



**SUMMERHAVEN WIND LP
LEAVE TO CONSTRUCT TRANSMISSION FACILITIES
EB-2011-0027**

June 8, 2011

Interrogatory #1: Basis for Recommended 10 metre (or more) Distance Separation between Transmission and Distribution poles

Reference: Kinetrics Report/CONCLUSIONS/p. 5/first paragraph

Preamble:

The report at the Reference states that:

Due to its proximity, the transmission line will provide lightning protection against direct lightning strikes. It is recommended to maintain a minimum distance of 10 m or more between the transmission and distribution poles to limit the GPR (Ground Potential Rise) transfer during lightning strikes to the transmission line and 60 Hz faults.

Question/Request:

- (i) Please indicate the basis for concluding that 10 metres or more is required between the poles of the transmission line and the distribution line to limit the Ground Potential Rise (GPR) transfer during lightning strikes to the transmission line and 60Hz faults.
- (ii) Did the Kinetrics study simulate lightning strikes and its effect on the GPR transfer rise? If so, what was the GPR transfer in the event of a lightning strike? If not, please provide the results of such a study.
- (iii) Did the Kinetrics study simulate 60 Hz faults on the transmission system and its effect on the GPR transfer? If so, please provide details of assumptions and results. If not please undertake a simulation and provide the results based on:
 - a. Fault assumptions such as: single-phase to ground, two phases to ground, or three-phases to ground faults
 - b. The fault current for each case; andPlease tabulate the results on the GPR transfer rise calculated in the event of each of the assumed cases.
- (iv) For comparison purposes, please provide results by repeating the simulation and calculating the GPR transfer assuming an offset of 4.7 metres [14 metres – 9.3 metres] between the transmission line structures and the HCHI distribution line (assumptions – Tech.Conference, Exhibit TCJ1.5) – essentially repeating the requested simulations outlined in Questions/Requests (ii) and (iii) above.

Interrogatory #2: Establishing a Base Line for Existing Neutral Potential on HCHI Distribution Lines

Reference: Kinetrics Report/Section 1. CONCLUSIONS/p. 5/second paragraph

Preamble:

The report at the Reference states in part that:

The calculated neutral potential to remote earth remained below 7 V in both cases. The Ontario Electrical Safety Code limits the neutral potential to 10 V, which could be still exceeded depending upon the existing potentials that may be present. [emphasis added].

Question/Request:

- (i) Please undertake a simulation to establish the existing neutral potentials referenced above on HCHI's circuits under two scenarios – one scenario assuming HCHI's existing distribution system voltage level (is it 8.32/4.8 kV or is it 4.16/2.4 kV) and the second scenario with the future distribution system voltage level of 27.6/16 kV.

Interrogatory #3: Contribution to Animal Contact Potential at Existing Customer Premises

- Reference:**
- (a) Kinetrics Report/Section 1. CONCLUSIONS/p. 5/second paragraph
 - (b) Kinetrics Report/Figure 3 & Exhibit TCJ1.4, Technical Conference (May 17, 2011)

Preamble:

The report at Reference (a) states in part that:

In addition, utilities must maintain their contribution to animal contact potentials at customer premises under 0.5 V which could be exacerbated by the new line.

Question/Request:

- (i) Please provide a list of the customers who have animals that can be affected due to the proposed construction of the 230 kV transmission line where it runs parallel to a HCHI's distribution line for approximately 2 kilometres on the same side of the road as shown in Reference (b).

- (ii) Please indicate if any of the customers listed in (i) above complained in the past about problems with their animals that were traced to animal contact neutral potentials? Also indicate as to whether such complaints resulted in HCHI taking mitigating steps to address that issue. If so what mitigation did HCHI implement?
- (iii) Did your consultant, Kinetrics, simulate the impact of the proposed transmission line, as outlined in Reference (b), on the animal contact potential and calculate the magnitude of the increase at those customers identified in (ii) above? If yes, what are those impacts? If not, please conduct such simulations and provide the results.

Interrogatory #4: Effort Level and Time Required to Conduct a thorough Assessment on the Impact of the 230 kV line on HCHI's Distribution Line

Reference: Kinetrics Report/Section 1. CONCLUSIONS/p. 5/fifth paragraph

Preamble:

The report at the noted Reference states that:

This study was based on the draft design information available to date and do [sic] not provide a thorough assessment on the impact of the 230 kV line on the HCHI distribution line. A more comprehensive study is recommended when final construction plans will become available.

Question/Request:

- (i) Please provide an estimate of the amount of time needed to complete the study, once the final design of the 230 kV transmission line is filed in this proceeding.
- (ii) Please ensure that the scope of the detailed study cover the other aspects as outlined in the Board staff Questions/Requests listed in this interrogatory document?

Interrogatory #5: Offset Between the proposed 230 kV Transmission Line and the HCHI Distribution Line

- Reference:**
- (a) Kinetrics Report/Section 2. INTRODUCTION/p. 5/first paragraph under INTRODUCTION
 - (b) Kinetrics Report/Figure 4 & Exhibit TCJ1.5, Technical Conference (May 17, 2011)

Preamble:

At Reference (a), the Report states in part that:

The latest 230-kV draft design provided by NextEra shows the offset between the transmission line structures and the HCHI distribution line as 3.4 m (see Figure 4).

At Reference (b), it is noted that the offset is 4.7 metres being the difference between:

- **14 metres** (distance between the 230 KV line and the centerline of County Road 5); and
- **9.3 metres** (distance between HCHI's distribution line and the centerline of County Road 5)

Question/Request:

- (i) Was a mistake made? If so, please provide updates to the study, where applicable, to reflect the offset being 4.7 metres instead of assuming it to be 3.4 metres. Please also ensure use of that 4.7 metre offset in calculating the various additional requests made by Board staff in this interrogatory document. If not, please explain the discrepancy.

Interrogatory #6: Potential Negative Consequences on HCHI's Distribution System

- Reference:** Kinetrics Report/Section 2. INTRODUCTION/pp. 5-6/last paragraph in page 5 and page 6

Preamble:

The Kinetrics report at the noted Reference, states in part that:

Even with the 230-kV currents well balanced, the result is a longitudinal potential induced in all distribution line conductors that may negatively impact the distribution line operation. The following negative consequences can be experienced on the distribution side due to this coupling:

- *Difficulty in maintaining voltage levels on the distribution line or keeping unbalanced phase voltages below 1% (causing damage to customer motors).*
- *Failure of distribution line arresters by induced voltages during transmission line faults.*
- *Maintenance issues such as induced voltages and currents on the de-energized distribution line when the transmission line remains energized.*
- *Excessive voltages between the distribution phase conductors and the neutral may appear during transmission-line faults as well as the associated ground potential rise on customer service conductors.*
- *Stray voltage problems. The Ontario Energy Board since 2009 requires utilities to maintain the cow contact potentials in farm country below 0.5 V (which can be related back to induction to the neutral).*

Question/Request:

- (i) Did Kinetrics quantitatively calculate any of the noted 5 aspects? If not, please indicate the reasons for not carrying out such analysis.
- (ii) Is the Applicant intending to have Kinetrics perform the more detailed study upon receipt of the final 230 kV design including quantitative evaluation of the 5 items identified in the noted Reference and repeated in the Preamble above?

Interrogatory #7: Modelling Methodology and Results

Reference: Kinetrics Report/Section 4. MODELLING METHODOLOGY AND RESULTS/p. 6/first paragraph under Section 4

Preamble:

The Report states in part at the Reference that:

Distribution neutrals usually contribute significantly to station grounding because they fan out in several directions and are multi-grounded. The models are based on the driving point impedance seen looking into a system of cascaded π circuits. Carson earth return impedances [4] account for the longitudinal branches. Pole, transformer and customer grounds describe the shunt connections to earth. The models also account for inductive coupling

between phase conductors and the neutral. This coupling tends to increase the split of current flowing back to the substation on the neutral.

It is important to establish a base case that reflects HCHI's system as it exists today, and the effect of the unbalanced loads on its distribution feeders may affect the distribution neutral voltages, under the current situation

Question/Request:

- (i) Please explain the number of distribution circuits that Kinetrics modelled in this study, and for each distribution line, its location and voltage level (8.32/4.8 kV or 4.16/2.4 kV, etc);
- (ii) Please provide the results of the distribution neutral voltages of the existing HCHI's system without modelling the proposed 230 kV transmission system, and another set with modelling the transmission system.
- (iii) Please repeat step (ii) above, assuming HCHI system to have converted to 27.6/16 kV system without modelling the transmission system. Please confirm that the calculation with modelling of the transmission system is shown in Figure 1, page 7 of the Kinetrics Report.

Interrogatory #8: Voltage Unbalance – Detailed Calculations

Reference: (a) Kinetrics Report/Section 4. MODELLING METHODOLOGY AND RESULTS/p. 6/second paragraph under Section 4
(b) Kinetrics Report/Appendix C

Question/Request:

- (i) At Reference (a), the report indicated that the spread sheet software used by Kinetrics was validated against simulation software such as EMTP. Please provide a short description of the EMTP simulation.

Preamble:

At Reference (b), Appendix (c) shows the results of the potential along the feeder and reflects the effect of inductive coupling for three cases:

- one scenario between the proposed 230 kV transmission line and the existing 8.32/4.8 kV; and
- two more scenarios for the coupling between the 230 kV transmission system and the future 27.6/16 kV distribution

system – one at “closer 27.6 kV line”, and one at “more distant 27.6 kV line”.

Question/Request:

- (ii) In regard to Appendix C, for each of the three scenarios please provide a description / narrative for each of the sub-tables containing assumptions, and results.
- (iii) Indicate whether the “Closer Scenario for 27.6 kV” reflects an offset of 3.4 metres. If so, please recalculate that scenario to reflect an offset of 4.7 metres as outlined in Interrogatory No. 5 above.
- (iv) Please indicate what is the offset distance assumed for the “More distant 27.6 kV Line” scenario.
- (v) Please provide a calculation to reflect offsets between the 4.7 metres provided by the applicant on May 17, and the 10 metres proposed in your Report. Perhaps one run at 6 metre offset and one at 8 metre offset.