Hydro One Networks Inc.
EB-2021-0107
Leave to Construct Application: Ansonville TS and Kirkland Lake TS A8K/A9K Refurbishment Project – Application and Evidence

Interrogatories of Environmental Defence

Interrogatory 1

Reference: Exhibit B-5-1

Preamble:

> "Hydro One aims to refurbish all deteriorated line sections of circuits A8K and A9K, while increasing each circuit's Long Term Emergency operating rating to 550 A, as requested by the IESO. To achieve this, the following options were considered:
>
> > **Alternative 1 (Preferred) –** Replace the deteriorated components along all line sections of circuits A8K and A9K, including obsolete copper conductor, aluminum conductor steel reinforced ("ACSR") conductor tested to be at end-of-life condition, corroded steel shieldwire and rotten wood poles. The higher Long Term Emergency operating rating of 550 A will be achieved through the use of taller wood poles, which will provide for the increased clearances required for higher thermal capability. Any work on non-deteriorated components in order to meet the increased rating requirement will be minimized. Alternative 1 refurbishes an approximate total of 180 circuit km of transmission circuits A8K and A9K.
> >
> > **Alternative 2 –** Replace the deteriorated components along all line sections of circuits A8K and A9K, including obsolete copper conductor, aluminum conductor steel reinforced ("ACSR") conductor tested to be at end-of-life condition, corroded steel shieldwire and rotten wood poles. The existing ampacity of circuits A8K and A9K are limited to 230 A and 290 A respectively. Scope of work for this alternative is limited to refurbishing end of life structures, conductors and other transmission line components. This approach would result in an ampacity of 390 A. This alternative, however, would only meet the pure sustainment need and would not meet a Long Term Emergency operating rating of 550 A, as requested by the IESO. Alternative 2 refurbishes an approximate total of 112 circuit km of transmission circuits A8K and A9K."

Questions:

(a) Please confirm that the two criteria for this project are that: (1) deteriorated sections of circuits A8K and A9K are replaced; and (2) that each circuit's Long Term Emergency operating rating is increased to 550A.

(b) Please confirm whether Alternatives 1 and 2 were the only two options considered. If other options were considered, please describe them and explain why these other options were not included among the transmission alternatives in the application.

Interrogatory 2

Reference: Exhibit B-6-1, Attachment 1, page 8

Preamble: The IESO report "End-of-Life Conductor Upgrades on the Ansonville x Kirkland (AxK) 115kV Lines" dated August 2021, states as follows:

> "In the context of end-of-life replacement decisions, an option was evaluated in which circuits A8K/A9K are right-sized, i.e., further upgraded when they are replaced. This alternative is called the "Upgrade Option" and includes upgrading A8K/A9K to a summer planning rating of 550 Amperes. The IESO understands that a conductor with a summer planning rating of 550 Amperes is the highest rated conductor that can be installed using the existing tower structures."

Question:

(a) Please confirm whether the IESO's understanding (i.e., that a conductor with a summer planning rating of 550 Amperes is the highest rated conductor that can be installed using the existing tower structure) is correct. If not, what is the highest rated conductor that the existing tower structures can accommodate?

Interrogatory 3

Reference: Exhibit B-6-1

Preamble:

> "Hydro One's minimum standard size conductor for this range of application is 411 ACSR. All alternatives presented use this size of conductor, however the preferred alternative results in replacing more line with this sized conductor, and therefore results in greater loss reduction."

Questions:

(a) Does Hydro One take the position that it was unable to seek OEB approval for a larger conductor than 411 ACSR even if this could cost-effectively avoid transmission losses (i.e., the net present value of the transmission loss reductions would be higher than the net present value of the incremental cost of the larger conductor)?
(b) Was Hydro One or the IESO responsible for determining whether a larger conductor would be more cost-effective due to the value of incremental transmission loss reductions (i.e., greater than 411 ACSR)? Please provide Hydro One's view and confirm the IESO's view.

(c) Please provide the name and title of the primary Hydro One engineers that were involved in the development of this project.
(d) Please provide the name and title of the primary IESO engineers that were involved in the development of this project.
(e) Did Hydro One and the IESO discuss the possibility of upsizing the conductors to cost-effectively reduce transmission losses? If yes, please provide the approximate dates of any such discussions, a summary of what was concluded, and any correspondence on that topic.

Interrogatory 4

Reference: Exhibit B-6-1

Preamble:

> "Hydro One's minimum standard size conductor for this range of application is 411 ACSR. All alternatives presented use this size of conductor, however the preferred alternative results in replacing more line with this sized conductor, and therefore results in greater loss reduction."

Questions:

(a) Did Hydro One consider any other size conductor other than the 411 ACSR for this application? If not, why not?
(b) Please provide a list of the type and size of conductors that would also result in a summer planning rating of 550 Amperes. Presumably this will include a variety of larger conductors.
(c) Please estimate the cost of the project based on the various potential conductors that would meet the required summer planning rating of 550A and include those estimates in the following table:

Conductor Alternatives – Capital Cost Comparison	
	Total Capital Cost
Conductor 1: 411 ACSR	$69.7 million
Conductor 2	
…	
Conductor n	

(d) To assist us in determining whether a more detailed transmission loss analysis is unnecessary, please estimate annual transmission losses that would result from the various potential conductors that would meet the required summer planning rating of 550A and include those estimates in the following table. Please estimate the losses as if the lines were fully loaded 24/7/365. Note that this request is intended to assist in screening and is not a forecast.

Conductor Alternatives – Annual Transmission Loss Comparison for Screening	
	Estimated Transmission Loss
Conductor 1: 411 ACSR	X kwh

Conductor 2	Y kwh
…	…
Conductor n	

(e) To assist us in determining whether a more detailed transmission loss analysis is unnecessary, please calculate the cost of the transmission losses set out in part (d) above at $120/MWh and provide the results in the following table:

Conductor Alternatives – Annual Transmission Loss Value (for Screening Only)	
	Estimated Transmission Losses Value
Conductor 1: 411 ACSR	$X
Conductor 2	$Y
…	…
Conductor n	

(f) Please estimate annual transmission losses that would result from the various potential conductors that would meet the required summer planning rating of 550A and include those estimates in the following table. Please estimate the losses based on historic load data of Hydro One's choosing and make and state all necessary assumptions.

Conductor Alternatives – Annual Transmission Loss Comparison	
	Estimated Transmission Losses
Conductor 1: 411 ACSR	X kwh
Conductor 2	Y kwh
…	…
Conductor n	

(g) Please estimate annual transmission losses assuming the load increases by 2% annually over 40 years starting from the amount listed in (f).

Conductor Alternatives – Transmission Loss Comparison – 40 Years			
	Estimated Annual Transmission Losses		
	Year 1	…	Year 40
Conductor 1: 411 ACSR ACSS	X kwh		
Conductor 2	Y kwh		
…	…		
Conductor n			

(h) Please estimate the value of transmission losses listed in (g) based on the avoided cost figures published by the IESO as part of its latest Annual Planning Outlook for both capacity and energy and provide the results in the following table. Please provide the calculations used to derive costs from the avoided cost figures.

Conductor Alternatives – Transmission Loss Value – 40 Years			
	Estimated Annual Transmission Losses Value		
	Year 1	…	Year 40
Conductor 1: 411 ACSR ACSS	$X	…	

Conductor 2	…		
…			
Conductor n			

(i) Please provide the equations necessary to determine the losses along the line in question based on the various conductor options that would meet the required summer planning rating of 550A. Please include a function to determine the losses based on the load (MW).

(j) For the most recent year with available data, please provide a live excel spreadsheet showing the load on the line (MW) and the transmission losses on the line (MW) for every hour in that year. For that same year, please also provide HOEP and GA for every hour in the year.

Interrogatory 5

Reference: Exhibit B-6-1

Preamble:

> "Hydro One's minimum standard size conductor for this range of application is 411 ACSR. All alternatives presented use this size of conductor, however the preferred alternative results in replacing more line with this sized conductor, and therefore results in greater loss reduction."

Question:

(a) Please conduct an analysis assessing the cost-effectiveness of upsizing the conductor that compares the incremental costs to the incremental benefits (i.e., reduced transmission losses) over 40 years. Please express the losses as valued at HOEP and GA. Please express the result as an NPV figure. Please provide all the calculations, variables, and assumptions.

Interrogatory 6

Reference: Exhibit B-6-1

Preamble:

> "Hydro One's minimum standard size conductor for this range of application is 411 ACSR. All alternatives presented use this size of conductor, however the preferred alternative results in replacing more line with this sized conductor, and therefore results in greater loss reduction."

Questions:

(a) Please provide the capacity the various potential conductors that would meet the required summer planning rating of 550A and include those estimates in the following table:

Conductor Alternatives – Capacity Comparison	
	Capacity
Conductor 1: 411 ACSR	X MW
Conductor 2	
…	
Conductor n	

(b) Please estimate the value of this additional capacity to the electricity system to the extent that it may allow for less costly energy and/or capacity.

Interrogatory 7

Reference: Exhibit B-6-1, Attachment 1, page 8

Preamble: The IESO report "End-of-Life Conductor Upgrades on the Ansonville x Kirkland (AxK) 115kV Lines" dated August 2021, states as follows:

> "In the context of end-of-life replacement decisions, an option was evaluated in which circuits A8K/A9K are right-sized, i.e., further upgraded when they are replaced. This alternative is called the "Upgrade Option" and includes upgrading A8K/A9K to a summer planning rating of 550 Amperes. The IESO understands that a conductor with a summer planning rating of 550 Amperes is the highest rated conductor that can be installed using the existing tower structures."

Question:

(a) Please describe and estimate the cost of the tower modifications or replacements that would be required for the various potential conductors that would meet the required summer planning rating of 550Amperes and include those in the following table:

Conductor Alternatives – Tower Modification Comparisons		
	Description of Tower Modifications	Estimated Cost of Tower Modifications
Conductor 1: 411 ACSR		
Conductor 2		
…		
Conductor n		