

Hydro One Networks Inc.

7th Floor, South Tower
483 Bay Street
Toronto, Ontario M5G 2P5
www.HydroOne.com

Tel: (416) 345-5680
Cell: (416) 568-5534
Frank.Dandrea@HydroOne.com

Frank D'Andrea

Vice President, Regulatory Affairs & Chief Risk Officer



BY COURIER, RESS AND COURIER

November 4, 2019

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

Dear Ms. Long,

**EB-2019-0082 – Hydro One Network's 2020-2022 Transmission Rates Application –
Undertaking Responses J 2.2, J 3.1, J 3.2, J 3.6, J 4.1**

Attached please find the following undertaking responses in respect of the above noted proceeding:

- J 2.2: Circumstances for conductor replacement as per the EPRI report.
- J 3.1: Unit cost benchmarking studies.
- J 3.2: Updated table provided in JT 1.3 on sustainment OM&A costs.
- J 3.6: Tier 3 metric for forced outage frequency based on equipment type.
- J 4.1: Updated Table 2 in TSP 3.3.

This filing has been submitted electronically using the Board's Regulatory Electronic Submission System and two (2) hard copies will be sent via courier.

Sincerely,

ORIGINAL SIGNED BY KATHLEEN BURKE ON BEHALF OF FRANK D'ANDREA

Frank D'Andrea

Encls.

cc.EB-2019-0082 parties (electronic)

UNDERTAKING J2.2

Reference:

Exhibit B-1-1, TSP Section 1.4, Attachment 4, Figure 2-1.
 K-2.3 – OEB Staff Compendium, Capital Expenditures and Transmission System Plan Issues.

Undertaking:

Re: EPRI report, page 23, conductor replacements between 1998 and 2017, to describe the circumstances for each removal, including for example conductor age or condition assessment

Response:

As noted in the EPRI Conductor Report, Hydro One provided a total of 126 historical replacement records from 48 unique circuits, spanning the period from January 1988 to January 2017.

This data, listed below, consisted of segments from line sections that were replaced as a result of deteriorated condition or a service requirement, which necessitated an upgrade. Duplicated line sections reflect different replacements within the same line sections.

#	Circuit	Line Section	Length (km)	Installation Date	Replacement Date	Age
1	P5M	PORT ARTHUR TS #1 X CONMEE JCT	33	11/28/1943	1/1/1988	44
2	P5M	PORT ARTHUR TS #1 X CONMEE JCT	33	11/28/1943	1/1/1988	44
3	W12W	BUCHANAN TS X INGERSOLL TS	31.7	6/16/1905	1/1/1989	84
4	P5M	PORT ARTHUR TS #1 X CONMEE JCT	33	11/28/1943	1/1/1990	46
5	P5M	PORT ARTHUR TS #1 X CONMEE JCT	33	11/28/1943	1/1/1990	46
6	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	1/1/1990	69
7	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	1/1/1990	69
8	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	1/1/1990	69
9	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	1/1/1990	69
10	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	1/1/1990	69
11	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	1/1/1990	69
12	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	1/1/1990	69
13	B8W	BRANT TS X WOODSTOCK TS	35.3	11/1/1910	1/1/1990	79
14	B8W	BRANT TS X WOODSTOCK TS	35.3	11/1/1910	1/1/1990	79
15	56M1	RED ROCK JCT X NORAMPAC CTS	2.9	9/21/1937	1/1/1990	52
16	56M1	NIPIGON JCT X RED ROCK JCT	5.2	4/29/1921	1/1/1990	69
17	W8T	BUCHANAN TS X EDGEWARE JCT	17.1	12/1/1910	1/1/1990	79
18	B12	BURLINGTON TS-DUNDAS #2 JCT	12	6/30/1910	6/30/1991	81

Witness: Donna Jablonsky

19	B13	BURLINGTON TS-DUNDAS #2 JCT	12	6/30/1910	6/30/1991	81
20	57M1	RESERVE JCT X NIPIGON JCT	4.5	9/9/1924	1/1/1992	67
21	D10H	WATERLOO JCT X WALLENSTEIN JCT	18.6	8/1/1930	1/1/1994	63
22	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	1/31/1994	83
23	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	1/31/1994	83
24	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	1/31/1994	83
25	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	2/28/1994	73
26	H2JK	MANBY TS X RIVERSIDE JCT	5.5	7/4/1951	4/30/1994	43
27	H2JK	MANBY TS X RIVERSIDE JCT	5.5	7/4/1951	4/30/1994	43
28	H2JK	MANBY TS X RIVERSIDE JCT	5.5	7/4/1951	4/30/1994	43
29	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	5/31/1994	83
30	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	5/31/1994	83
31	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	5/31/1994	83
32	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	6/30/1994	84
33	A1N	VANESSA JCT X NORFOLK TS	12	1/28/1940	7/31/1994	55
34	W8T	BUCHANAN TS X EDGEWARE JCT	17.1	12/1/1910	9/30/1994	84
35	W8T	BUCHANAN TS X EDGEWARE JCT	17.1	12/1/1910	9/30/1994	84
36	Q4N	BECK GS #1 X PORTAL JCT	4.6	1/1/1922	9/30/1994	73
37	A1N	VANESSA JCT X NORFOLK TS	12	1/28/1940	9/30/1994	55
38	P33C	IPB OTTAWA RIVER JCT X CHATS FALLS JCT	6.7	10/1/1928	4/30/1995	67
39	P33C	IPB OTTAWA RIVER JCT X CHATS FALLS JCT	6.7	10/1/1928	4/30/1995	67
40	A1N	VANESSA JCT X NORFOLK TS	12	1/28/1940	6/30/1995	55
41	D10H	PALMERSTON TS X HANOVER TS	41.4	8/1/1930	7/31/1995	65
42	D10H	PALMERSTON TS X HANOVER TS	41.4	8/1/1930	7/31/1995	65
43	H2JK	MANBY TS X RIVERSIDE JCT	5.5	7/4/1951	7/31/1995	44
44	H2JK	MANBY TS X RIVERSIDE JCT	5.5	7/4/1951	7/31/1995	44
45	P33C	IPB OTTAWA RIVER JCT X CHATS FALLS JCT	6.7	10/1/1928	8/31/1995	67
46	D10H	WALLENSTEIN JCT X PALMERSTON TS	29.2	8/1/1930	2/29/1996	66
47	D10H	WATERLOO JCT X WALLENSTEIN JCT	18.6	8/1/1930	2/29/1996	66
48	Q3L	BECK GS #1 X PORTAL JCT	4.6	1/1/1922	5/1/1996	74
49	D8S	LEONG JCT X ST.MARYS TS	56.9	12/1/1910	6/24/1996	86
50	L1MB	MILLE ROCHES JCT X LUNENBURG JCT	8.4	7/29/1934	10/15/1997	63
51	D10H	WATERLOO JCT X WALLENSTEIN JCT	18.6	8/1/1930	6/15/1998	68
52	B1S	BARRETT CHUTE #2 JCT X ARDOCH JCT	38.5	7/20/1937	9/9/1998	61
53	B1S	BARRETT CHUTE #2 JCT X ARDOCH JCT	38.5	7/20/1937	10/1/1998	61
54	B1S	BARRETT CHUTE #2 JCT X ARDOCH JCT	38.5	7/20/1937	10/1/1998	61
55	L1S	CRYSTAL FALLS TS X VERNER JCT	20.2	8/28/1937	12/10/1998	61
56	L1S	CRYSTAL FALLS TS X VERNER JCT	20.2	8/28/1937	12/10/1998	61
57	B1S	BARRETT CHUTE #2 JCT X ARDOCH JCT	38.5	7/20/1937	5/20/1999	62
58	Q2AH	Beamsville TS x Saltfoot Jct	23.6	10/1/1922	2/7/2002	79

59	Q2AH	Saltfleet Jct. x Beach TS	3.9	10/1/1922	2/27/2002	79
60	Q2AH	Louth Jct x Beamsville TS	17.5	10/1/1922	3/4/2002	79
61	D1A	Hoopers Jct x St. John Valley	3.3	9/14/1943	4/21/2002	59
62	P3S	Sidney TS x Dale Jct	57.2	8/7/1928	7/26/2002	74
63	P3S	Sidney TS x Dale Jct	57.2	8/7/1928	7/29/2002	74
64	P3S	Sidney TS x Dale Jct	57.2	8/7/1928	7/30/2002	74
65	H27H	Hinchinbrooke TS x Havelock TS - South Phase	98.2	11/26/1929	8/1/2002	73
66	H27H	Hinchinbrooke TS x Havelock TS - North Phase	98.2	11/26/1929	8/1/2002	73
67	C25H	Chats Falls x Havelock TS - Centre Phase	171.7	10/1/1928	8/7/2002	74
68	C25H	Chats Falls x Havelock TS - South Phase	171.7	10/1/1928	8/7/2002	74
69	A6P	RESERVE JCT X PORT ARTHUR TS -Bottom Phase	91.1	11/20/1920	9/24/2002	82
70	A6P	RESERVE JCT X PORT ARTHUR TS #1	91.1	11/20/1920	9/26/2002	82
71	C25H	Chats Falls x Havelock TS - North Phase	171.7	10/1/1928	10/1/2002	74
72	C25H	Chats Falls x Tower #209	6.6	10/1/1928	2/10/2004	75
73	C25H	Chats Falls x Tower #209 - 1/4 span from tower #15	6.6	10/1/1928	2/10/2004	75
74	A5RK	RIVERDALE JCT-OVERBROOK TS	2.1	6/15/1947	6/15/2004	57
75	Q2AH	LOUTH JCT-CHERRY JCT	12.3	12/31/1921	12/31/2005	84
76	Q2AH	CHERRY JCT-BEAMSVILLE TS	5.2	12/31/1921	12/31/2005	84
77	Q5G	LOUTH JCT-CHERRY JCT	12.3	12/31/1921	12/31/2005	84
78	Q5G	CHERRY JCT-BEAMSVILLE TS	5.2	12/31/1921	12/31/2005	84
79	Q2AH	WEST LINCOLN CSS-WINONA TS	17.3	12/21/1921	12/21/2007	86
80	Q2AH	WINONA TS-SALTFLEET JCT	4.5	12/21/1921	12/21/2007	86
81	Q2AH	SALTFLEET JCT-Q2AH 254 JCT	3.5	12/21/1921	12/21/2007	86
82	Q5G	BEAMSVILLE TS-WEST LINCOLN CSS	1.9	12/21/1921	12/21/2007	86
83	A4K	CYRVILLE MTS-CYRVILLE JCT	1.9	7/15/1954	7/15/2008	54
84	L1S	CONISTON TS-SUDBURY JCT	8.8	6/14/1949	6/14/2009	60
85	L1S	SUDBURY JCT-MARTINDALE TS	2.1	7/10/1948	7/10/2009	61
86	M31W	INGERSOLL JCT-KARN TS	11.2	10/7/1909	10/7/2010	101
87	M32W	INGERSOLL JCT-KARN TS	11.2	10/7/1909	10/7/2010	101
88	K12	KARN TS-WOODSTOCK TS	2.3	10/7/1909	10/7/2010	101
89	K4	MACASSA #3 JCT-MATACHEWAN JCT	47.2	6/1/1924	6/1/2011	87
90	N21W	LUCASVILLE JCT-BOSTWICK ROAD JCT	26.9	9/15/1959	9/15/2011	52
91	N22W	LUCASVILLE JCT-BOSTWICK ROAD JCT	26.9	9/15/1959	9/15/2011	52
92	L14W	LEASIDE 2 JCT-BAYVIEW JCT	0.5	6/23/1928	6/23/2012	84
93	L14W	LEASIDE 2 JCT-BAYVIEW JCT	0.7	6/23/1928	6/23/2012	84
94	L14W	LEASIDE 2 JCT-LEASIDE TS	0.5	6/23/1928	6/23/2012	84
95	L14W	BIRCH JCT-BRIDGMAN JCT	1.4	6/24/1928	6/24/2012	84
96	L20D	KIPLING GS-HARMON JCT	4.5	12/13/1966	12/13/2012	46
97	A6P	RESERVE JCT-PORT ARTHUR TS #1	19	12/21/1920	12/21/2012	92
98	A6P	RESERVE JCT-PORT ARTHUR TS #1	15.9	12/21/1920	12/21/2012	92

Witness: Donna Jablonsky

99	A6P	RESERVE JCT-PORT ARTHUR TS #1	29.6	12/21/1920	12/21/2012	92
100	A6P	RESERVE JCT-PORT ARTHUR TS #1	5.3	12/21/1920	12/21/2012	92
101	D3A	HOOOPER'S JCT-ST.JOHNS VALLEY JCT	3.4	5/20/1943	5/20/2013	70
102	D1A	HOOOPER'S JCT-ST.JOHNS VALLEY JCT	3.4	6/28/1943	6/28/2013	70
103	M2W	MANITOUWADGE JCT B-MANITOUWADGE DS #1	0.1	10/7/1955	10/7/2013	58
104	M2W	MANITOUWADGE JCT B-MANITOUWADGE DS #1	0.1	10/7/1955	10/7/2013	58
105	D1A	DECEW FALLS SS-HOOOPER'S JCT	0.2	10/17/1954	10/17/2013	59
106	L24L	LAMBTON TS #2-LAMBTON JCT	3.1	1/17/1970	1/17/2014	44
107	H3L	HEARN SS-BASIN TS	0.2	3/20/1959	3/20/2014	55
108	D3A	DECEW FALLS SS-HOOOPER'S JCT	0.2	4/19/1943	4/19/2014	71
109	C27P	CHATS FALLS SS-GALETТА JCT	12.9	6/1/1932	6/1/2014	82
110	H27H	BANNOCKBURN JCT-HAVELOCK TS	30	11/26/1929	11/26/2014	85
111	D10S	VANSICKLE TS-LOUTH JCT	0.9	11/8/1952	11/8/2015	63
112	D9HS	VANSICKLE TS-LOUTH JCT	0.9	11/8/1952	11/8/2015	63
113	61M18	CONSTANCE DS-GODERICH TS	0.1	12/10/1959	12/10/2015	56
114	61M18	CONSTANCE DS-GODERICH TS	0	12/10/1959	12/10/2015	56
115	D10S	LOUTH JCT-GLENDALE TS	0.1	1/19/1922	1/19/2016	94
116	D9HS	LOUTH JCT-GLENDALE TS	6.1	1/19/1922	1/19/2016	94
117	D9HS	LOUTH JCT-GLENDALE TS	0.1	1/19/1922	1/19/2016	94
118	D9HS	LOUTH JCT-GLENDALE TS	6.1	1/19/1922	1/19/2016	94
119	C25H	CHATS FALLS SS-HAVELOCK TS	170.9	3/31/1932	3/31/2016	84
120	C25H	CHATS FALLS SS-HAVELOCK TS	170.9	3/31/1928	3/31/2016	88
121	S2B	ESPANOLA A JCT-ESPANOLA TS	0.2	5/8/1975	5/8/2016	41
122	S2B	EDDY TAP A JCT-ESPANOLA TS	0.1	5/8/1951	5/8/2016	65
123	H9W	WEST LINCOLN CSS-WINONA TS	17.3	5/26/1922	5/26/2016	94
124	H24C	MARINE JCT-OSHAWA NORTH JCT	54.5	11/4/1929	11/4/2016	87
125	Q12S	BECK #1 SS-WARNER ROAD JCT	0.3	1/1/1922	1/1/2017	95
126	B20P	BRUCE A TS-BRUCE HW PLANT D JCT	0.3	1/27/1975	1/27/2017	42

UNDERTAKING J3.1

1
2
3 **Reference:**

4 JT-2.28

5
6 **Undertaking:**

7 To look for and file available reports on unit cost benchmarking.

8
9 **Response:**

10 Power Systems Engineering (“PSE”) included a total cost benchmarking report at Exhibit
11 A, Tab 4, Schedule 1, Attachment 1. PSE determined that Hydro One’s total factor
12 productivity has consistently been greater than that of the transmission industry as a
13 whole. This was further confirmed by PSE’s findings from the total cost benchmarking
14 study, which shows that Hydro One’s actual costs are well below benchmarked costs.

15
16 In EB-2016-0160, Hydro One submitted an independent Transmission Total Cost
17 Benchmarking Study (“Navigant TCB study”)¹ that compared Hydro One’s performance
18 against a group of peer utilities. In respect of costs, the Navigant TCB study concluded
19 as follows:

- 20
- 21 • In 2014, Hydro One’s total transmission expenditure (OM&A and CAPEX) was
22 below the median of the peer group, 9.1% of the gross book value of in-service
23 transmission assets (“gross asset value”) compared to a median value of 13.9%
 - 24 • In 2014, Hydro One’s direct transmission expenditure (O&M and CAPEX) was
25 among the lowest in the peer group, 6.5% of gross asset value compared to a
26 median value of 9.7%
 - 27 • Hydro One’s direct transmission O&M was at the median of the peer group in
28 2014, 1.6% of gross asset value compared to a median value of 1.8%
 - 29 • Hydro One’s CAPEX was among the lowest in the peer group in 2014, 4.8% of
30 gross asset value compared to a median value of 6.6%
- 31

32 Hydro One does not have any further reports on unit cost benchmarking. Hydro One’s
33 work program is divided into projects and programs. Unit cost analysis is relevant for
34 programs that contain high volumes and generally repeatable units (e.g. insulator

¹ The TCB study was submitted as Exhibit B2, Tab2, Schedule 1, Attachment 1 in EB-2016-0160

1 replacements, wood pole replacements). Programs of this nature generally account for
2 20%-30% of the transmission capital expenditure.

3

4 The remainder of the transmission capital expenditure is comprised of projects.
5 Benchmarking project costs from one utility to the next, or even one project to the next in
6 the same utility is not a meaningful measure due to the variability between projects. This
7 is because each project will have unique scope, engineering requirements, construction
8 means and methods, equipment requirements, etc., which will inform the budget and
9 schedule.

10

11 Instead, project definition and governance processes are the most effective way to deliver
12 projects in an efficient and economic manner. Project definition and governance facilitate
13 a robust project execution plan which captures scope, schedule and cost requirements and
14 which identify potential risks to executing the project per plan. Hydro One has a robust
15 project definition and governance process that has been developed and improved in
16 recent years, and which is detailed in Exhibit B, Tab 2, Schedule 1. These enhancements
17 were made in part to address the recommendations in the Navigant TCB Study. In
18 addition, Hydro One has implemented enhanced project and portfolio reporting
19 capabilities and has identified a number of relevant metrics. These are listed in JT-1.16,
20 with objectives and if applicable, targets as presented in J-1.3.

UNDERTAKING J3.2

Reference:

JT-1.3 & K-3.3

Undertaking:

To update the table provided at JT-1.3, breakdown of sustainment OM&A, to include a column showing the average for 2015-2019.

Response:

The following table provides a breakdown of the subset of sustainment OM&A costs provided in Undertaking JT-1.03. The average for 2015 to 2019 is based on 2015-2018 actuals and 2019 forecasted spend. Detailed explanations for 2019 and 2020 are included in Undertaking JT-1.03.

Sustainment OM&A (\$ millions)	2015-2018 Actual	2015-2018 Actual & 2019 Forecast	2019 Forecast	2020 Forecast
	A	$D=(A \times 4+B)/5$	B	C
Power equipment preventative maintenance	20.6	19.5	15.2	17.6
Transformer refurbishments	4.7	4.2	2.4	3.9
Site infrastructure maintenance	23.0	22.3	19.8	21.3
Vegetation management	32.6	31.9	29.7	31.9
Overhead lines maintenance	17.1	16.5	14.0	17.2
Total	98.0	94.4	81.1	91.9

UNDERTAKING J3.6

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

Reference:
TSP 2.2 p 4

Undertaking:
To provide the data for the tier 3 metric, percentage of forced outages caused by equipment type for the last five years

Response:
The tier 3 metric identified in the previous rate application relates to equipment outages, irrespective of whether there is a customer interruption. The following table reflects the percent distribution of the tier 3 metric for forced outage frequency based on major equipment type over the last five years:

	2014	2015	2016	2017	2018	5-Year Total Ave
Line	23.1%	27.0%	41.5%	35.9%	44.7%	35.3%
Breaker	57.1%	47.3%	41.5%	45.7%	33.5%	44.1%
Transformer	16.4%	21.6%	13.5%	14.7%	18.4%	17.0%
Other	3.3%	4.0%	3.5%	3.6%	3.2%	3.6%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

UNDERTAKING J4.1

Reference:

TSP 3.3

Oral Hearing Volume 4, Page 1, Line 12 – Page 2, Line 5

Undertaking:

To update the Table 2 in the TSP 3.3, page 3 to include a column showing 2018 Q2 actuals and 2019 Q2 actuals.

Response:

2019 Q2 actual results are not indicative of 2019 full year results as overall expenditures are not necessarily incurred uniformly through the year. As evident from the table below, 2018 Q2 expenditures reflect 44% of the total capital expenditures for 2018. In 2019, Q2 expenditures represent 43% of the total capital expenditures forecasted for 2019.

OEB Category (in \$ millions)	Historical	Historical	Bridge	Bridge	Forecast				
	2018 Q2	2018	2019 Q2	2019	2020	2021	2022	2023	2024
	Actual	Actual	Actual	F/Cast	Test	Test	Test	Plan	Plan
System Access	12.8	33.7	13.6	45.1	24.8	11.3	11.7	12.7	4.1
System Renewal	359.8	776.2	372.5	773.3	865.2	1,103.1	1,172.8	1,177.4	1,193.8
System Service	33.6	73.9	36.7	103.8	204.1	148.2	151.8	174.3	204.2
General Plant	23.7	83.6	22.6	116.3	115.4	94.4	94.7	83.6	58.9
Progressive Productivity Placeholder				0.0	-17.0	-39.0	-61.0	-78.0	-91.0
Directive ¹				-0.3	-0.3	-0.3	-0.4	-0.4	-0.4
Total	430.0	967.3	445.4	1,038.2	1,192.2	1,317.7	1,369.6	1,369.6	1,369.6
Pension Adjustment Dec 31, 2018 Valuation ²				-3.2	-4.2	-5.2	-5.4	-5.4	-5.4
Updated Total				1,035.0	1,188.0	1,312.5	1,364.2	1,364.2	1,364.2

¹ The Directive adjustment reflects the impact of the directive issued by Ontario's Management Board of Cabinet on February 21, 2019 and the associated framework they approved on March 7, 2019. Refer to Exhibit F, Tab 4, Schedule 1 for further details.

² As per J1.1

Witness: Andrew Spencer