

## **Supporting Documentation 1:**

**A. Background on the Electricity Sector**

**B. Background on the Undertaking**

**C. Rationale for the Reference Route**

### ***A. Background on the Electricity Sector in Ontario***

Hydro One traces its history back to 1906 when the Ontario Legislature passed the *Power Commission Act* and created the Hydro-Electric Power Commission of Ontario, renamed Ontario Hydro in 1974. In October 1998, the Ontario legislature enacted the *Energy Competition Act* authorizing the restructuring of Ontario Hydro with the aim of introducing competition in the wholesale and retail electricity markets in Ontario. On April 1, 1999, in accordance with the *Energy Competition Act*, Ontario Hydro was restructured principally into three separate entities:

- (1) Ontario Power Generation Inc. (OPG), responsible for the generation and sale of electricity in Ontario;
- (2) Ontario Hydro Services Company Inc., later renamed Hydro One Inc., whose subsidiary, Hydro One Networks Inc., responsible for planning, construction, operation, and maintenance of its transmission and distribution system; and
- (3) Independent Electricity Market Operator later renamed the Independent Electricity System Operator (IESO), responsible for managing Ontario's electricity system and operating the wholesale electricity market.

Hydro One Inc. is a holding company with four operating subsidiaries, namely:

- Hydro One Networks Inc. – This is the largest subsidiary. It is responsible for the planning, construction, operation and maintenance of Hydro One's transmission and distribution systems. Hydro One owns and operates 97% of transmission infrastructure in Ontario including approximately 30,000 km of high-voltage transmission lines. In addition, it owns and operates 26 interconnections with neighbouring provinces and states, which allow electricity to flow into and out of Ontario. The Hydro One distribution system, which delivers electricity to homes, farms and businesses, is the largest in the Province, with almost 123,000 km of wires serving approximately 1.3 million customers.
- Hydro One Brampton Networks Inc. – This subsidiary distributes electricity to the

City of Brampton.

- Hydro One Telecom Inc. – This subsidiary is involved in the marketing of excess fiber optic capacity.
- Hydro One Remote Communities Inc. – This subsidiary operates and maintains the generation and distribution assets used to supply electricity to 18 communities across northern Ontario that are not connected to the Province’s electricity grid.

Subsequent to this restructuring of Ontario Hydro, the Ontario Power Authority (OPA) was established by the *Electricity Restructuring Act*, 2004.

The *Electricity Restructuring Act* made three changes in the institutional arrangements of the electricity sector in Ontario with respect to long-term planning. In this legislation:

- the OPA was given the mandate to both develop an Integrated Power System Plan (IPSP) and address the looming supply–demand imbalance in Ontario through conservation and generation procurements;
- the Government was given the discretion to determine the future “supply mix” for the Province as a starting point for the IPSP; and
- the OEB was given the authority to review and approve the IPSP.<sup>1</sup>

The IPSP will serve as both a focused implementation plan for the near term and a road map for the longer term.

These changes to the electricity sector in Ontario have implications for compliance with *EA Act* requirements. Historically, Ontario Hydro was responsible for all aspects of project planning and undertaking the EA process, including establishing the need and defining alternatives to meet it. Currently, the OPA is responsible for establishing the need for new transmission facilities and, for this project, they assessed that no other “alternative to” the Bruce to Milton Project can meet the need for increased transmission capacity to the provincial grid and the GTA for December 1, 2011. Hydro One’s role is to implement the

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<sup>1</sup> OPA website – System Planning

findings of the OPA through the planning, construction, operation and maintenance of the Bruce to Milton Project.

### **OPA Consultation Activities on the IPSP**

The IPSP stakeholder engagement process began in mid-summer 2006 and ran until January 2007. It was organized along work stream “modules” based on subject matter. These streams were categorized according to IPSP issue documents/supporting technical papers released for discussion at different times during this period.

OPA’s consultation on the draft IPSP involved the release of documents/supporting technical papers for public comment and review. A series of tele/web-conference sessions and workshops on specific IPSP issues were held. OPA’s website includes links to these discussion papers and materials from workshops and web-cast presentations. (Refer to Supporting Document 2 and OPA’s website for more details). During the consultation for the preliminary IPSP, the OPA received numerous comments which provided support for the Bruce to Milton Project (including comments from the Association of Power Producers of Ontario and the Canadian Wind Energy Association).

As part of the planning process for the project, Hydro One and OPA consulted with regional/municipal planners in communities that were likely to be affected by the proposed Bruce to Milton project. In total, eleven municipalities, four counties and one region were contacted. During these consultations, OPA staff explained the need for the project and the rationale for expansion of the existing Bruce to Milton transmission corridor. Hydro One staff provided a project overview, including a description of the project, the required approvals, the public consultation, including a description of the project, the required approvals, the public consultation program and the timelines for placing the new line in service by December 2011.

#### Consultation: Tele/web-conferences, Workshops and Comments/Paper submissions

Following the release of these documents/supporting technical papers, the general public and participants were encouraged to review these papers and provide comments/questions

to OPA via email or regular mail. A series of tele/web-conference sessions were held; for each session, participants called in to listen to discussions/presentations and ask questions during the question period which followed these sessions. Workshops were organized for participants on specific IPSP issues. Participants could submit voluntary discussion papers. OPA also had the option to formally request participants to prepare discussion papers which it funded. Web-links to presentations, workshops, discussion and sessions materials and web-casts are accessible on OPA's website. Discussion papers, public comments/questions and answers are available on OPA's website.

Funds were made available for prospective participants in the IPSP stakeholder engagement process based on OPA's eligibility guidelines and procedures. A total of 28 participants were funded from different interest groups including Green Energy Coalition, Lake Ontario Waterkeepers, Federation of Ontario Cottagers Association, and Community Development Corporations, e.g., Northwatch, Kasabonika.

The following summarizes the consultation activities for Discussion Paper #5:

Dates	Paper Releases	Tele/Web conference activities	Workshops
<b>Consultation Prior to Discussion Paper # 5</b>			
Thursday, June 29, 2006 from 2:30p.m.- 4 p.m.	Scope and Overview Paper # 1 released.	Launch of Webinar: the Integrated Power Supply Plan Scope Paper– web-based briefing session.	
Tuesday, July 11, 2006 at 10 a.m.		Launch of Document Feedback Session - Teleconference and Web-cast.	
<b>Consultation Regarding Discussion Paper # 5</b>			
Monday, November 13, 2006	Transmission Discussion Paper # 5 released.		
Wednesday, November 22, 2006 to Friday, November 24, 2006			Sustainability, Supply, Transmission and Integration Workshop at the Westin Harbour Castle (three-day working session).
<b>Discussions with Aboriginal Groups</b>			
Thursday, April 26 2007 @ 3:00 p.m.		First Nations/Métis Web/teleconference events.	
Friday, April 27 2007 @ 10:00 a.m.	Presentation of papers in English, French, Cree, Ojibway and Oji-Cree languages.	First Nations/Métis Web/teleconference events.	
May-June, 2007		First Nations/Métis Regional Forum	

## ***B. Background on the Undertaking***

### **Provincial Need for Electricity Transmission**

The OPA is developing the IPSP to address the long-term needs of the people of Ontario for generation and transmission of electrical power to the year 2027 and beyond. The total demand for electricity generation in Ontario is expected to continue increasing over time and is estimated to be more than approximately 40,000 MW by 2027.

Many of the existing generating stations in Ontario will need replacement or refurbishment during the IPSP planning period. As well, the Province of Ontario has developed an “Off-Coal” initiative, which accelerates the retirement of the existing coal-fired generating stations. The new generation to be developed in Ontario will involve renewable and clean generation technologies including wind, hydroelectric and natural gas powered generation while emphasizing conservation and demand management. The reliance on nuclear generation is expected to remain approximately at its current level.

Transmission facilities in Ontario have not been significantly expanded since the early 1980s. Many new transmission lines or ROW expansions will be required during the IPSP planning period to transmit electricity from new and refurbished generation sites to service the people of Ontario.

### **OPA’s Assessment of Bruce Area to GTA Electricity Transmission**

In Discussion Paper 7: Integrating the Elements - A Preliminary Plan (OPA 2006b), the OPA presented its preliminary 20-year IPSP taking the development of the Province’s electricity system through to the year 2027. The paper outlines the context and purposes of the plan, the process of evaluating it, the resulting Preliminary Plan and the next steps. The elements of the plan – load forecast, conservation, supply resources and transmission – are discussed in the preceding IPSP discussion papers. The OPA identified the following challenges in the 2007-2010 timeframe for the Bruce area to GTA:

- transmission investments to ensure deliverability of the output from the Bruce

Power Complex's refurbished units and potential wind resources in the area;

- transmission reinforcements in the GTA, southern Georgian Bay, Windsor, Brant, the Kitchener area and Woodstock; and
- decisions needed in the near term to enable the resources that will be required in the medium term (i.e., after 2010).

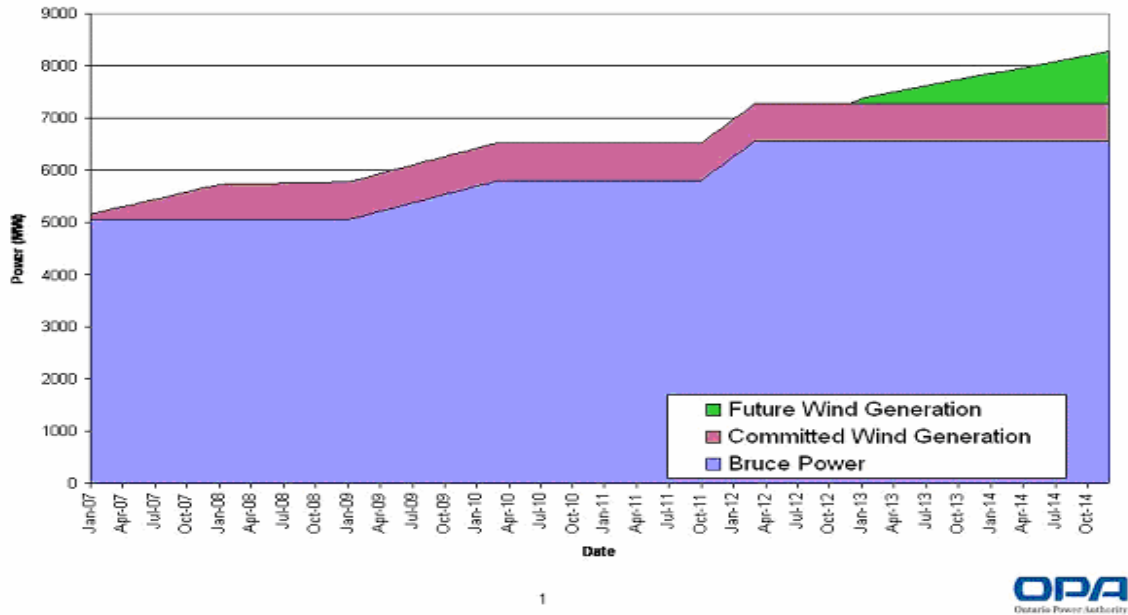
The need and rationale for the transmission of power from Bruce area to the provincial power grid including the GTA are discussed in the OPA (2006a) Discussion Paper 5: Transmission and the OPA (2006b) preliminary IPSP and briefly summarized in the following paragraphs.

Bruce Power is in the process of refurbishing and returning to service the two "laid-up" generating units, Units 1 and 2, at the Bruce A nuclear plant. These units, each rated at 750 MW, are scheduled to return to service in 2009. They will add 1,500 MW of base load generation to the Ontario system, which will improve the Province's reliability of supply. Coincidental to the return of the two Bruce units, Bruce Power is scheduling the outage of other units at the Bruce A plant for extended maintenance work from 2009 to 2011. Thus, in effect, an equivalent of one Bruce unit is added between 2009 and the end of 2011, and two units thereafter.

Additionally, about 725 MW of wind generation has been committed for the Bruce area. OPA's latest studies done for preparation of the IPSP identify a potential for another 1,000 MW of wind generation that could be developed in this area. Together, these new wind and nuclear generation resources will add approximately 1,500 MW by 2009, approximately 2,225 MW by 2012 with maintenance work completion, and over 3,000 MW in the longer term with the addition of potential wind development.

The generation increases in the Bruce area between now and 2012, and the possible amount to 2014, are shown in Figure SD-1.





**Figure SD-1: Power Generation in the Bruce Area**

The existing system that transmits power from the Bruce area to the provincial power grid including the GTA was last expanded around 1990 and currently has sufficient capacity for the existing generation, namely the four units at Bruce B and two units at Bruce A, with a combined output of approximately 5060 MW.

In Discussion Paper 5, the OPA identified five long-term transmission options to increase the capacity of the electricity transmission system in southwestern Ontario to meet this need. These alternatives were Bruce to Longwood, Bruce to Kleinburg, Bruce to Crief, Bruce to Essa and Bruce to Milton. The OPA determined that two of the alternatives, Bruce to Crief and Bruce to Kleinburg did not align with provincial policy to maximize use of existing ROWs and would require a planning period that would not satisfy the need date. The Bruce to Longwood alternative was deemed to be too long, would have required costly and time consuming compensating measures and could not be constructed within the period of time that would satisfy the need date. OPA determined that the two alternatives that would be assessed were Bruce to Milton and Bruce to Essa because these would make use of an existing ROW, in accordance with the Provincial Policy Statement and could potentially be in service by the need date, taking into consideration the planning and construction phases

of the project.

The OPA assessed the technical merits of two options for addressing electricity transmission from the Bruce area to the provincial power grid and the GTA: Bruce to Milton and Bruce to Essa. Based on this assessment (see section entitled Bruce Area to GTA Transmission Line, below) the OPA concluded that the Bruce to Milton option is the only transmission alternative that meets the overall need to transmit the existing and committed generation in the Bruce area, to facilitate the development of future resources in the Bruce area and north of Barrie, and to be consistent with provincial land use policy.

The OPA has established the need for the Bruce to Milton Project through their preliminary IPSP planning process. For this project, Hydro One is relying on the analysis, consultation and recommendations of the OPA, specifically for the determination of need and alternatives to this project. Therefore, the OPA recommendation provides a starting point for Hydro One's EA process.

The final recommendation considered technical requirements, total system capacity, provincial land use policy and the overall cost to Ontario electricity consumers.

There is some additional capacity to incorporate the committed wind generation in the Bruce area once the critical sections of two of the Bruce 230 kV circuits between Hanover and Orangeville have been uprated and additional static or dynamic shunt reactive sources installed at the Middleport, Orangeville and Detweiler stations. Hydro One is currently assessing the extent of the work required to uprate the 230 kV circuits. The OPA recommends that this uprating work should proceed immediately to enable an in-service date of mid-2009 as a near-term measure before the Bruce to Milton Project comes in-service in December 2011.

OPA and IESO staff have worked together in the past year to identify and assess interim measures for increasing the transfer capability between the Bruce area and the provincial power grid and the GTA. The interim measures that were found to be the most effective are:

- generation rejection of up to 1,500 MW (two Bruce units or one Bruce unit and wind generation) and
- subject to confirmation from the due diligence study noted below, 30% series compensation of the Bruce to Longwood and Longwood to Nanticoke 500 kV circuits.

The results of the IESO interim measures assessment indicate that the immediate enhancements, which can be placed in service in 2009, combined with generation rejection will allow the output from seven Bruce units and committed wind generation to be transmitted. Thirty percent (30 %) series compensation may be used as a stopgap measure to further expand transmission capability to accommodate eight Bruce units if approvals for a new 500 kV line are delayed. The OPA has stated that the interim measures are not alternatives to the long-term solution. The use of generation rejection as an interim measure until a more permanent solution is in place is subject to Northeast Power Coordinating Council (NPCC) approval. With regard to the use of series compensation, a new technology for Ontario, for increasing the transmission capability out of Bruce, Hydro One has expressed concern regarding the system and equipment risks.

### **Bruce Area to GTA Transmission Line**

OPA Discussion Paper 5 concluded that a new double-circuit 500 kV line from the Bruce area to the provincial power grid and the GTA is required to address the long term transfer capability requirements for delivering wind and nuclear power from the Bruce area to Ontario's electricity consumers. Subsequent to the release of the Discussion Paper, the OPA assessed the technical merits of two options for addressing electricity transmission from the Bruce area to the provincial power grid and the GTA: Bruce to Milton and Bruce to Essa. These studies revealed:

- the Bruce to Essa option would increase transmission capacity to deliver committed future generation in the Bruce area, by approximately 6,500 MW between 2009 and 2012 (including approximately 700 MW of renewable energy capacity). However, the Bruce to Essa option would not provide sufficient capacity for an additional 1,000 MW of forecast renewable generating resources in the Bruce area. The Bruce

to Essa option does not provide a direct connection to the provincial grid including the GTA and energy transfer would consume capacity on the existing transmission line between the Essa Transformer Station (TS) near Barrie and the Claireville TS located in the GTA. This would constrain the delivery of additional energy from sources north of Barrie and require a reinforcement of the Essa to Claireville transmission line earlier than would otherwise be the case.

- the Bruce to Milton option offers greater capability to deliver future renewable generation developments in the Bruce area (i.e., 8,300 MW vs. 7,300 MW). Furthermore, unlike the Bruce to Essa option, it provides a direct connection to the provincial power grid and the GTA and therefore would not impede development of future renewable generation projects north of Barrie. These projects include the proposed Lower Mattagami Hydroelectric Redevelopment and Mattagami Lake Generating Station.

On this basis, OPA concluded that the Bruce to Milton option is the only transmission alternative that:

- meets the overall need to transmit the existing and committed generation in the Bruce area;
- preserves the transmission capability between Barrie and the GTA for future generation developments north of Barrie; and,
- is consistent with provincial land use policy as set out in the 2005 Provincial Policy Statement (PPS) (MMAH, 2005a). The PPS provides policy direction on matters of Provincial interest related to land use planning and development and sets the policy foundation for regulating the development of land use. The PPS section 1.6.2 states that the use of existing infrastructure and public service facilities should be optimized wherever feasible, (e.g., by utilizing a widened corridor) before consideration is given to developing new infrastructure and public service facilities.

In a letter sent to Hydro One on December 22, 2006, the OPA stated that it believed that

action must be taken urgently to ensure that there is adequate system capacity to permit all available generation in the Bruce area to be transmitted, in accordance with its analysis of the matter outlined in Section 2.3.6 of the OPA (2006a) Discussion Paper 5 on Transmission.

In its letter dated March 23, 2007, the OPA requested that Hydro One commence the planning and approvals process required to construct a new double-circuit 500 kV transmission line between the Bruce Power Complex and Hydro One's existing Milton SS located in the Town of Milton (the reference route) to be in-service by December 1, 2011. A copy of this correspondence is provided in Environmental Assessment Terms of Reference Bruce to Milton Transmission Reinforcement Project, *Appendix A*. In keeping with the provincial land use policy, the reference route follows an existing ROW. When this undertaking is completed, the system will provide capacity for an additional 1,000 MW of power relative to other options (i.e., options which do not meet the need). By expanding an existing ROW, the project will require approximately 20% less land area than would a new ROW.

If the proposed transmission line is not placed in service in 2012, the committed and proposed wind generation in the Bruce area and committed generation from the Bruce Power Complex will be constrained from entry into the Ontario power grid. As a result, committed Bruce area generation facilities will not be able to operate. Consequently the Province will have difficulty reducing its dependency on coal-fired generation as planned, and Ontarians may face energy shortages. The Province of Ontario is also committed to pay for power from the Bruce area that cannot be delivered to customers.

### **Technical and Cost Requirements Leading to Reference Alignment**

When evaluating the various combinations of line segments, the study team had to take into consideration a strong technical and cost preference for the new line not to cross existing 500 kV transmission lines with one area of exception (discussed below). Two facts shaped the determination of the reference route: the fact that Hydro One holds most of the rights for a 26 km stretch of land, extending east from the Bruce facility; and the fact that when entering the Milton Switching Station, there is a requirement to be on the east side of the

existing line. Additionally there is a technical requirement to be on the east of the existing right of way when entering the Milton Switching Station (in order to line up with the future position in the Switching Building).

### ***C. Rationale for the Reference Route***

#### **Reasons for Preference to Avoid Cross-Overs**

There are multiple reasons for avoiding crossing over another 500kV line:

- Any cross-over would require an outage of several weeks duration, during which time some power could be stranded in the Bruce area. This may have implications for service interruption and the province's economy, since the situation would probably result in the import of power.
- A fenced area may be required and additional property rights may be required to locate the extra dead-end (turning) towers,
- The cost of crossing an existing 500 kV line is between three and five million dollars;
- Once a cross-over is in place, long-term system vulnerability is increased and line maintenance is more difficult.

Due to the complex number and configuration of transmission lines along the routes, any crossover of a 500 kV line could necessitate other crossovers. Any route that exited the Bruce Generating Station on a right-of-way to the south of the existing right-of-way would need to cross the 230 kV line going to Deitweiller twice (once in the Bruce facility and once at Willow Junction) and the 500 kV line going to Longwood. If proceeding to Milton, a route that was on the south side of the right-of-way would have to cross the 500 kV line coming from Nanticoke to Milton.

Crossovers between Bruce Generating Station and Colbeck would require crossings of multiple transmission lines which would be undesirable due to increased costs and the need for multiple outages (which are much more difficult to obtain than single outages.)

### **Exception to the Rule**

There is one location where a cross-over is justified from a technical and cost perspective. To the north of the Milton Switching Station, Hydro One owns a little more than 2 km of right of way on the west side, adjacent to the existing right of way, north of Highway 401, to north of the intersection of the Hydro One 500 kV transmission lines coming in from Nanticoke (to the west). This area has high development pressure and high real estate costs. Through discussion with municipal officials in Halton Hills, Hydro One has been made aware of approved developments in this area, to the east of the right of way, that are expected to proceed prior to approvals for this project. In light of the planned development, if Hydro One did not take advantage of the existing rights on the west of the transmission corridor in this area, project costs could be expected to rise by \$60 million to in excess of \$100 million. Taking advantage of the existing rights in this area allows the planned developments to proceed without affecting the economic benefits these developments will provide to the area and to the municipal tax base.

### **Utilizing Existing Rights-of-Way**

To minimize potential effects, Hydro One wishes to maximize use of existing rights-of-way. Hydro One prefers to build on the north side of the right-of-way when exiting the Bruce Generating Station, along a 26 km stretch of land where rights were acquired during construction of the existing transmission lines, adjacent to the existing right-of-way between the Bruce Generating Station and Bradley Junction. If Hydro One did not take advantage of these existing rights and built the new line to the south of the existing right-of-way, costs could be expected to increase by \$7.5 million and an additional 50 to 55 property owners would be affected in this area.

In summary, Hydro One's reference alignment is along the north of the existing right-of-way when exiting the Bruce Generating Station, crossing over the 230kV line near Colbeck, to continue to parallel the existing 500kV line on the east until crossing over to Hydro One owned right of way on the west to avoid development lands in Halton Hills.