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BY EMAIL AND RESS

October 14, 2021

Ms. Christine E. Long
Registrar
Ontario Energy Board
Suite 2700, 2300 Yonge Street
P.O. Box 2319
Toronto, ON M4P 1E4

Dear Ms. Long:

EB-2021-0136 – Hydro One Networks Inc. Richview TS by Trafalgar TS Reconductoring Project Application – Additional Clarification Questions From Environmental Defence

In response to an email request received by Hydro One on October 12, 2021, from Environmental Defence, Hydro One is providing additional calculations pertaining to Exhibit I, Tab 3, Schedules 3 part g), and 4 part a). As indicated in Mr. Elson's email, Hydro One does not necessarily agree with the logic, parameters and assumptions posed in these questions.

An electronic copy of the interrogatory responses has been submitted using the Board's Regulatory Electronic Submission System.

Sincerely,

Joanne Richardson

c/ EB-2021-0136 Intervenors (Electronic only)

RESPONSE TO ENVIRONMENTAL DEFENCE REGARDING INTERROGATORY #3

Preface

In response to an email received by Hydro One on October 12, 2021 from Kent Elson[1], on behalf of Environmental Defence (ED), Hydro One was asked to provide additional calculations on Exhibit I, Tab 3, Schedules 3 part g).

Reference:

Exhibit I, Tab 3, Schedule 3g)

Please estimate the value of transmission losses listed in (f) based on the avoided cost figures published by the IESO as part of its latest Annual Planning Outlook and provide the results in the following table:

Conductor Alternatives – Transmission Loss Value – 40 Years			
	Estimated Annual Transmission Losses Value		
	Year 1	…	Year 40
Conductor 1: 1433 kcmil ACSS	$X	…	
Conductor 2	…		
…			
Conductor n			

Interrogatory

Please update the figure in Exhibit I, Tab 3, Schedule 3, Page 7 to include the avoided cost figures from the Annual Planning Outlook for both energy and capacity (link). The logic behind this is that reduced losses mean that less generation capacity is needed, especially because the losses are highest at the peak. HONI does not need to agree with that logic. I am just trying to explain the rationale for the question. Please provide all calculations and assumptions.

[1] Please refer to Attachment 1 to this submission.

Response:

Part g)

Please see Table 1, below, which has been modified to include the avoided capacity cost figures from the Annual Planning Outlook[2], as requested by ED.

The IESO avoided capacity costs has been assumed as $122.10/kW-year in 2020 dollars as requested by ED. This represents the highest avoided capacity cost forecast by the IESO between 2021 and 2040. Going forward (for the balance of the 40-year period of analysis), the avoided cost is assumed constant at this value.

Hydro One is providing the calculations requested by ED using the parameters ED specified. This interrogatory response is not an endorsement by Hydro One of the assumptions, results or proposition posed by ED in its question.

[2] https://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/APO-Avoided-Costs.ashx

Table 1 (Table E Modified) - Conductor Alternatives – Transmission Loss and Value Comparison[3] – 40 Years (based on Forecast Capacity and Energy Costs)

No.	Losses (MWh)		IESO Avoided Energy Cost	Avoided Cost Based on IESO APO			Losses (kW) (See Note 1)		IESO Avoided Capacity Cost	Avoided Capacity Cost Based on IESO APO			Total Difference E+C
	1433 kcmil	1730 kcmil	(2020$/MWH)	1433 kcmil	1730 kcmil	Difference E	1433 kcmil	1730 kcmil	(2020$/KW-per year) (See Note 2)	1433 kcmil	1730 kcmil	Difference C	(See Note 3) E+C
0	3908.6	3275.9	$23.00	$89,897.31	$75,346.30	$14,551.01	922.3	773.0	$122.10	$112,614.88	$94,386.75	$18,228.13	$32,779.13
1	4064.9	3407.0	$22.93	$93,225.46	$78,135.75	$15,089.71	959.2	803.9	$122.10	$117,119.47	$98,162.22	$18,957.25	$34,046.96
2	4227.5	3543.2	$22.98	$97,165.05	$81,437.67	$15,727.38	997.6	836.1	$122.10	$121,804.25	$102,088.71	$19,715.54	$35,442.93
3	4396.6	3685.0	$28.65	$125,952.02	$105,565.11	$20,386.91	1037.5	869.6	$122.10	$126,676.42	$106,172.26	$20,504.17	$40,891.08
4	4572.5	3832.4	$27.42	$125,394.07	$105,097.47	$20,296.60	1079.0	904.3	$122.10	$131,743.48	$110,419.15	$21,324.33	$41,620.93
5	4755.4	3985.7	$28.46	$135,356.56	$113,447.40	$21,909.15	1122.1	940.5	$122.10	$137,013.22	$114,835.91	$22,177.31	$44,086.46
6	4945.6	4145.1	$32.98	$163,088.04	$136,690.20	$26,397.84	1167.0	978.1	$122.10	$142,493.75	$119,429.35	$23,064.40	$49,462.24
7	5143.4	4310.9	$32.36	$166,452.43	$139,510.02	$26,942.41	1213.7	1017.3	$122.10	$148,193.50	$124,206.52	$23,986.97	$50,929.39
8	5349.2	4483.3	$33.05	$176,766.21	$148,154.39	$28,611.83	1262.3	1057.9	$122.10	$154,121.24	$129,174.78	$24,946.45	$53,558.28
9	5563.1	4662.7	$32.97	$183,392.93	$153,708.48	$29,684.44	1312.7	1100.3	$122.10	$160,286.09	$134,341.78	$25,944.31	$55,628.75
10	5785.7	4849.2	$36.23	$209,642.28	$175,709.05	$33,933.23	1365.3	1144.3	$122.10	$166,697.53	$139,715.45	$26,982.08	$60,915.31
11	6017.1	5043.1	$35.64	$214,476.74	$179,760.99	$34,715.75	1419.9	1190.0	$122.10	$173,365.43	$145,304.07	$28,061.37	$62,777.11
12	6257.8	5244.9	$34.33	$214,819.69	$180,048.43	$34,771.26	1476.7	1237.6	$122.10	$180,300.05	$151,116.23	$29,183.82	$63,955.08
13	6508.1	5454.7	$34.74	$226,081.47	$189,487.36	$36,594.12	1535.7	1287.1	$122.10	$187,512.05	$157,160.88	$30,351.17	$66,945.29
14	6768.4	5672.8	$34.33	$232,353.15	$194,743.88	$37,609.27	1597.2	1338.6	$122.10	$195,012.53	$163,447.31	$31,565.22	$69,174.49
15	7039.1	5899.8	$37.26	$262,272.83	$219,820.69	$42,452.14	1661.0	1392.2	$122.10	$202,813.03	$169,985.20	$32,827.83	$75,279.97
16	7320.7	6135.7	$38.32	$280,517.58	$235,112.29	$45,405.28	1727.5	1447.9	$122.10	$210,925.56	$176,784.61	$34,140.94	$79,546.23
17	7613.5	6381.2	$38.72	$294,773.02	$247,060.32	$47,712.71	1796.6	1505.8	$122.10	$219,362.58	$183,856.00	$35,506.58	$83,219.29
18	7918.1	6636.4	$41.17	$325,954.56	$273,194.73	$52,759.83	1868.4	1566.0	$122.10	$228,137.08	$191,210.24	$36,926.84	$89,686.67
19	8234.8	6901.9	$43.86	$361,167.47	$302,707.99	$58,459.48	1943.2	1628.7	$122.10	$237,262.56	$198,858.65	$38,403.92	$96,863.40
20	8564.2	7178.0	$46.59	$399,016.01	$334,430.27	$64,585.74	2020.9	1693.8	$122.10	$246,753.07	$206,812.99	$39,940.08	$104,525.81

[3] Assumes load increase growth of 2% per annum.

No.	Losses (MWh)		IESO Avoided Energy Cost	Avoided Cost Based on IESO APO			Losses (kW) (See Note 1)		IESO Avoided Capacity Cost	Avoided Capacity Cost Based on IESO APO			Total Difference E+C
	1433 kcmil	1730 kcmil	(2020$/MWH)	1433 kcmil	1730 kcmil	Difference E	1433 kcmil	1730 kcmil	(2020$/KW-per year) (See Note 2)	1433 kcmil	1730 kcmil	Difference C	(See Note 3) E+C
21	8906.7	7465.1	$46.59	$414,976.65	$347,807.48	$67,169.17	2101.7	1761.6	$122.10	$256,623.19	$215,085.51	$41,537.68	$108,706.85
22	9263.0	7763.7	$46.59	$431,575.71	$361,719.78	$69,855.94	2185.8	1832.0	$122.10	$266,888.12	$223,688.93	$43,199.19	$113,055.12
23	9633.5	8074.2	$46.59	$448,838.74	$376,188.57	$72,650.17	2273.2	1905.3	$122.10	$277,563.64	$232,636.49	$44,927.15	$117,577.33
24	10018.9	8397.2	$46.59	$466,792.29	$391,236.11	$75,556.18	2364.2	1981.5	$122.10	$288,666.19	$241,941.95	$46,724.24	$122,280.42
25	10419.6	8733.1	$46.59	$485,463.98	$406,885.55	$78,578.43	2458.7	2060.8	$122.10	$300,212.84	$251,619.63	$48,593.21	$127,171.64
26	10836.4	9082.4	$46.59	$504,882.54	$423,160.98	$81,721.56	2557.1	2143.2	$122.10	$312,221.35	$261,684.41	$50,536.94	$132,258.50
27	11269.9	9445.7	$46.59	$525,077.84	$440,087.42	$84,990.43	2659.4	2228.9	$122.10	$324,710.20	$272,151.79	$52,558.41	$137,548.84
28	11720.7	9823.5	$46.59	$546,080.96	$457,690.91	$88,390.04	2765.8	2318.1	$122.10	$337,698.61	$283,037.86	$54,660.75	$143,050.79
29	12189.5	10216.5	$46.59	$567,924.19	$475,998.55	$91,925.65	2876.4	2410.8	$122.10	$351,206.56	$294,359.37	$56,847.18	$148,772.83
30	12677.1	10625.1	$46.59	$590,641.16	$495,038.49	$95,602.67	2991.4	2507.2	$122.10	$365,254.82	$306,133.75	$59,121.07	$154,723.74
31	13184.2	11050.1	$46.59	$614,266.81	$514,840.03	$99,426.78	3111.1	2607.5	$122.10	$379,865.01	$318,379.10	$61,485.91	$160,912.69
32	13711.5	11492.1	$46.59	$638,837.48	$535,433.63	$103,403.85	3235.5	2711.8	$122.10	$395,059.61	$331,114.26	$63,945.35	$167,349.20
33	14260.0	11951.8	$46.59	$664,390.98	$556,850.98	$107,540.00	3365.0	2820.3	$122.10	$410,862.00	$344,358.83	$66,503.16	$174,043.16
34	14830.4	12429.9	$46.59	$690,966.62	$579,125.02	$111,841.60	3499.6	2933.1	$122.10	$427,296.48	$358,133.19	$69,163.29	$181,004.89
35	15423.6	12927.1	$46.59	$718,605.28	$602,290.02	$116,315.27	3639.5	3050.4	$122.10	$444,388.33	$372,458.52	$71,929.82	$188,245.09
36	16040.5	13444.2	$46.59	$747,349.50	$626,381.62	$120,967.88	3785.1	3172.5	$122.10	$462,163.87	$387,356.86	$74,807.01	$195,774.89
37	16682.2	13981.9	$46.59	$777,243.48	$651,436.88	$125,806.59	3936.5	3299.4	$122.10	$480,650.42	$402,851.13	$77,799.29	$203,605.89
38	17349.5	14541.2	$46.59	$808,333.21	$677,494.36	$130,838.86	4094.0	3431.3	$122.10	$499,876.44	$418,965.18	$80,911.26	$211,750.12
39	18043.4	15122.9	$46.59	$840,666.54	$704,594.13	$136,072.41	4257.8	3568.6	$122.10	$519,871.50	$435,723.78	$84,147.71	$220,220.13
40	18765.2	15727.8	$46.59	$874,293.20	$732,777.90	$141,515.31	4428.1	3711.3	$122.10	$540,666.36	$453,152.73	$87,513.62	$229,028.93

1. *This represents losses occurring in the RxT lines at time of System Peak (Based on 2020 summer peak that occurred on 9 July 2020 at 17:00 hours).*
2. *This represents the avoided cost per KW of capacity per year. For the purpose of this exercise we have calculated the yearly avoided cost as the sum of the summer and winter monthly costs for the entire year. The highest value of $122.1 occurs in 2032 and for simplification this value has been used for all years.*
3. *Represents total avoided costs Capacity + Energy*

RESPONSE TO ENVIRONMENTAL DEFENCE REGARDING INTERROGATORY #4

Reference:
Exhibit B-3-1, p. 8

Preamble:
In response to an email received by Hydro One on October 12, 2021 from Kent Elson[1], on behalf of Environmental Defence, Hydro One was asked to provide additional calculations on Exhibit I, Tab 3, Schedules 4 part a).

Reference:
Exhibit I, Tab 3, Schedule 4a)

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 result as an NPV figure. Please provide all the calculations, variables, and assumptions.

Interrogatory:
Please update the NPV analysis in Exhibit I, Tab 3, Schedule 4, Page 4 with an electricity price of $120/MWh and a 1.5% discount rate. The logic behind this is that (a) the HOEP excludes the real cost of electricity and (b) a societal discount rate of between 0 and 3% is appropriate for energy efficiency initiatives (per this Synapse Energy report at page 61, link).

Response:
Hydro One has performed the NPV exercise using the assumptions of an electricity price of $120/MWh and a 1.5% discount rate as requested by ED. The updated incremental NPV is negative $4.6M as shown in Tables 1 and 2 below. Hydro One does not agree with utilizing a 1.5% discount factor when assessing Transmission investments as it is not in line with Hydro One's OEB-approved Draft Rate Order for cost of capital parameters[2].

[1] Please refer to Attachment 1 to this submission.
[2] EB-2019-0082 - Hydro One Networks' 2020-2022 Transmission Revenue Requirement, Draft Rate Order, May 28, 2020 – Exhibit 1.4 page 1.

Hydro One is providing the calculations requested by ED using the parameters ED specified. This interrogatory response is not an endorsement by Hydro One of the assumptions, results or proposition posed by ED in its question.

Table 1 - Incremental Cost NPV Analysis – Between Two Options: 1433 kcmil ACSS vs. 1730 kcmil ACSS conductors, Page 1

Incremental analysis comparing two options: 1433 vs. 1730 kcmil ACSS conductors (in $k) and Discount Rate of 1.5%
For 40 Years Ended December 31st, 2065

	Total	Period 0	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Incremental Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental OM&A (Costs) | Cost Savings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating Cash Flows	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Income Tax Recovery | (Provision)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Operating Cash Flows	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Incremental Capital Expenditures for the upsize to 1730 kcmil	-18,100	-18,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental CCA Tax Shield	4,770	0	384	353	325	299	275	253	233	214	197	181	167	153	141	130	119	110	101	93	86	79	72
Incremental Line Loss Savings	12,835	0	280	267	262	262	251	255	257	253	281	291	308	332	340	378	352	339	339	339	339	339	339
Net Incremental Impact to Ratepayers	**-496**	**-18,100**	**664**	**620**	**586**	**561**	**525**	**508**	**489**	**467**	**478**	**472**	**474**	**485**	**481**	**508**	**471**	**449**	**440**	**432**	**424**	**417**	**411**
Discount Factor Full Year Discount @ 0.015		1.0000	0.9852	0.9707	0.9563	0.9422	0.9283	0.9145	0.9010	0.8877	0.8746	0.8617	0.8489	0.8364	0.8240	0.8118	0.7999	0.7880	0.7764	0.7649	0.7536	0.7425	0.7315
Annual Net Present Value		-18,100	654	601	561	528	488	465	441	414	418	407	403	406	396	412	377	353	341	330	320	310	301
Cumulative Net Present Value for the upsize to 1730 kcmil	**-4,590**	**-18,100**	**-17,446**	**-16,844**	**-16,283**	**-15,755**	**-15,267**	**-14,803**	**-14,362**	**-13,948**	**-13,530**	**-13,123**	**-12,720**	**-12,314**	**-11,918**	**-11,505**	**-11,128**	**-10,775**	**-10,433**	**-10,103**	**-9,783**	**-9,473**	**-9,173**

*With Discount Factor of 1.5%

Table 2 - Incremental Cost NPV Analysis – Between Two Options: 1433 kcmil ACSS vs. 1730 kcmil ACSS conductors, Page 2

Incremental analysis comparing two options: 1433 vs. 1730 kcmil ACSS conductors (in $k) and Discount Rate of 1.5%
For 40 Years Ended December 31st, 2065

	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	Terminal Value
Incremental Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental OM&A (Costs) | Cost Savings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating Cash Flows	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Income Tax Recovery | (Provision)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Operating Cash Flows	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Incremental Capital Expenditures for the upsize to 1730 kcmil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incremental CCA Tax Shield	67	61	56	52	48	44	40	37	34	31	29	27	24	23	21	19	18	16	15	144
Incremental Line Loss Savings	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339	0
Net Incremental Impact to Ratepayers	**405**	**400**	**395**	**391**	**386**	**383**	**379**	**376**	**373**	**370**	**368**	**365**	**363**	**361**	**359**	**358**	**356**	**355**	**354**	**144**
Discount Factor Full Year Discount @ 0.015	0.7207	0.7100	0.6995	0.6892	0.6790	0.6690	0.6591	0.6494	0.6398	0.6303	0.6210	0.6118	0.6028	0.5939	0.5851	0.5764	0.5679	0.5595	0.5513	0.5513
Annual Net Present Value	292	284	276	269	262	256	250	244	239	233	228	224	219	215	210	206	202	199	195	79
Cumulative Net Present Value for the upsize to 1730 kcmil	**-8,881**	**-8,597**	**-8,320**	**-8,051**	**-7,789**	**-7,533**	**-7,283**	**-7,039**	**-6,800**	**-6,567**	**-6,339**	**-6,115**	**-5,896**	**-5,682**	**-5,471**	**-5,265**	**-5,063**	**-4,864**	**-4,669**	**-4,590**

*With Discount Factor of 1.5%