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BY COURIER

July 2, 2013

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

Dear Ms. Walli:

EB-2013-0040 and EB-2013-0041 Bornish Wind, LP, Kerwood Wind, Inc. and Jericho Wind, Inc. – Hydro One Networks Inc.'s Responses to Interrogatory Questions

Please find attached an electronic copy of responses provided by Hydro One Networks Inc. to interrogatory questions. Two (2) hard copies will be sent to the Board shortly.

An electronic copy of the responses have been filed using the Board's Regulatory Electronic Submission System.

Sincerely,

ORIGINAL SIGNED BY SUSAN FRANK

Susan Frank

Attach.
C – Intervenors in EB-2013-0040 and EB-2013-0041 (by e-mail)

Ontario Energy Board (Board Staff) INTERROGATORY #1 List 1

Interrogatory

At page 1 of the evidence, Hydro One Networks Inc. ("Hydro One") states that:

> The Bornish line will be located on a right of way in Middlesex County, on the opposite side of Kerwood Road, Elginfield Road and Nairn Road from Hydro One's 4.8/8.24 kV distribution line for about 11 km. Similarly, the Kerwood line will be located on the opposite side of the right of way on Kerwood Road from Hydro One's 4.8/8.24 kV distribution line for about 7 km. Over the total distance of 18 km, Hydro One Distribution ("Hydro One") serves about 20 customers who reside on the opposite side of the road from Hydro One's existing distribution line. The proposed transmission lines will therefore be located between Hydro One's distribution lines and those customers. In order for Hydro One to serve these or future customers requiring an electrical connection along these routes, Hydro One distribution lines will have to cross the proposed transmission lines at several locations. Some work on these crossings will be required when the transmission lines are built, while other work may need to be performed later, as circumstances arise.

a) About 20 customers reside on the opposite side of the road from Hydro One's existing distribution line and Hydro One anticipates future customers. In order to understand the rate of growth in new connections, please provide the number of new distribution customers that were connected along the subject 18 km route in the past five years (2008 to 2013 YTD) and the expected new customer connections for the next five years (2013 to 2018).

b) Please provide the same information as above in part (a) for the number of customer modifications.

c) Hydro One states that work "will be required when the transmission lines are built?
   i. Please describe the work that will be required.
   ii. Please identify if that work is required for current and/or future customers.
   iii. What is the estimated cost of that work?

Response

a) Five customers were connected in the past five years (2008 to 2013 YTD). Hydro One expects that there will be another five new customer connections for the next five years, given the number of connections made over the same period in the past.

b) No modifications or upgrades were made in the past five years (2008 to 2013 YTD). However, Hydro One recognizes that there could possibly be modification or upgrade requests from customers in the future.

c) The requested information is tabulated below:

CUSTOMER ARRANGEMENT	DESCRIPTION OR WORK	APPROXIMATE ADDED COST DUE TO THE GENERATOR'S LINE CONSTRUCTION
1) Existing *Secondary* Overhead Service (Current Customer)	Secondary* overhead road crossings must be re-located from overhead service to underground in order to cross the road and the Applicant's new line. *Secondary lines carry voltage no greater than 600 volts directly into the customer's property.	$7,300 per existing secondary overhead crossing
2) Existing *Primary* Overhead Service (Current Customer)	The Applicant will maintain Hydro One's standard clearances on the current customer's primary service when building the new transmission line above existing primary service crossings. Therefore, an existing customer with this arrangement will not be affected by the project.	N/A
3) New *Secondary* Underground Service (Future Customer)	Utilizing a road bore, Hydro One would install secondary service underground to cross beneath the road and to rise on the customer side of the Applicant's line.	$5,100[1]
4) New *Primary* Underground Service (Future Customer)	Utilizing a road bore, Hydro One would install primary service underground to cross beneath the road and to rise on the customer side of the Applicant's line. This option is needed as the transmission line will not be built with any extra ground clearance to accommodate *future* primary crossings (and therefore, is not the same as case 2, above).	$9,850[2]
5) Service Upgrades for Secondary or Primary Services (Current Customer)	Hydro One would provide a service upgrade (e.g., a higher voltage or increased capacity) to a current customer.	Depends on Customer's Request

[1] $9,400 (Total Cost) = $4,300 (normal situation*) + $5,100 (incremental).
[2] $15,420 (Total Cost) = $5,570 (normal situation*) + $9,850 (incremental).
* Normal situation: In the absence of the transmission line proposed by the Applicant.

Ontario Energy Board (Board Staff) INTERROGATORY #2 List 1

Interrogatory

At page 2 of the evidence, Hydro One states that:

> A distributor's costs of accommodating a generator-transmitter's presence can be recovered from specific new and existing customers, from all distribution ratepayers, from the transmitter, or from a combination thereof. Hydro One notes that neither the Transmission System Code nor the Distribution System Code provides guidance on this issue and that there is no requirement **for transmitters** or transmission-connected generators such as Bornish and Kerwood to sign a connection agreement with Hydro One Distribution that would comprehensively address their impacts on the distribution system. [emphasis added]

a) Have there been situations in which Hydro One Transmission work has had an impact on the Hydro One Distribution system?

b) If yes to part (a), please describe the impacts.

c) If yes to part (a), what agreements and cost recovery structures were put in place?

Response

a) Hydro One is not aware of situations in which Hydro One Transmission work has had an impact on Hydro One Distribution lines. Hydro One Transmission's high-voltage lines generally do not follow municipal rights of way, but are built on transmission corridors across less inhabited areas or fields. Accordingly, transmission lines do not lie between Hydro One Distribution's low voltage lines and its customers. If the situation discussed in this proceeding were to occur (that is, a perpendicular crossing of the high-and low-voltage lines were required), Hydro One Transmission would increase the size of the transmission structure on either side of the crossing in order to maintain adequate clearance above the distribution line.

b) Not applicable.

c) Not applicable.

Ontario Energy Board (Board Staff) INTERROGATORY #3 List 1

Interrogatory

At page 2 of the evidence, Hydro One indicates that it is optimistic that a mutual agreement will be reached between the parties in this case.

What is the current status of design requirements and cost recovery discussion between Hydro One and the Applicants?

Response

The Applicants are designing their new transmission line on the opposite side of Hydro One's existing distribution line on the municipal road. The two parties are negotiating the following to address situations where the two lines must, of necessity, come into closer proximity or cross one another:

- If the Applicants cannot obtain municipal approval to locate their high-voltage line on the side of the road which is opposite from that with Hydro One's infrastructure, the Applicants will ask Hydro One to re-locate its existing overhead line underground, thereby enabling the Applicant to locate their transmission line on that side of the road. Hydro One's cost of re-locating its distribution line will be charged to the Applicants on the same basis as Hydro One would invoice a customer who requests that an overhead line be located (or re-located) underground.

- Where Hydro One's existing road crossing lines must perpendicularly cross the Applicants' transmission line to access distribution customers, , and:
  - Hydro One's existing road crossing line is a *Primary* line (i.e., 16 kV / 27.6 kV), the Applicants will design their pole line with sufficient height to maintain separation for these crossings in accordance with Hydro One's standard, at the Applicants' cost;
  - Hydro One's existing road crossing line is a *Secondary* line (i.e., less than 600 Volts) Hydro One's line will be re-located underground in order to safely cross the Applicants' transmission line, at the Applicants' cost.

- If Hydro One must make an electrical service connection for new customers, Hydro One is requesting that the Applicants pay the incremental cost to re-locate Hydro One's distribution wires underground or that the Applicants either change their pole(s) or install an additional pole to allow for the normal overhead crossing. Hydro One's position is that the Applicants should pay the incremental costs of these changes for 10 years (i.e., one-half of the Applicants' OPA contract duration).

The two parties have generally agreed on the work required but are still negotiating the cost responsibilities and duration of the agreement on those cost responsibilities.

More details on the arrangements which would need to be addressed are provided in response to HONI IRR to Board Staff 1.

The Corporation of the County of Middlesex INTERROGATORY #1 List 1

A: TRANSMISSION AND CONNECTION LINES: ROUTE, ENGINEERING PRINCIPLES AND LAND RIGHTS

The evidence of Hydro One Networks Inc. ("Hydro One") indicates:

a. "The co-existence and co-location of two licensed entities with electricity infrastructure on adjacent rights of way introduces new considerations to ensure safe, reliable and economic provision of customer services and supply;" and that

b. A "satisfactory resolution of these (co-location) issues is a necessary prerequisite to the Board granting a Leave to Construct."

Interrogatory

In both applications, at Exh B-4-1, pg. 4-5, the Co-owners indicate that they have consulted with Hydro One with respect to co-location of transmission lines, but that Hydro One would not accommodate their requests. Please provide a summary of all co-location discussions, fully describe the issues and impasse between Hydro One and the Applicants with respect to co-locations and provide an expert engineering opinion as to whether the impasse can be resolved to allow co-location and prevent poles on each side of the travelled portion the roadways.

Response

For clarity, Hydro One assumes that references to 'co-location' mean the joint use of Hydro One's distribution poles by both high- and low voltage lines (that is, the attachment of transmission lines longitudinally above distribution lines on distribution poles, which is also referred to as 'over-building.')

The Applicants' response to Interrogatory #10 of the County of Middlesex, filed May 23, 2013, provides an accurate summary of the discussions between the Applicants and Hydro One on this issue. Hydro One Distribution's safety and reliability concerns with the joint use arrangement proposed by the Applicants stem primarily from inductive coupling and possible electrical contact between high- and low- voltage circuits. A fuller discussion of these concerns and Hydro One's review of mitigation measures is provided below:

Inductive Coupling

Hydro One conducted engineering studies on two proposals to attach 69 kV circuits to its distribution poles, and determined that, as the 69 kV circuits are designed to deliver the output of a generating facility, they can be expected to be loaded close to capacity on a recurrent basis. The current on these circuits will be higher than the traditional 400 Amp capacity of Hydro One Distribution feeders; therefore, inductive coupling from the

proposed circuit is likely to reach levels beyond those experienced in normal Hydro One practice. This raised the following concerns:

i. *Induction contributing to Temporary Over-voltage* – Temporary Overvoltage ("TOV") is expected to be elevated dramatically in the presence of an unbalanced fault on the proposed line, since the resulting coupling to the lower voltage circuit is not moderated by cancellation of magnetic field contributions from balanced 3-phase currents. Hydro One's design practice requires such TOV levels to be limited to 1.3 pu (corresponding to industry requirement for an effectively grounded system).

ii. *Induction contributing to increased Neutral to Earth Voltage levels* – Balanced load currents on the proposed circuit will contribute to Neutral to Earth Voltage ("NEV") levels on Hydro One's 4-wire feeders. This contribution may raise NEV levels beyond the 10 V limit mandated by the Ontario Electrical Safety Code ("OESC") for all customer service entrances and result in the supply system's contribution to Animal Contact Voltage ("ACV") at livestock farming operations exceeding the permissible off-farm contribution limit of 0.5 V established in the Distribution System Code.

iii. *Voltage Unbalance* -- Although the proposed circuit is expected to carry balanced currents in normal operation, the resulting voltages induced into Hydro One's 3-phase feeders would not be balanced because the respective phase conductor pairs are not symmetrically displaced. Voltage unbalance on the Hydro One feeder is therefore likely to be impacted, depending on the relative phasing of the system voltage waveform versus the inductive contribution. Hydro One must comply with the American National Standards Institute ("ANSI") C84.1 standard, which indicates that electric supply systems should be designed and operated to limit the maximum voltage unbalance to 3% when measured at the revenue meter under no-load conditions. At the same time, the National Equipment Manufacturers Association ("NEMA"), which represents motor and drive manufacturers, requires motors to give rated output for only 1% of voltage unbalance per NEMA MG-1-1998, and to be derated for application at higher unbalance.

Potential Conductor Breakage Leading to Electrical Contact

Hydro One Distribution's 44 kV feeders have a design rating of about 30 MVA, potentially serving 10,000 customers at an average 3 kW residential load. Over-building arrangements introduce the risk of direct conductor contact between the respective circuits, whether caused by natural or by contingent hazards. Contact between a high- and a low-voltage conductor would subject customers served from the lower voltage circuit to temporary over-voltages, which would be significantly higher than normal. Such over-voltages would in turn, potentially lead to permanent equipment damage and large-scale service disruptions, requiring extensive restoration times. Hydro One has determined that the probability of a breakage occurring at least once in a 40 km circuit over 50 years is 25% for a 230 kV line and 44% for a 115 kV line.

Increased Potential for Lightning Strikes

The higher poles used in over-building arrangements introduce an increased possibility of lightning strikes, with resulting potential pole fires and outages.

Mitigation Measures

Mitigating Inductive Coupling -- Induction issues may or may not be substantial, depending on project specifics, and the effects can vary along the route. At minimum, to accommodate over-building, Hydro One would have to replace its current distribution wood poles, which are 45 to 60 feet in height, with 100-foot steel poles, and implement framing which maintains specified distances between the high- and low-voltage wires**.** Such mitigation measures would require case-by-case assessment, design, monitoring, and additional technical "fixes" as may be needed to address issues which arise at individual locations. Even with these measures, complete elimination of the issues is not guaranteed.

Mitigating Potential Electrical Contact between High- and Low-Voltage Conductors -- Hydro One is not aware of any utility finding a sound engineering solution to the issue of potential electrical contact that does not compromise safety or service reliability. As utilities have become aware of these issues after the fact, surge arresters have been used to mitigate problems, but problems, nonetheless, remain. For example, in response to several instances of conductor contact on shared poles, the British Columbia Utilities Commission ("BCUC") issued a directive requiring installation of surge arresters as sacrificial devices to mitigate customer impact, and contemplation of changes to certain operating (reclosing) practices that involve a tradeoff between service reliability versus personnel and equipment safety.[1] It should be noted that the Commission's directive concludes that the installation of surge arresters, as directed, "will substantially but not entirely mitigate the damage" caused by over-voltages resulting from conductor contact. Hydro One's design philosophy is not to use underrated protective equipment (in this case, surge arresters), because it is not a safe or prudent engineering practice.

Mitigating Lightning Strikes and Pole Fires -- The risk of pole fires can be managed by resorting to steel poles, and the adverse impact on feeder service reliability can be addressed by installing lightning arresters on each under-built lower voltage circuit, placed at regular intervals along the entire exposure. These types of mitigation measures, however, increase initial capital costs and ongoing future maintenance costs related to an ongoing program of arrester inspections and possible replacement.

Following its review of these considerations, Hydro One decided not to allow new joint use agreements involving transmission voltages on distribution poles and formalized this decision in the change to its joint use policy in 2012.

[1] Letter L-35-11 Re: British Columbia Utilities Commission Directives to British Columbia Hydro and Power Authority (BC Hydro) in Letter L-60-10 originating from Order G-54-09 Mission/Stave Falls Power Outage Event, Log No. 33625, April 27, 2011.

The Corporation of the County of Middlesex INTERROGATORY #2 List 1

A: TRANSMISSION AND CONNECTION LINES: ROUTE, ENGINEERING PRINCIPLES AND LAND RIGHTS

The evidence of Hydro One Networks Inc. ("Hydro One") indicates:

a. "The co-existence and co-location of two licensed entities with electricity infrastructure on adjacent rights of way introduces new considerations to ensure safe, reliable and economic provision of customer services and supply;" and that

b. A "satisfactory resolution of these (co-location) issues is a necessary prerequisite to the Board granting a Leave to Construct."

Interrogatory

In EB-2013-0040 Exh B-4-1, the Co-owners identify two areas on Elginfield Road/Nairn Road where the transmission line route is not specified as being within a County road allowance. The reasoning is related to Bell Canada overhead telecommunications facilities and Hydro One distribution facilities.

Please identify the extent to which the transmission line route in these locations can avoid cross overs and can co-locate. Please advise as whether or not the cross over is absolutely necessary and whether or not there is any possibility of co-location, which could prevent poles on each side of the travelled portion the roadway.

Response

For the safety and reliability reasons provided in HONI IRR to County of Middlesex #1, Hydro One's joint use policy does not allow joint use of high- and low-voltage lines on its distribution poles. Therefore, Hydro One's position is that this cross-over of the transmission line from the south to the north side of Elginfield/Nairn Road, as described by the Applicant, is absolutely necessary.

The Corporation of the County of Middlesex INTERROGATORY #3 List 1

A: TRANSMISSION AND CONNECTION LINES: ROUTE, ENGINEERING PRINCIPLES AND LAND RIGHTS

The evidence of Hydro One Networks Inc. ("Hydro One") indicates:

a. "The co-existence and co-location of two licensed entities with electricity infrastructure on adjacent rights of way introduces new considerations to ensure safe, reliable and economic provision of customer services and supply;" and that

b. A "satisfactory resolution of these (co-location) issues is a necessary prerequisite to the Board granting a Leave to Construct."

Interrogatory

In EB-3013-0041 Exh B-4-1, the Applicants identify that the transmission line route at the crossing of Ausable River is on the opposite side of the travelled portion of the road as existing Hydro-One distribution facilities.

Please identify the extent to which the transmission line route in these locations can avoid cross overs and can co-locate. Please advise as whether or not the cross over is absolutely necessary and whether or not there is any possibility of co-location, which could prevent poles on each side of the travelled portion the roadway.

Response

There appears to be a misunderstanding respecting this location. The following quotes lines 11-13 of the Applicant's evidence in Exhibit B, Tab 4, Schedule 1, page 4:

> "Along the portion of the route that crosses the Ausable River, while **there are no Hydro One facilities**, there are existing Bell Canada overhead facilities on one side of the ROW." [Emphasis added]

Accordingly, the Applicant's original need to cross the road in this location was due, not to the presence of Hydro One's assets, but to those of Bell Canada. In the meantime, the Applicant's response to Middlesex County's Interrogatory #11 filed May 23, 2013, indicates that the Applicant believes that there is no longer a necessity to cross the road there, because Bell Canada has agreed to re-locate its assets underground.