential reliability impacts.

There is a need, however, for the careful management of transmission operations as the Nanticoke Generating Station transitions away from coal-fired generation at a time when Units 1 and 2 at the Bruce A Generating Station are planned to be reintroduced into service. Nanticoke provides critical voltage support to the transmission network, particularly along the 500 kV corridor between London and Toronto. The loss of the Nanticoke generation coupled with the increase in production from Bruce A and new renewable generation in the area will require the installation of shunt capacitor banks and interim reactive power support from the Nanticoke site.

The development of gas-fired generation is rapidly providing replacement capacity and many of the operational capabilities offered by coal. Capacity from gas-fired facilities has surpassed coal generation in the province. Over the last year, the Greenfield Energy Centre and the first phase of the Portlands Energy Centre have been placed in service, providing 1,500 MW of capacity. Another 1,600 MW of gas supply is expected to become operational before the summer of 2009.

As Ontario's electricity sector becomes more dependent on natural gas as a primary fuel, the adequacy and security of the natural gas supply infrastructure becomes even more critical to the reliability of the electricity system. The IESO has been working with its partners in both the gas and electricity industries to develop communication protocols and shared operational and planning studies.

Beyond the coal shutdown, a new challenge emerges – the need to refurbish or retire and replace aging nuclear units. Ministry of Energy and Infrastructure directives call for the amount of planned nuclear capacity be limited to 14,000 MW over the next 20 years. To meet this objective, the majority of nuclear units will need to be refurbished or be replaced through new-build projects.

All four 500 MW units at Pickering B will be nearing the end of their service lives, requiring an analysis of how best to maintain or replace

this capacity. Similarly, all four Bruce B units will reach the end of their service lives within the next decade. In addition, a decision is anticipated soon about which technology is to be used in the two new nuclear units on the Darlington site.

These decisions will have significant impacts between 2015-2020 as many of these developments will require major grid-related outage programs and new transmission capability. This convergence of decisions regarding Ontario's nuclear fleet will require intricate planning as some facilities are taken out of service, others are reintroduced, and still others are commissioned for the first time. This planning needs to take into account the operational challenges that each option entails.

PRIORITY AREA #2: OPERATING A GREENER ELECTRICITY SYSTEM

A more sustainable, diverse and variable supply mix requires a more flexible and innovative approach to operating the electricity system. A new model for system operations is emerging – one that responds to production and consumption activity on a local level and then moves to meet remaining provincial electricity needs.

A rapid transformation is taking place within Ontario's generation mix. New renewable resources with different operating characteristics are coming on-stream; generation is becoming increasingly dispersed and demand management is taking a more active role in providing reliability.

Ontario now leads the country in wind power capacity, with over 700 MW of installed wind generation, and more to come. Production from these facilities has been strong with an average capacity factor of 30 per cent for the first 10 months of 2008. Ontario is extremely well-positioned to support the growth of wind generation in the province – with a diversity of potential sites.

Given the intermittent nature of wind facilities, the IESO has been proactively working with others to address any impediments to additional wind integration. It is also looking at operational, planning and forecasting issues. For example, winter forecasts will now incorporate higher capacity factors for wind generation, a reflection of wind's stronger performance at that time of the year.

Providing the necessary flexibility and ramping capability within the new supply mix will be key. Supply must be continually balanced to meet the needs of the province and its interconnections. The IESO will be looking at ways to evolve these capabilities efficiently during this transformation.

Increased distributed or embedded generation will also facilitate the growth of renewables in the province. Distributed generation can be more efficient in mitigating local reliability concerns and reducing power system losses. The Ontario Power Authority (OPA) has signed contracts for approximately 1,400 MW of distributed generation – mostly through wind, solar and biomass projects – to be in place by 2011.

Demand response (DR) programs that specifically target load reduction during hours with tight supply cushions are beginning to take shape, signalling to consumers when those demand reductions are most needed.

DR programs are maturing, and in particular, the OPA's DR 3 program launched this fall is contracting with large customers to reduce load over 100 or 200 peak hours in a year. The structure of this new program will also provide a highly reliable and verifiable supply resource.

The innovation taking place to create a more sustainable supply mix needs to be matched with innovation in system operations. The IESO has been working with industry partners to develop a greater understanding of these new resources as well as what tools and standards are needed to effectively manage them.

With many more players contributing to system reliability, a need for more centralized information gathering and co-ordination is emerging. In jurisdictions with significant amounts of renewable generation, system control centres often have the ability to track production and consumption activity on a local level and then move to maintain reliability by directing large-scale generation to provide energy for the remaining demand.

To be effective, this new approach to system operations would benefit from the co-ordinating influence of market prices and smart grid technologies. Wholesale electricity markets signal to consumers and producers when generation and demand response is needed the most – harmonizing all participants to work in ways that support reliability.

A greener and more distributed electricity sector also requires advanced information technologies to enable the flow of information to and from the distribution level. Smart grid technologies extend the reach of system operations to the distribution system, enabling the system operator to understand how local consumption and production activity can impact the broader reliability picture. These same technologies (such as smart meters) also open the door for a broader group of consumers to respond to price signals and reduce their energy use during peak periods.

The IESO is leading an industry forum to develop a vision for a smart grid in Ontario. The forum report will be released early in 2009.

PRIORITY AREA #3: THE CONTINUING NEED FOR TRANSMISSION ENHANCEMENTS

While significant progress is being made to revitalize the province's transmission system, the demands of the changing supply mix are accelerating. Additional transmission capacity will be needed to support new generation from renewables and to address regional congestion concerns.

Ontario's transmission infrastructure faces challenges on two fronts: an aging existing infrastructure and the need to adapt to the new demands of the changing supply mix. Work is proceeding on a number of important projects to address short-term needs.

The conditional approval provided by the Ontario Energy Board (OEB) to proceed on the construction of a new 500 kV double-circuit line along the Bruce to Milton transmission corridor was an important milestone toward delivering the full capability of the two Bruce nuclear units that are being refurbished as well as new wind resources in the area. It is scheduled to be in service by the winter of 2011/12.

Completion of the new Ontario/Quebec interconnection near Ottawa will increase import capability by an additional 1,250 MW when at full capacity. New transfer capability is being planned for the North-South interface, which will relieve the restrictions on existing generating capacity and accommodate output from expanded hydro facilities on the Mattagami River.

Hydro One has also identified sustainment capital investments totalling over \$600 million to be completed during the next two years. These investments are required to maintain both the reliability and the continued availability of its aging transmission infrastructure.

And while significant progress is being made in preparing transmission facilities for the increase of new supply, there remain a number of areas of concern.

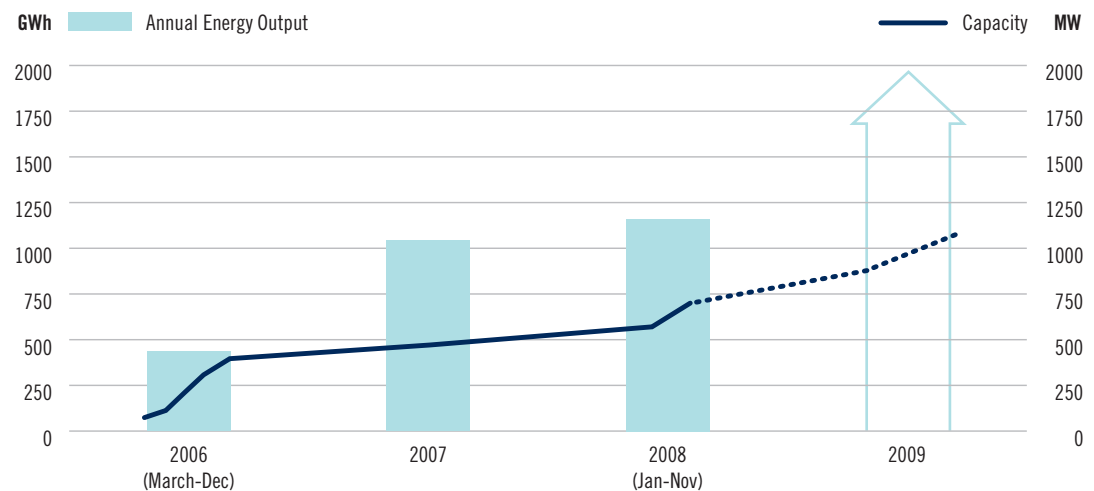
New transmission and generation reinforcements in the West GTA will come in service over the next two years and will greatly support reliability, yet the southerly part of this area still requires additional generation capacity. New peaking facilities in the Kitchener-Guelph-Cambridge area are needed to address supply constraints in that area. Congestion in Northern York Region is being addressed in part by a new transformer station to come in service in summer 2009 and through demand response. The need continues, however, for a peaking gas plant in the area. The OPA is procuring generation for all three regions.

Pressures will also be placed on the transmission system as a result of the growth of renewable generation. A series of transmission lines is needed to support new wind capacity in areas that are either congested or located away from existing transmission facilities. For example, a line is being proposed to Manitoulin Island to accommodate new generation resources to be located on the island.

Transmission enhancements will also be required to accommodate replacement nuclear capacity from the Darlington site. The existing right-of-way between the Bowmanville and Cherrywood transformer stations east of Toronto can accommodate a third 500kV transmission line. The installation of this new line, together with the development of the Oshawa Area Transformer Station, would then provide sufficient transfer capability to allow up to 3,600 MW of new generating capacity from Darlington.

Given the pace of change, managing the system as some generation facilities are retired, new ones incorporated and new transmission facilities are constructed, will require careful outage planning. Changing one component of the system, whether it is generation or transmission, impacts the flows, limits and capabilities of all the other parts of the system. Switching, replacing, refurbishing or building new infrastructure cannot be done on an ad-hoc basis. It requires close co-ordination of all the elements impacted by the proposed changes. Through its outage management process, the IESO will work closely with Hydro One and other partners to ensure the reliable operation of the system during this period of significant change.

ONTARIO WIND CAPACITY AND GENERATION (EXISTING AND PLANNED 2006-2009)





Darlington Generating Station

THE CHANGING SUPPLY PICTURE

Ontario is currently benefiting from a high level of reliability, due in part to new supply coming in service as coal-fired facilities remain operable. There are, however, a number of challenges to reliability following the coal phase-out as the province's aging nuclear fleet undertakes an extensive process of renewal.

Coal Phase-out

Since the 1960s, Ontario's fleet of coal-fired generation has provided both substantial amounts of capacity and operational flexibility to the province's electricity system. Yet concerns about the emission of greenhouse gases and other pollutants from these facilities have led to the provincial decision to phase-out all coal-fired electricity production in Ontario by the end of 2014.

Replacing coal will represent the single largest greenhouse gas reduction initiative in North America – equivalent to taking almost seven million cars off the roads. Lakeview Generating

Station, with a capacity of roughly 1,140 MW, was closed in 2005. While the precise timing for the phase-out of coal generation at the remaining stations – Nanticoke, Atikokan, Thunder Bay and Lambton – is still under development, the IESO has released an operational study which concluded that the future resources planned in Ontario Power Authority's (OPA) Integrated Power System Plan will provide sufficient reliability and operational flexibility following the phase-out of coal.

The OPA is presently managing 9,871 MW of generation and demand management contracts, excluding the Standard Offer Program (SOP) for smaller scale projects. These contracts include 3,000 MW of nuclear refurbishment, more than 5,400 MW of natural gas generation, and more than 1,400 MW of renewable and demand reduction capacity, all of which are expected to be in service by 2013. Together, they will aid in the balancing of the provincial supply mix and support the replacement and eventual elimination of existing coal-fired generation.

The retirement of coal-generating capabilities at the Nanticoke station does create operational concerns. As power flows in the Bruce/Southwestern Ontario area begin to change, careful management of the transmission system is crucial. With an increase in generation from Bruce A and new wind farms in the area, coupled with the decrease in generation from Nanticoke, additional reactive power support through the installation of shunt capacitor banks and interim voltage support from the Nanticoke units will be required.

Progress on the coal phase-out is also aiding the implementation of provincial limits on greenhouse gas emissions from the coal-fired units in the near-term. New reductions start next year, initially with targets of 19.6 megatonnes (Mt) in 2009, 15.6 Mt in 2010 with a hard cap of 11.5 Mt by 2011.

“If implemented effectively, climate change initiatives can result in improvements to reliability in North America, bring new generation technologies to fruition, diversifying the fuel mix, strengthening the transmission system and encouraging the development of the smart grid,”

Reliability Impacts of Climate Change Initiatives a report by the North American Electric Reliability Corporation (NERC)

These new restrictions will require close attention and careful management by Ontario Power Generation (OPG) and the IESO to minimize reliability impacts. During this interim period, the IESO can direct OPG's coal-fired assets to exceed those limitations should reliability concerns emerge, providing an added level of confidence that emissions reductions can proceed without jeopardizing reliability.

The Renewal of Ontario's Nuclear Fleet

Nuclear energy provides roughly 50 per cent of Ontario's power needs. This capacity makes up the majority of Ontario's baseload generation that runs continuously, 24 hours a day. Based on Ontario's experience over the last few decades, this proportion of nuclear capacity within the supply mix works to enhance reliability and helps dampen the financial impacts of fluctuating fuel costs.

In determining Ontario's supply mix, the province directed the OPA to plan enough nuclear generation to meet baseload requirements up to a maximum of 14,000 MW capacity. Much of this capacity is, however, nearing the end of its service life, requiring a series of decisions about how to replace it.

This replacement can be achieved through the refurbishment of existing units, the construction of new units or a combination of both. How much of the replacement capacity will be provided through new-build projects will have a significant impact on how electricity supply is managed following the elimination of coal-fired production in 2014.

The approvals process and construction period for new nuclear generation take longer than any other type of generation – as decisions need to be made at least 10 years before the units are required. As a result, these decisions are needed in a timely fashion if the province is to sustain the desired levels of nuclear capacity needed to manage reliability.

How these decisions unfold will also have a significant impact on system reliability and, in particular, will require a sophisticated outage management program in order to incorporate new supply and facilitate retirements or outages for refurbishment. More detail about the impact of changes in Ontario's nuclear capability on the transmission system can be found on pages 13-16.

Here's an overview of Ontario's nuclear fleet:

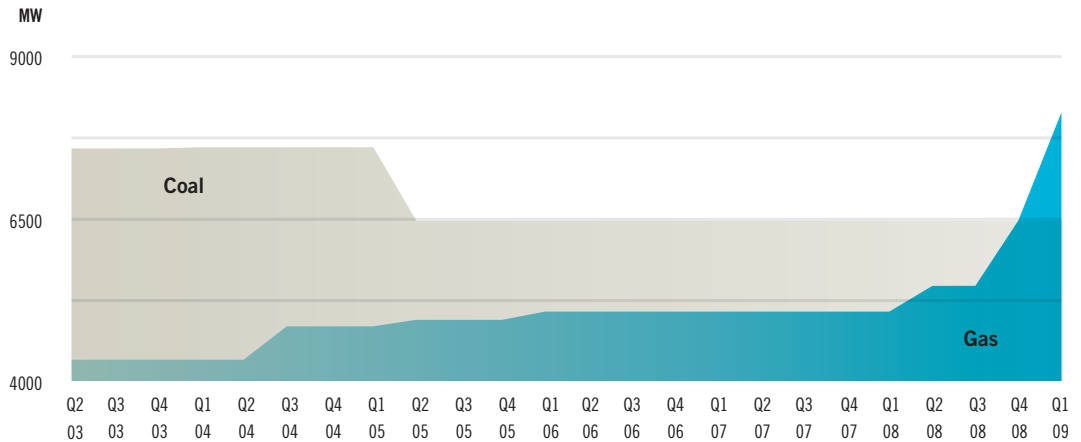
Bruce Generating Station: The refurbished Bruce A Units 1 and 2 are expected to be placed back in commercial service by summer 2010. The service lives of Bruce A Units 3 and 4 are expected to be extended through 2010 and 2015 respectively. These units will then be taken out of service for more than two years for refurbishment. Four Bruce B units are currently operating and will reach their end of service life within the next decade.

Darlington Generating Station: The existing units at Darlington will reach their end of service lives within a decade, or soon after. No decision has been made concerning the possible refurbishments of these units. However, a decision has been taken to build new additional nuclear units at Darlington and a competitive process is currently underway to determine which supplier and technology will be used.

Pickering Generating Station: As Ontario's oldest nuclear facility, the Pickering Generating Station comprises four units operating at Pickering B and two at Pickering A. Pickering A Units 1 and 4 were recently refurbished and placed back in service. Pickering B units will reach their end of service life by the middle of the next decade. A decision is pending about whether to refurbish these remaining units or replace them.

In the case of refurbishment of Pickering B units, the work could begin as early as 2013, and be completed around 2020. To minimize the impact

GAS-FIRED GENERATING CAPACITY NOW EXCEEDS COAL GENERATING CAPACITY



on the system, refurbishment work needs to be staggered to limit the number of units removed from service at any one time.

The alternative to refurbishment of Pickering B is its subsequent replacement with new-build nuclear facilities. The OPA's Integrated Power System Plan assumes that if new-build replacement for Pickering B were contracted, the first unit would begin service around 2020, taking into account the 10-year lead time for design, regulatory and construction activity.

The Pickering decision could affect Ontario's electricity system capacity by the retirement of 2,000 MW of capacity from Pickering B combined with the possible re-assessment of sustaining the 1,000 MW of operable capacity from Pickering A. This capacity and associated energy might be replaced with stepped-up implementation of conservation, more installation of renewables, more intensive operation of existing gas generation, the introduction of new build gas generation, or higher volumes of imports.

Without refurbishment, it is possible that Pickering B might continue to be operated for a few years beyond its otherwise scheduled retirement. There are various means of achieving a short-term extension of Pickering service, including the option of lower production levels from those reactors.

Increased Reliance on Gas

Gas generation is key to providing the flexibility that will be lost with the elimination of coal-fired generation. Projects that were procured earlier in the decade are coming on-stream. Since 2006, more than 1,600 MW of new gas generation has

come online. In the next three years, another 3,300 MW of new gas generation is expected to become operational.

The commissioning of the first phase of the Portlands Energy Centre in the summer of 2008 was a critical step in addressing the supply needs of the Toronto area. This fall, the Greenfield Energy Centre in the Sarnia area brought another 1,153 MW of capacity to the system. Looking just ahead to the first quarter of 2009, the Goreway station, St. Clair Energy Centre and the combined cycle operations of the Portlands station, representing a total of approximately 1,660 MW, will ramp up production. The OPA is also in the process of procuring a number of other new generation plants to address regional concerns and to provide the additional operating flexibility needed to eliminate coal generation.

This shift toward natural gas also creates new challenges for the industry. By mid-2009, gas will represent 23 per cent of supply, up from 12 per cent in 2001. As Ontario becomes more dependent on natural gas as a primary fuel for electricity generation, the adequacy and security of the natural gas supply and its infrastructure becomes even more critical to the reliability of electric supply.

Unlike the electricity industry, the effect of contingencies in the gas sector are not always immediate and often take time to become more widespread. As a result, communications channels are being established to ensure that information between the IESO and provincial gas distributors is exchanged when events occur on one system that could impact the other. Work on an agreement to develop a framework for conducting coordinated gas and electricity operating and planning studies is close to completion.



Melancthon Wind
Farm Project

OPERATING A GREENER ELECTRICITY SYSTEM

The move to a greener, more distributed supply mix will promote greater innovation in the way the system is managed. System operations need to adapt to the operating characteristics of these resources to ensure that the inherent diversity of the new supply mix works to maintain reliability.

The New Supply Mix

Renewable generation and conservation are taking a more prominent position in Ontario's supply mix. In 2006, the Ontario Government set a target of 22,000 MW of renewable resources and conservation efforts by 2025. The OPA is looking at ways to accelerate – or even surpass – target in its current review of the Integrated Power System Plan (IPSP).

Work to achieve this goal is well underway. Ontario now leads the country in wind generation capacity; the number of distributed

generation projects is escalating; and demand response programs are moving to a level where they can be considered as reliable as traditional capacity resources.

Wind

Ontario is moving ahead quickly with the implementation of new wind power developments. There is more than 700 MW of installed wind capacity in the province, which, between January and November 2008, produced more than 1 TWh of electricity. This capacity is expected to grow considerably by the summer of 2009 to 1,100 MW.

The potential to increase the amount of wind supply in the province is significant. In its analysis of the operability of the IPSP, the IESO determined that approximately 5,000 MW of wind generation could be accommodated.

The report recognized that at higher wind penetration levels, heightened attention would be required for the system to be able to handle the variability of wind generation. The report also indicated that the generation mix in the plan did provide adequate load-following capability to support this level of wind generation.

Ontario is well-positioned for considerable growth in wind generation in the province even beyond that level. A 2006 study commissioned by the IESO, the OPA and the Canadian Wind Energy Association provided important analysis that will help facilitate the growth of wind power in the province:

- Ontario has promising wind development potential – with a good selection of sites across the province. A diversity of wind farm locations will mitigate the variability impacts of this resource. For example, it is unlikely that extreme weather incidents would have a sudden impact on the entire system.
- Wind persistence is high from each 10 minute interval to the next. As a result, wind output is not likely to vary more than 10 per cent over these short periods. Understanding this variability is important in understanding whether any additional operational capability from other generation is needed.

The operational characteristics of wind differ significantly from the other resources in the supply mix. The intermittent nature of wind power makes it difficult to forecast generation with certainty. For example, wind output on December 2, 2008 reached 617 MW. By contrast, wind production reached a low of just 2 MW on July 19, 2008, a hot and windless day.

This seasonal bias is reflected in the monthly capacity factors, or the percentage of capacity that actually produced energy. In January and February of this year, average capacity factors were 43 per cent, yet in August, this same figure reached only 13.5 per cent.

To some extent, improved forecasting can help accommodate this level of variability. The IESO has been working to develop new wind forecasting methodologies that will take into account the wind's stronger performance in the winter and shoulder periods of the year. Some of these methodologies are being implemented by the end of 2008 and will result in higher forecast capacities for the winter.

As more variable generation comes online, new tools and processes will be needed to balance this supply against other types of supply during periods of low demand. For example, high levels of wind generation during periods of low demand could create surplus baseload generation concerns. Surplus baseload generation currently occurs only a few times a year and is resolved through the rescheduling of outages to take advantage of these conditions, or through increased exports.

The IESO will continue to work with its partners to ensure the reliable and effective integration of wind within the province – which includes tapping into the experience with wind generation developing in other jurisdictions.

Current Large Wind Operations in Ontario

Erie Shores Wind Farm (99 MW)	Bayham/Malahide/Houghton Township
Kingsbridge I Wind Power Project (39.6 MW)	Goderich
Melancthon I Wind Project (67.5 MW)	Melancthon Township
Prince I Wind Power Project (99 MW)	Awere/Dennis/Pennefather/Prince Township
Prince II Wind Power Project (90 MW)	Dennis/Pennefather Township
Ripley Wind Power Project (76 MW)	Huron/Kinloss Township
Melancthon II Wind Project (132 MW)	Amaranth/Melancthon Township
Kruger Energy Port Alma Wind Power Project (101 MW)	Port Alma

The expansion of renewables – wind, solar, biomass and others – will increasingly take place within distribution systems, and outside the traditional control of the IESO and its operation of the bulk electrical system. The OPA has already signed contracts for approximately 1,400 MW of renewable embedded generation to be in place by 2011 under its Standard Offer Program.

It is expected that embedded generation will soon displace significant amounts of output from larger generating units that are connected to the high-voltage system. These large units currently provide fast voltage control, operating reserve and load following that contribute to reliability of the grid. The IESO is assessing all of these aspects and will be working closely

with stakeholders to maintain reliability of the grid as the types and characteristics of the future supply mix changes.

The IESO is also working with local distribution companies, the OPA and the OEB to increase visibility of the real-time output of distributed generation in an effective and cost-efficient manner. Knowing how much generation is available and operating within a distribution area is one aspect that will assist the IESO to reliably manage overall provincial load requirements.

Demand Management

Demand response and conservation efforts throughout the province are gaining momentum and are starting to play a more active role in maintaining reliability of the system. The IESO-administered market – with real-time prices that signal the supply/demand situation – ensures that demand management initiatives are triggered when they are most needed. In order to know in advance how much demand management can be relied on, these programs have to be carefully identified, well co-ordinated and their results verified.

Since market opening, the IESO has had at its disposal almost 500 MW of dispatchable load. For the most part, these participants offer operating reserve into the market, curtailing production should the IESO need to invoke operating reserve to maintain reliability. At times, this economically-driven demand response capability has been critical over the last few years to maintain reliability, as it can free up much-needed generation for energy production.

With the launch of the OPA's DR 3 program this summer, demand response efforts are becoming more accessible to a broader group of consumers and will also be able to make a more active contribution to system reliability. The OPA has begun to contract with large customers and aggregators of small customers to reduce consumption for 100 or 200 hours during periods when the supply cushion is low. Registration for this program has accelerated rapidly over the last two months, with an initial 80 MW of load, out of a target of 250 MW, already subscribed to the program.

The operability of the DR 3 program starts to mimic traditional forms of generation in that it is dispatched when supply is needed most. Demand response resources are committed to respond to dispatches for the duration of the contract. The IESO directs DR 3 participants to reduce demand either directly or through an aggregator when the supply cushion is diminished. The IESO is also responsible for the settlement, measurement and verification of the program.

Demand response programs are continuing to evolve. Programs such as Peaksaver, which cycle down residential air conditioners, will also be linked to the same triggers as DR3, widening the scope of concrete demand response measures. Another OPA program, DR2, expected to launch in the new year, will promote institutional changes within organizations that will contribute to lower daily peaks. It will provide the equivalent of capacity payments to companies that revamp their ongoing processes to shift energy use from peak hours to off-peak hours.

Smart Meters

Ontario's smart metering initiative is moving into a new phase with the implementation of time-of-use rates. Currently, Milton Hydro and Newmarket Hydro are billing the majority of their customers on time-of-use rates.

The IESO is responsible for the oversight and management of the central data repository (MDM/R) that collects smart meter consumption data and bundles it into time-of-use billing quantities for local distribution companies. This repository went live in 2008. Further enhancements to the MDM/R and increased customer education will lead the way to a broader roll out of the time-of-use rates in 2009.

Ontario's smart metering network captures information from residential and small business consumers on an hourly basis providing them with a tool to better manage their energy use. This system provides a more flexible platform for other sophisticated demand response programs and tools to be built. As the province contemplates a vision for the development of smart grid capabilities, it has the benefit of a comprehensive smart metering system and consumers who will be accustomed to variable pricing.

Maintaining Reliability and Sustainability

Achieving a more sustainable and diverse supply mix requires more than creating new supply resources and expanding transmission infrastructure. It necessitates a fundamental rethinking of how all the pieces that comprise the electricity system work in tandem to provide a reliable electricity service.

In the traditional system management model, reliability is maintained primarily through large-scale generation that delivers supply through the transmission system. For the most part, the IESO maintains reliability by forecasting provincial demand, directing generators to meet demand, and then monitoring the power flows to ensure reliability is maintained. In effect, almost all system operations take place on the bulk-electricity system.

This paradigm is changing. As increasing amounts of generation will take place within distribution systems, the impact of this activity won't be visible on a provincial level. Distributed generation will also be mostly renewable and potentially intermittent in its operating characteristics. Add to that a more engaged consumer base that makes its energy use decisions based on market signals or demand response programs, and the task of system management clearly needs to evolve.

Reliability standards will need to be updated to facilitate a greater contribution by renewables and distributed generation. Forecasting processes will also need to better incorporate

these new forms of supply. Work in both these areas is already progressing. Most importantly, however, the system operator will require a clearer view of electricity production and consumption on all levels of the system. Balancing supply and demand only on the transmission grid will no longer be sufficient to meet the electricity needs of Ontarians, and creates potential reliability risks.

In the coming years, the role of system manager will require a more sophisticated level of information gathering and analysis – particularly within distribution service areas. Advanced technologies will provide the IESO with more detailed information about how local needs are being met through distributed generation and demand response, so that it can then move to address the broader provincial needs that aren't being met.

Through the Ontario Smart Grid Forum, the electricity industry is looking to better understand how to leverage information technologies to support reliability. Automated controls, advanced monitoring systems and information technology provide the capability to bring the “customer to the control room,” using electricity consumption and production information on a granular level to build a more accurate overall picture of the province's true energy needs.

More discussion about smart grid technologies can be found on page 17.

Wind Generation in Leading Jurisdictions around the World

Jurisdiction	Wind Capacity (MW)	Total Installed Capacity (MW)	Local Approach
California	2,600 (4.6% of total installed capacity)	56,136	Actively involved in storage technology initiatives. Recent transmission planning study focused on the integration of large volumes of wind to determine load following, hourly ramping requirements, regulation capacity and over-generation issues.
Texas (ERCOT)	6,023 (9.8% of total installed capacity)	61,552	Proactively involved in enhancing high-voltage transmission system to accommodate wind generation.
Spain	15,039 (17% of total installed capacity)	86,231	Wind power is facilitated by pumped generation storage and 40,000 MW of reserve capacity in excess of peak demand. Wind capacity expected to increase by 3,500 MW per year.
Germany	22,247 (17.5% of total installed capacity)	127,000	Infrastructure supports renewables with high rates of transmission capacity and population density.
Denmark	3,125 (24% of total installed capacity)	12,969	Infrastructure supports renewables with high rates of transmission capacity and population density.

LOADING UP: ELECTRICITY STORAGE TECHNOLOGY

New technologies are emerging that store electricity for varying periods of time, allowing better management of supply and demand fluctuations. Storage technologies can be highly responsive to system control requirements, with the ability to ramp-up quickly to meet rising demand and capture excess generation during periods of low demand. This flexibility can work to balance the variability of renewable generation, providing reliability with the added benefit of low emissions.

There are a number of storage technologies currently available:

Pumped Storage reverses the water flow between reservoirs which is then used to produce electricity during peak hours. Many of the newer pumped storage projects use wind turbines to drive the pumps directly – creating a renewable and extremely reliable resource. Pumped generation can, however, come with high construction costs and be difficult to locate given land-use impacts.

Flywheel Systems are literally massive rotating cylinders that can spin as much as 30,000 RPM, developing such inertia that they can be available to provide highly flexible generation regulation. A 20 MW flywheel facility is currently in development in New York State.

Compressed Air Storage takes advantage of abandoned gas and oil wells by storing compressed air and using it to run turbines during peak periods.

Other technologies – including hydrogen production and storage, supercapacitors and advanced battery technologies – are also developing with the potential to offer a suite of new options to manage reliability.

These technologies are being explored by system operators around the world. Many are adapting their current procedures to take advantage of the high-responsive operating characteristics of this form of supply, which can be an ideal companion to some of the variable renewable generation options.

The Sir Adam Beck Pump Generating Station in Niagara provides 174 MW of electricity by using excess generation capacity to pump water from the Niagara River into a 300 hectare reservoir.





The Thorold Cogeneration
Project currently under
development

THE CONTINUING NEED FOR TRANSMISSION ENHANCEMENTS

Ontario's transmission system is undergoing a similar process of renewal. New infrastructure is needed to replace or upgrade aging facilities, while changes in the provincial supply mix are requiring additional transmission support. In particular, new transmission projects are proceeding to address the province's short-term needs.

Further transmission enhancements will be needed to address the rapid growth of renewable generation in the province to extend the reach of the system to remotely located wind and hydro facilities. New transmission resources, as well as a carefully co-ordinated outage management process, will also be required to accommodate changes within the province's nuclear fleet.

The Bruce Area

Earlier this year, the Ontario Energy Board approved a leave to construct for a new 500 kV double-circuit line between the Bruce nuclear

complex and Milton TS. Subject to an environmental assessment approval, the line is scheduled to be in service by winter 2011/12.

This new line will provide sufficient new transmission capacity to deliver the energy from all eight units at the Bruce complex and up to 1,700 MW of wind generation. About 700 MW of this wind generation is already committed and in various stages of construction. Two enabler* lines are proposed to support an additional 1,000 MW of generating capacity: one in the Bruce Peninsula area; and one into the Goderich area. Both would be available by winter 2015/2016.

Construction of the new 500 kV Bruce to Milton line and the associated facilities at the terminal stations will require numerous outages on the grid. This is expected to be especially challenging, particularly since seven or possibly eight Bruce generating units could be available for operation at the Bruce complex before construction of the line is completed. The IESO will be

*Enabler lines are special purpose transmission facilities that connect remote generation and load to the IESO-controlled grid.

working with Hydro One to facilitate the outages required to complete the line construction and to reduce congestion.

Greater Toronto Area

GTA-West

Following the completion of Hurontario SS by the spring 2010, the loads in northern Mississauga, Brampton and Bramalea will have an alternative source of supply, reducing the impact of potential contingencies. Further work in the Hurontario SS area to enhance the supply capability is scheduled to be completed by spring 2012.

Additional transmission enhancements are planned between Milton TS and Claireville TS in order to meet the growing supply needs of Georgetown, Milton, Halton Hills, Brampton and north Mississauga. This project includes new 500/230 kV auto-transformers to be installed at Milton TS by spring 2015 as well as the extension of the 230 kV transmission facilities from Meadowvale TS to Hurontario TS.

The completion of the Sithe-Goreway (840 MW) generating facilities by the spring 2009 will not only provide relief for the auto-transformers at Claireville TS but will also provide valuable reactive compensation to control system voltages. Voltage support is particularly important immediately following a contingency involving any of the 500 kV circuits from the Bruce complex, in southern Ontario, or in the GTA. The completion of the Halton Hills GS (630 MW) by the following spring will reduce the loading on the auto-transformers at Trafalgar TS and provide further post-contingency reactive support to the area.

GTA-Southwest

In response to a directive from the Minister of Energy and Infrastructure, the Ontario Power Authority (OPA) has initiated a process to procure 850 MW of gas-fired generating capacity in the southwestern GTA, along the Oakville TS to Manby TS corridor. The required in-service date for this new generating capacity is December 2013.

This new generating capacity is required to replace existing coal-fired generating facilities that are scheduled to be phased out in 2014 and to meet future local needs. Locating a facility in this area provides 500/230 kV autotransformer relief and will also defer future transmission investments by reducing loads on the 230 kV network that supplies parts of

Oakville, southern Mississauga, and southwestern parts of Toronto. This facility will also help to control voltages in this same area.

GTA-Central

Work to increase the transfer capability of the 500 kV corridor that runs across north Toronto is required to reliably accommodate existing and additional supply east of the Greater Toronto Area. Operating currently as two double-circuit lines, these circuits are to be unbundled and terminated as four individual circuits. This work, scheduled to be completed by the winter 2010/11, will also facilitate further expansion at the stations along the corridor to accommodate increased supply to the growing loads north of Toronto.

Subject to the required approvals, an additional 115 kV circuit between Leaside TS and Bridgeman TS is to be installed by spring 2012. This addition, in combination with a planned upgrade of two of the existing 115 kV circuits in the area, will enhance the supply capability in the midtown Toronto area.

The reliability of supply to the central Toronto area is on track to be improved with the completion of the Portlands Energy Centre. The installation of the heat-recovery steam generators at Portlands is now complete, allowing the commissioning of the steam-turbine unit to commence. Once this phase of the work is finished early next year, the plant will then be able to deliver its full-rated output of 550 MW as an efficient combined-cycle facility. The addition of this new generating station, combined with the earlier completion of the John to Esplanade link has provided alternate sources of supply and improved the reliability to the area.

GTA-East

A new 500 kV double-circuit line between Bowmanville TS and Cherrywood TS is proposed in order to accommodate up to 3,600 MW of new generating capacity at Darlington B Generating Station. Subject to necessary approvals, the new line is scheduled to be in service by the summer 2016 to coincide with the planned development of the new generating facilities.

A new Oshawa area 500/230 kV transformer station is also planned to coincide with the completion of the new 500 kV line. This station would connect the existing and new 500 kV circuits with the existing 230 kV transmission facilities that supply loads in the Oshawa, Whitby and Ajax areas and relieve the loadings on the auto-transformers at Cherrywood TS.

It has been proposed that the new 500 kV line should be located on the existing transmission corridor. The IESO has initiated a review in conformance with NERC standards of the effect of losing all the transmission facilities on this common corridor. Any further increase in generation at Darlington or points east will require extensive analysis of the capacity of this transmission corridor.

Northern York Region

The plan to address the supply issues in Northern York Region involved the establishment of a new transformer station to provide relief for the heavily-loaded Armitage TS and the installation of up to 350 MW of gas-fired generating capacity.

Holland TS is nearing completion and will soon allow the transfer of some of the existing load at Armitage TS. This will then free-up capacity at Armitage TS to allow additional load growth in the immediate area to be accommodated at that station.

The OPA has recently procured a 393 MW gas-fired generation facility in the area to be in service by the end of 2011.

Northeast and Central Ontario

In order to remove restrictions on existing generating capacity and to allow additional renewable resources in the north, enhancements to the north to south transmission path are required. Projects in this area, with scheduled in-service dates through to the winter of 2011/12, are designed to increase transmission transfer capability by about 750 MW. This will be enough to remove restrictions on the existing generating capacity in the northeast and to accommodate the increased output from expanded generating facilities on the Mattagami River.

To accommodate additional wind resources on Manitoulin Island, an enabler line from the island to the existing 230 kV transmission corridor between Algoma and Sudbury is proposed to be available by the winter of 2015/16.

Additional renewable resources may need to be procured in the northeast and northwest parts of the province in order to meet provincial supply mix targets. Any further development of resources in the northeast and northwest will require additional transmission capacity. As a result, new transmission facilities both north and south of Sudbury have been proposed with an expected in-service date of winter 2017/18.

Northwest

A promising site for additional wind and hydroelectric generation is in the Lake Nipigon area. An enabler line from the existing 230 kV transmission corridor between Lakehead (Thunder Bay) and Marathon is being considered in order to connect future wind resources and include enough capacity for proposed the Little Jackfish hydroelectric station on Lake Nipigon.

Eastern Ontario

Various projects are underway to increase transfers of up to 1,250 MW in either direction between Ontario and Quebec following the completion of the new interconnection and its associated direct current facilities later next year.

Ontario-New York Ties at Niagara

The import capability from New York via the two 345 kV and the two 230 kV interconnections at Niagara is often restricted by the thermal ratings of the existing transmission facilities of the QFW Interface. These limitations are even more pronounced during outage conditions. Completion of the reinforcement of this interface is necessary for improved utilization of the interconnection with New York at Niagara Falls.

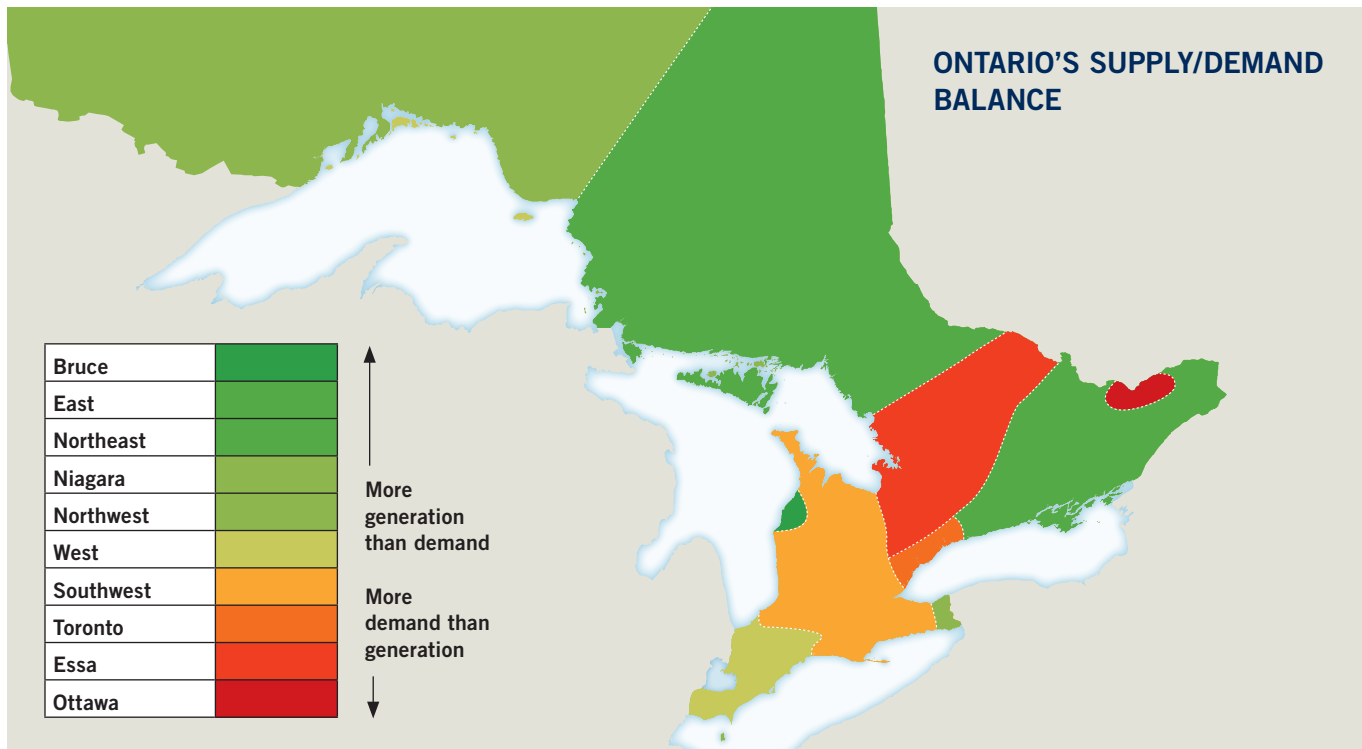
Once the QFW work is complete, it becomes appropriate to explore further expansion of the interface capability at Niagara. Since three of the eight river crossings at Beck GS are presently idle, these would appear to present an opportunity to establish an additional interconnection at this location. Increasing the capability of this interface would address these limitations and further augment any future moves toward a more regional approach to balancing supply. This need will become even more prominent with increased renewable resources associated with variable operating characteristics.

Southwestern Ontario

A new transformer station is proposed close to Leamington to supply the growing load in the Leamington area and to off-load the adjacent Kingsville TS. Subject to regulatory approvals, this work is scheduled to be completed by the winter of 2012/13.

The Windsor area is connected into the Ontario transmission grid via four circuits to Chatham, two connected from Keith TS and two from Lauzon TS. These two stations, with a 115 kV transmission path connecting them, provide the main supply to the other stations

ONTARIO'S SUPPLY/DEMAND BALANCE



in the Windsor area, and act as the main connection point for local generation. Also subject to regulatory approvals, a series of enhancements to the 230 kV transmission facilities in the area will remove the risk of overloads on the local 115 kV system, remove restrictions on local generation, and improve voltage performance in the area between Windsor and Chatham.

Ontario-Michigan Phase Angle Regulators

Phase angle regulating transformers, also known as phase shifters can be used to control, to a limited extent, the flow of power over the grid. For the Ontario-Michigan interconnection, phase shifters have been planned to limit unscheduled parallel or loop flows on transmission assets in southern Ontario and Michigan.

Two phase shifters located at Lambton TS require some remedial work, which is anticipated for 2009. A third phase shifter at Keith TS in Windsor is functioning normally. These phase shifters are available to control flows in emergency situations, but operation under normal conditions is not available pending agreements between the IESO and the Midwest Independent System Operator (MISO).

A fourth phase shifter near Port Huron, Michigan is scheduled to be replaced by late 2009. Control of the flows on this interface is limited until all four phase shifters are in service.

Kitchener-Waterloo-Cambridge-Guelph and Orangeville Areas

Transmission facilities presently supplying the Kitchener, Waterloo, Cambridge, and Guelph areas are all approaching their thermal limits and with continued load growth in the area, some circuits are expected to exceed IESO standards in less than five years.

The OPA is proposing to contract for up to 450 MW of gas-fired generating capacity to be incorporated into Cambridge-Preston TS. In addition to providing peaking capacity for the province, this generating facility would also address some of the existing local supply limitations and to assist with the restoration of the area's loads in the event of a protracted outage involving some of the critical transmission facilities. However, some potential for transmission overloads would still remain in the area.

Several alternatives, which would involve additional transmission reinforcements, are under consideration, and would depend on the eventual size, location and timing of the gas-fired generation.

SMART GRIDS: IMPROVING THE EFFICIENT USE OF INFRASTRUCTURE AND PROMOTING DEMAND MANAGEMENT

The move to greater customer involvement, increased renewable and distributed generation, and expanded transmission capacity necessitate even more flexible and responsive system operations. Smart grid technologies are emerging as a critical component of the renewal taking place in Ontario's electricity sector. They enable system operators to more effectively manage a system that is becoming more diverse, more complex and less predictable.

A smart grid can mean many things. As a whole, it refers to a power system that uses information technologies to automate the flow of information back and forth between consumers and producers and then uses that information to support more efficient production, delivery and consumption decisions. In its many parts, a smart grid can comprise residential smart meters; plug-in cars; widely dispersed micro- and small-scale generation; and aggregators of demand response, just to name a few. All of these components are connected through advanced monitoring and communications systems.

This ability to flow information to and from consumers and suppliers is critical for the development of Ontario's new supply mix. For example, demand management programs rely on consumers and their appliances being able to receive and respond to price signals. Embedded generation

can become more efficient and more adequately relieve local congestion if it can respond to electricity prices and communicate directly to the provincial electric system.

For the system operator, the information provided by smart grid technology paints a more detailed and complete picture of the supply and demand situation at each moment – particularly on a local level. In congested areas, operators will have a better understanding of what demand response and generation is available to meet local needs and then be able to more effectively use the surrounding transmission infrastructure to serve remaining needs. Smart grid technology can also provide enhanced operational performance, whether it be anticipating and resolving problems before they become outages, or minimizing the impact and resolution times of those outages that do occur.

As a result, the IESO has launched an industry dialogue about how best to harness the potential of smart grid technologies for Ontario. Ontario's Smart Grid Forum is developing a vision for the province to develop a co-ordinated approach that leverages existing investments and ensures future investments yield full benefit to Ontarians.



Vehicle-2-Grid: How Plug-in Electric Vehicles Support Reliability

Electric plug-in vehicles offer a clear demonstration of how energy use decisions on a small scale can impact the broader reliability picture.

During off-peak hours, car owners can recharge their car batteries, benefiting from lower electricity prices. As a result, generation and transmission capacity is being used when demand is lowest. Homeowners may also choose to avoid higher peak prices by using their car batteries to provide electricity for some of their home consumption.

TABLE 1: GENERATION PROJECTS PLANNED OR UNDERWAY IN ONTARIO

SOURCE OF PROJECT	GENERATION PROJECTS PLANNED OR UNDERWAY	INSTALLED CAPACITY (MW)	PLANNED IN-SERVICE DATES
RENEWABLE GENERATION			
Renewables I RFP – Hydroelectric generation	Umbata Falls Hydroelectric Project	23	Q4 2008
Renewables II RFP – Wind generation	Wolfe Island Wind Project	198	Q2 2009
	Enbridge Ontario Wind Farm	182	Q1 2009
Renewables II RFP – Hydroelectric generation	Island Falls Hydroelectric Project	20	Q4 2009
Government directive for Hydroelectric Energy Supply Agreement with Ontario Power Generation	Little Long, Harmon, Kipling and Smoky Falls	450	Unit in-service dates ranging from 2012 to 2013
	Lac Seul	13	Q4 2008
	Hound Chute	9.5	Q4 2010
	Lower Sturgeon, Sandy Falls and Wawaitin	35	Q4 2010
GAS-FIRED GENERATION			
Clean Energy Supply RFP	Greenfield South Power Plant	280	Under Review
	St. Clair Energy Centre	577	Q1 2009
Government directive for Central Toronto	Portlands Energy Centre Combined Cycle Operation	245	Q1 2009
Government directive for Western GTA	Goreway Station	839	Q1 2009
GTA West RFP	Halton Hills Generation Station	632	Q2 2010
Government Directive for Northern York Region	York Energy Centre	393	Q4 2011
COMBINED HEAT AND POWER			
Combined Heat and Power (CHP) RFP	Algoma Energy Cogeneration Facility	63	Q2 2009
	East Windsor Cogeneration Centre	84	Q3 2009
	Thorold Cogeneration Project	236	Q2 2010
NUCLEAR GENERATION			
Government directive for Bruce Power Refurbishment Implementation Agreement	Bruce A, Unit 1 back in service after refurbishment	750	Q3 2010
	Bruce A, Unit 2 back in service after refurbishment	750	Q2 2010
	Bruce A, Unit 3 (life extended through to 2010) back in service after refurbishment	750	As early as Q3 2013
	Bruce A, Unit 4 (life extended through to 2015) back in service after refurbishment	750	As early as Q3 2018
Nuclear capacity expansion	Additional capacity	27	Q3 2009
	Darlington, two units	TBD	TBD

TABLE 2: REGIONAL REQUIREMENTS – PROJECTS CURRENTLY UNDER STUDY OR PROPOSED

This table lists the projects that Hydro One is actively pursuing. Some of these projects have already been committed and are planned to be in-service within the next two to three years. Others are in the design phase and are expected to be placed in-service in the following decade.

AREA	RELIABILITY NEEDS IN THE AREA	EXPECTED/ REQUIRED BY	PROJECT(S) PROPOSED TO MEET THE REQUIREMENT
Northeastern & Central Ontario	Isolate the Tembec (Spruce Falls) mill from the Smoky Falls line	Spring-2009	Kapuskasing TS: Install a 115kV breaker and reterminate the line from Smoky Falls GS
	Improve operational flexibility	Summer-2009	Pinard TS: Install 230kV circuit-switcher
	Increase transfer capability across the Flow-South Interface	Winter-2008/9	Essa TS x Claireville TS: Uprate 500kV circuits E510V & E511V
		Fall-2009	Porcupine TS: Install 2x125MVar shunt capacitors
		Fall-2010	Porcupine TS: Install SVC
		Fall-2010	Kirkland Lake TS: Install SVC
		Fall-2010	Essa TS: Install 250MVar shunt capacitor
		Winter-2010/11	Nobel SS: Install series capacitors in 500kV circuits
		Winter-2011/12	Hanmer TS: Install 149MVar shunt capacitor
	Increase transfer capability across the Mississagi Flow-East Interface	Summer-2009	Mississagi TS: Expand existing generation rejection scheme
		Fall-2010	Mississagi TS: Install 2x75MVar shunt capacitors
		Fall-2010	Algoma TS: Install 100MVar shunt capacitor
		Fall-2011	Mississagi TS: Install +300/-100MVar SVC
	Incorporate expanded facilities at the Mattagami River plants	Winter-2010/11	Pinard TS: Install 100MVar shunt capacitor
		Winter-2010/11	Little Long SS: Expand 230kV switching facilities and install 100MVar shunt capacitor
		Winter-2010/11	Harmon GS to Kipling GS: Modify 230kV transmission line
	Incorporate new, renewable generating capacity	Winter-2015/16	Manitoulin Island: Install new 230kV enabler line
		Summer-2017	North of Sudbury: Reinforce Transmission System
		Winter-2017/18	Sudbury to the GTA: Reinforce Transmission System
Northwestern Ontario	Provide voltage support	Spring-2009	Fort Frances TS: Install 22MVar moveable shunt capacitor
		Winter-2010/11	Dryden TS: Install shunt capacitor
	Improve the supply to the Thunder Bay area	Summer-2010	Thunder Bay GS: Reconfigure the 115kV busbar
	Replacement for the C7 synchronous condenser	Winter-2010/11	Lakehead TS: Install a +60/-40MVar SVC
	Reinforce supply to the Thunder Bay area	Summer-2013	Lakehead TS to Birch TS: Install 230kV line
Bruce Area	Increase transfer capability from the Bruce Area to accommodate a further 1000MW of new generating capacity	Winter-2008/09	Hanover TS x Orangeville TS: Uprate section of 230kV circuits B4V & B5V
		Spring-2010	Bruce Complex: Modify Bruce Special Protection System
		Spring-2011	Nanticoke TS: Install 500kV 350MVar SVC
		Spring-2011	Detweiler TS: Install 230kV 350MVar SVC
		Winter-2011/12	Bruce Complex to Milton TS: Install new 500kV double-circuit line
		Spring-2009 to Fall-2009	Middleport TS, Nanticoke TS & Buchanan TS: Install 7 capacitor banks
	Incorporate new, renewable generating capacity	Winter-2015/16	Goderich Area: Install new 230kV enabler line
		Winter-2015/16	Bruce Peninsula Area: Install new 230kV enabler line
Eastern Ontario	Increase transfer capability between Ontario & Quebec	Summer-2009 and Spring-2010	Hawthorne TS: Establish 1250MW dc Interconnection
		Fall-2008	St Lawrence: Revise Beauharnois-Saunders GR Scheme
		Fall-2012	Hawthorne TS to Merivale TS: Increase capacity of 230kV circuits M30A & M31A
	Increase supply capability to the area	Summer-2012	Ottawa South Area: Reinforce transmission facilities

TABLE 2: CONTINUED

AREA	RELIABILITY NEEDS IN THE AREA	EXPECTED/ REQUIRED BY	PROJECT(S) PROPOSED TO MEET THE REQUIREMENT
GTA-West	Provide voltage support	Winter-2008/09	Meadowvale TS: Install 44kV shunt capacitors
	Provide voltage support	Summer-2009	Halton TS: Install 27.6kV shunt capacitors
	Enhance the supply capability to Pleasant TS & Jim Yarrow TS and limit amount of load lost to individual contingencies	Spring-2010	Hurontario SS: Establish new SS & extend 230kV line from Cardiff TS
		Spring-2011	Hurontario SS to Jim Yarrow Jct: Build two 3km 230kV circuits
		Spring-2012	Hurontario SS to Pleasant TS: Build one 6km 230kV circuit
	Increase supply capability of the corridor and reduce transfers on the 500kV circuits to Claireville TS	Spring-2015	Milton TS: Install 500/230kV auto-transformers and construct new 230kV lines to Hurontario SS to create a new 230kV transmission corridor between Milton TS and Claireville TS.
GTA-Central	Reinforce corridor to allow Claireville 230kV bus to be operated open	Fall-2009	Claireville TS to Richview TS: Terminate idle 230kV circuit
	Increase transfer capability of transmission corridor	Winter-2010/11	Cherrywood TS to Claireville TS: Unbundle the two 500kV super-circuits
	Increase supply capability to the area	Spring-2012	Leaside TS to Bridgeman TS: Build new 115kV circuit
	Improve supply reliability	Summer-2016	Reinforce transmission facilities into downtown Toronto
GTA-East	Incorporate new generating facilities at Darlington B	Summer-2016	Bowmanville TS to Parkway TS: Reinforce the 500kV transmission facilities
	Reinforce supply to the Oshawa/Whitby/Ajax areas	Summer-2016	Oshawa Area: Build new 500/230kV transformer station
Barrie-Stayner Area	Increase supply capability to the area	Spring-2009	Construct new 230kV double-circuit line between Essa and Stayner TS to replace existing 115kV line.
			Install 230/115kV auto-transformer at Stayner TS
			Install 230/44kV DESN station at Stayner TS
Niagara Area	Increase transfer capability of the Queenston Flow West Interface	Originally scheduled for Summer-2006. Delayed indefinitely	New 230kV double-circuit line between Allanburg TS to Middleport TS to reinforce the 230kV transmission corridor
	Increase supply capability	Spring-2009	Beck GS to Niagara-Murray TS: Uprate 115kV circuit Q4N
	Increase supply capability to the area	Spring-2009	St Catharines Area: Uprate circuits D9HS, D10S & Q11S
Burlington-Branford-Woodstock Areas	Increase load meeting capability of the station	Fall-2008	Burlington TS: Replace 215MVA transformers with 250MVA units
	Increase station's fault interrupting capability	Fall-2011	Burlington TS: Replace twelve 115kV breakers and buswork
	Improve 115kV supply in the Woodstock area	Spring-2011	Ingersoll TS: Extend 230kV tap to new 230/115kV transformer station
		Spring-2011	Woodstock East TS: Install new 115/27.6kV DESN station
Southwestern Ontario	Reinforce supply to the Windsor/Leamington/Kingsville Areas	Winter-2012/13	Essex County: 230kV double-circuit line to the new Leamington TS + 230kV double-circuit line between Sandwich Junction and Lauzon with full 230kV switching installed at Lauzon TS
	Increase the transfer capability through Keith TS	Spring-2013	Keith TS: Replace the two 115MVA transformers with 250MVA units
	Increase supply capability for Windsor	Spring-2014	Keith TS to Essex TS: Uprate 115kV circuits J3E and J4E
Kitchener-Waterloo-Cambridge-Guelph & Orangeville Areas	Provide dynamic voltage support	Spring-2011	Detweiler TS: Install 230kV 350MVA SVC
	Increase the supply meeting capability for the Cambridge area	Winter-2012/13	Galt Junction to Galt TS: Uprate the 230kV circuits M20D and M21D
	Increase the supply meeting capability for the area	Spring-2012	Reinforce transmission facilities in the area

THE ONTARIO RELIABILITY OUTLOOK IS ISSUED BY THE INDEPENDENT ELECTRICITY SYSTEM OPERATOR (IESO) TO REPORT ON PROGRESS OF THE INTER-RELATED GENERATION, TRANSMISSION AND DEMAND MANAGEMENT PROJECTS UNDERWAY TO MEET FUTURE RELIABILITY REQUIREMENTS.



Power to Ontario. On Demand.

Independent Electricity System Operator

655 Bay Street, Suite 410

P.O. Box 1

Toronto, Ontario M5G 2K4

Reception: 905.855.6100

Media inquiries: 416.506.2823

IESO Customer Relations

Phone: 905.403.6900

Toll-free: 1.888.448.7777

E-mail: customer.relations@ieso.ca

The Independent Electricity System Operator (IESO) manages the province's power system so that Ontarians receive power when and where they need it. It does this by balancing demand for electricity against available supply through the wholesale market and directing the flow of electricity across the transmission system.

Filed: April 8, 2009
EB-2009-0078
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ATTACHMENT A

Hydro One Networks Inc.

483 Bay Street
South Tower, 8th Floor
Toronto, Ontario M5G 2P5
www.HydroOne.com

Tel: 416.345.5892
Fax: 416.345.6984



Enza Cancilla

Manager
Public Affairs

Mayor Alan Spacek
Town of Kapuskasing
88 Riverside Drive
Kapuskasing, ON P5N 1B3

March 10, 2009

Dear Mayor Spacek:

RE: Transmission Line Upgrade - Harmon Junction (Jct) to Kipling Generating Station (GS)

Thank you for attending our briefing on the Lower Mattagami River system transmission upgrades on February 24, 2009. As you know, Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One Networks Inc. (Hydro One) is required to add a second 230 kilovolt (kV) circuit to the existing tower that runs from Harmon Junction (Jct) to Kipling Generating Station (GS), approximately 4 km in length. We will also need to replace two anchor towers.

An Environmental Study Report was completed and filed with the Ministry of the Environment in 1994 (*Hydroelectric Generating Station Extensions Mattagami River*), in accordance with the *Environmental Assessment Act*. This report will be updated to confirm if any changes to environmental and technical factors have occurred. The addition of the second circuit requires a Leave to Construct approval from the Ontario Energy Board (OEB) under Section 92 of the *OEB Act*. Hydro One is planning to file this application in April 2009. If approved, construction is expected to begin in early 2011 with the line in-service June 2013.

We are working closely with OPG and understand that its consultation program for the Lower Mattagami River Extension has included information about Hydro One's transmission upgrade between Harmon Jct and Kipling GS. As such, Hydro One's consultation approach will focus on notifying elected officials and staff, government agencies and other key stakeholders and posting information to our website.

Attached is an updated copy of the presentation from our meeting on February 24, 2009. We would appreciate it if you could please forward this information to the Northeastern Ontario Municipal Association along with other members of your council. We look forward to receiving a council resolution in support of the Harmon Jct to Kipling GS transmission line upgrade.

Please do not hesitate to contact me at 416-345-5892 if you require further information or Amy Bowen, Community Relations Officer at 1-877-345-6799 or by email at Amy.Bowen@HydroOne.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Enza Cancilla".

Enza Cancilla
Manager, Public Affairs

Enc.

cc Yvan Brousseau, CAO
Paul Burroughs, Ontario Power Generation

Hydro One Networks Inc.

483 Bay Street
South Tower, 8th Floor
Toronto, Ontario M5G 2P5
www.HydroOne.com

Tel: 416.345.5892
Fax: 416.345.6984



Enza Cancilla

Manager
Public Affairs

Mayor Kevin Somer
Town of Smooth Rock Falls
142 First Avenue
Smooth Rock Falls, ON P0L 2B0

March 10, 2009

Dear Mayor Somer:

RE: Transmission Line Upgrade - Harmon Junction (Jct) to Kipling Generating Station (GS)

On February 24, 2009 Michelle Larose and John Cormier attended our briefing on the Lower Mattagami River System transmission upgrades on behalf of the Town of Smooth Rock Falls. As you know, Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One Networks Inc. (Hydro One) is required to add a second 230 kilovolt (kV) circuit along the existing towers that runs from Harmon Junction (Jct) to Kipling Generating Station (GS), approximately 4 km in length. We will also need to replace two anchor towers.

An Environmental Study Report was completed and filed with the Ministry of the Environment in 1994 (*Hydroelectric Generating Station Extensions Mattagami River*), in accordance with the *Environmental Assessment Act*. This report will be updated to confirm if any changes to environmental and technical factors have occurred. The addition of the second circuit by Hydro One also requires a Leave to Construct approval from the Ontario Energy Board (OEB) under Section 92 of the *OEB Act*. Hydro One is planning to file this application in April 2009. If approved, construction is expected to begin in early 2011 with the in-service June 2013.

We are working closely with OPG and understand that its consultation program for the Lower Mattagami River Extension has included information about Hydro One's transmission upgrade between Harmon Jct and Kipling GS. As such, Hydro One's consultation approach will focus on notifying elected officials and staff, government agencies and other key stakeholders and posting information to our website.

Attached for your information is an updated copy of the presentation provided at our meeting on February 24, 2009. We would appreciate it if you could share this information with your council. Following council's review of this information, we hope that you can provide Hydro One with a council resolution in support of the Harmon Jct to Kipling GS transmission line upgrade.

Please do not hesitate to contact me at 416-345-5892 if you require further information or Amy Bowen, Community Relations Officer at 1-877-345-6799, or by email at Amy.Bowen@HydroOne.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Enza Cancilla".

Enza Cancilla
Manager, Public Affairs

Enc

Cc Michelle LaRose, CAO

Cc Paul Burroughs, Ontario Power Generation

Filed: April 8, 2009
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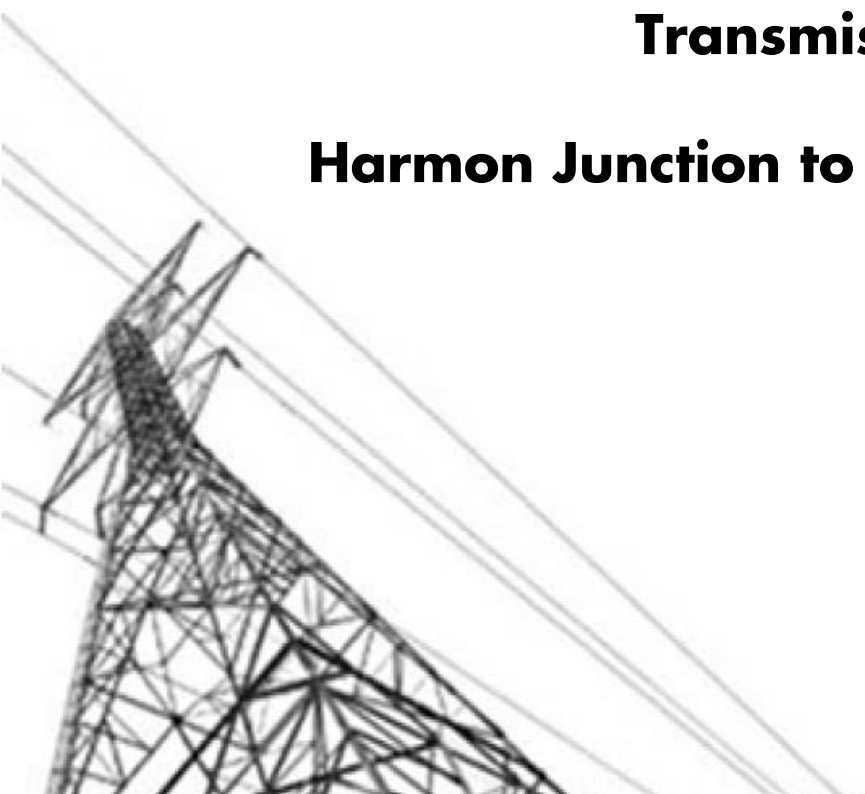
ATTACHMENT B

Hydro One Networks

**Lower Mattagami River System
Transmission Upgrades**

Harmon Junction to Kipling Generating Station

February 24, 2009



Agenda

- Introductions
- Objectives for meeting
- Hydro One's Scope of Work (in support of OPG Initiative)
- Tower Types
- Environmental and Technical Features
- Approval Requirements
- Public and Stakeholder Consultation
- Project Timeline

Existing Lower Mattagami Generating Capacity

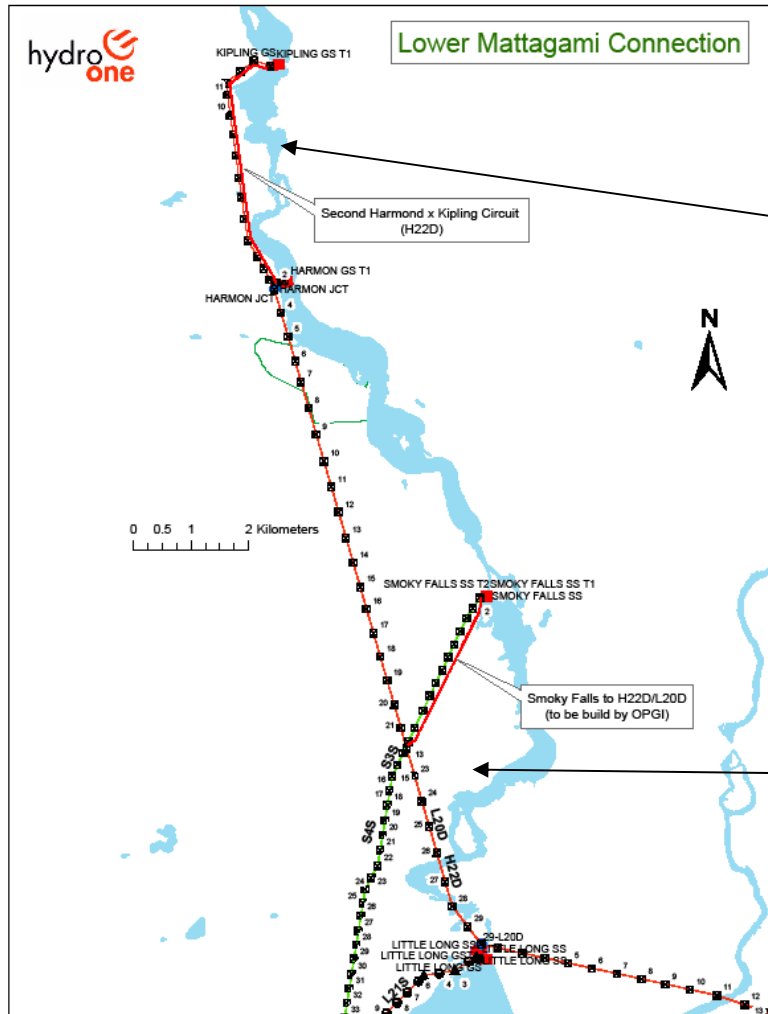
- Kipling Generating Station (GS)
 - 158 megawatts (MW)
- Harmon GS
 - 140 MW
- Smoky Falls GS
 - 136 MW
- Little Long GS
 - 52 MW



Scope of Work

- OPG is planning to add approximately 450 MW of new generation to the system
- To accommodate this new generation Hydro One will:
 - Add a second 230 kV circuit (~4km) from Harmon Junction to Kipling GS
 - Mainly on 12 existing towers
 - 10 towers would be modified and two anchor towers would need to be replaced
 - Modifications are also required at switching stations
- OPG will build and own a new 230 kV double circuit line from Smoky Falls GS to Hydro One 230 kV Circuits H22D and L20D

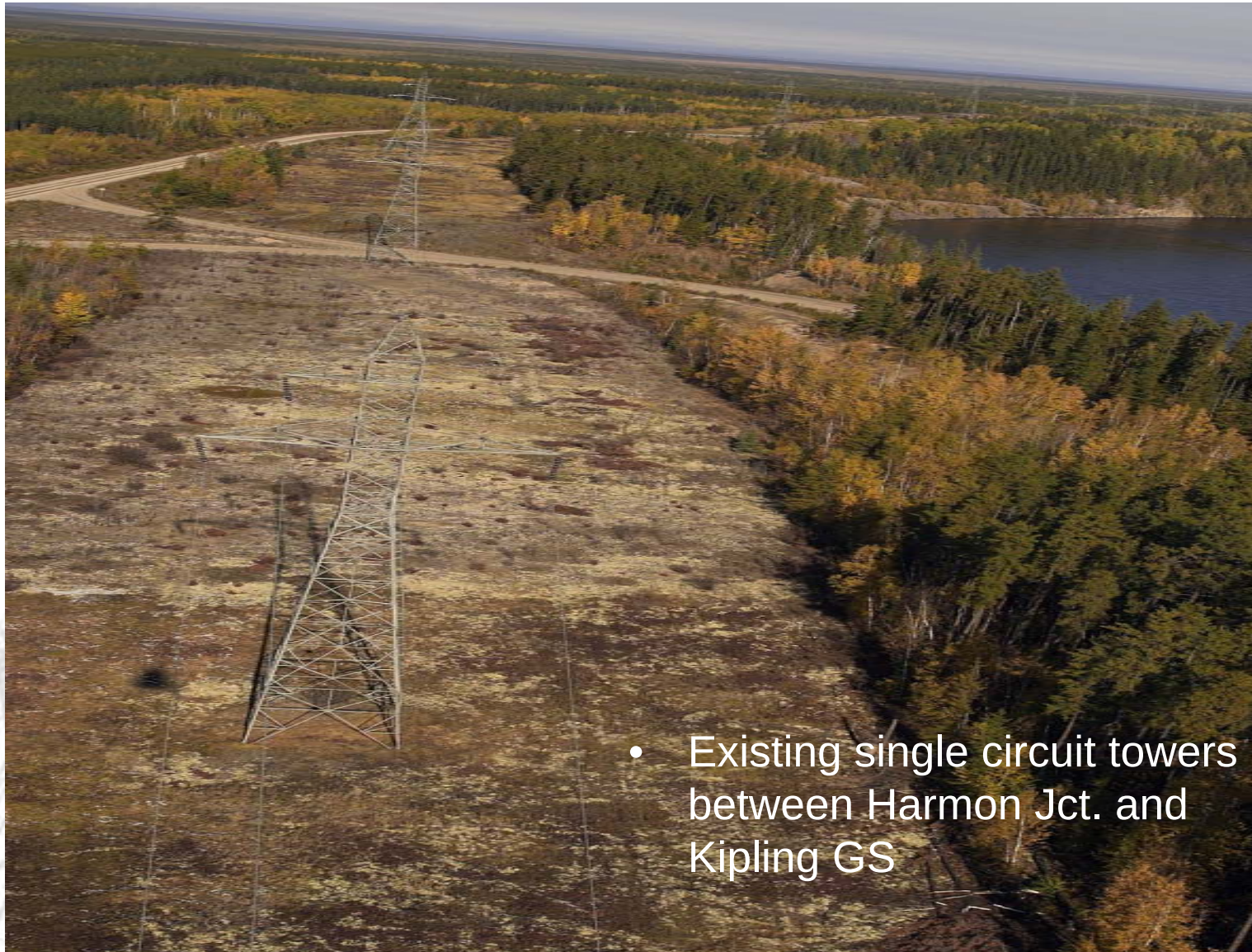
Map of Study Area



Hydro One to build 2nd
230 kV circuit

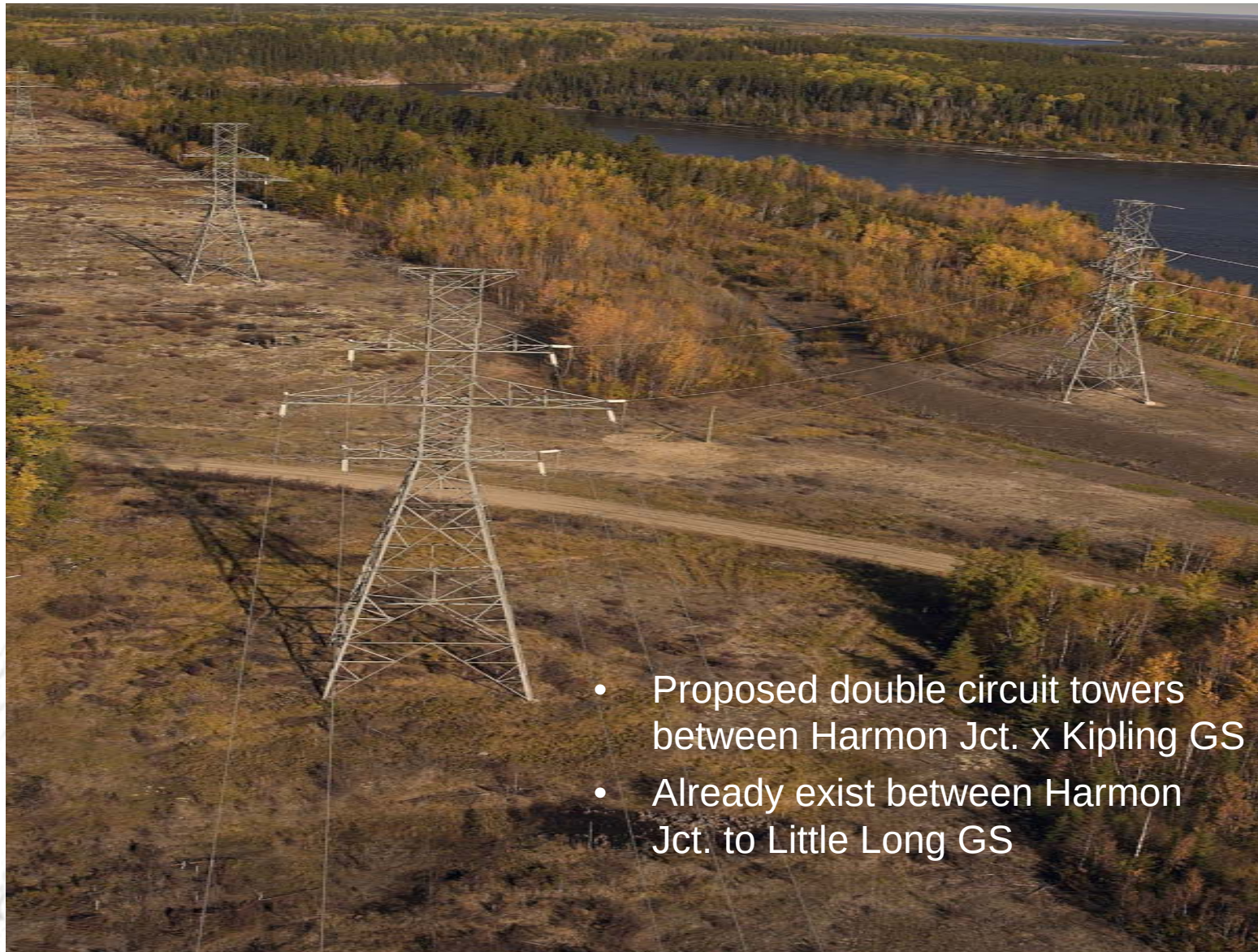
OPG to build 230 kV
circuit

Existing Transmission Towers



- Existing single circuit towers between Harmon Jct. and Kipling GS

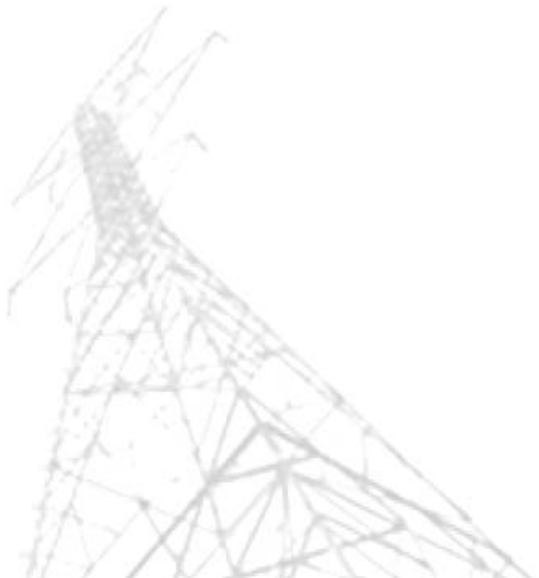
Proposed Towers



- Proposed double circuit towers between Harmon Jct. x Kipling GS
- Already exist between Harmon Jct. to Little Long GS

Environmental and Technical Features

- Project features minimize effects:
 - No vegetation removal required
 - No new right-of-way widening required
 - Use of existing access roads

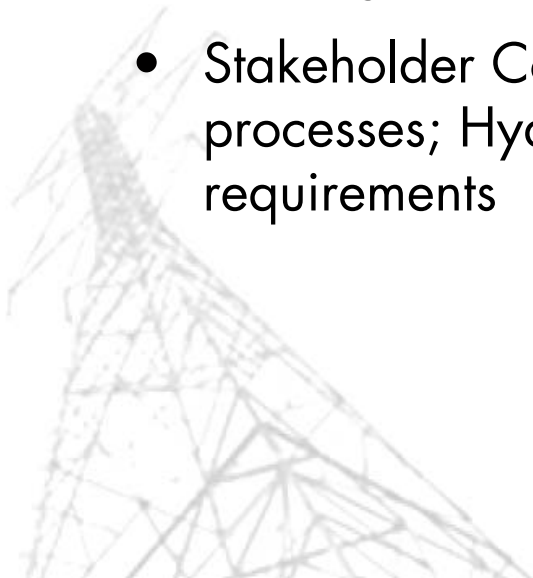


Approval Requirements

- *Ontario Environmental Assessment Act*
 - The facilities are subject to the provincial *Environmental Assessment Act* in accordance with the *Class Environmental Assessment for Minor Transmission Facilities*
 - The original EA was approved in 1994
 - Updating original approval to confirm no changes have occurred
 - Submission to Ministry of the Environment in spring 2009
- *Ontario Energy Board Act*
 - The project is also subject to "Leave to Construct" approval under Section 92 of the *Ontario Energy Board (OEB) Act*.
 - OEB considers impacts project may have on consumers with respect to price, reliability and quality of service
 - Section 92 filing is being coordinated with OPG

Public and Stakeholder Consultation

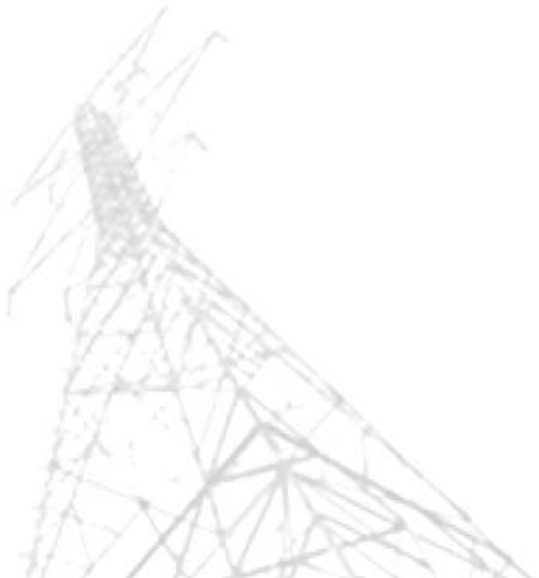
- OPG had an Open House to provide information about their project for the public in April 2008, and
 - Kapuskasing, Ontario January 27, 2009
 - Smooth Rock Falls, Ontario January 28, 2009
- Hydro One's approach will be coordinated with OPG
 - Notify elected officials and staff, MPP, and government agencies and other key stakeholders
- Stakeholder Consultation is a requirement of both EA and OEB processes; Hydro One commitment beyond meeting legislative requirements



Target Project Timeline

Next Steps	Dates
Notification of Hydro One transmission upgrade	March 2009
Anticipated OEB filing	April 2009
EA amendment submission to MOE	Spring 2009
Anticipated OEB approval	December 2009
Start of construction	Early 2011
Project in-service	June 2013

Questions?



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ATTACHMENT C

Hydro One Networks Inc.

483 Bay Street
South Tower, 8th Floor
Toronto, Ontario M5G 2P5
www.HydroOne.com

Tel: 416.345.5892
Fax: 416.345.6984



Enza Cancilla

Manager
Public Affairs

Mr. Gilles Bisson
60 Wilson Ave.
Suite 202
Timmins, ON
P4N 2S7

March 23, 2009

Dear Mr. Bisson:

RE: Transmission Line Upgrade - Harmon Junction (Jct) to Kipling Generating Station (GS)

As you may know, Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One Networks Inc. (Hydro One) is required to add a second 230 kilovolt (kV) circuit along the existing towers that run from Harmon Junction (Jct) to Kipling Generating Station (GS), approximately 4 km in length. We will also need to replace two anchor towers.

An Environmental Assessment Report was completed and filed with the Ministry of the Environment in 1990 and approved in 1994 (*Hydroelectric Generating Station Extensions Mattagami River*), in accordance with the *Environmental Assessment Act*. This report will be updated to confirm if any changes to environmental and technical factors have occurred. The addition of the second circuit by Hydro One also requires a Leave to Construct approval from the Ontario Energy Board (OEB) under Section 92 of the *OEB Act*. Hydro One is planning to file this application in April 2009. If approved, construction is expected to begin in early 2011 with an in-service date of June 2013.

It is anticipated that there will be minimal environmental impacts associated with upgrading the existing towers that run from Harmon Jct to Kipling GS. No vegetation removal or right-of-way widening is required and construction crews will be able to utilize existing access roads.

We are working closely with OPG and understand that its consultation program for the Lower Mattagami River Extension has included information about Hydro One's transmission upgrade between Harmon Jct and Kipling GS and ample opportunity for public input. As such, Hydro One's consultation approach will focus on notifying elected officials and staff, government agencies and other key stakeholders, and posting information to our website.

For more information about the project you can visit our website at www.HydroOne.com/Mattagami.

Please do not hesitate to contact me at 416-345-5892 if you require further information about the project, or Amy Bowen, Community Relations Officer at 1-877-345-6799, or by email at Amy.Bowen@HydroOne.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Enza Cancilla".

Enza Cancilla
Manager, Public Affairs

Filed: April 8, 2009
EB-2009-0078
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ATTACHMENT D



Corporation
of the Town of
de la ville de
Kapuskasing

Office of the Mayor — Bureau du maire

March 17, 2009

Ms. Enza Cancilla,
Manager, Public Affairs,
Hydro One Networks Inc.,
483 Bay Street,
South tower, 8th Floor,
TORONTO, Ontario
M5G 2P5

Dear Ms. Cancilla:

I appreciated meeting with yourself and other Hydro One Networks Inc. officials to be briefed about the Hydro One Networks Inc. transmission upgrade with the addition of a second circuit to the existing tower from Harmon Junction to the Kipling Generating Station to accommodate the Lower Mattagami River extension.

This information was of benefit and it is encouraging to learn about the advance work being undertaken.

Kapuskasing Council gave consideration to the request for resolution support for the Hydro One Networks Inc. initiative and I am pleased to advise that Council provided overwhelming support. Please find enclosed a copy of the resolution for your records.

I trust this meets with your approval and please do not hesitate to make contact in event there is other assistance the municipality may provide.

Yours truly,

A handwritten signature in dark ink, appearing to read "Alan Spacek".

ALAN SPACEK
Mayor

THE CORPORATION OF THE TOWN OF KAPUSKASING

RESOLUTION NO. 2009- 041

COUNCIL MEETING MARCH 13, 2009

MOVED BY COUNCILLOR: _____

SECONDED BY COUNCILLOR: _____

That Kapuskasing Council support the Hydro One Networks Inc. transmission line upgrade from Harmon Junction to the Kipling Generation Station.

CARRIED ☒
DEFEATED ☐
DEFERRED OR TABLED ☐

RECORDED _____	FOR	AGAINST
Alan Spacek		
Martin Credger		
Martin Dinnissen		
Peter Drobny		
Yvon Guertin		
David Plourde		
Frank Siebert		

DECLARATION OF CONFLICT OF INTEREST

BY: _____

NATURE OF INTEREST _____

Filed: April 8, 2009
EB-2009-0078
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ATTACHMENT E



Corporation of the Town of

Corporation de la Ville de

Smooth Rock Falls

P.O. Box 249 - C.P.

SMOOTH ROCK FALLS, Ont. P0L 2B0

TEL: 705-338-2717

FAX: 705-338-2584

E-mail: srftown@ntl.sympatico.ca

March 26, 2009

Enza Cancilla, Manager, Public Affairs
Hydro One Networks Inc.
483 Bay Street
South Tower, 8th Floor
Toronto, Ontario
M5G 2P5

Dear Mrs. Cancilla,

Please be advised that Council at their Committee of the Whole Meeting of March 18th, 2009, passed the following resolution.

RESOLUTION # 2009-28

Moved by: Michel Arseneault
Seconded by : Sue Perras

BE IT RESOLVED THAT Council support Hydro One in their Harmon Jct to Kipling GS transmission line upgrade.

CARRIED

Yours truly,

THE CORPORATION OF THE TOWN OF SMOOTH ROCK FALLS

Michelle Larose
CAO/Clerk-Treasurer

Filed: April 8, 2009
EB-2009-0078
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ATTACHMENT F

Hydro One Networks Inc.

483 Bay Street

Toronto, Ontario M5G 2P5

www.HydroOne.com

LeeAnne.Cameron@HydroOne.com

Tel. No. 416-345-5699

Fax. No. 416-345-6600



Lee Anne Cameron

Director, First Nation & Métis Relations

TCT5, South Tower

March 31, 2009

Urgil Courville

President, Northern Lights Métis Council

P.O. Box 2690

275 Fifteenth Ave.

Cochrane, ON P0L 1C0

Dear President Courville:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

The undertaking will require modifications to eleven of the thirteen existing transmission towers and the replacement of two anchor towers. To accommodate the additional circuit, tower heights will increase by approximately 5 metres, while the bases of the towers are expected to remain unchanged. The project is anticipated to have little or no environmental impact since no vegetation removal or right-of-way widening is required and construction crews will be able to utilize existing access roads. Construction is expected to begin in early 2011 with an in-service date of June 2013.

At Hydro One, we are committed to consulting with the Métis so that you have all the information you need to understand the nature of our project. Should you wish additional information with respect to Hydro One's contribution to the Lower Mattagami River Project (Hydroelectric Generation Station Extension - Mattagami River Environmental Approval) please feel free to contact me at (416) 345-5699 or Doug Magee at (416) 345-6596. We encourage you to visit our project website for additional details. www.hydroone.com/mattagami

Sincerely,

A handwritten signature in black ink, appearing to read "Lee Anne Cameron". The signature is fluid and cursive, with a long horizontal stroke at the end.

Lee Anne Cameron

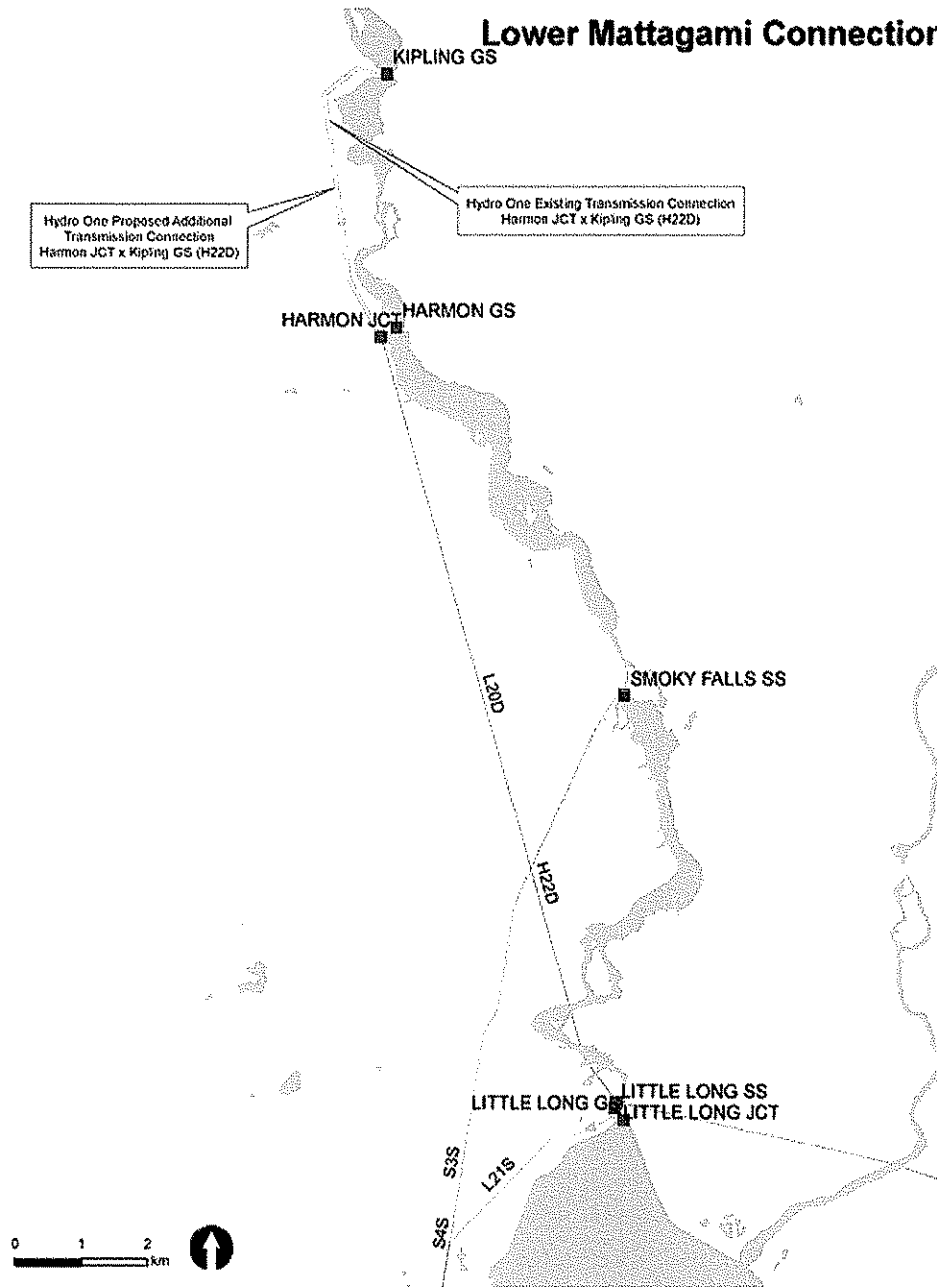
Director, First Nation & Métis Relations

Hydro One Networks Inc.

483 Bay Street, 5th Floor, South Tower

Toronto, ON. M5G 2P5

Lower Mattagami Connection



Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario M5G 2P5
www.HydroOne.com
LeeAnne.Cameron@HydroOne.com

Tel. No. 416-345-5699
Fax. No. 416-345-6600



Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Chief Randy Kapashesit
Mocreebec Council of the Cree Nation
P.O. Box 4
Moose Factory ON P0L 1W0

Dear Chief Kapashesit:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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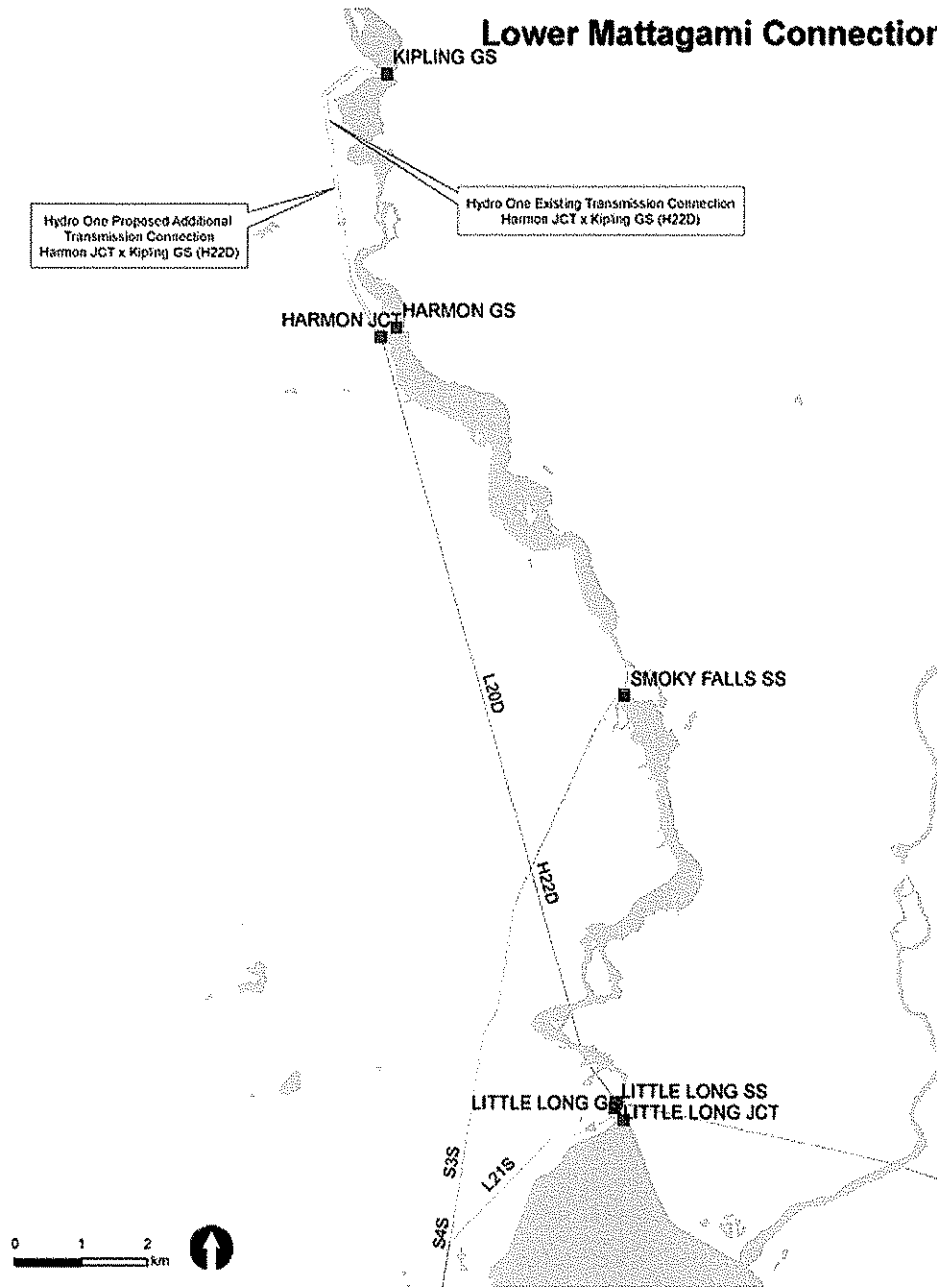
At Hydro One, we are committed to consulting with First Nations so that you have all the information you need to understand the nature of our project. Should you wish additional information with respect to Hydro One's contribution to the Lower Mattagami River Project (Hydroelectric Generation Station Extension - Mattagami River Environmental Approval) please feel free to contact me at (416) 345-5699 or Doug Magee at (416) 345-6596. We encourage you to visit our project website for additional details. www.hydroone.com/mattagami

Sincerely,

A handwritten signature in black ink, appearing to read "Lee Anne", written over a horizontal line.

Lee Anne Cameron
Director, First Nation & Métis Relations
Hydro One Networks Inc.
483 Bay Street, 5th Floor, South Tower
Toronto, ON. M5G 2P5

Lower Mattagami Connection



Hydro One Networks Inc.

483 Bay Street

Toronto, Ontario M5G 2P5

www.HydroOne.com

LeeAnne.Cameron@HydroOne.com

Tel. No. 416-345-5699

Fax. No. 416-345-6600



Lee Anne Cameron

Director, First Nation & Métis Relations

TCT5, South Tower

March 31, 2009

Chief Ray Murray
Flying Post First Nation
P.O Box 1027
Nipigon, Ontario
P0T 2J0

Dear Chief Murray:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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At Hydro One, we are committed to consulting with First Nations so that you have all the information you need to understand the nature of our project. Should you wish additional information with respect to Hydro One's contribution to the Lower Mattagami River Project (Hydroelectric Generation Station Extension - Mattagami River Environmental Approval) please feel free to contact me at (416) 345-5699 or Doug Magee at (416) 345-6596. We encourage you to visit our project website for additional details. www.hydroone.com/mattagami

Sincerely,

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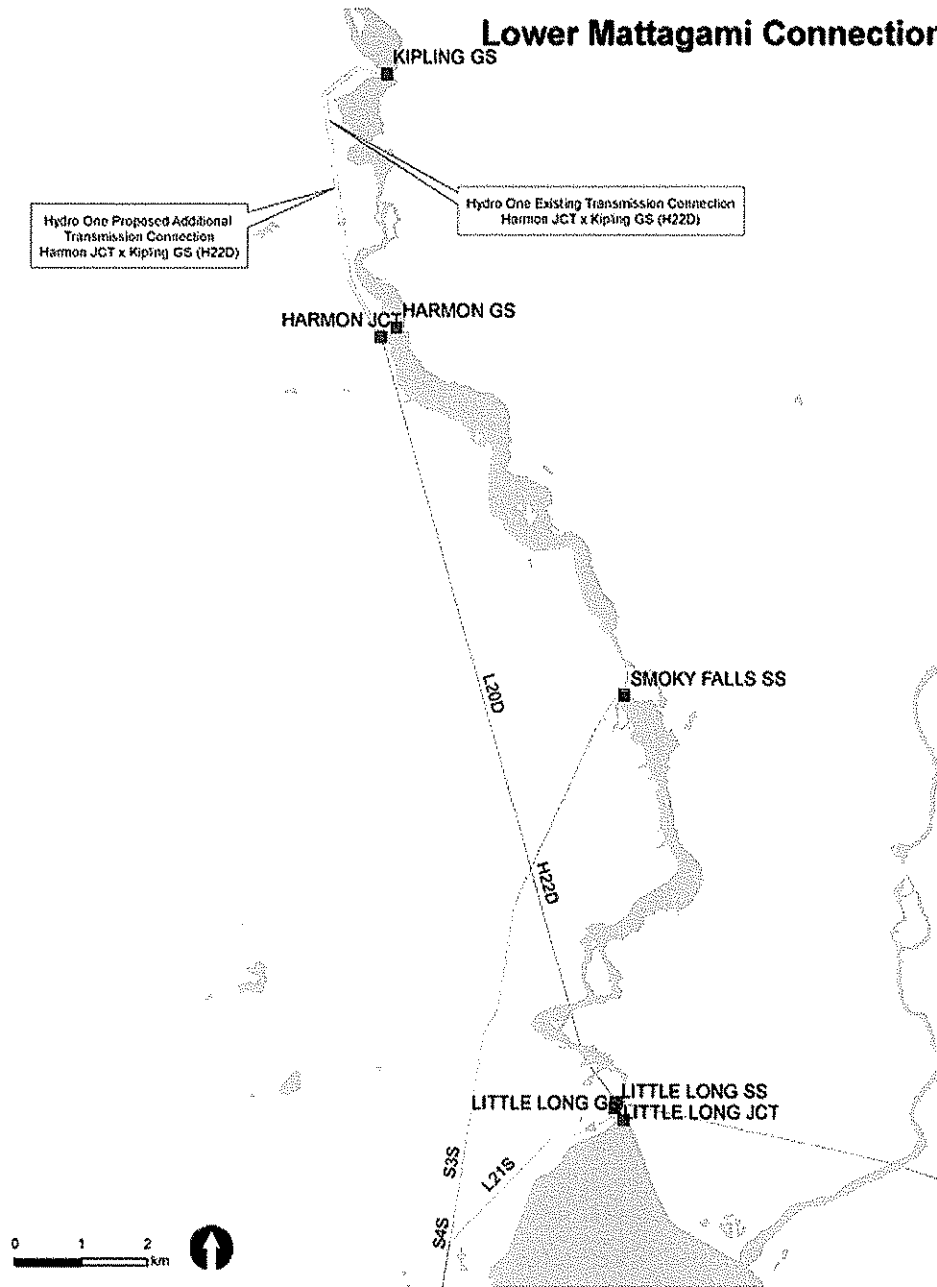
Lee Anne Cameron

Director, First Nation & Métis Relations

Hydro One Networks Inc.

483 Bay Street, 5th Floor, South Tower

Lower Mattagami Connection



Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario M5G 2P5
www.HydroOne.com
LeeAnne.Cameron@HydroOne.com

Tel. No. 416-345-5699
Fax. No. 416-345-6600



Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Natalie Durocher
President, Métis Nation of Ontario – Timmins
347 Spruce St. South
Timmins, ON P4N 2N2

Dear President Durocher:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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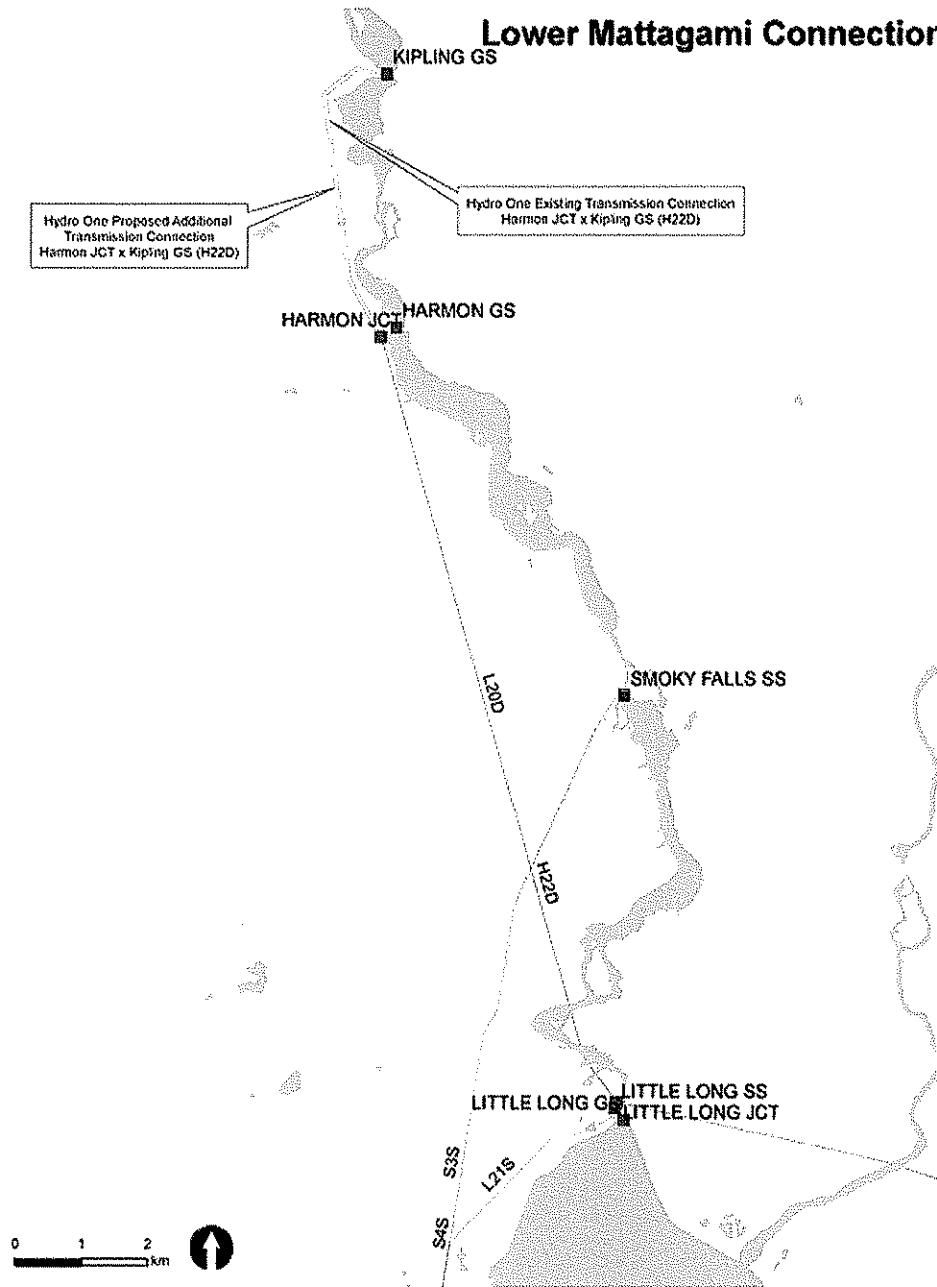
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Sincerely,

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Lee Anne Cameron
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Toronto, ON. M5G 2P5

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Toronto, ON. M5G 2P5

Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Chief Gloria McKenzie
Beaverhouse First Nation
26 Station Road North
P.O. Box 1022
Kirkland Lake ON P2N 3L1

Dear Chief McKenzie:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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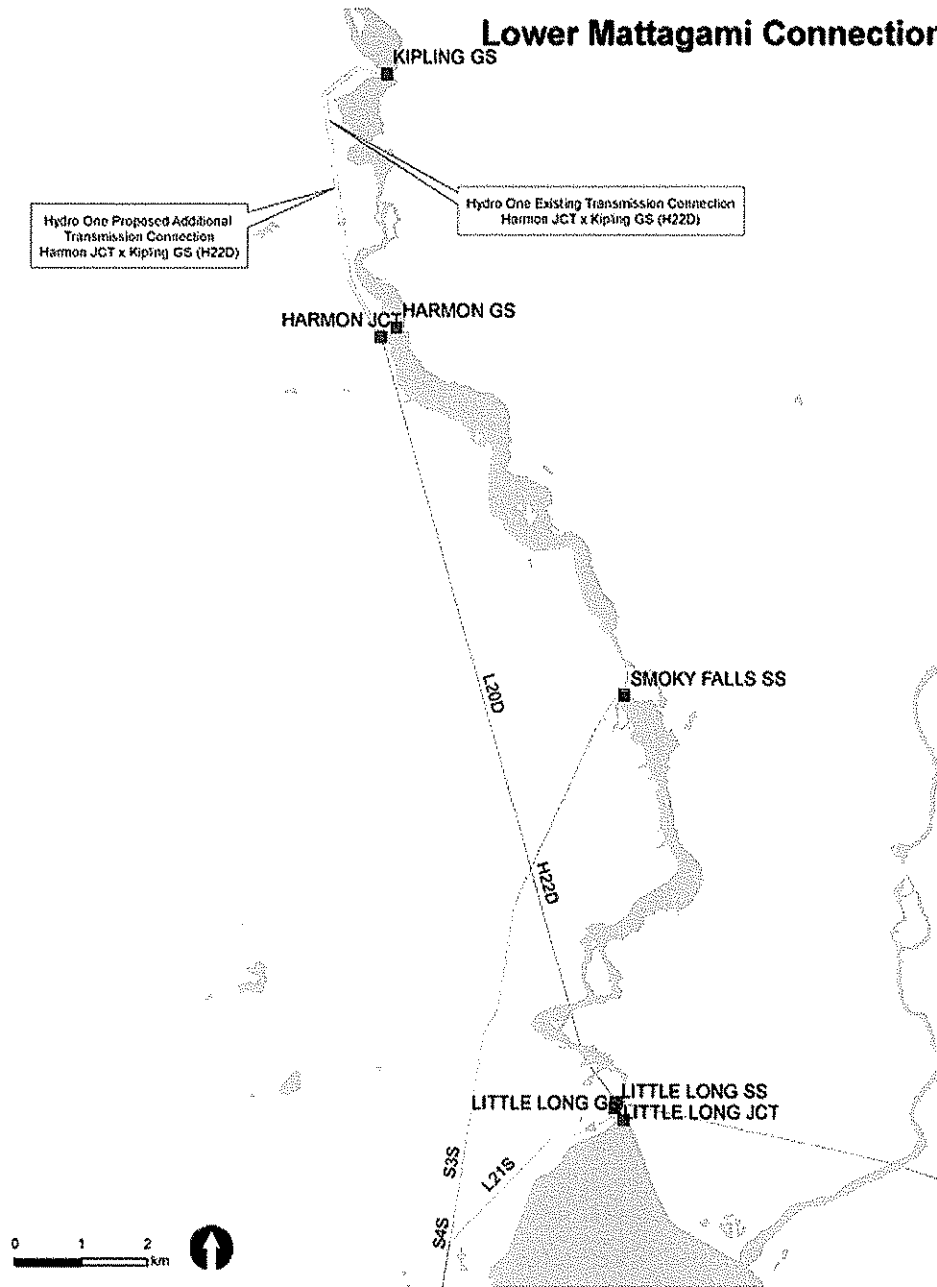
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Lee Anne Cameron
Director, First Nation & Métis Relations
Hydro One Networks Inc.
483 Bay Street, 5th Floor, South Tower
Toronto, ON. M5G 2P5

Lower Mattagami Connection



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Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Chief Anita Stephens
Chapleau Ojibwe First Nation
P.O. Box 279
Chapleau ON P0M 1K0

Dear Chief Stephens:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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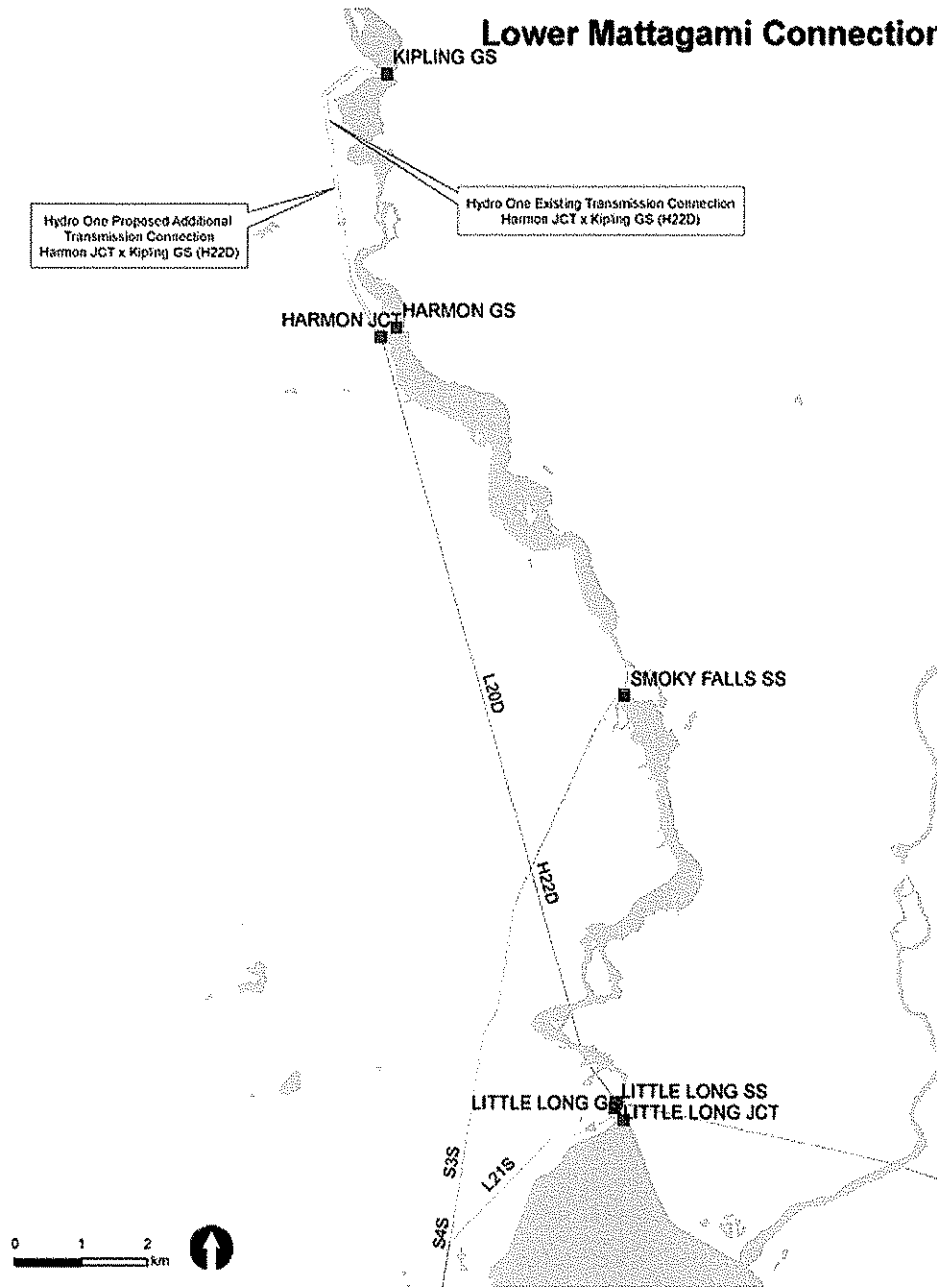
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Sincerely,

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Lee Anne Cameron
Director, First Nation & Métis Relations
Hydro One Networks Inc.
483 Bay Street, 5th Floor, South Tower
Toronto, ON. M5G 2P5

Lower Mattagami Connection



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Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Chief Richard Winickaby
Matachewan First Nation
P.O. Box 160
Matachewan, Ontario
P0K 1M0

Dear Chief Winickaby:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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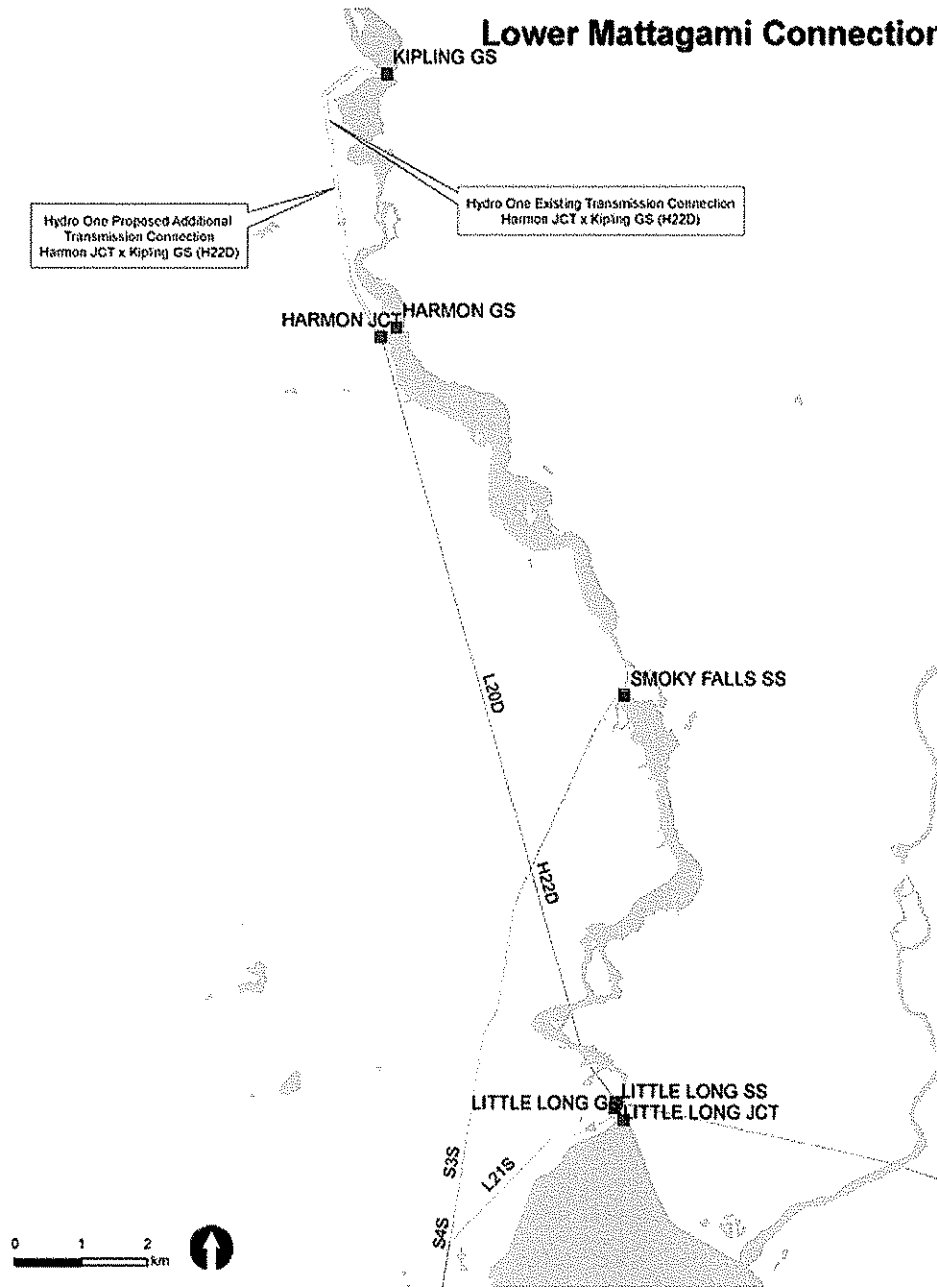
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Sincerely,

A handwritten signature in black ink, appearing to read "L. Cameron".

Lee Anne Cameron
Director, First Nation & Métis Relations
Hydro One Networks Inc.
483 Bay Street, 5th Floor, South Tower

Lower Mattagami Connection



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Fax. No. 416-345-6600



Lee Anne Cameron

Director, First Nation & Métis Relations

TCT5, South Tower

March 31, 2009

Chief Rene Ojeebah

Brunswick House First Nation

P.O. Box 117

Chapleau ON P0M 1K0

Dear Chief Ojeebah:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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Lee Anne Cameron

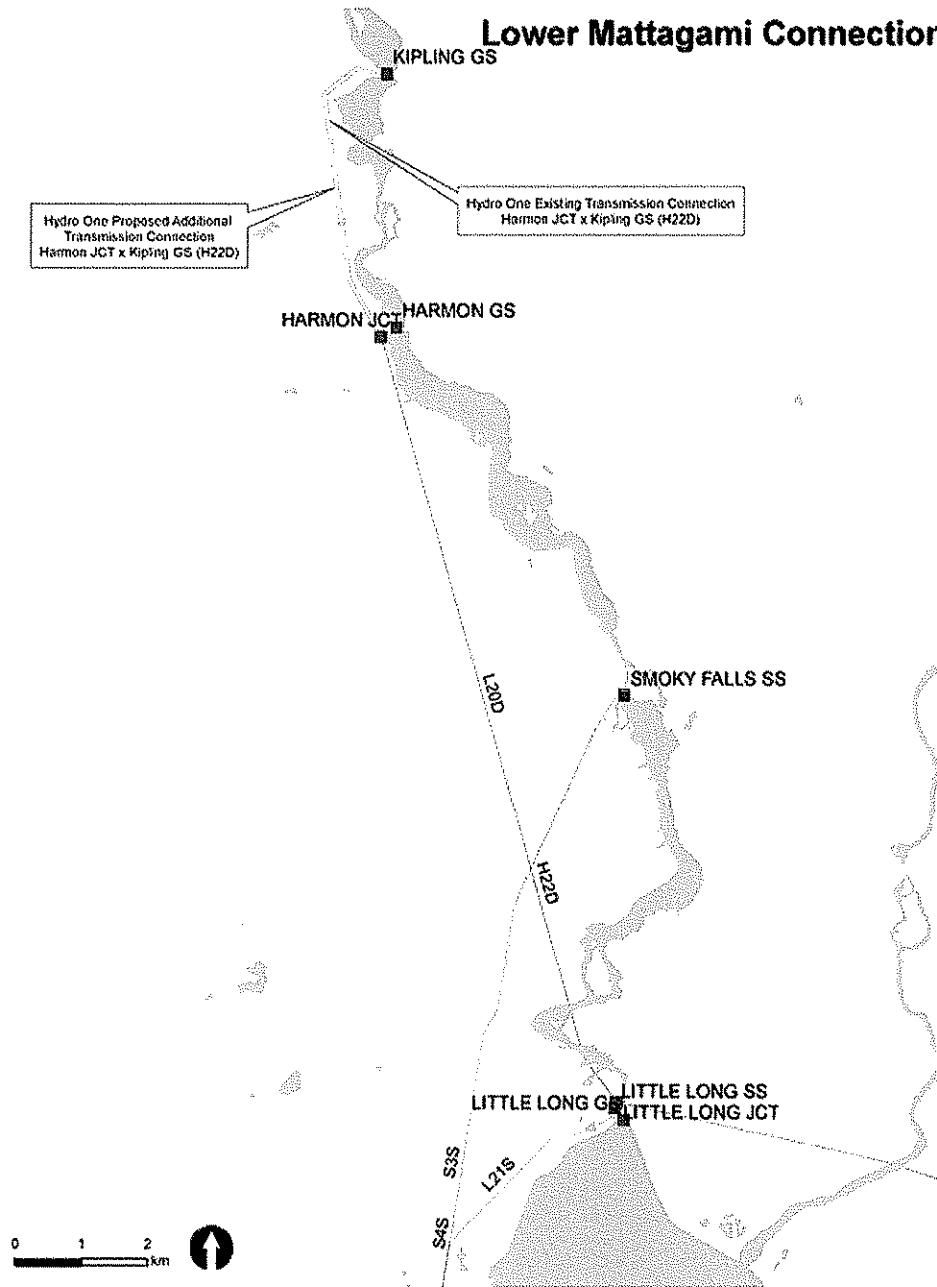
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Toronto, ON. M5G 2P5

Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Chief David Babin
Wahgoshig First Nation
R.R. #3
Matheson, Ontario
P0K 1N0

Dear Chief Babin:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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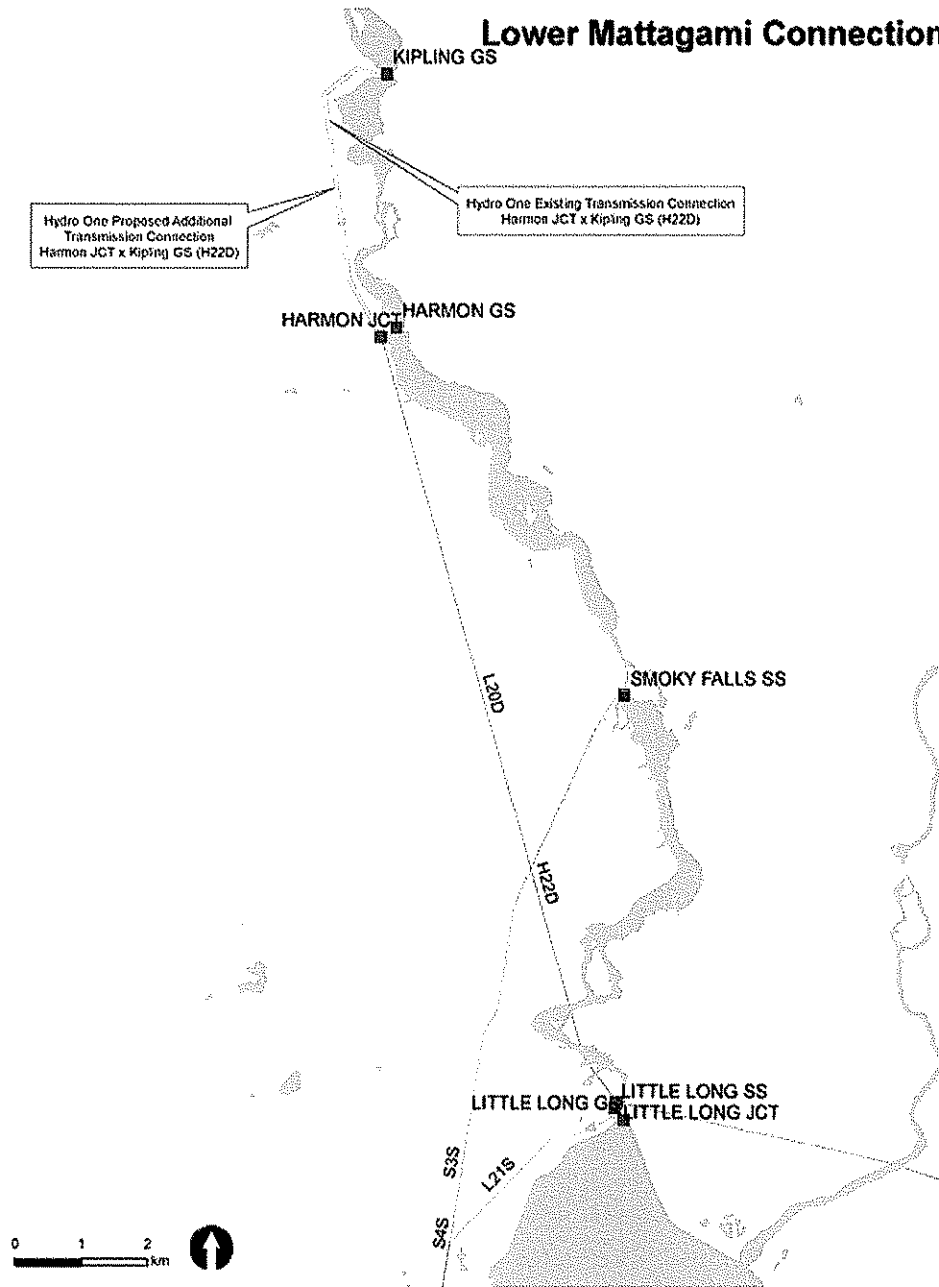
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Lee Anne Cameron
Director, First Nation & Métis Relations
Hydro One Networks Inc.
483 Bay Street, 5th Floor, South Tower
Toronto, ON. M5G 2P5

Lower Mattagami Connection



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Fax. No. 416-345-6600



Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Chief Norm Hardisty
Moose Cree First Nations
P.O Box 190
Moose Factory, Ontario
P0L 1W0

Dear Chief Hardisty:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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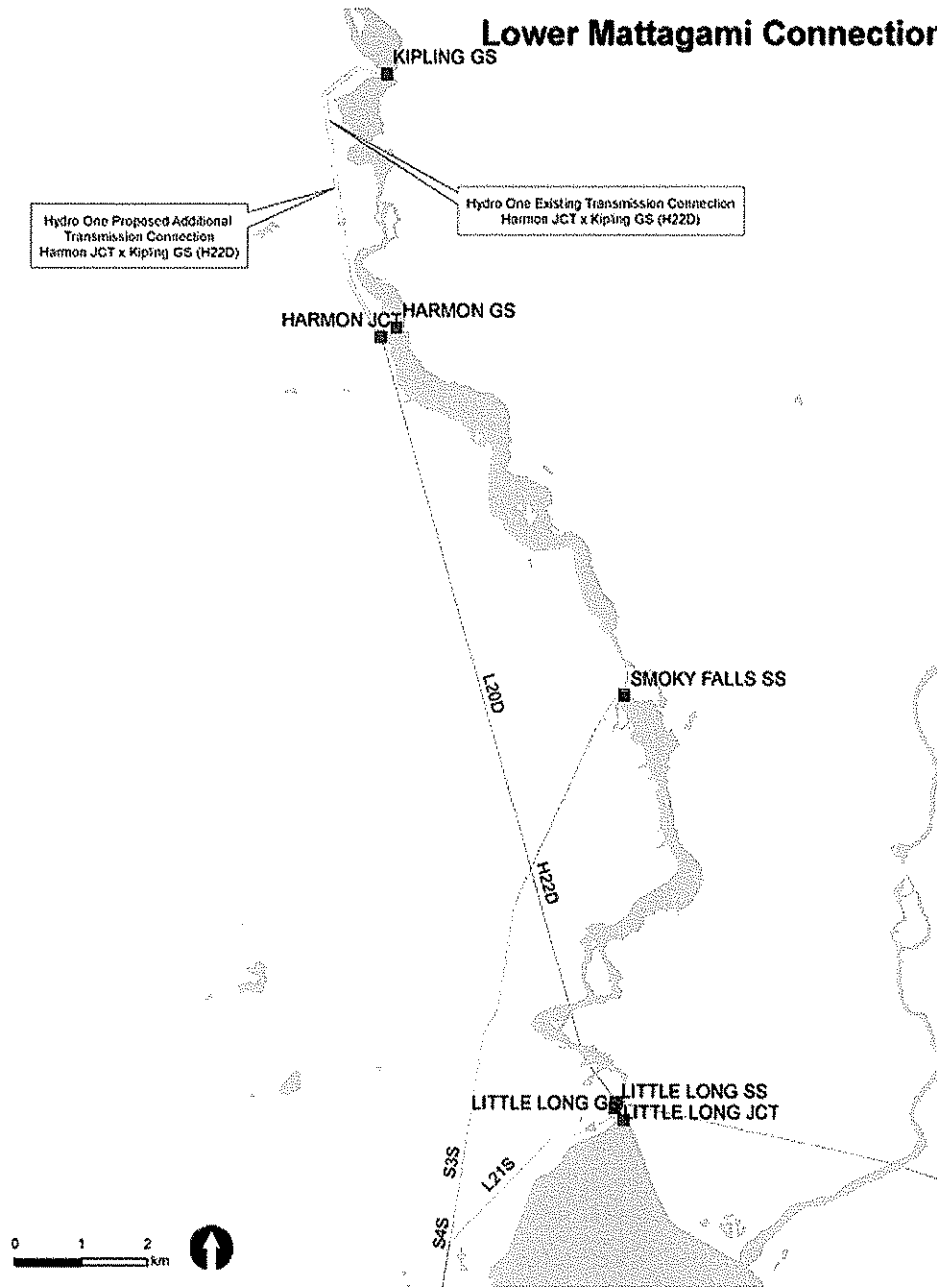
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Sincerely,

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Lee Anne Cameron
Director, First Nation & Métis Relations
Hydro One Networks Inc.
483 Bay Street, 5th Floor, South Tower
Toronto, ON. M5G 2P5

Lower Mattagami Connection



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Fax. No. 416-345-6600



Lee Anne Cameron
Director, First Nation & Métis Relations
TCT5, South Tower

March 31, 2009

Chief Dwight Sutherland
Taykwa Tagamou Nation (New Post)
R.R. #2 – Box 3310
Cochrane On P0L 1C0

Dear Chief Sutherland:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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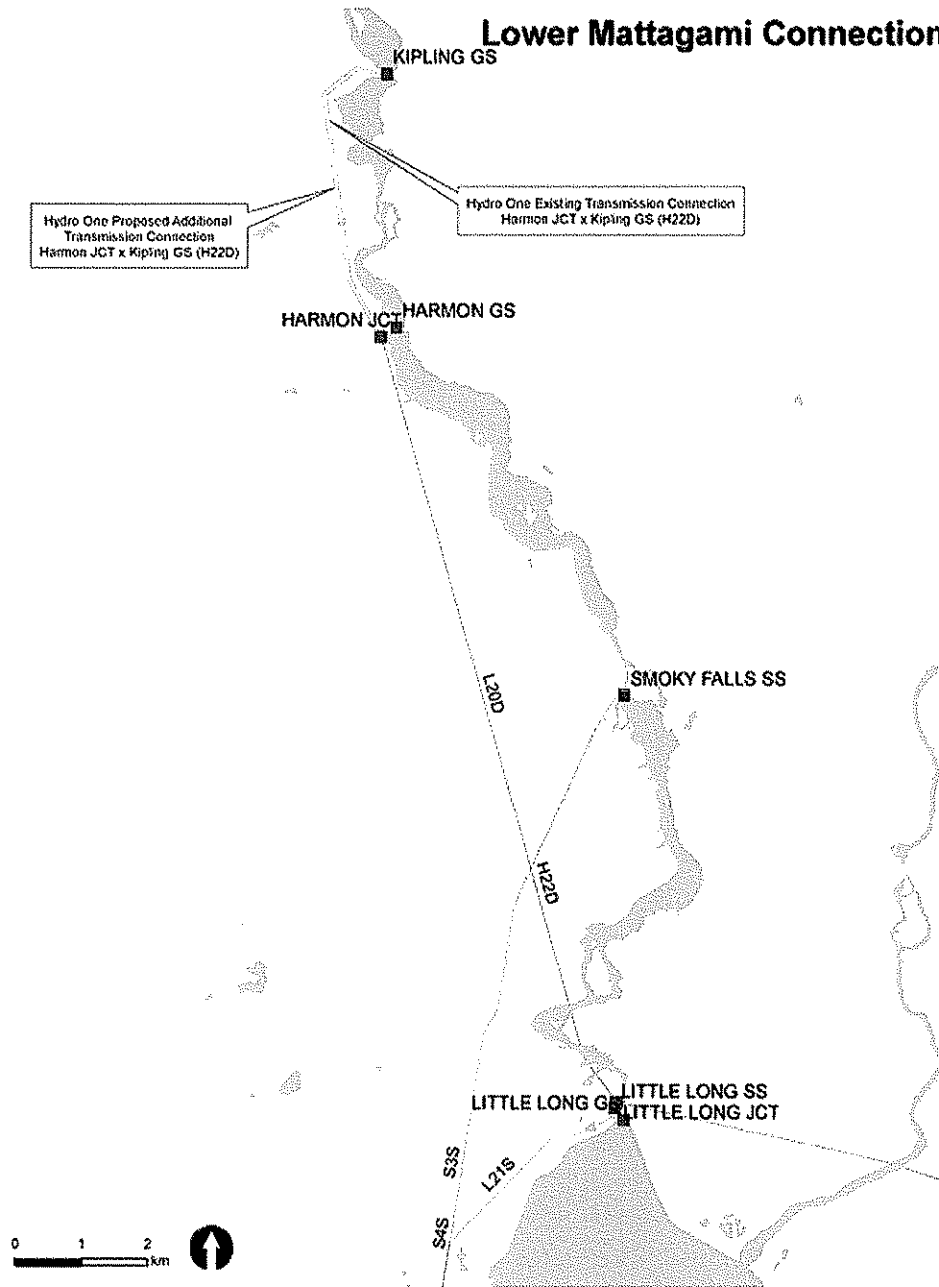
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Sincerely,

A handwritten signature in black ink, appearing to read "Lee Anne Cameron". The signature is fluid and cursive, with a large initial "L" and a long, sweeping underline.

Lee Anne Cameron
Director, First Nation & Métis Relations
Hydro One Networks Inc.
483 Bay Street, 5th Floor, South Tower
Toronto, ON. M5G 2P5

Lower Mattagami Connection



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Lee Anne Cameron

Director, First Nation & Métis Relations

TCT5, South Tower

March 31, 2009

Chief Walter Naveau

Mattagami First Nation

P.O. Box 99 Gogama, Ontario

P0M 1W0

Dear Chief Naveau:

Re: Lower Mattagami River System Transmission Upgrades

You may be aware that Ontario Power Generation (OPG) is planning to add 450 megawatts (MW) of new generation to the Lower Mattagami River system. To accommodate some of this new generation, Hydro One is also required to add a second 230 kilovolt (kV) circuit to the existing towers that run from Harmon Junction (Jct.) to Kipling Generating Station (GS); a distance of approximately 4.6 km in length. The attached map shows the location of the project.

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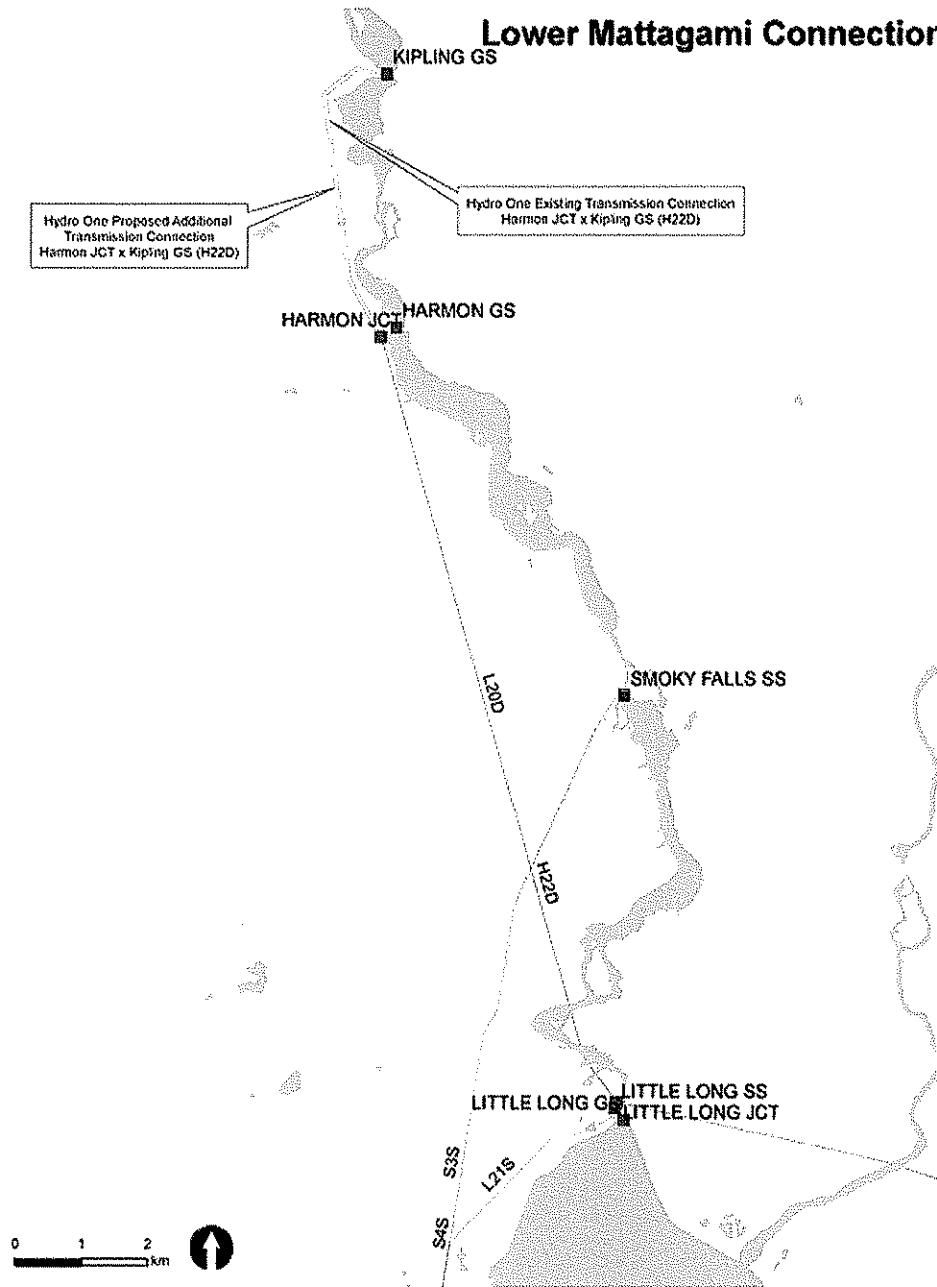
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483 Bay Street, 5th Floor, South Tower

Toronto, ON. M5G 2P5

Lower Mattagami Connection



STAKEHOLDER AND COMMUNITY CONSULTATION

1.0 Introduction

This exhibit outlines Hydro One's consultation and communication process, and input received to date regarding the Project. Hydro One is committed to working to address community and stakeholder issues to ensure any concerns regarding the proposed transmission upgrades are addressed. And that municipal staff, elected officials, the general public as well as relevant government ministries are kept informed of the project status.

The proposed facilities are located in northeastern Ontario, 80 kilometres northeast of the Town of Kapuskasing which constitutes the nearest urban centre to the proposed transmission line upgrade and 120 kilometres northwest of the Town of Smooth Rock Falls.

We are working closely with Ontario Power Generation (OPG) and understand that its public consultation process for the Lower Mattagami River Project has included information about the required Hydro One's transmission upgrade between Harmon Junction (Jct) and Kipling Generating Station (GS). As such, Hydro One's consultation approach will focus on notifying key stakeholders in the vicinity of the transmission line who may have an interest in the proposed transmission line upgrade, and ensuring information is available to the general public via Hydro One's website.

The initial step in Hydro One's consultation process involved meeting with OPG on January 30, 2009 to identify key issues and potentially affected communities and stakeholders and ensure coordination of consultation activities and building on activities already undertaken by OPG.

2.0 Objectives and Consultation Process

The intent of the consultation process is to inform the community and stakeholders about the project, identify any issues, and develop plans that address those issues where appropriate. Given the nature of Hydro One's project, which is limited largely to the use of existing towers with some modifications, the project is expected to have little or no environmental impact since no vegetation removal or right-of-way widening is required and construction crews will be able to use existing access roads.

In addition, OPG's consultation process in support of the Lower Mattagami River Project has provided the local community with a broad awareness of the need for both OPG and Hydro One's projects. The general public has had an opportunity to participate in OPG's consultation program which included an open house in April 2008, and more recently, open houses in Kapuskasing January 27, 2009 and Smooth Rock Falls January 28, 2009. At these sessions OPG provided information regarding its project and included information about Hydro One's transmission component.

The feedback from these OPG sessions indicates that the local community is very supportive of the project with most interest directed at potential construction employment and business opportunities. A few environmental issues regarding the hydroelectric facilities were raised which will be addressed by OPG.

3.0 Notification of Elected Officials and Staff

In an effort to ensure local municipal officials were aware of Hydro One's role and plans with respect to the Lower Mattagami River, it hosted a project briefing in Toronto on February 24, 2009 to outline the transmission requirements and address any questions or concerns. Those in attendance included Town of Kapuskasing Mayor Alan Spacek, the

1 Chief Administrative Officer, and Councillor Yvon Guertin, and the Chief Administrative
2 Officer, and Public Works Superintendent from the Town of Smooth Rock Falls. The
3 Mayor of Kapuskasing indicated that the community is very familiar and supportive of
4 OPG's project, and similarly, would support Hydro One's transmission initiative and
5 provide any assistance necessary. Representatives of Smooth Rock Falls were also
6 supportive and indicated that they would deliver the information to their Mayor and
7 Council about the project.

8
9 At the February 24, 2009 briefing Mayor Alan Spacek also noted that he would seek the
10 formal support of the Northeastern Ontario Municipal Association (NEOMA), in the
11 form of a resolution. The NEOMA is an association of municipalities located along
12 Highway 11 between Hearst and Timmins, Ontario with the objective of providing a
13 unified voice for Northeastern Ontario.

14
15 The Kapuskasing and Smooth Rock Falls mayors and councils were also notified in
16 writing on March 10, 2009 (Attachment A) about the project and provided copies of the
17 PowerPoint presentation (Attachment B) delivered to the members of both municipalities
18 during the February 24, 2009 briefing. The MPP for Timmins – James Bay, Gilles
19 Bisson was also notified about the project (Attachment C) and to date, no issues have
20 been raised by these stakeholders.

21
22 On March 17, 2009 Hydro One received a Council resolution from the Town of
23 Kapuskasing indicating that Council provided overwhelming support in favour of the
24 project (Attachment D). On March 26, 2009 Hydro One received a Council resolution
25 from the Town of Smooth Rock Falls in support of the project (Attachment E).

4.0 First Nations and Métis Notification

The existing transmission corridor for this project is located on crown land. On April 1 2009 Hydro One notified in writing (Attachment F) First Nations and Métis communities that may potentially be impacted by this project about our plans to upgrade the towers in support of OPG Lower Mattagami River developments and our intention to file this Application. These First Nations and Métis communities were originally identified by OPG through its contact with the Department of Indian and Northern Affairs (INAC) and the Ministry of Aboriginal Affairs. The communities include:

- Moose Cree First Nations
- Mocrebec Council of the Cree Nation
- Taykwa Tagamou Nation
- Wabun Tribal Council communities (Beaverhouse, Brunswick House, Chapleau Ojibwe, Matachewan, Wahgoshig, and Flying Post First Nations)
- Metis Nation of Ontario

Any issues or concerns raised by the First Nations and Metis will be documented and this evidence updated.

5.0 Public Notification – Project Webpage

A project information page has been created on the Hydro One Networks' website www.HydroOneNetworks.com/newprojects to further facilitate public access to information about the project and communication with Hydro One staff. This site provides information about the project and timelines, as well as details on the environmental screening process. The site will be kept up to date as new information

1 becomes available. As we are working closely with OPG and understand that its
2 consultation program for the Lower Mattagami River Project has included information
3 about Hydro One's transmission upgrade, a link to our project page will be displayed on
4 OPG's website.

ENVIRONMENTAL ASSESSMENT APPROVAL

An Environmental Assessment Report was submitted to the Ministry of the Environment for the predecessor “Hydroelectric Generating Station Extensions Mattagami River” and approved in 1994. There was no expressed opposition to the project and all concerns were satisfactorily resolved. There are no requirements under the *Environmental Assessment Act* for the current project; however, Hydro One is undertaking an environmental screening for due diligence purposes. Based on an Environmental Assessment Report for the project that was filed with the Ministry of the Environment in 1990 and approved in 1994; Section 2.2.1 “Procedure to Amend the EA’ sets out the process to follow should changes be proposed. The current Lower Mattagami River Project requires an additional circuit to be added to the existing 230kV circuit from Harmon Jct. to Kipling GS. Following the amendment process, Hydro One is completing an environmental screening report, has undertaken a Stage I archaeological assessment and provided details to the Ministry of Environment EAAB regarding the scope of the work and associated effects for circulation and review. This screening will be completed in April 2009 at which time it will be submitted to the Ministry of Environment.

LAND MATTERS

1.0 DESCRIPTION OF LAND REQUIRED

The Lower Mattagami proposed transmission facilities will include 4.56 km of new 230 kV single-circuit line on the existing 230 kV overhead transmission line right-of-way between the existing Kipling Generating Station to the existing Harmon Junction. The existing corridor running from Kipling GS to Harmon Junction is approximately 150' wide or 75' on either side of the centre line and is a combination of land rights as follows:

- Provincially owned property segments held by a Water Power Lease #105, by Ontario Power Generation (OPG) and Hydro One enjoying an Easement in Gross from OPG, for its transmission facilities situated upon this Water Power Lease along with Ministry of Natural Resources (MNR) land use permit occupations for the other section of the transmission line right-of-way. There are identified to be 3 mining locations (claims) situated along the proposed transmission line route and a title search will be conducted to verify ownership and the existence of any easement rights across these lands.
- Private roads (OPG and former logging trail roads)

The proposed transmission line facilities will be accommodated largely by land rights Hydro One has secured along the existing corridor. These rights consist of the existing land tenure rights Hydro One enjoys by its easement and permits with Ontario Power Generation and the Ontario Ministry of Natural Resources on all of the provincially-owned lands. It is not anticipated that there are any private property easements. However, a title search will be conducted to verify if any existing permanent easement rights exist on private property.

1 **2.0 DESCRIPTION OF LAND RIGHTS**

2
3 The existing transmission line corridor crosses OPG Water Power Lease (WPL) #105 and
4 Hydro One enjoys an easement in gross from OPG for its transmission line right-of-way
5 crossing this WPL. In addition, Hydro One has a land use permit for its remaining right-
6 of-way to Harmon Junction.

7
8 It is not anticipated that there are any private property easements however, a title search
9 will be conducted to verify if any existing permanent easement rights, exist on private
10 property.

11
12 **3.0 LAND ACQUISITION PROCESS**

13
14 Hydro One will be using its existing land rights along the corridor from Kipling GS to
15 Harmon Junction and no additional land rights are expected to be required. Temporary
16 access rights may be required and these will be identified in the construction planning
17 stage.

18
19 If applicable, any affected landowners will also be notified of the routing of the proposed
20 facilities as part of the OEB's Section 92 notice requirements and as part of the EA
21 approval process.