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BY COURIER

March 25, 2008

Mr. David MacIntosh
Case Manager
Energy Probe Research Foundation
225 Brunswick Ave
Toronto ON M5S 2M6

Dear Mr. MacIntosh:

EB-2007-0050 – Hydro One Networks' Section 92 Bruce - Milton Transmission Reinforcement Application – Hydro One Networks' Response to Interrogatory Questions from Energy Probe List 2, List 3 and List 4

I am attaching a paper copy of the responses to the interrogatory questions from Energy Probe Interrogatory Lists 2, 3 and 4 (questions 10 to 29).

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

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

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

Sincerely,

Oded Hubert

c. Ms. Kirsten Walli, Ontario Energy Board

Energy Probe INTERROGATORY #10 List 2

Interrogatory

Ref: Exh. B/T 6/S 2
Issue 2.4(b): Have appropriate comparisons been carried out on all reasonable alternatives with respect to reliability and quality of electricity service, including stability and transient stability levels, voltage performance and Loss of Load Expectation projections under normal and post-contingency conditions?

The evidence at Schedule 2 is the final version of the IESO System Impact Assessment Report, dated March 27, 2007. Section 8 is entitled *Reference Load Flow Diagrams with all eight units in-service*. At Page 10, Subsection 8.2 focuses on *Contingency Conditions*.

(a) Please explain how the contingency scenarios analyzed in the System Impact Study were chosen?

(b) Were any contingency scenarios other than the ones cited in the study analyzed? If so please provide the analyses.

(c) How frequently have the contingency scenarios in the System Impact Study actually occurred in the past 20 years?

(d) The study references breaker failure as the precipitating event for two of the contingencies in the study. What sort of events are contemplated that would result in the loss of two 500 kV circuits in the two transmission line contingencies?

Response

a) The *Transmission Design Criteria* defined in Section 5 of *NPCC Document A2: Basic Criteria for Design and Operation of Interconnected Power Systems* (please see the response to Board Staff Interrogatory 3.2 for a link to the above-noted document) require that both stability and acceptable voltages be maintained during and following the most severe of the contingencies listed below:

   a. A permanent three-phase fault on any generator, transmission circuit, transformer or bus section with **normal fault clearing**.

   b. Simultaneous permanent phase-to-ground faults on different phases of each of two adjacent transmission circuits on a multiple circuit tower, with **normal fault clearing**.

c. A permanent phase-to-ground fault on any transmission circuit, transformer, or bus section with **delayed fault clearing**.

d. Loss of any **element** without a fault.

e. A permanent phase-to-ground fault on a circuit breaker with **normal fault clearing**.

f. Simultaneous permanent loss of both poles of a direct current bipolar facility without an AC fault

g. Failure of a circuit breaker to operate when initiated by an SPS following: loss of any **element** without a fault; or a permanent phase-to-ground fault, with **normal fault clearing**, on any transmission circuit, transformer or bus section.

Experience has shown that the loss of the double-circuit line between the Bruce Power Complex and the Milton SS represents the most severe contingency for the area under review. Consequently, although operating limits are derived for all of the contingency conditions defined in the A2-Document, the analysis performed for the purpose of assessing a project's effect on the reliability of the integrated power system is usually confined to the most severe contingency condition. In the case of the Bruce to Milton project the most severe contingency condition is the loss of the double-circuit line between the Bruce Power Complex and the Milton SS, involving circuits B560V & B561M.

b) Since the new Bruce to Milton 500kV line will also involve new terminations on to the 500kV busbar at the Milton SS, the effect of specific breaker-failure conditions that would result in the simultaneous loss of two transmission circuits were analyzed as required by Item g. (above) from the A2-Document.

c) Although the contingency conditions that have been reviewed in the SIA Report occur very rarely, it is the IESO's obligation as a member of NPCC to ensure that the Interconnected Power System is designed and operated in a manner that would ensure that stability and acceptable voltages are maintained during and following the most severe contingency conditions. The frequency with which the contingency conditions occur is not a consideration in the A2-Document.

d) The two breaker failure conditions referred to on Page 14 of the SIA Report could arise as follows:

i. A contingency involving the 500kV circuit B561M, between the Bruce Complex and the Milton SS would normally be cleared (isolated) at the Milton SS through the tripping of breakers KL561 & L61L71 (please refer to Diagram 3 of the Report).

Should breaker L61L71 fail to open for any reason, this would be detected by the breaker-failure protection associated with this particular breaker, and tripping of the breakers associated with the next protection zone would be initiated to isolate the faulted element, B561M. This would entail opening breaker HL573 together with the 'New' breaker associated with the H-busbar at the Milton SS, as well as the breakers associated with circuit M571V at Claireville TS.

The net result of this action would be to remove not only the faulted circuit B561M from service but also circuit M571V.

ii. Similarly, for a contingency involving the 500kV circuit M570V, between the Milton SS and Claireville TS, the faulted element would normally be isolated at the Milton SS by the operation of breakers KL570 & L70L73. A failure of breaker L70L73 to operate would require breaker HL573 at the Milton SS to be tripped via the breaker-failure protection. In addition, the 230kV breakers at Trafalgar TS that are associated with the auto-transformer connected to circuit M573T would also be tripped. (Trafalgar TS is not equipped with any 500kV fault interrupting devices that could isolate the faulted element.)

As before, the net result would be to remove not only the faulted circuit M570V from service, but also circuit M573T, together with the auto-transformer at Trafalgar TS that is directly associated with this circuit.

Since either of these conditions would result in the simultaneous loss of two major circuits, the consequences to the system are more severe and require separate consideration. Wherever possible, the layout of the transformer station is designed to minimise the effect of such breaker-failure conditions by placing the termination of a non-critical (or less critical) circuit adjacent to a critical one.

Energy Probe INTERROGATORY #11 List 2

Interrogatory

Ref: Exh. B/T 6/S 2

Issue 2.4(b): Have appropriate comparisons been carried out on all reasonable alternatives with respect to reliability and quality of electricity service, including stability and transient stability levels, voltage performance and Loss of Load Expectation projections under normal and post-contingency conditions?

The evidence at Schedule 2 is the final version of the IESO System Impact Assessment Report, dated March 27, 2007. Section 5 is entitled *Forecast Primary Demand* and states:

> The primary demand used in the model was 28,400MW, representing the value that has been forecast for the extreme weather condition for the summer-2010.

(a) Please explain the rationale for using the extreme weather condition loading rather than the peak demand forecast for the summer of 2010 in the System Impact Study.

(b) How frequently have extreme weather demand forecasts actually materialized in the past 20 years?

Response

a) A number of different demand forecasts are made to serve different purposes. The normal weather demand forecast employs the median effect of weather using a rolling average comprising the previous 31 years. Normal weather forecasts tend to be more heavily used for Resource Adequacy projections rather than for transmission system design. Ontario transmission system design criteria take into account extreme weather demands. If the transmission system was designed to accommodate only the normal weather forecast, the transmission system would only support demand approximately 50 percent of the time, which represents an unacceptable risk. The extreme weather condition load is used to reduce the risk that the transmission system will not be able to support peak demand to an acceptable level.

b) The extreme-weather forecast uses the most onerous weather conditions since 1970. Since market opening, near extreme weather was experienced in 2002 and 2006. In 2002, the impact was blunted by the Canada Day holiday and in 2006 the weather led to an all-time peak demand of 27,005 MW.

Energy Probe INTERROGATORY #12 List 2

Interrogatory

Ref: Exh. B/T 6/S 2

Issue 2.4(b): Have appropriate comparisons been carried out on all reasonable alternatives with respect to reliability and quality of electricity service, including stability and transient stability levels, voltage performance and Loss of Load Expectation projections under normal and post-contingency conditions?

The evidence at Schedule 2 is the final version of the IESO System Impact Assessment Report, dated March 27, 2007. Section 3 is entitled *Background*, and discusses among other matters, the generation of power from wind.

(a) Wind generation included in the study is noted as 725 MW at the top of page 3. Is this number the combined installed capacity of all the wind generators expected to be in service by 2010? If so, please provide the rationale for not using the effective capacity of wind generation. If not, please provide the analysis used to arrive at the effective capacity of wind generation.

(b) Have any analyses been conducted to determine the probability that wind generation in the Bruce will peak coincident with the weather conditions on which the extreme weather demand forecast is based? If so please provide the studies.

Response

a) The System Impact Assessment (SIA) assumed that the Blue Highlands Wind Farm would be completed. This 49.5 MW project has since been abandoned. Consequently, the amount of the wind-turbine capacity under contract with the OPA (committed projects) that is expected to be in-service by 2010 within the Bruce area now totals 675 MW instead of the 725 included in the SIA. The updated wind generation capacity is included in the OPA's updated evidence at Exhibit B, Tab 6, Schedule 5, Appendix 1, page 5.

The rating used in the IESO's analysis for each individual wind-turbine project corresponds to the capacity provided on the OPA web site. Although it is recognized that the output from the wind projects will vary significantly, to ensure that the transmission system will be capable of accommodating the forecast peak generation the IESO assumes that all generating facilities operate at full output. Please see the response to Board Staff Interrogatory 1.6(iv).

b) The IESO has studies based on historical weather data that assess Ontario wind generation potential. Please refer to the wind integration study used in the development of the Integrated Power System Plan, commissioned by the IESO, OPA and CanWea. This report includes an assessment of wind generation during peak demands. The report can be found at the following electronic link: http://www.ieso.ca/imoweb/pubs/marketreports/OPA-Report-200610-1.pdf.

However, similar to the above response, please note that the IESO has not used this information to probabilistically assess the ability of transmission reinforcement options to accommodate peak generating capacity at the time of peak demand.

Energy Probe INTERROGATORY #13 List 2

Interrogatory

Ref: Exh. B/T 6/S 2
Issue 2.4(b): Have appropriate comparisons been carried out on all reasonable alternatives with respect to reliability and quality of electricity service, including stability and transient stability levels, voltage performance and Loss of Load Expectation projections under normal and post-contingency conditions?

The evidence at Schedule 2 is the final version of the IESO System Impact Assessment Report, dated March 27, 2007. Section 7 is entitled *Study Criteria*. Table 1 at Page 6 is entitled Long-Term Emergency Ratings for the 'Critical' Circuits in the Study Area.

Please explain the term "long term emergency rating" as it applies to transmission lines analyzed in the System Impact Study.

Response

If transmission line conductors are operated continuously at a temperature of up to 93^{o}C there is no detrimental effect on the expected lifespan of the line, which is typically assumed to be 40 years.

At temperatures above 93^{o}C, annealing of the conductors may occur, and if the conductors were to be operated for an extended period at temperatures above 93^{o}C the result would be a reduction in the expected lifespan of a line.

Recognising that the loading on most transmission lines is cyclical, it has been normal practice to accept operation of the conductors of most lines at temperatures of up to 127^{o}C for limited periods. For regular ACSR conductors, the time limit is usually 200 hours per year, whereas for high aluminium content conductors this limit is only 50 hours per year.

The analysis has therefore assumed that in the event of a contingency, remedial measures would be implemented within the time periods specified above to reduce the transfers on the various circuits affected by the contingency to within their continuous operation temperature ratings, corresponding to a conductor temperature of 93^{o}C.

During the interim period, until these measures could be implemented, it has been further assumed that the conductors would be operated at temperatures of up to 127^{o}C. The rating corresponding to this temperature is defined as the 'long-term emergency rating' and represents the continuous current that could be imposed on the conductors without raising their temperature above 127^{o}C.

Energy Probe INTERROGATORY #14 List 2

Interrogatory

Ref: Exh. B/T 4/S 2
Issue 2.6: Are the project's rate impacts and costs reasonable for:

- the transmission line;
- the station modifications; and,
- the Operating, Maintenance and Administration requirements

a) At the bottom of page 3 of the schedule reference is made to "zero incremental network load". Please provide the analysis that led to this conclusion.

b) Has Hydro One considered the Transmission rate impact of the Bruce B units being laid up when they reach the end of their useful design life? If so, please provide the analysis. If not, please explain why this would not be a relevant consideration in evaluating the application.

Response

(a) Hydro One assumes that the intended reference was to Exhibit B, Tab 4, Schedule 3.

The analysis leading to the inclusion of "zero incremental network load" for the proposed Bruce to Milton line was based on the forecast in Table 2 below prepared by Hydro One. This forecast shows the expected increase in Hydro One Transmission's Network pool peak demand from the in-service date of the new line at the end of 2011 over a 25-year forecast period ending in 2036. The Extreme column in Table 2, for example, indicates that the Network pool peak load is forecast to increase by about 1,551 MW or 6.4% over the period, for a 0.2% increase per annum. This forecast reflects the impacts of provincially mandated CDM reductions. Given the minor expected increase in demand, the evidence in Exhibit B, Tab 4, Schedule 3 indicated at page 3 that "provincial Network pool peak load is forecast to remain essentially flat over the 25-year evaluation period, after mandated provincial CDM reductions. Accordingly, while the Bruce to Milton line will carry significant load from the refurbished nuclear and new wind generators located or expected to locate in the Bruce area, that load will not represent additional load to the pool, as it will replace load currently supplied from other generation sources in the province. To be consistent with the pool view, the DCF analysis takes a conservative approach and attributes zero load and revenue to the Bruce to Milton line. "

While a conservative approach was taken in attributing zero load growth (and hence zero incremental transmission revenue) to the Bruce to Milton project, the benefits of the Project (in terms of avoided undelivered energy costs and reduced losses, if the line is built) are considerable. The dollar value of these benefits, as shown below in Table 1, is adapted from the results provided in the response to Pollution Probe Interrogatory 10.

The dollar amounts in the response to Pollution Probe Interrogatory 10 reflect the undelivered energy and losses if the Bruce to Milton line is not built (and assuming the near-term measures and expanded Bruce Special Protection scheme are in place). As such, they represent the costs of the “do-nothing” alternative, where “do-nothing” means implementing the short-term options to improve system capability but none of the long-term alternatives. At the same time, the amounts in response to Pollution Probe Interrogatory 10 also measure the undelivered energy and losses that would be avoided if the line is built, and as such they represent the benefits of building the line, measured against the same “do-nothing” alternative.

The Net Present Value of these benefits, in terms of avoided costs, is approximately $1,605 million as shown in Table 1. When compared with the new line’s estimated capital cost of up to $645 million, the capital “P” project is anticipated to provide a net benefit of approximately $960 million, as shown below:

NPV of Avoided Undelivered Energy and Losses		$ 1,605 M
Less: Cost of Bruce to Milton Line	$ 645 M	
Net Benefit/(Cost)	$ 960 M	

The results in Table 1 have been adjusted from the amounts included in the response to Pollution Probe Interrogatory 10 to include undelivered energy and losses from 2012 to 2030 (instead of from 2009) in order to conform with the line’s in-service date at the end of 2011, when the avoided costs will start to be realized. The amounts from the response provided to Pollution Probe Interrogatory 10 have also been discounted to the 2012 starting point of the study period, using OPA’s same 4% discount rate.

(b) The rate impact analysis of the project included in Exhibit B, Tab 4, Schedule 4, pages 3 and 4, assumes that the new transmission facilities will continue to be used and useful over the 25 year study horizon. This assumption is consistent with the expectation that the additional transfer capability provided by the new facilities will provide benefits to the grid, such as additional margin to cover operating variations, in the event that Bruce B refurbishment does not occur. Please see the response to Pollution Probe Interrogatory 15 for more details.

Table 1

Net Present Value of Undelivered Energy and Losses
With New Line (OPA Discount Rate)
(With Near-Term Measures + Expansion of BSPS)

	Undiscounted Benefits (M$)		**Discounted Benefits to 2012 (M$)**		
Year	LIE	Losses	LIE	Losses	Total
2012	$ 3	$ 20	$ 3	$ 20	$ 24
2013	$ 88	$ 24	$ 85	$ 23	$ 107
2014	$ 138	$ 22	$ 127	$ 21	$ 148
2015	$ 164	$ 23	$ 146	$ 21	$ 167
2016	$ 164	$ 23	$ 140	$ 20	$ 160
2017	$ 163	$ 23	$ 134	$ 19	$ 153
2018	$ 31	$ 26	$ 25	$ 20	$ 45
2019	$ 2	$ 19	$ 1	$ 15	$ 16
2020	$ 2	$ 19	$ 1	$ 14	$ 15
2021	$ 2	$ 19	$ 1	$ 13	$ 15
2022	$ 2	$ 19	$ 1	$ 13	$ 14
2023	$ 31	$ 25	$ 20	$ 17	$ 37
2024	$ 159	$ 22	$ 99	$ 14	$ 113
2025	$ 158	$ 22	$ 95	$ 13	$ 108
2026	$ 158	$ 22	$ 91	$ 13	$ 104
2027	$ 158	$ 22	$ 88	$ 12	$ 100
2028	$ 158	$ 22	$ 85	$ 12	$ 96
2029	$ 158	$ 22	$ 81	$ 11	$ 93
2030	$ 158	$ 22	$ 78	$ 11	$ 89
Sum	$ 1,899	$ 419	$ 1,303	$ 301	$ 1,605

Table 2
Forecast of Hydro One Transmission Peak-Load
Network Pool (MW)

		Year	Weather-Normal	Extreme
		2008	23312	24711
		2009	23082	24466
		2010	22828	24197
		2011	22861	24233
Line In-Service	1	2012	22904	24279
	2	2013	22948	24325
	3	2014	22993	24372
	4	2015	23039	24422
	5	2016	23087	24472
	6	2017	23136	24524
	7	2018	23187	24578
	8	2019	23239	24633
	9	2020	23292	24689
	10	2021	23347	24747
	11	2022	23403	24807
	12	2023	23460	24867
	13	2024	23519	24930
	14	2025	23579	24993
	15	2026	23640	25058
	16	2027	23703	25125
	17	2028	23767	25193
	18	2029	23832	25262
	19	2030	23898	25332
	20	2031	23966	25404
	21	2032	24035	25478
	22	2033	24106	25552
	23	2034	24178	25628
	24	2035	24250	25705
	25	2036	24325	25784

2012-2036	Weather-Normal	Extreme
- Increase (MW)	1,463	1,551
- Increase (%)	6.4%	6.4%
- Increase (p.a.)	0.2%	0.2%

Energy Probe INTERROGATORY #15 List 3

Interrogatory

Ref: Exh. A/T 1/S 1 p. 2
Exh. A/T 2/S 1 pp. 2, 4-5
Exh. B/T 1/S 3 p. 1

Issue 1.1: Has the need for the proposed project been established?

The Applicant has repeatedly used terms such as "earliest possible in-service date" and "urgent in-service timelines" to explain its leave-to-construct request. What specific economic (demand side) rationale is being used to justify such urgency and an early leave-to-construct?

Response

Two refurbished Bruce units and approximately 700 MW of new wind generation, representing 2,200 MW of total new generation, will come into service in the Bruce Area in 2009. Additionally, there is the potential for another 1,000 MW of wind development in the Bruce Area that is currently prevented from developing because of the lack of transmission capability. The existing OPA moratorium which prevents the OPA from issuing Standard Offer Program (SOP) contracts in the Bruce Area is reflective of the impact of the lack of transmission capability in the Bruce Area. These factors underscore the urgency of adding to the capability of the existing Bruce transmission system, which is adequate only for today's level of generation (approximately 5,000 MW).

The new generation from the Bruce Area will replace power and energy from generation resources in the Ontario fleet that are reaching their end-of-life date and provide supply to meet load growth (net of conservation). This new generation will also contribute to the Government of Ontario's goal of ending coal-fired generation by 2015 and increasing the level of renewable energy in Ontario. While system upgrades and stop-gap measures can provide some near-term relief to transmission capability in the Bruce Area, the lack of a suitable long-term solution will result in higher costs in the form of undelivered energy, higher losses and restricted resource development in the Bruce Area. Please refer to the following responses: Pollution Probe Interrogatory 47(f), and Board Staff Interrogatory 3.4.

Energy Probe INTERROGATORY #16 List 3

Interrogatory

Ref: Exh. A/T 2/S 1 p. 2
Exh. B/T 4/S 3 p. 1
Exh. B/T 6/S 5/Appendix 1
Exh. B/T 6/S 5/Appendix 4 pp. 2-4

Issue 1.1: Has the need for the proposed project been established?

More generally, what are the demand side criteria for this project as a whole; criteria distinguished from such policy goals as "off-coal," "additional renewable generation development," and "supply mix goals," etc.? (Please note that this interrogatory is drafted to avoid the prohibitions identified in the second paragraph in section on "Project Economics" (Exh. B/T4/S3 p. 1, lines 10-18.)

Response

OPA's need forecast for the Bruce to Milton Project incorporated provincial conservation targets. Consistent with the directive from the Minister of Energy to the OPA, dated June 13, 2006, the forecast assumed that the projected peak demand in Ontario would be reduced by 1,350 MW by 2010, and further reduced by an additional 3,600 MW by 2025.

Inclusion of this conservation assumption still results in the OPA forecasting a need for over 20,000 MW of new renewable and conventional supply side resources by 2025. The incremental 1,500 MW of nuclear and 1,700 MW of wind generation from the Bruce Area is a component of this overall resource requirement.

Energy Probe INTERROGATORY #17 List 3

Interrogatory

Ref: Exh. A/T 2/S 1 p. 1
Exh. B/T 3/S 1 p. 2
Exh. B/T 6/S 5/Appendix 1
Exh. B/T 6/S 5/Appendix 4 p. 2
Issue 1.1: Has the need for the proposed project been established?

Please explain the demand side justification for this transmission project in reference the Greater Toronto Area (GTA), which is the delivery end-point for planned transmission. Beyond the putative problem of "bottled up" supply at the Bruce site, what evidence is there that GTA electricity consumers are demanding the kind of electricity supply that is anticipated by December 2011?

Response

The reason for terminating the Bruce line at the Milton station in the GTA is to connect Bruce Area generation to the main power grid in southern Ontario. The Milton station is a major station in southern Ontario with strong access to the rest of the Ontario grid, not just the GTA. While the physical connection is to the Milton station in the GTA, the power from the generating resources in the Bruce Area is available through the power grid to serve all customers of Ontario. Please also refer to the response to Saugeen Interrogatory 13.

Energy Probe INTERROGATORY #18 List 3

Interrogatory

Ref: Exh. B/T 6/S 5/ Appendix 7, p. 1
Exh. B/T 4/S 3 pp. 2-4
Exh. B/T 3/S 1 p. 3
Issue 1.1: Has the need for the proposed project been established?

Why has the Applicant not built into its project development criteria the fact that Provincial Government CDM policies (e.g. Ministerial Directive, June 13, 2006) are relevant to this project and ought to influence its substantive outcome, particularly since the Applicant has elsewhere acknowledged anticipated “flat-lining” of electricity demand in Ontario and related “CDM reductions” (B-4-3, p. 2, lines 2-3)? Why is this project entirely supply-driven?

Response

Please refer to responses to Energy Probe Interrogatories 14 and 16.

Energy Probe INTERROGATORY #19 List 3

Interrogatory

Ref: Exh. B/T 4/S 3 pp. 1-2
Issue 1.1: Has the need for the proposed project been established?

Has the Applicant considered conducting a thoroughgoing "economic impact assessment" of this project; an economic assessment that would have the scope and seriousness of a Class Environmental Assessment; something comparable but much more elaborated than the description in "2.0 Economic Feasibility"? If not, why not?

Response

Hydro One and OPA consider the economic assessments conducted in support of the Application to be sufficient to meet regulatory filing requirements and approvals for the Project. Please refer to the following responses: Board Staff Interrogatory 3.4, Pollution Probe Interrogatories 7 through 11 and 47 regarding the OPA's Financial Evaluation Model, and Energy Probe Interrogatory 14.

Energy Probe INTERROGATORY #20 List 3

Interrogatory

Ref: Exh. B/T 1/S 1 p. 3
Exh. B/T 3/S 1 p. 1
Issue 1.1: Has the need for the proposed project been established?

In two or more references (above), the Applicant has made vague assertions about the amount of electricity potentially to be supplied from the Bruce A site, to wit: "In 2009 Bruce Power is expected to return to service two 750 MW units at Bruce A …; Bruce Power will be removing one [in the same year], and 'later' one additional, (sic) of the operating 750 MW units from the Bruce A plant for refurbishment." What specifically and concretely in quantitative terms is the plan for additional electricity supply coming out the Bruce site in 2009?

Response

Please refer to the "Bruce Power" area (shaded blue) in Exhibit B Tab 1 Schedule 1 Page 4 Table 1 (Hydro One's updated evidence of March 25, 2008) attached to this response as Attachment A. This graph indicates the expected amount of nuclear power from 2007 to 2014. An incorrect graph was inadvertently filed in the November 30, 2007 update.

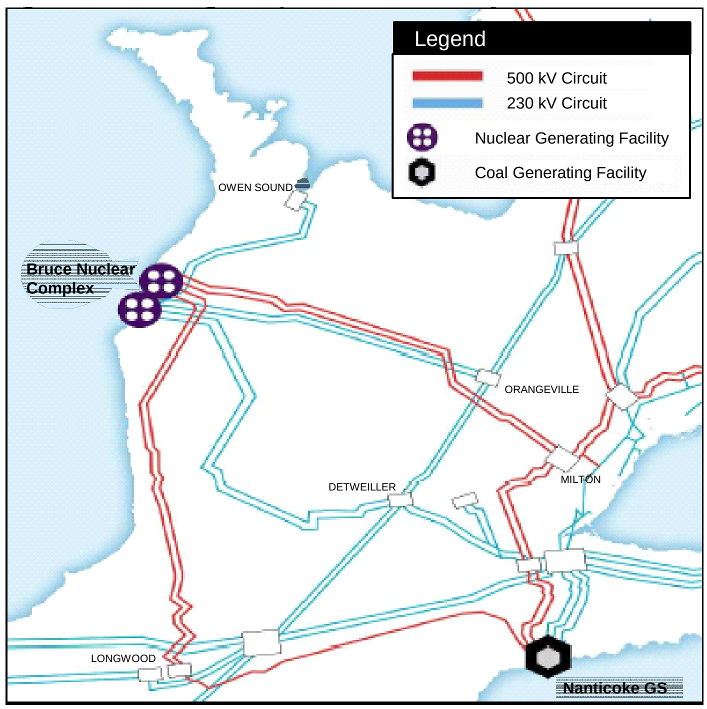
Attachment A

Exhibit B, Tab 1, Schedule 1
Page 3 and 4

PROJECT LOCATION AND EXISTING TRANSMISSION SYSTEM

1.0 PROJECT LOCATION

The transmission project described in Exhibit B, Tab 2, Schedule 1 is located in southwestern Ontario. The transmission elements of this project extend from the Bruce Power Complex on the eastern shore of Lake Huron (north of Kincardine) to west of Orangeville in Dufferin County, and continue to Hydro One's Milton Switching Station (SS) in the western Greater Toronto Area (GTA). The route passes through four counties and one regional municipality (Bruce, Grey, Wellington, Dufferin, and Halton, respectively) and eleven municipalities (Kincardine, Brockton, Hanover, West Grey, Southgate, Wellington North, Erin, East Luther Grand Valley, East Garafraxa, Halton Hills and Milton). A detailed map of the project location and the existing transmission facilities is provided in Exhibit B, Tab 1, Schedule 2.



Source: OPA

2.0 EXISTING TRANSMISSION FACILITIES IN SOUTHWESTERN ONTARIO

Southwestern Ontario is the area of southern Ontario that lies to the west of the GTA and Barrie. This area has a number of large generating stations such as Bruce, Nanticoke, Lambton (and Beck in the Niagara area) with a total of approximately 15,000 MW of generation. The area also includes major load centers such as Hamilton, Windsor and Kitchener-Waterloo-Cambridge-Guelph. Table 1 summarizes generation, peak demand and interconnection capability in southwestern Ontario during the summer of 2005.

Table 1: Generation, Load and Interconnection Capacities in SW Ontario (2005)

Generation (MW)		**Loads (MW)**	
Bruce	5,060	Windsor/Essex	1,000
Nanticoke	3,945	Sarnia	800
Lambton	1,972	London	750
Beck	2,006	KWCG	1,400
Windsor area gas	739	Hamilton	1,300
Sarnia	510	Woodstock/Ingersoll	195
Other	746	Brantford/Brant	250
		Niagara	1,020
		Other	2,100
Total Generation	14,978	Total Load	8,815
Interconnections Capability			
Michigan		**New York at Niagara**	
Import – Summer	1,550	Import - Summer	1,300
Export – Summer	1,950	Export - Summer	1,300
Import – Winter	1,750	Import – Winter	1,650
Export – Winter	2,200	Export - Winter	1,950

Source: OPA, Ontario's IPSP Discussion Paper #5

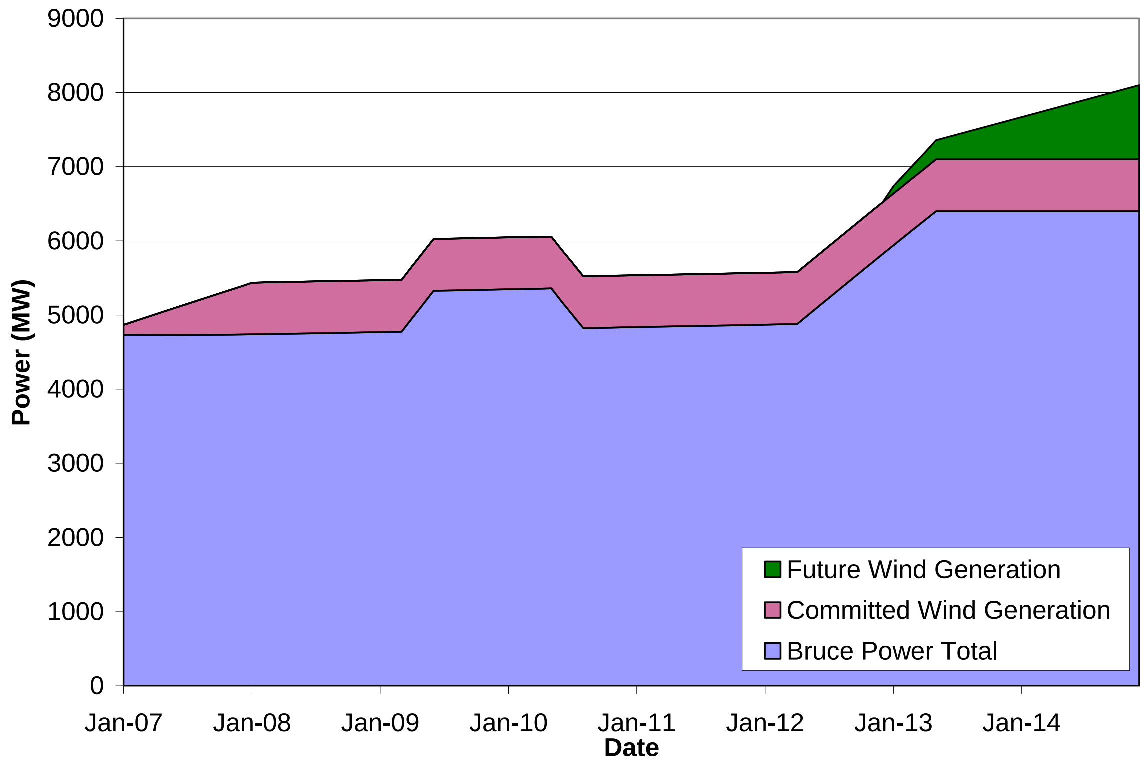
The transmission assets in southwestern Ontario connect the major generation and load centers in the region to the interconnected grid. Almost half of the generating capacity in the region supplies the energy needs of other parts of the province. Furthermore, the Bruce Power Complex currently provides approximately 20% of the Province's peak power needs. The transmission facilities in this area are designed and placed to support this concentration of generation capacity, respecting physical constraints such as system and voltage stability, and thermal limits. This is a tightly interconnected system, where the availability and performance of each major element (especially the 500 kV facilities) can affect the integrity of the entire network and neighbouring jurisdictions.

2.1 Generation Resources in the Bruce Area

The generation capacity at the Bruce Power Complex currently totals 4,700 MW. By 2009, a total of 700 MW of existing and committed wind generation through the Provincial Government's renewable energy initiatives will bring the total generation capacity in the Bruce area to 5,400 MW. In 2009 Bruce Power is expected to return to service two 750 MW units at Bruce A that are currently being refurbished under a contract with the Ontario Power Authority (OPA). At the same time, Bruce Power will be removing one, and later one additional, of the operating 750 MW units from the Bruce A plant for refurbishment. By 2013, the refurbishment work of these units will be completed and the total committed generation in the Bruce area will increase to 7,100 MW. This schedule reflects the amended contract between Bruce Power and the OPA announced in August, 2007. Please see Exhibit B, Tab 6, Schedule 5, Appendix 1, page 2 for more information.

As part of the development of the Integrated Power System Plan (IPSP), the OPA's Transmission Discussion Paper No. 5 (pages 39-53) indicates that there is considerable potential for additional renewable generation, particularly wind generation, in the Bruce area. Another 1,000 MW of wind generation is expected, for a total of about 8,100 MW in this area (refer to Exhibit B, Tab 6, Schedule 5, Appendix 5). Figure 1 illustrates OPA's forecast generation in the Bruce area from 2007 to 2014.

Figure 1: Bruce Area Available Generation (2007 – 2014)



Source: OPA

2.2 Transmission Resources in Southwestern Ontario

The generation from Bruce Power Complex and the existing Bruce area wind generation are currently incorporated into the grid via 500 kV and 230 kV transmission lines as follows:

- The 500 kV Bruce x Milton SS and Claireville TS double-circuit tower line, B561M and B560V;
- The 500 kV Bruce x Longwood TS double-circuit tower line, B562L and B563L;

- The 230 kV Bruce x Orangeville TS double-circuit tower line, B4V and B5V;
- The 230 kV Bruce x Detweiler TS double-circuit tower line, B22D and B23D; and,
- The 230 kV Bruce x Owen Sound TS double-circuit tower line, B27S and B28S.

Major 500 kV facilities in southwestern Ontario include 500 kV transformer or switching stations at the Bruce Power Complex, Milton SS, Longwood TS (west of London), Nanticoke GS (east of Port Dover), and Middleport TS (east of Brantford). A detailed map of the existing transmission facilities is provided in Exhibit B, Tab 1, Schedule 2.

Depending on the load, generation and import patterns, these circuits have about 5,000 MW of transmission capacity to deliver the output from the Bruce Power Complex and the existing wind generation. The maximum transmission capacity is based on applicable reliability standards (Northeastern Power Coordinating Council ("NPCC"), North American Electric Reliability Council ("NERC")) and the planning assumption that with all remaining circuits in-service, the power system performance should satisfy required criteria and guidelines following the loss of any of the double-circuit lines (first contingency).

In summary, the present-day transmission system has the capability to transmit the currently available generation from the Bruce area, but is not sufficient to transmit the additional generation that is committed and planned for the area.

Energy Probe INTERROGATORY #21 List 3

Interrogatory

Ref: Exh. B/T 1/S 1 p. 4
Issue 1.1: Has the need for the proposed project been established?

It appears from Figure 1: Bruce Area Available Generation (2007-2014) that there may be "700" additional megawatts of electricity planned to be transmitted from the Bruce site in 2009 with precisely the same amount of electricity being reduced in early 2010, and not recaptured until 2012. Why is this transmission project being initiated in 2008 and its approval expedited over the next few months when there is no effective, lasting demand for such a transmission project until 2012 – which also assumes no effective provincial CDM initiatives are in play?

Response

In Figure 1 referenced above, the net increase in the amount of Bruce Area generation above today's 4,800 MW level is forecast to increase in the future. The shortfall in transmission capability is forecast to be about (please refer to the figure reproduced below):

1. 0 MW in early 2007 (Existing System, only six units in-service at Bruce NGS)

2. 500 MW in 2008 (Committed Wind goes in-service)

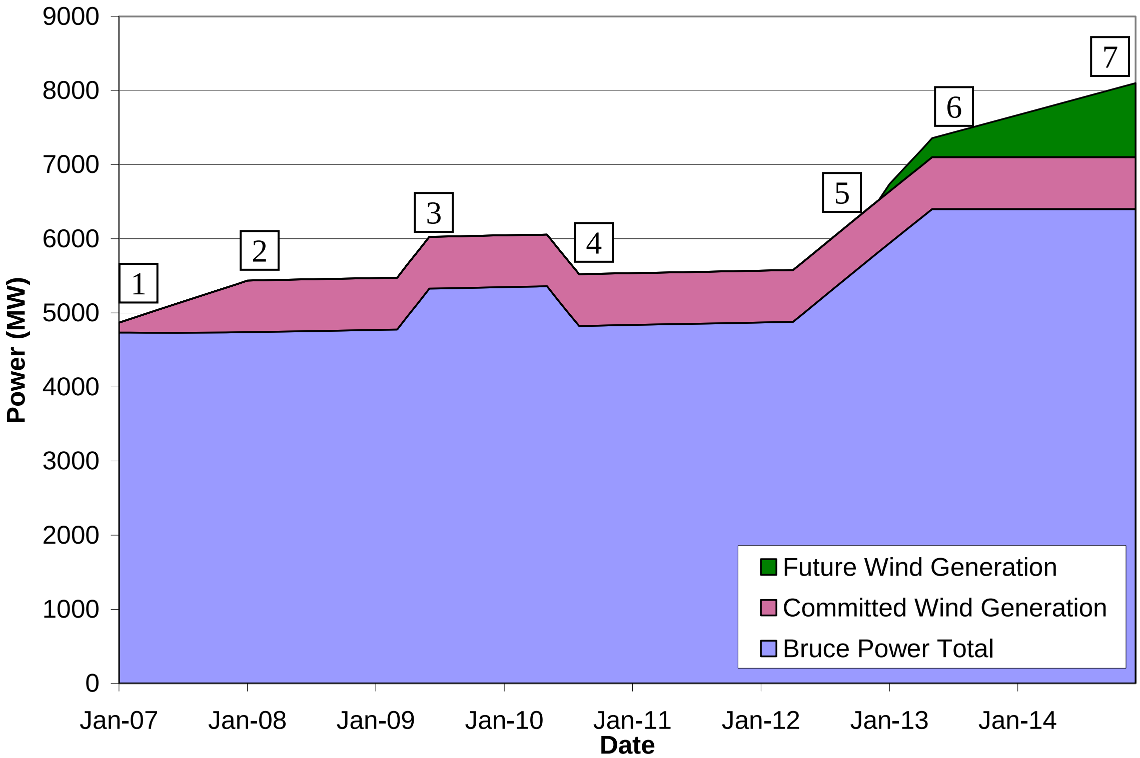
3. 1,000 MW in 2009-2010 (Bruce A units 1 and 2 return from refurbishment before Bruce A units 3 and 4 are removed from service for refurbishment)

4. 500 MW in 2011 (Both units 3 and 4 are being refurbishment)

5. 1,500 MW in 2012 (Bruce units start returning from refurbishment)

6. 2,600 MW in 2013 (All eight Bruce units are in-service, planned wind starts coming in-service)

7. 3,100 MW in 2014 (All eight Bruce units are in-service; most of the planned wind is in-service)



The capability of the existing Bruce transmission system is about 5,000 MW. While the proposed near-term measures will increase the capability to 5,400 MW, this is still far short of the capability required in 2009 of 6,000 MW total. Thus, the need for long-term reinforcement of the Bruce transmission system exists in 2009. Until this reinforcement (the Project) is in place, interim stop-gap measures must be used, such as generation rejection and continuation of the OPA moratorium under the Standard Offer Program with regard to granting power purchase contracts for generation developments in the Bruce Area.

Energy Probe INTERROGATORY #22 List 3

Interrogatory

Ref: Exh. B/T 3/S 2 pp. 6 and 8
Issue 2.6: Are the project's rate impacts and costs reasonable for:

- the transmission line;
- the station modifications; and,
- the Operating, Maintenance and Administration requirements

Can the Applicant confirm that the total expected cost of the project including route refinements is up to $645 million?

Response

Confirmed

Energy Probe INTERROGATORY #23 List 3

Interrogatory

Ref: Exh. B/T 4/S 2 p. 3
Issue 2.6: Are the project's rate impacts and costs reasonable for:

- the transmission line;
- the station modifications; and,
- the Operating, Maintenance and Administration requirements

What is the basis for selecting a "contingency" cost value of $28 million as entered in Table 4? What explains this specific figure?

Response

The Contingency Cost Estimate is based upon the consideration of anticipated engineering, construction, and material costs. The estimate is approximately 9% of these forecast costs. This percentage estimate is based on Hydro One's past experience.

Energy Probe INTERROGATORY #24 List 3

Interrogatory

Ref: Exh. B/T 4/S 2 pp. 3 and 4
Issue 2.6: Are the project's rate impacts and costs reasonable for:

- the transmission line;
- the station modifications; and,
- the Operating, Maintenance and Administration requirements

Since "approximately 72% of the total cost before overheads and AFUDC will be subject to public tendering, competitive bidding processes or market valuation," how likely is the Applicant/ratepayer to experience/suffer cost over-runs? In what order of magnitude does the Applicant estimate the cost over-runs will amount to?
Interrogatory

Response

At this point in time Hydro One is not expecting any cost-overruns. While actual incurred costs are subject to prevailing market conditions at the time of tendering and after, Hydro One continues to view its current forecast cost estimates to be reasonable.

Energy Probe INTERROGATORY #25 List 3

Interrogatory

Ref: Exh. A/T 1/S 1 p. 2
Issue 2.6: Are the project's rate impacts and costs reasonable for:

- the transmission line;
- the station modifications; and,
- the Operating, Maintenance and Administration requirements

What are the justifications for *early* land expropriations? Is the *primary* need for early land expropriations based on the issue cited variously as "earliest possible in-service date" and "urgent in-service timelines?"

Response

Yes. The OPA has determined the date for the new transmission line is 2009. Hydro One has determined that the earliest possible in-service date is December 2011. With an approximate three year construction period to project in-service, most of the land rights acquisition must be completed no later than early 2009 in order to achieve the targeted December 2011 in-service date.

Energy Probe INTERROGATORY #26 List 3

Interrogatory

Ref: Exh. A/T 2/S 1 p. 4
Exh. B/T 6/S 9 p. 1

Issue 5.2: What is the status and process for Hydro One's acquisition of permanent and temporary land rights required for the project?

What are the justifications for choosing 53-61 m. (175-200 ft.) extended-width land corridors, i.e. what are the technical, economic and land use reasons?

Response

This issue was discussed during Day 2 of the Technical Conference. Please refer to Transcript pages 150 to 152. Locating the proposed Bruce to Milton corridor alongside and adjacent to the existing transmission corridor results in a lesser amount of land being necessary as compared to a green-field alternative. A greenfield siting option would require a corridor width of 250 ft. In comparing this width to the proposed widened corridor requirement of 53-61m (175-200 ft) a 20% reduction is achieved. This difference is explained by the fact that the existing corridor includes a buffer zone to accommodate the potential for conductor sway that would otherwise have to be taken into consideration in a greenfield siting alternative.

Energy Probe INTERROGATORY #27 List 3

Interrogatory

Ref: Exh. B/T 6/S 1 p. 1
Issue 5.2: What is the status and process for Hydro One's acquisition of permanent and temporary land rights required for the project?

What is the Applicant's operating definition of "extensive consultation program"; what is the intended participant structure of this program; what is its intended scope and duration?

Response

Hydro One considers the phrase "extensive consultation program" to describe the open, consistent and transparent consultation activities that have been conducted to date and that have provided a wide range of audiences with varying levels of interest to be informed of the Bruce to Milton Transmission Reinforcement Project. The program has included circulation of Project information, how to participate in the planning and approvals processes (i.e. the OEB and EA process as well as workshops convened by Hydro One). While emphasis has been placed upon those parties most likely to be affected by the Project, namely property owners and interested Aboriginal Groups, the program has also been broad enough to include other important stakeholder groups as identified in the sample list below:

- Municipal elected officials and their staff
- Provincial Ministries, Agencies, Boards, Commissions
- Federal Departments, Agencies, Boards
- Provincial MPPs
- Federal MPs
- General Public
- Conservation Authorities
- Legal Counsel representing landowners
- Media
- Special Interest Groups
- Non-Governmental Organizations
- Energy industry sector members, including generator and local distribution companies

To facilitate public and stakeholder participation, over the course of the past year the extensive consultation program has involved the following steps:

- Hydro One's property agent has been assigned as a single-point of contact for affected landowners

- 9 Public Information Centres held in 7 different communities along the route have been convened
- 2 Landowner Workshops and one Agency/Municipal Workshops have been held
- A Bruce to Milton Toll-Project Hotline was established at launch of the Project
- A Bruce to Milton project website (www.HydroOneNetworks.com/BrucetoMilton) was established and has been updated regularly.
- Newspaper ads in local communities and Aboriginal newspapers in the study area announcing EA milestones, opportunity to participate and how to contact Hydro One were published
- Personally addressed letters to property owners and key stakeholders advising them of important milestones were issued
- Responses have been provided to outline messages and written correspondence
- Ad mail was distributed to property owners within 500 meters of the proposed Reference Route (approximately 20,0000 newsletters and EA Commencement Notices, and submission of EA Terms of Reference distributed)

The intended scope and duration of the consultation program is to continue throughout the OEB and EA regulatory approval processes and to continue through to the completion of construction in 2011. The focus of the consultation program will change over the course of the Project from planning and approvals to construction, and predominantly consultation with property owner and interactions with the affected municipalities.

Energy Probe INTERROGATORY #28 List 3

Interrogatory

Ref: Exh. B/T 3/S 2 p. 2
Issue 5.2: What is the status and process for Hydro One's acquisition of permanent and temporary land rights required for the project?

Does the Applicant consider its public information notice(s) to be adequate and appropriate? If so, why? If not, why not?

Response

Yes. Adequacy and appropriateness of public information notices are reflective of the high level of public engagement. To date, Hydro One has had significant involvement of the public in all of its notified consultation initiatives (e.g, public information centers, workshops). For example, over 500 people attended the Spring 2007 Public Information Centers ("PICs"). Approximately 200 people attended the 2 route refinement PICs in November 2007. Over 150 people attended the 2 landowner workshops that were held early in 2008. Please also refer to Energy Probe Interrogatory 27 and to Exhibit B, Tab 6, Schedule 6, pages 16-18 (updated November 30, 2007).

Energy Probe INTERROGATORY #29 List 4

Interrogatory

Ref: Exh. B/T 3/S 1

Issue 1.1: Has the need for the proposed project been established?

Does the Applicant consider its public information notice(s) to be adequate and appropriate? If so, why? If not, why not?

Two large commercial wind farms inject into the transmission system serving Bruce – Amaranth and Kingsbridge. Amaranth has completed two years of service, and Kingsbridge is now about two weeks short of two years of service. In its first two individual years of service, Amaranth's output exceeded 50% capacity factor in 22% and 24% of the hours in the respective years. If transmission service to Amaranth was limited to 50% of the nameplate capacity of the farm, the output in year one would have been reduced by 4.6% of CF and the output in year two would have been reduced by 5.4% of CF. The bottled power lost to the customer would have been 27 GWh in year one and 32 GWh in year two. The market value of the replacement power to customers would have been about $1.2 million in year one and $1.5 million in year two.

Similarly, for Kingsbridge output exceeded 50% CF in 28% and 32% of the hours in the respective years. If transmission service to Kingsbridge was limited to 50% of the nameplate capacity of the farm, the output in year one would have been reduced by 6.4% of CF and the output in year to date two would have been reduced by 8.2% of CF. The bottled power lost to the customer would have been 22 GWh in year one and 28 GWh in year two. The market value of the replacement would have cost customers about $1 million and $1.3 million per year respectively.

The correlation coefficient for output from the two farms is approximately 75%. The correlation coefficient for output from wind power and nuclear in the region is much lower. This indicates that if transmission capacity to a wind generation region was limited to 50% of the nameplate, the bottle power lost to customers would be much less than estimated above.

Similar to wind power, the nuclear station at Bruce rarely generates at or close to its full nameplate capacity. Wind power in Ontario, like most regions of the northern hemisphere at our latitude, is subject to a very reliable drop in wind output during summer.

a) Please indicate the net consumer impact, including transmission cost and replacement generation cost, of sizing the peak summer transmission capacity with firm capacity to serve 50% of the expected nameplate capacity of wind power in the Bruce region and 7/8ths or 87.5% CF of the expected nameplate nuclear capacity.

b) Please provide any analysis done by Hydro One or the OPA analyzing the economically optimal sizing of transmission capacity serving the Bruce region.

c) Please confirm that all generation figures in Figure 1 on Page 2 reflect forecast resource nameplate capacity without any adjustment for reliability.

Response

From the Preamble to this Interrogatory the inferred cost of wind generation appears to be approximately $45/MWh. OPA does not consider this to be a realistic assumption.

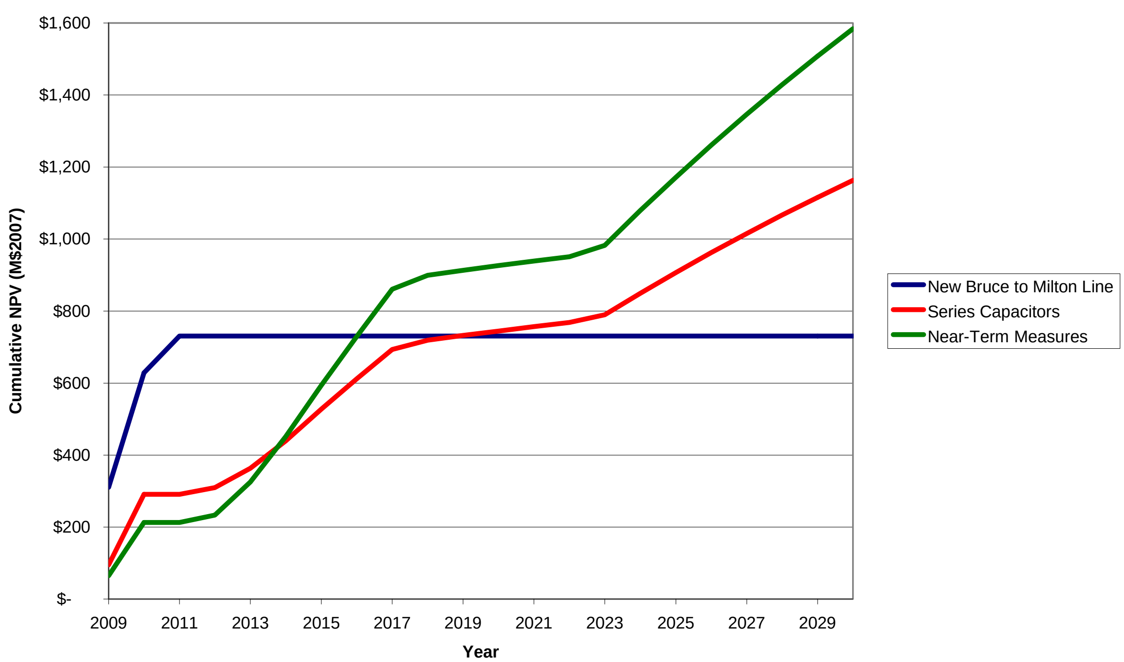
a) The transmission capability proposed in the Interrogatory is 6,450 MW (50% of 1,700 MW of Wind + 87.5% of 6,400 MW of Nuclear = 6,450 MW). This is approximately equal to the capability of the series capacitor option (6,326 MW, please refer to the response to Pollution Probe Interrogatory 16). The OPA's financial evaluation model is discussed in Pollution Probe Interrogatory 47. The model takes into account the variability of wind and nuclear generation as well as transmission capability. The results of the OPA's financial evaluation of the series capacitors option, as compared to the proposed Bruce to Milton line, are discussed in the response to Board Staff Interrogatory 3.4. OPA has determined that by the end of the study period in 2030, the net present value of costs associated with implementing a series capacitors option, exceeds the net present value of costs associated with the Bruce to Milton line by over $400 million in present dollars. This does not take into account the technical and operation complexities that are also expected to occur with a series capacitors solution.

b) It is not possible to "size" the transmission capability to a specific value. Improvements to the transmission system increase transmission capability in steps. All of the new line alternatives (such as Bruce to Essa, HVDC, etc.) provide equal to or less than the transmission capability of the proposed Bruce to Milton line for a higher capital cost. Therefore, the alternatives involving new lines were not assessed in terms of economics because they will result in a higher cost for the above reasons. The financial evaluation that was conducted analyzed three different steps in transmission capability out of the Bruce Area:

1. Near-Term Measures
2. Series Capacitors
3. Proposed Bruce to Milton Line

The financial evaluation provided in the response to Board Staff Interrogatory 3.4 has been expanded to include the near-term measures option (see graph shown).

Cumulative Net Present Value of Costs for the Bruce to Milton Line, Series Capacitors and the Near-Term Measures Options



Initially, the proposed Bruce to Milton line has the highest cost due to its larger upfront capital costs as compared to the series capacitors or near-term measures options. However, the costs of the increased undelivered energy and losses from employing either the Series Capacitors option or the Near-Term Measures option make the proposed Bruce to Milton line significantly less expensive in the long-run. As shown in the Chart above by comparing the levels of the respective lines at far right hand side of the chart, the cumulative net present value of costs for the Bruce to Milton Project is $400 million less than the Series Capacitors option and $900 million less than the Near Term Measures option over the study period.

c) Confirmed. The generation forecast in Figure 1 is based on nameplate capacity of forecasted resources.