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Report of Navigant Consulting, Inc.
To The Ontario Energy Board

Transmission System Code Review – Phase 1
Determination Of The Remaining Value
Of An Asset

December 9, 2003

Prepared by

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Overview

The Ontario Energy Board (OEB) has retained Navigant Consulting, Inc. (NCI) to review and analyze proposed approaches for determining the remaining value of transmission assets. The issues NCI addresses herein are outlined in a report issued to the OEB following a settlement conference of parties participating in the Phase 1, Transmission Code Review.[1] The settlement conference was held September 9 through 16 in accordance with Procedural Order No. 4, dated July 30, 2003 of this Proceeding. Participants in the conference identified seven key issues that are discussed in a document titled, *Facilitator's Report to the Board on the Results of the Settlement Conference*.

The outcome of settlement discussions included a recommendation to further explore methods for determining the remaining value of a transmission asset.[2] Pages 1 through 5 (and Item 1.a) in the facilitator's report highlight advantages and disadvantages of candidate approaches raised by stakeholders to calculate Net Book Value (NBV). Certain parties believe "it would be more acceptable if the remaining asset life were adjusted by Iowa curves or other appropriate annuity adjustments to reflect the changed life expectancy of the asset at the time the valuation is being undertaken." The proposed approach was formulated by Board staff to explore the workability of one of the options explored in the "Settlement Conference." Our report includes a calculation of the remaining value of a representative set of transmission assets based on NBV with an adjustment to reflect dispersion measurement using methods developed by Iowa State University using the approach proposed by Board staff.

Scope

Navigant Consulting, Inc.'s primary objective is to review the proposed approach, and assess whether such an approach could be reasonably implemented, and if not, to recommend alternate approaches. The approach is applied only to Transformer Connection assets; NCI makes no assertions regarding the applicability of these method or concepts as applied to Line Connection assets.

Key tasks include:

(1). Determine whether the proposal to determine NBV using Iowa dispersion curve adjustment methods is workable.

(2). Identify the depreciation policies for transmitters, including interval cycles used to update depreciation studies (e.g., 3 to 7 years often is cited as typical cycle range).

(3). Identify the effort level and cost for a depreciation study for a company the size of Hydro One or TransEnergy (Hydro Quebec's transmission business unit).

[1] Transmission System Code Review Proceeding – RP-2002-0120

[2] Principle #5; Proposition #3, Bypass; Proposition #8, Available Capacity

(4). Offer opinions regarding the workability of the approach, with recommendations for change(s), if required, to enhance the "workability" of the approach.

(5). Determine how often utilities update depreciation studies, focusing in particular on transmission assets (if such studies are performed independently of other utility assets).

(6). Complete one example of the NBV approach for a Transformer Connection asset; specifically, a Transformer Station (TS). Demonstrate how the proposed approach would work through the determination of variances in asset lives of various groups as well as the adjustment to the NBV of the various types of assets, leading to a determination of the adjusted NBV for TS.

(7). Discuss options a transmitter has with respect to accounting treatment when bypass events occur. This subtask addresses the accounting treatment and potential rate impacts for each option.

The representative asset cited above is a 230/44kV Transformer Connection asset. NCI's calculation of NBV is based on a TS) placed in service in 1960 and1985. TS equipment components include:

- Two power transformers;
- 10 feeder positions;
- 15 circuit breakers;
- 30 disconnect switches;
- 2 capacitor banks;
- Protection systems and control building with main and back-up protection schemes for all system elements in that station; and
- All other auxiliary system elements such as station service transformer.

Our efforts include a confirmation (or lack thereof) that the above steps, after appropriate corrections, provides an unambiguous, predictable and verifiable method to calculate variances in asset life expectancy using the proposed method and adjusted asset lives.[3]

Assumptions and Methodology

Navigant Consulting, Inc. relied on the best available information to calculate the original cost and accrued depreciation of the representative 230/44kV TS. Sources include cost data previously employed by Hydro One and other Canadian and U.S. utilities to construct similar TS assets. The accumulated depreciation reserve is calculated based on the remaining asset lives of individual plant categories as defined by the Uniform System of Accounts (US of A) in Hydro One's 1998 transmission

[3] The proposed approach by Board Staff, which NCI understands is to be treated as strictly confidential, is the interpretation and possible implementation of the approach outlined in a 7-page article prepared by the "Society of Management Accountants of Ontario" entitled, "Estimating depreciation for infrequently transacted assets", by Richard Ellsworth, January 1, 2000, Appraisal Journal (32-38), Vol 68, Issue 1; ISSN: 0003-3087.

rate filing. Remaining lives are determined by use of Iowa group survivor curves as applied to the individual assets that comprise the representative TS.

The original 18 Iowa survivor curves were published in 1935 and updated in 1942 in Bulletins 155 and 156, respectively. The 1942 bulletin has been subsequently updated and now includes 31 survivor curves. NCI relied on Hydro One survivor curve assignments included in its 1998 transmission filing and prior updates by their Depreciation Review Committee (DRC).[4] Navigant Consulting, Inc. is confident asset lives and curve assignments made by Hydro One's DRC are reasonably accurate, as their approach and annual review cycle are consistent with or exceed industry practices.

Key assumptions NCI employed include:

- Average lives and remaining lives using Iowa dispersion curves for group assets were established for each asset category;

- Original costs are based on current costs (2003), deflated to 1960 and 1985 dollars via use of regional Handy-Whitman Cost Trends for Electric Utility Construction;

- All TS assets are original; installed in 1960 and 1985, respectively;

- TS equipment is located outdoors, and reflects a design configuration and layout similar to those constructed by Hydro One's predecessor in the 1980's and 1960's for similarly rated equipment;

- Salvage value is equal to the cost of removal[5];

- All costs are current and expressed in Canadian dollars; and

- Accumulated depreciation reserve balances are based on original costs multiplied by Condition Percent (using Iowa survivor curve tables) at an interest rate of 0 percent; the zero percent assumption assumes that lost opportunity costs (i.e., revenues and rate of return) do not apply.

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[4] Hydro One's Depreciation Review committee (DRC) typically conducted annual reviews of individual asset groups to determine if adjustments to asset lives and Iowa curve assignments are warranted. Such adjustments are made to either raise or lower annual depreciation expense rates that included in a utility's cost of service.

[5] If the TS were sold, assets such as breakers and transformers often have tangible value including use elsewhere on the power system or sale on the open market. For the subject study, NCI assumes the TS would remain in service. If retired, NCI assumes the cost of removal of its equipment would equal the market value of the asset.

Determination of Net Book Value

Depreciation theory predicts that the remaining life of a unit of property, on average, will increasingly exceed the average age of a group of similar assets the longer the unit of property is in service. Average and book service lives for TS equipment typically ranges between 20 and 50 years; average lives for transmission line equipment often is much longer. The assumed 1985 installation is about 40 to 50 percent, and the 1960 installation about 90 percent of the average life of the composite TS components.

Exhibits 1a and 1b presents remaining lives and Condition Percent for Hydro One transmission equipment by asset class for TS' installed in 1985 and 1960, respectively. The percent survivors for most asset categories for 1985 vintage equipment is mostly above 90 percent (Exhibit 1.a), and the probable life for each category exceeds by a relatively small margin the average service lives of equipment placed into service on day one. In contrast, the percent survivors for 1960 vintage equipment ranges from 14 percent to 75 percent (Exhibit 1.b), with the average of the group at about 50 percent. However, the probable life for each asset category exceeds by a much large margin the average service lives of equipment placed into service on day one.

The Condition Percent for each asset, used to estimate the remaining value of an asset as a percent of original cost, is listed in the last column of Exhibits 1a and 1b.[6] Most of the information presented in these exhibits was obtained from Hydro One DRC updates, which eliminated the need to independently conduct steps 1 through 3 in Appendix I, a significant task.

<u>1985 TS NBV</u>

The table below lists original cost and net book value for the representative TS constructed in 1985. The original cost of the substation, $25 million, is typical for suburban, outdoor construction for 230/44/27kV class equipment.

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[6] Iowa State bulletins define Condition Percent as the ratio of the remaining value of an asset to its original cost. Condition Percent ratios are listed in Bulletin 156 for each of the Iowa survivor curves. Hydro One's Depreciation Review Committee periodically updates the average lives and appropriate survivor curve base on a "best fit" for each asset class. NCI, at times, used interpolation to estimate Condition Percent as the tables included in these bulletins are presented in 5-year intervals. Also, NCI assumed an average age of 20 and 45 years, respectively, for 1985 and 1960 vintage equipment to minimize use of interpolation to calculate Condition Percent using the Iowa State tables.

Net Book Value – 1985 Transformation Connection Asset – Transformer Station

Equipment Category	(1) Cost ($/Unit)	(2) Quantity	(3) Extended Cost	(4) Estimated Original Cost in 1985	(5) Condition Percent	(6) Accumulated Depreciation	(7) Net Book Value Iowa Curve	(8) Net Book Value Average Age
Land	$ 400,000	1	$ 400,000	252,783.9	1.00	$ -	$ 252,784	$ 252,784
Site Improvements	$ 400,000	1	$ 400,000	252,783.9	0.66	$ 85,947	$ 166,837	$ 185,375
Buildings	$ 300,000	1	$ 300,000	189,588.0	0.56	$ 83,798	$ 105,790	$ 113,753
Protection & Controls	$ 150,000	15	$ 2,250,000	1,421,909.6	0.50	$ 712,377	$ 709,533	$ 710,955
Transformer (230/44kV)	$ 6,250,000	2	$ 12,500,000	7,899,498.0	0.56	$ 3,491,578	$ 4,407,920	$ 4,739,699
Breakers* - 230kV	$ 700,000	0	$ -	-	0.48	$ -	$ -	$ -
Breakers - 44kV	$ 400,000	15	$ 6,000,000	3,791,759.0	0.57	$ 1,645,623	$ 2,146,136	$ 2,275,055
Disconnect Switches	$ 50,000	30	$ 1,500,000	947,939.8	0.57	$ 411,406	$ 536,534	$ 568,764
Exit Feeders	$ 40,000	10	$ 400,000	252,783.9	0.57	$ 109,708	$ 143,076	$ 151,670
Capacitor Bank (Per kVA)	$ 625,000	2	$ 1,250,000	789,949.8	0.57	$ 342,838	$ 447,112	$ 473,970
		Totals	**$ 25,000,000**	**$ 15,798,996**	**0.56**	**$ 6,883,275**	**$ 8,915,721**	**$ 9,472,025**

*Assumed to be part of bulk or line connection assets

The $25 million substation cost decreases to about $16 million when adjusted for inflation using Handy Whitman Indices. The average Condition Percent of the collective assets is approximately 56 percent; when applied to the estimated 1985 balances it produces a net book value of about $9 million, which is slightly less than the $9.5 million NBV obtained using average age to calculate depreciation

1960 TS NBV

The table below lists original cost and net book value for the representative TS constructed in 1960. The $25 million TS 2003 cost estimate decreases to about $5 million when adjusted for inflation using Handy Whitman Indices. The average Condition Percent of the collective assets is approximately 32 percent; when applied to the estimated 1960 balances it produces a net book value of about $1.4 million, well above the $0.5 million NBV obtained using average age to calculate depreciation.

Net Book Value – 1960 Transformation Connection Asset – Transformer Station

Equipment Category	(1) Cost ($/Unit)	(2) Quantity	(3) Extended Cost	(4) Estimated Original Cost in 1960	(5) Condition Percent	(6) Accumulated Depreciation	(7) Net Book Value Iowa Curve	(8) Net Book Value Average Age
Land	$ 400,000	1	$ 400,000	78,485.3	1.00	$ -	$ 78,485	$ 78,485
Site Improvements	$ 400,000	1	$ 400,000	78,485.3	0.44	$ 44,109	$ 34,377	$ 31,394
Buildings	$ 300,000	1	$ 300,000	58,864.0	0.32	$ 40,322	$ 18,542	$ 5,886
Protection & Controls	$ 150,000	15	$ 2,250,000	441,480.0	0.15	$ 373,492	$ 67,988	$ -
Transformer (230/44kV)	$ 6,250,000	2	$ 12,500,000	2,452,666.7	0.32	$ 1,680,077	$ 772,590	$ 245,267
Breakers* - 230kV	$ 700,000	0	$ -	-	0.15	$ -	$ -	$ -
Breakers - 44kV	$ 400,000	15	$ 6,000,000	1,177,280.0	0.25	$ 885,315	$ 291,965	$ 117,728
Disconnect Switches	$ 50,000	30	$ 1,500,000	294,320.0	0.25	$ 221,329	$ 72,991	$ 29,432
Exit Feeders	$ 40,000	10	$ 400,000	78,485.3	0.25	$ 59,021	$ 19,464	$ 7,849
Capacitor Bank (Per kVA)	$ 625,000	2	$ 1,250,000	245,266.7	0.25	$ 184,441	$ 60,826	$ 24,527
		Totals	**$ 25,000,000**	**$ 4,905,333**	**0.29**	**$ 3,488,104**	**$ 1,417,229**	**$ 540,568**

*Assumed to be part of bulk or line connection assets

The average age of new TS is about 50 years. The TS cited in the above example is 45 years old, or about 90 percent of the average. However, the predicted remaining life for a 1960 vintage TS that is still in service ranges from 120% to 180% of the average using Iowa dispersion curves. The average Condition Percent of 29 percent reflects these percentages and the extended remaining lives.

In contrast, the average Condition Percent for a 1985 TS (56%) is based on estimated remaining lives of 100% to 115% of the average life of a new TS. The use of Iowa survivor curves in each of the above examples accounts for the change in life expectancies of TS assets that are in service at the time the valuation is undertaken. Because of the highly non-linear nature of the dispersion curves, the remaining lives of older assets, such as the 1960 vintage TS, typically exceed those of more recent vintage equipment.

Depreciation Practices of Other Utilities

Navigant Consulting, Inc. surveyed utilities and commissions throughout Canada to ascertain depreciation review cycles and practices. NCI approach included including direct calls and an investigation of the respective organization's web sites. An ancillary task includes estimating the cost to conduct the depreciation studies and reviews.

Appendix II lists 8 of the 9 provincial utilities or commissions NCI contacted.[7] Survey results indicate most utilities, on average, review update depreciation studies every five years. The cycle interval may change depending on timing of rate filings, asset retirements or additions, or asset sales or acquisitions. NCI's experience in the U.S. suggests Canadian utilities employ similar review cycles, although we are aware of many utilities that have not updated depreciation studies for up to 10 years or longer. Often, utilities update depreciation studies when it files for a general rate application. The large number of recent mergers and acquisitions in the U.S. also has prompted commissions to require utilities to update cost of service and rate studies, including depreciation rates. The 5-year cycle typically applies to both generation and power delivery assets, including transmission.[8]

Although survey feedback was sparse, the information we obtained and NCI's experience suggests a cost to conduct a complete depreciation study for a utility similar to Hydro One or Hydro Quebec would range from $75,000 to $125,000 (U.S.). This value likely would be reduced if generation assets were excluded from the study, or if the study only analyzed transmission assets. Transmission assets typically are about 30 to 40 percent of total power delivery system assets. Using net book value of transmission delivery assets total assets as a proxy, NCI estimates the cost of a depreciation study for transmission assets for a medium size utility would be approximately $40,000 to $60,000. This range includes $10,000 for project management and administrative fees, which are incurred regardless of the size of the utility.

[7] AlaLink/TranAlta also was contacted, but NCI was unable to obtain information to support our findings.

[8] Expert witness testimony and a 1990 report prepared by Coopers & Lybrand indicated commissions in the U.S. and Canada typically require utilities to update depreciation studies every 3 to 5 years.

Applicability of the Proposed Approach to Transmission Asset Valuation

Navigant Consulting, Inc.'s calculation of net book value using dispersion curve techniques (for a TS constructed in 1985) demonstrates that the approach proposed by Board staff (based on the recommendations from Settlement Conference participants) is reasonable and relatively straightforward to perform. The steps listed in Appendices I and II describe the steps that must be taken to calculate NBV. Appendix IV describes in step-by-step detail how the process is applied to individual assets.

NCI emphasizes the level of effort needed to perform each of the five tasks is contingent upon the availability of accurate and up-to-date depreciation data, including average ages and Iowa Curve assignments by asset class. NCI used asset age and curve assignments contained in Hydro One's DRC reports, which eliminated the need to perform steps (1) through (3). If depreciation studies were needed to provide updated age and survivor curve assignments, the level of effort to calculate NBV would be significantly greater.

Accounting Treatment

Electric utility accounting practices for assets removed from service usually include credits to original plant balances and accumulated depreciation reserves in an amount equal to original plant cost. The approach recognizes that for grouped assets, some assets are retired prior to their average lives, whereas other similar assets are retired beyond the average service life for the group. Over time, the early retirements should be offset by retirements that occur beyond the average service life of the group. Where imbalances exist, depreciation studies are undertaken to update the depreciation expense rates for the grouped assets based on the amount and vintage of, retirement patterns, and expected remaining lives of plant in service using Iowa dispersion curves.

Hence, if a plant unit is retired prior to when accumulated reserve for the asset equals or exceeds original cost, the credit to the reserve account will exceed the amounts charged to accumulated reserves via annual depreciation expense. In this case, the shareholder benefits. Alternatively, if the asset is retired well beyond its average life, the accumulated reserve could exceed the credit to the reserve account, which would benefit ratepayers. These imbalances would exist until the next rate filing or depreciation study is completed.

Navigant Consulting, Inc. is aware that accounting policies for gas distributors in Ontario effectively determine whether an extraordinary retirement of a depreciable asset is charged to a balance sheet or an income statement account. If the retirement is charged to an income statement account, it flows directly to shareholders. If charged to the balance sheet, the retirement is reflected in rates. Accounting rules call for symmetric treatment of gains and losses.

Although NCI did not independently confirm practices in Ontario or other provinces, such policies may apply as well to electric transmitters. However, in some instances, some or all of the plant may not be retired if bypassed or stranded; for example, to serve other customers who continue to receive service from the transmitter. Different rules may apply when credits apply to plant accounts for assets that are not retired from service.

Exhibit 1A

Remaining Lives and Condition Percent for Hydro One Transmission Assets

(1985 Installation)

Hydro One - Grid Component Description	Iowa Dispersion Curve	Average Life (assigned by Hydro One)	Age as a Percent of Average Life	Percent Survivors for 1985 Installation	Probable Life of Survivors (As a % of Ave. Life)	Condition Percent (at 0% Interest)
Transmission Line Clearing	S2.0	100	20%	99.9	1.00	0.77
Transmission Line - Steel Supports & Footings	S1.5	100	20%	99.0	1.00	0.70
Transmission Line - Wood Supports (HV & LV)	S2.5	40	50%	96.0	1.02	0.48
Transmission Line - Service Structure & Roads	S2.0	55	36%	98.7	1.01	0.62
Transformers - High Voltage	L1.0	50	40%	88.3	1.10	0.56
Foundations - High/Low Voltage	L1.0	50	40%	88.3	1.10	0.56
Circuit Breakers Installations	R2.0	40	50%	89.1	1.09	0.50
Site Improvements	L1.0	75	27%	94.0	1.04	0.66
Buildings	L1.0	50	40%	88.3	1.10	0.56
Insulators - High Voltage	R3.0	60	33%	97.5	1.02	0.62
Station Structures	R3.0	50	40%	96.9	1.02	0.58
Land - LV		100	20%			
Tunnels & Ducts	S1.0	50	40%	93.6	1.05	0.57
Circuit Breakers - 230kV	S2.0	40	50%	94.5	1.04	0.48
Circuit Breakers - 115kV	S3.0	40	50%	98.2	1.01	0.48
Circuit Breakers - <115kV	S1.5	50	40%	96.0	1.03	0.57
Station Service	L2.0	30	67%	76.8	1.14	0.37
Easements & Rights	S2.0	100	20%	99.9	1.00	0.86
Grounding Systems - Including Skywire	S2.0	45	44%	96.4	1.02	0.52
Conducting Copper - ACSR on steel HV	S2.0	60	33%	98.7	1.01	0.63
Conducting Copper - ACSR on steel LV	L0.5	55	36%	88.0	1.12	0.60
Clearing & Overbuilding - HV	S2.0	80	25%	99.7	1.00	0.75
Steel Towers - HV	S2.0	80	25%	99.7	1.00	0.75

Note: Age as a Percent of Average Life column is rounded to reflect an average age of 20 years for assets installed in 1985.

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Exhibit 1b

Remaining Lives and Condition Percent
for Hydro One Transmission Assets (TS Equipment Only)

(1960 Installation)

IOWA Dispersion Curve Analysis - Condition Percent for Utility Assets Installed in 1960							
Hydro One Review DRC Update	Hydro One - Grid Component Description	Iowa Dispersion Curve	Average Life (assigned by Hydro One)	Age as a Percent of Average Life	Percent Survivors for 1960 Installation	Probable Life of Survivors (As a % of Ave. Life)	Condition Percent (at 0% Interest)
Oct 97	Transformers - High Voltage	L1.0	50	90%	52.5%	140%	32%
Oct 97	Foundations - High/Low Voltage	L1.0	50	90%	52.5%	140%	32%
Oct 97	Circuit Breakers Installations	R2.0	40	113%	37.9%	137%	15%
Oct 97	Site Improvements	L1.0	75	60%	74.4%	121%	44%
Oct 97	Buildings	L1.0	50	90%	52.5%	140%	32%
Oct 97	Station Structures	R3.0	50	90%	67.8%	115%	21%
Mar 95	Land - LV		100	45%			100%
Mar 95	Tunnels & Ducts	S1.0	50	90%	59.0%	126%	26%
Mar 95	Circuit Breakers - 230kV	S2.0	40	113%	34.0%	133%	15%
Mar 95	Circuit Breakers - 115kV	S3.0	40	113%	26.0%	128%	11%
Mar 95	Circuit Breakers - <115kV	S1.5	50	90%	60.2%	123%	25%
Mar 95	Station Service	L2.0	30	150%	13.9%	177%	14%

Note: Age as a Percent of Average Life column is rounded to reflect an average age of 45 years for assets installed in 1960.

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Appendix I

October 22, 2003

Consultant Report
Transmission System Code Review -Phase 1
Issue #1 (ADR) - Determination of the Remaining Value of an Asset

Proposal: Use of NBV plus Adjustment Reflecting Dispersion Measurement (Using Iowa State University Approach/Techniques)

Delivery Date : Friday, November 14, 2003

Cost: Please indicate the cost to perform this task. And the basis for charging, if the scope is extended

Scope: Review of Proposal Approach and Implementability

<u>Review of the Proposal Approach</u>

(1) Are the steps outlined in the attached 2-page proposal correct? If not, what are the needed changes to make them accurate(see Notes below).

(2) Would the steps, after any corrections suggested by the consultant, lead to an **unambiguous**, **predictable** and **verifiable** method to calculate the variance of life expectancy calculated using the proposed method and the life according to existing depreciation policy.

Notes:

(i) The proposed approach, **<u>to be treated as strictly confidential</u>**, is the interpretation and possible implementation of the approach outlined in a 7-page article sent to us by the "Society of Management Accountants of Ontario" which is entitled "Estimating depreciation for infrequently transacted assets" , BY Richard Ellsworth, January 1, 2000, Appraisal Journal (32-38), Vol 68, Issue 1; ISSN: 0003-3087.

(ii) The Issue, Determination of the Remaining Value of an Asset, is covered from pages 1 to 5 of the ADR Report and it is entitled "**Determination of the Remaining Value of an asset**".

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Review of Proposal Implementability

(1) Is the proposal workable?

(2) Our understanding is that a review of the Depreciation Policies for transmitters is carried out periodically (say between 3 to 7 years). Is that true? if not what is the range experienced in the industry for such a cycle?.

(3) For a company, the size of Hydro One or that of TransEnergy (Hydro Quebec's transmission arm), what is the effort level and cost for such a study?

(4) As part of our assessment of the workability of the approach, recommend changes if required to enhance the "workability" of the approach.

(5) How often other utilities update their depreciation studies, focusing in particular on transmission assets (if such studies are performed independently of other utility assets).

(6) Complete one illustrative example as specified below. The objective is to demonstrate how the proposed approach would work through the determination of variances in asset lifes of various groups as well as the adjustment to the NBV of the various types of assets leading to a determination of the adjusted NBV of the compund asset e.g. "a Transformer Station":

The illustrative example is a Transformation Connection Asset (230/44 kV Transformer Station, assumed to have been **put in service in 1985** and **comprised of**:
(i) two power transformers;
(ii) 10 feeder positions;
(iii) 15 circuit breakers;
(iv) 30 disconnect switches;
(v) 2 capacitor banks;
(vi) protection and control building with main and back-up protection schemes for all system elements in that station;
(vii) all other auxiliary system elements such as station service transformer .. etc.

Please use representative unit costs, without being concerned too much about accuracy of unit costs.

(7) Provide a discussion of the various options a transmitter has with respect to the accounting treatment when bypass events occur. This would deal for each option with the accounting treatment and who would best benefit from such treatment e.g. the shareholders versus the rate payers (the transmission service rate payers).

Short Report

A Report reviewing the proposed approach and address aspects (1) to (7) listed above, will be presented to the Board on the due date.

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Appendix II

TRANSMISSION SYSTEM CODE REVIEW PROCEEDING
(RP-2002-0120)

Proposed Definition

Issue No.1/ADR: **Determination of the Remaining Value of an Asset**

Subject: Use of NBV plus Adjustment Reflecting Dispersion Measurement
(Using Iowa State University Approach/Techniques)

<u>Proposed Adjustment Steps:</u>

The proposed steps to determine the adjusted remaining value of an asset start with the NBV of an asset as obtained from the accounting records. For the purpose of illustrating the methodology, assume a single asset e.g. 115 or 230 kV Delivery Power Transformer. Then the transmitter will carry out an adjustment using statistical analysis and dispersion curves techniques(using the Iowa State University approach) to adjust the NBV value, according to the following steps:

(1) First, compile a life table that represent the total number of units that could be retired and the number that actually retired for each vintage age. This requires that a survival table is prepared and requires that the placed in-service date or the start date for active assets, and both the start date and retirement date for retired assets are recorded.;

(2) Second, from the total units that could be retired and the units actually retired, the retirement rate for each vintage age can be calculated. The percentage surviving at a particular age is then calculated as the cumulative product of the survival rates. The resulting survival curve depicts the relationship between asset age and the expected percentage surviving from a given asset population. This curve is designated the("Observed Survivor Curve");

(3) Third, calculate the best fit of that "Observed Survivor Curve" with the "Survivor Curve Model" of the "S series-Symmetrical-Moded Curves" of the Iowa Family of Survivor Curves. The best fit analysis is performed using standard regression analysis techniques that minimizes the squared differences between itself and the observed survivor curve is the best fitting survivor curve model;

(4) Fourth, the average useful life for the population of system elements (Delivery Power Transformers in this example) is calculated as the area under the best fitting survivor curve;

(5) The difference between the life according to the existing depreciation policy and the life calculated from this process, which can be negative or positive, is then used to calculate an incremental adjustment amount (positive or negative) to the NBV for that transmission system element (Delivery Power Transformer in this example).

The above steps are needed for all system elements. Thus the bove process have to be repeated for all system elements. The total or aggregate NBV adjustments would of course reflect the cumulative results for the various number of assets for each class of transmission system elements.

Appendix III

Depreciation Review Practices Of Canadian Electric Utlitilies

ATCO Electric

ATCO's last full review of depreciation parameters was completed in 1996 in connection with general tariff application. ATCO Electric has used the technical update process since 1987. ATCO Electric previously undertook full depreciation studies in 1991, 1992 and 1996.

Manitoba Hydro

Manitoba Hydro employs a five-year cycle for all assets. The last depreciation study was completed in 2002/2003 in anticipation of a potential rate case in early 2004. The study has not yet been filed and is not available at this time. The cost for consultant to conduct the study is estimated at 50-100K. Internal cost and efforts are not tracked, but are significant. Similar to Hydro One, Manitoba Hydro has assembled a depreciation rate review committee to conduct periodic updates.

Hydro-Quebec/TransEnergie

HQ employs a five-year cycle for all assets. They do not use external consultants. Similar to Hydro One, HQ has assembled a dedicated internal depreciation review committee to conduct periodic updates. Hydro-Quebec was unable to provide a cost estimate to perform these studies.

Nova Scotia Power

In connection with a 2002 rate case, Nova Scotia Power was directed to prepare a depreciation study. The last time a depreciation study was filed was in August 1995, in preparation for the Company's 1996 rate case application. The updated study was filed with the Utilities and Review Board in April 2003 (NCI has obtained a copy of the study). Nova Scotia Power states that it normally undertakes depreciation studies as part of a general rate application. The Board was of the opinion that Nova Scotia Power should review its depreciation rates more frequently than once every seven years. The evidence submitted by Nova Scotia Power indicates a forecast expense of $265K for depreciation consultant spending and vacancies in 2001 filled in 2002.

New Brunswick Power

NCI contacted the New Brunswick Public Utility Board, but they were unable to provide any specific information or statistics. In a 1991 generic hearing, NCI obtained information that indicates NB Power evaluates service lives every five years.

Ontario

According to 1990 Coopers Lybrand report, Ontario Hydro reviewed transmission service lives at least every five years and generation once a year. These practices have been confirmed in the DRC reports NCI reviewed for the years 1990 through 1998.

Saskatchewan

A five-year depreciation cycle review is conducted for all assets. SaskPower's last study was completed in the summer of 2002 in response to a Saskatchewan Rate Review Panel request. SaskPower conducts depreciation studies using internal staff; hence, costs and level of effort are not tracked. There is no dedicated internal depreciation rate review committee. The current depreciation study is not public and NCI was unable to obtain a copy.

BC Hydro

BC Hydro has not conducted a rate case since 1994. The 1994 rate case does not refer to a specific depreciation study.

Appendix IV

Illustrative Example of the Iowa Survivor Curve Approach for a TS Transformer

The following example describes the methodology employed to predict net book value (NBV) using Iowa survivor curves to estimate the remaining life of an asset, in this case a TS transformer installed in 1960 and 1985. (Average ages were rounded to 45 and 20 years for transformers installed in 1960 and 1985, respectively.) From Exhibit 1.a and 1.b, a TS transformer has an average life of 50 years and a retirement curve pattern of L1.0, which reflect retirement modes assigned by Hydro One's Depreciation Review Committee.

The curves presented in the following chart are excerpted from Bulletin 125 of the Iowa State publications for Type "L" retirement curves. There are 4 types of retirement curves in the Iowa State bulletins, which are labeled according the modes of retirements relative to the average retirement age: (1) Left-Modal (L), where the greatest frequency of retirements is prior to the average service life; (2) Symmetrical-Modal (S), where the greatest frequency of retirements is the average age; (3) Right-Modal (R), where the greatest frequency of retirements is after the average service life; and (4) Origin-Modal (O), where the greatest frequency of retirements occurs just after the equipment is placed in service. The numerical value that appears adjacent to the letter code indicates the relative heights of the modes for each curve. For higher subscripts, the percentage of retirements is more pronounced near the average retirement age. The lower the subscript, the more disperse the retirement pattern.

The average age of a group of assets is calculated by dividing the area under the respective curves by the maximum value on the y-axis. The remaining or probable life of any asset assigned to one of the survivor curves is determined by dividing the area under the curve from the observation age by the percent survivors. The probable life curves appear to the right of the survivor curves in the illustration.

The designation of "L" to transformation assets reflects a retirement pattern where the frequency of retirements is highest in the years prior to the average age of the group. The designation of numerical code 1.0 suggests the retirement pattern is spread somewhat evenly over the maximum life of the asset group. In Figure IV-1, the maximum frequency of retirements of the L 1.0 group occurs at an age of about 70 percent of the average service life of the group of assets. For 1985 vintage assets, transformer age as a percent of the average age of the group is 40 percent. (The dashed line furthest to the left in Figure IV-1 illustrates where the transformer age, 40 percent, intersects the L1 survivor curve.) The solid line that appears in the upper part of Figure IV-1 indicates that the percent survivors for 1985 vintage transformers is about 90 percent and the probable life of about 110 percent of the average age of the asset group. These values appear in Exhibit 1.a. However, for older assets such as a TS installed in 1960, the remaining life of the asset increases. The intersection of the dashed line for the 90 percent age group for L1 predicts about 52 percent survivors and a probable transformer life of about 140 percent of the average age of the entire group of transformers. These values appear in Exhibit 1.b.

Figure IV-1

Iowa Curve for Left Modal Asset Group

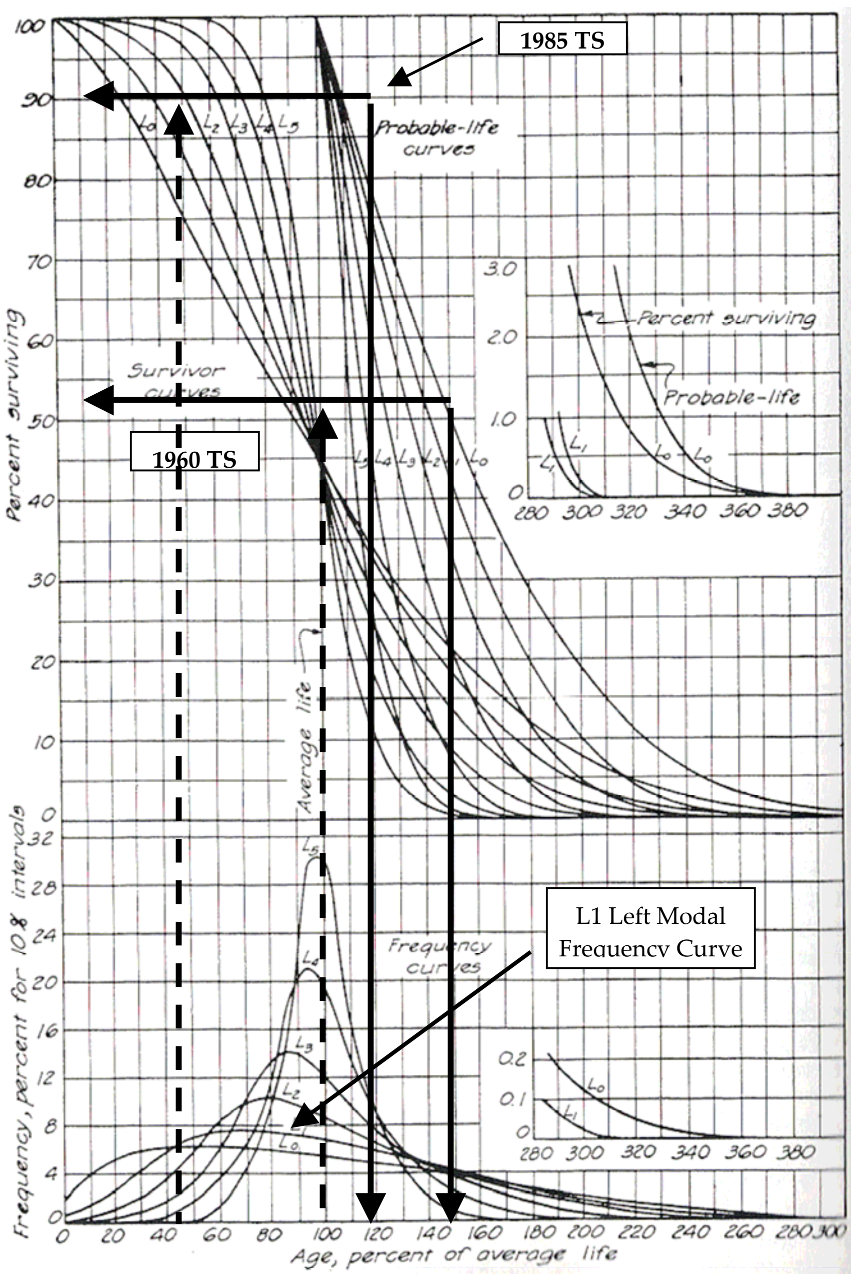

Fig. 21.—Final survivor, probable-life, and frequency curves for the left-modal types.

The Iowa State bulletins also produce tables of Condition Percent, which the bulletins define as 100 times the ratio of the present depreciable value of a property to its depreciable value when new. The table included below presents Condition Percent for an L 1.0 property with an average life of 50 years, which is the designation Hydro One's DRC has assigned to transformers. The first column is the age of the asset, the second the percent survivors. Columns 3 through 7 list the Condition Percent for interest rates of 0, 2, 4, 6 and 8 percent, respectively. The interest rates reflect the remaining economic value of an asset, in effect a rate of return for the asset. Since the asset is assumed to produce no return once bypassed or stranded, an interest rate of zero was selected. For asset ages of 20 and 45 years, the Condition Percent for the transformer is about 56 and 32 percent, respectively (highlighted in the blocked diagrams below).

Table IV-1

Condition Percent of Group Properties
Type L1 Curve for 50-Year Average Life

Type Curve L_1
50 Years Average Life

1	99.8773	96.895	97.704	98.242	98.600	98.846
2	99.7253	93.982	95.557	96.612	97.316	97.800
3	99.5402	91.179	93.479	95.030	96.070	96.787
4	99.3178	88.467	91.455	93.482	94.846	95.790
5	99.0543	85.840	89.478	91.962	93.640	94.806
6	98.7457	83.296	87.548	90.470	92.452	93.832
7	98.3883	80.832	85.665	89.005	91.280	92.869
8	97.9785	78.447	83.828	87.570	90.128	91.919
9	97.5133	76.142	82.040	86.166	88.996	90.983
10	96.9896	73.916	80.302	84.794	87.887	90.063
11	96.4050	71.769	78.614	83.457	86.802	89.162
12	95.7575	69.699	76.978	82.157	85.745	88.281
13	95.0457	67.707	75.395	80.894	84.717	87.422
14	94.2684	65.791	73.866	79.672	83.719	86.588
15	93.4254	63.950	72.390	78.490	82.753	85.780
16	92.5168	62.182	70.967	77.349	81.821	84.999
17	91.5434	60.487	69.598	76.251	80.923	84.248
18	90.5065	58.861	68.283	75.195	80.061	83.527
19	89.4083	57.303	67.020	74.182	79.235	82.836
20	88.2513	55.811	65.808	73.212	78.446	82.177
21	87.0388	54.382	64.645	72.282	77.692	81.550
22	85.7745	53.014	63.531	71.394	76.973	80.954
23	84.4627	51.703	62.464	70.545	76.289	80.389
24	83.1083	50.446	61.439	69.733	75.638	79.854
25	81.7164	49.240	60.456	68.956	75.019	79.346
26	80.2926	48.081	59.512	68.212	74.428	78.865
27	78.8430	46.966	58.601	67.497	73.862	78.407
28	77.3737	45.891	57.722	66.807	73.319	77.968
29	75.8912	44.852	56.869	66.139	72.793	77.544
30	74.4020	43.843	56.038	65.487	72.280	77.131
31	72.9120	42.863	55.225	64.847	71.775	76.723
32	71.4227	41.908	54.428	64.217	71.277	76.319
33	69.9351	40.978	53.648	63.596	70.784	75.919
34	68.4499	40.072	52.882	62.986	70.297	75.521
35	66.9679	39.190	52.131	62.384	69.815	75.127
36	65.4899	38.329	51.394	61.790	69.338	74.734
37	64.0168	37.490	50.670	61.205	68.866	74.344
38	62.5493	36.672	49.960	60.627	68.397	73.956
39	61.0881	35.874	49.261	60.056	67.933	73.570
40	59.6342	35.095	48.575	59.493	67.472	73.185
41	58.1881	34.335	47.901	58.936	67.014	72.801
42	56.7508	33.593	47.237	58.385	66.560	72.418
43	55.3228	32.869	46.585	57.840	66.108	72.036
44	53.9050	32.161	45.943	57.301	65.659	71.655
45	52.4981	31.470	45.311	56.768	65.212	71.274