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November 28, 2014

via RESS – signed original to follow by courier

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
PO Box 2319
2300 Yonge Street, 27th floor
Toronto, ON M4P 1E4

Dear Ms. Walli:

Re: Toronto Hydro-Electric System Limited ("Toronto Hydro")
Custom Incentive Rate-setting Application for 2015-2019 Electricity Distribution Rates and Charges – Outstanding Undertaking Response
OEB File No. EB-2014-0116

Toronto Hydro writes to the Ontario Energy Board ("OEB") in respect of the above-noted matter.

On November 24, 2014, Toronto Hydro filed its responses to all undertakings provided at the Technical Conference on November 17 and 18, 2014, with the exception of Undertaking TCQ J1.7. Enclosed is the response to this Undertaking.

Please do not hesitate to contact me if you have any questions.

Yours truly,

[original signed by]

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:encl.

:DC\acc

cc: Charles Keizer and Crawford Smith
Intervenors of Record for EB-2014-011

TECHNICAL CONFERENCE UNDERTAKING RESPONSE TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. J1.7 and Response to Member Quesnelle''s Question Posed during the Evidence Presentation":

Reference(s):

To calculate the financial life of a portion of the assets and economic life of a portion of the assets, on a best efforts basis and provide it if it is relevant; otherwise advise if it is not relevant.

RESPONSE:

In the course of the Evidence Conference, Member Quesnelle asked Toronto Hydro to comment on the relationship between the financial treatment of assets (i.e., Financial Useful Life) and the optimal replacement strategy embodied in the steady state concept (i.e., Economic End-of-Life). What follows in this response demonstrates that the financial assumptions that are made for financial reporting purposes have a dynamic relationship to good engineering, system care and economic decision-making.

The distribution system is in steady state when the backlog of assets operating beyond end-of-life and hence the aggregate operating (or lifecycle) cost is effectively minimized. Toronto Hydro uses a variety of measures to inform its judgment regarding the optimal replacement strategy, which balances system needs with value for ratepayers. (These concepts are explained in Exhibit 2B, Section D.)

TECHNICAL CONFERENCE UNDERTAKING RESPONSE TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

As indicated in the evidence, the most compelling approach from an economic perspective is to immediately replace the backlog of assets operating beyond end-of-life so that the cost of ownership would be balanced sooner. However, Toronto Hydro has adopted a paced approach for the CIR application. The utility's capital needs currently exceed depreciation. Capital expenditures are expected to converge towards deprecation over time if the investments reflected in the application are made as and when required.

While capital costs and depreciation are expected to converge, this not the same as saying that the Financial Useful Life of assets (i.e., depreciation periods) will converge with their Economic End-of-Life values (i.e., optimal replacement time). These two measures are fundamentally different. The financial lives are based on the range of expected service lives of asset classes as derived from the 2009 "Useful Life of Assets" study.[1] In contrast, the economic lives are determined on an individual basis for each asset based on its particular age and condition (if information is available) and its risk cost.[2]

For these reasons, Economic End-of-Life could not be used to calculate the Financial Useful Life and associated depreciation expense under MIFRS. The economic lives of individual assets within an asset class can vary substantially (for an example see Undertaking J1.15) and can change based on changes in system configuration. Thus economic lives do not offer a consistent and stable metric for recovery of capital cost."

The intent of this undertaking and the other two undertakings that were provided with respect to the concept of "useful life" (namely J1.14 and J1.16) is to facilitate a

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[1] Prepared by Kinectrics for Toronto Hydro and filed in EB-2010-0142 (Exhibit Q1, Tab 2)

[2] Risk cost is largely a product of the excess cost to replace an asset on an emergency basis and the interruption cost experienced by customers if it fails, which in turn is based on each individual asset's particular configuration within the distribution system.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

comparison of three useful life metrics that Toronto Hydro utilizes – Financial Useful Life, Useful Life, and Economic End-of-Life – and to explain the relationship between the metrics and how they relate to Toronto Hydro's capital needs.

In the response that follows, Toronto Hydro provides: (1) definitions of the three metrics; (2) an explanation of how these metrics are derived and applied in Toronto Hydro's financial and investment planning policies and processes; and (3) a table, filed as Appendix A, comparing the asset age values for each of the three concepts for various asset classes.

Metrics Definitions

The three metrics in question are defined as follows:

- Financial Useful Life (also previously referred to as "depreciation life") is the period over which an asset is depreciated, resulting in depreciation expense.
- Useful Life (also referred to as "end-of-life" or previously referred to as "engineering end-of-life") is the mean service life of the asset. This metric is used as part of the Current-State System Analysis to determine the percentage of assets at, approaching or beyond their useful lives, and is also used as one of several inputs in the failure probability calculation for assets within the Feeder Investment Model (FIM).
- Economic End-of-Life (also known as "Optimal Intervention Time") is used to determine the intervention time of an existing asset, based upon the optimal relationship between the minimum life cycle cost of the new asset to be installed and the existing asset's risk cost. See Exhibit 2B, Section D3, Figure 3, page 8, which is reproduced on page 6 of this response.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

Generally, Toronto Hydro uses these metrics and models as tools and indicators to inform decision-making processes. Planning engineers consider the Useful Life and Economic End-of-Life metrics and use their outputs to inform their exercise of professional judgment in the management of asset risk and system reliability. Financial Useful Life is used to account for Toronto Hydro's rate base. Ultimately, decisions whether to replace assets sooner or later than on the basis of one or more of these indicators are based on a number of considerations that must be taken into account in prudent utility management and investment. These include operating characteristics, execution considerations, customer needs, and service obligations.

The following subsections further explain how these metrics are applied in Toronto Hydro's financial and investment planning policies and processes.

Financial Useful Life

Based upon the conclusions of the independent detailed review of useful lives conducted by Kinectrics (please refer to the 2009 Kinectrics "Useful Life of Assets" report filed in EB-2010-0142 at Exhibit Q1, Tab 2), Toronto Hydro implemented certain changes in accounting estimates related to the manner in which it records and accounts for its property, plant and equipment in accordance with the OEB's reporting standards. The changes in estimates of Financial Useful Lives of assets were reflected in the corresponding depreciation and amortization balances in Toronto Hydro's financial statements effective January 1, 2011, and in Toronto Hydro's last rebasing application (EB-2010-0142). The Financial Useful Lives were within the ranges provided by Kinectrics.

TECHNICAL CONFERENCE UNDERTAKING RESPONSE TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

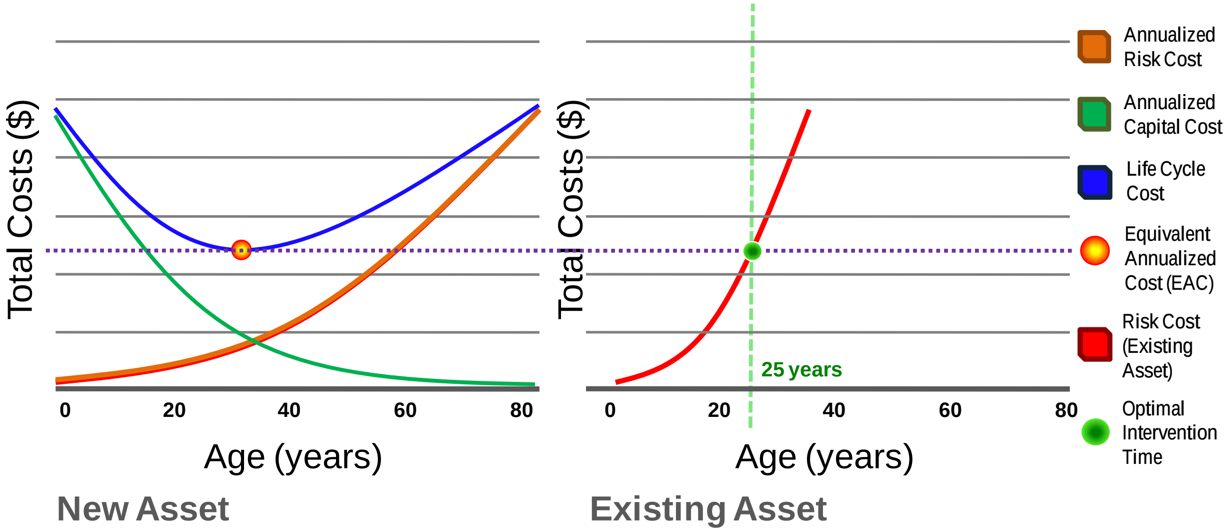
Useful Life

Useful Life values are also derived from the 2009 Kinectrics "Useful Life of Assets" report. As previously explained in the interrogatory response to OEB Board Staff 36 (b), the Useful Life is calculated by identifying the mid-point between the "minimum useful life" and the "maximum useful life" values as defined within the Kinectrics report. Many of the hazard rate distribution functions used to determine the age-based failure probability within the FIM for a given asset have been calibrated using these Useful Life values. These values are also used as part of the Current-State System Analysis (explained in Section D3.1.1.1 of Toronto Hydro's Distribution System Plan) in order to determine the replacement value of assets prior to, approaching or exceeding their useful lives.

Economic End-of-Life

The figure below provides a graphical representation of Economic End-of-Life. On the left side of the figure, the life cycle cost of a new asset (illustrated by the blue curve) is calculated by performing the simple sum of the annualized capital cost (illustrated by the green curve) and the annualized risk cost (illustrated by the orange curve).

TECHNICAL CONFERENCE UNDERTAKING RESPONSE TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO



The annualized capital cost is derived from the cost of replacing the existing asset with the new asset – this cost has been annualized as a yearly cost across the life-cycle of the new asset. The minimum life-cycle cost – also referred to as the Equivalent Annualized Cost (EAC) – will be cross-referenced against the existing asset's risk cost curve – illustrated by the red curve on the right side of the figure – in order to determine the optimal intervention time, also known as the Economic End-of-Life of the existing asset. At this point, it becomes more cost-efficient to replace the existing asset than to continue operating it.

Comparison of Metrics Values

To compare the three metrics, Toronto Hydro has included a table in Appendix A that shows the Financial Useful Life for each of Toronto Hydro's distribution asset classes, along with the Useful Life and Economic End-of-Life for each of these classes where applicable and available. The Economic End-of-Life results are presented as a range of

TECHNICAL CONFERENCE UNDERTAKING RESPONSE TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

values because these values vary from asset to asset. In contrast, Financial Useful Life and Useful Life values are in each case the same for all assets within a given asset class.

Please note that the Useful Life and Economic End-of-Life results in Appendix A have not been provided for all Financial Useful Life asset classes. Useful Life is given only for the subset of asset classes where this metric is applied within the AM Planning Process. Ranges of Economic End-of-Life values are currently unavailable for certain asset classes because they have not been modeled or there is insufficient data for the purposes of this exercise.

Conclusion

Toronto Hydro's capital needs for the five-year CIR period are demonstrated by the number of assets operating beyond Useful Life and the rate at which existing assets continue to reach the end of Useful Life (i.e., the 26% and 7% figures shown on Slide 8 of Exhibit EC1). The backlog of assets requiring renewal in the 2015-2019 period are already operating well beyond their Economic End-of-Life. As a consequence, within this period, the FIM is a tool to establish the relative priority of program expenditures. As detailed in slide 24 of the Evidence Conference (Exhibit EC1), Toronto Hydro uses a number of decision-support systems to plan investments. The capital plan that Toronto Hydro has proposed is a consequence of engineering judgment based on rigorous asset management processes and tools, assumptions and data points, all of which are informed by, but not solely based on, the metrics and indicators of useful life discussed in this response.

	Asset	USoA Account Number	USoA Account Description	Depreciation Useful Life	Useful Life		Economic End of Life 1		
							Min	Mid	Max
	Poles	1830	Poles, Towers and Fixtures	40 - 50	Poles - Wood, Concrete, Steel	45	3	61	100*
	OH Switch	1835	Overhead Conductors and Devices	30	OH Switch - Load Break	40	2	27	100*
					OH Switch - Disconnect	45	1	32	83
					OH Switch - SCADAMATE	40	2	11	100*
	O/H SMD - 20 Switches	1835	Overhead Conductors and Devices	45	NA		NA	NA	NA
	OH Primary Conductors	1835	Overhead Conductors and Devices	50	OH Primary Conductor	64	NA	NA	NA
	OH Secondary Conductors	1855	Services	50	OH Secondary Conductor	64	NA	NA	NA
	OH Transformers	1850	Line Transformers	30	OH TX	35	1	39	114*
Stations	Power Transformers	1815	Transformer Station Equipment - Normally Primary Above 50 kV	32	Stations - Power TX	44	NA	NA	NA
		1820	Distribution Station Equipment - Normally Primary Below 50 kV	32			NA	NA	NA
	AC Station Service Equip (TS)	1815	Transformer Station Equipment - Normally Primary Above 50 kV	32	NA		NA	NA	NA
	AC Station Service Equip (MS)	1820	Distribution Station Equipment - Normally Primary Below 50 kV	32	NA		NA	NA	NA
	Stations Grounding Transformer	1820	Distribution Station Equipment - Normally Primary Below 50 kV	25 - 30	NA		NA	NA	NA
	Stations - DC Batteries	1820	Distribution Station Equipment - Normally Primary Below 50 kV	10	Stations - DC Batteries	10	NA	NA	NA
	Storage Battery Equipment	1825	Storage Battery Equipment	15	NA		NA	NA	NA
	DC Station Service Battery Charger	1820	Distribution Station Equipment - Normally Primary Below 50 kV	20	NA		NA	NA	NA
	Stations Switchgear	1820	Distribution Station Equipment - Normally Primary Below 50 kV	40	Stations - Switchgear Enclosures	50	NA	NA	NA
	Substation Equipment - Outdoor Breaker	1820	Distribution Station Equipment - Normally Primary Below 50 kV	30	CB - Air Blast	40	NA	NA	NA
					CB - Magnetic Air	43	NA	NA	NA
					CB - SF6	45	NA	NA	NA
					CB - Vacuum	45	NA	NA	NA
					CB - Oil	45	NA	NA	NA
	Transformer Station Equip - Disconnect Switch	1815	Transformer Station Equipment - Normally Primary Above 50 kV	30	NA		NA	NA	NA
	Substation Equipment - Disconnect Switch	1820	Distribution Station Equipment - Normally Primary Below 50 kV	30	NA		NA	NA	NA
	Digital & Numeric Relays	1980	System Supervisory Equipment	20	NA		NA	NA	NA
	Transformer Station Equip - Steel Structure & OH Bus	1815	Transformer Station Equipment - Normally Primary Above 50 kV	35	NA		NA	NA	NA
	Transformer Station Equip - Steel Structure & OH Bus	1820	Distribution Station Equipment - Normally Primary Below 50 kV	35	NA		NA	NA	NA
	UG Primary Cable - PILC	1845	Underground Conductors and Devices	60	UG Primary Cable - PILC	75	31	100	100*
	UG Primary (Direct Buried)	1845	Underground Conductors and Devices	20	UG Primary Cable - DB Jacketed	40	23	49	100
					UG Primary Cable - DB Unjacketed	23	8	36	66
					UG Primary Cable - Conduit, Jacketed	50	21	62	100*

	Asset	USoA Account Number	USoA Account Description	Depreciation Useful Life	Useful Life		Economic End of Life 1		
							Min	Mid	Max
UG	U/G Dist Lines And Feeders - Primary Cable in Duct	1845	Underground Conductors and Devices	40	UG Primary Cable - Conduit, Unjacketed	50	17	52	100*
					UG Primary Cable - Concrete, Unjacketed	50	20	63	100*
					UG Primary Cable - Concrete, Jacketed	50	21	62	100*
	UG Secondary Cable Direct Buried	1845	Underground Conductors and Devices	20	UG Secondary Cable - DB	23	NA	NA	NA
	UG Secondary Services - Direct Buried	1855	Services	20			NA	NA	NA
	UG Secondary Cable - In Duct	1845	Underground Conductors and Devices	40	UG Secondary Cable - Conduit	50	NA	NA	NA
	UG Secondary Services - In Duct	1855	Services	40			NA	NA	NA
	UG Network Transformers	1850	Line Transformers	20	UG Network Units - Fibertop	30	12	47	67
					UG Network Units - Semi-Dust-Type	30	3	44	100*
					UG Network Units - Submersible	30	2	100	100*
	UG Transformers	1850	Line Transformers	30	UG TX - Pad-Mounted	35	3	21	90
					UG TX - Submersible	33	3	21	100*
	Vaults	1840	Underground Conduit	40	Civil - Network Vaults	60	5	70	100*
					Civil - UG Submersible Tx Vault	60	NA	NA	NA
	Vault Roofs	1840	Underground Conduit	20	Civil - Network Vaults Roofs	25	NA	NA	NA
	Vault Switches	1845	Underground Conductors and Devices	30	UG Switch - Minirupter	40	3	32	100*
	UG Switches - Padmount Switchgear	1845	Underground Conductors and Devices	20	UG Switch - PMH	30	7	100	100*
					UG Switch - SF6	40	8	26	100*
					UG Switch - SF6 PAD SCADA	35	10	100	100*
	Civil - Duct Structures	1840	Underground Conduit	30	NA		NA	NA	NA
	Cable Chambers	1840	Underground Conduit	50	Civil - Cable Chambers	65	NA	NA	NA
	Cable Chambers - Roof	1840	Underground Conduit	20	Civil - Cable Chambers Roof	25	NA	NA	NA
	System Supervisory Equipment	1835	System Supervisory Equipment	30	NA		NA	NA	NA
		1980	System Supervisory Equipment	15 - 30	NA		NA	NA	NA
Meters	Residential Energy Meters	1860	Meters	25	Residential Energy Meters	18	NA	NA	NA
	Industrial/Commercial Energy Meters	1860	Meters	25	Industrial/Commercial Energy Meters	18	NA	NA	NA
	Wholesale Energy Meters	1860	Meters	25	Wholesale Energy Meters	18	NA	NA	NA
	Current & Potential Transformer (CT & PT)	1860	Meters	25 - 40	Current & Potential Transformer (CT & PT)	18	NA	NA	NA
	Smart Meters	1860	Meters	15	Smart Meters	18	NA	NA	NA
		1970	Load Management Controls - Customer Premises	10		18	NA	NA	NA

Note 1: In some cases, the Economic End-of-Life results at the minimum range will indicate assets at a very young age that require replacement – this may be due to the manner in which these assets are connected, as a significant amount of customers may experience an outage should those assets fail. In these instances, the FIM could be indicating that it is worthwhile to reconfigure the existing state of assets such that a reduced amount of customers are exposed to an impact of failure. On the maximum end of the range, there are certain assets that have received Economic End-of-Life results of 100 or 114 years of age (marked with asterisks in this table) – in actuality, these Economic End-of-Life results represent the limits of the time domain that is being evaluated within the FIM, and the actual Economic End-of-Life results in these instances may be a higher age beyond these time intervals.