2017

DEPRECIATION REVIEW COMMITTEE RECOMMENDATIONS

FOR

NUCLEAR

DECEMBER 2017

MEMORANDUM **December 2017**

2017 Depreciation Review Committee Recommendations – Nuclear

PURPOSE AND SUMMARY

This memorandum is intended to obtain approval for the recommendations resulting from the 2017 Depreciation Review Committee (DRC) review of the average service lives of the selected asset classes and the station service lives for OPG's nuclear facilities. The nuclear facilities are the Pickering Nuclear Generating Station, the Darlington Nuclear Generating Station and the Bruce Nuclear Generating Stations.

The 2017 DRC makes the following recommendations for depreciation purposes.

Station Service Lives

The DRC recommends an extension of the Pickering units' end-of-life (EOL) date from December 31, 2020 to December 31, 2022 for Units 1 and 4, and December 31, 2024 for Units 5 through 8. There is no recommendation for changing the EOL dates of Darlington, Bruce A or Bruce B. The following average nuclear station EOL dates are recommended to be effective from December 31, 2017:

Darlington	December 31, 2052
Pickering Units 1 & 4	December 31, 2022
Pickering Units 5-8	December 31, 2024
Bruce A	December 31, 2052
Bruce B	December 31, 2061

The change of the Pickering units' EOL dates is expected to have the following illustrative estimated impacts on depreciation expense based on actual asset values as of November 30, 2017 (i.e. including neither the impact of the anticipated year-end 2017 adjustment to the asset retirement obligation (ARO) estimate and asset retirement costs (ARC), nor future capital additions).

($M)	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Estimated Pickering Depreciation Expense Change Based on November 30, 2017 Asset Values	-120	-120	-120	+125	+125	+55	+55

The impact of the change in the accounting EOL dates on the revenue requirement approved by the Ontario Energy Board (OEB) will be subject to an accounting order application with the OEB. The accounting order will seek the OEB's approval to establish a deferral account to record the revenue requirement impact on the prescribed facilities arising from the anticipated year-end 2017 ARO/ARC adjustment and depreciation and amortization expense beginning January 1, 2018 resulting from the above changes to Pickering EOL dates. Subject to the impact of the year-end 2017 ARO/ARC adjustment, OPG will propose that the revenue requirement impact recorded in the deferral account be based on forecast net book values and forecast capital in-service additions included in the nuclear rate base that will be approved through the EB-2016-0152 Payment Amounts Order.

Selected Nuclear Asset Classes (Major Fixed Assets)

Asset Class	**Recommendation**
15110 - Site Improvements	No change to average service life.
15361 - Irradiated Fuel Bays - PB&DN	No change to average service life.

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Asset Class	Recommendation
15411 - Turbine Blades & Diaphragms - PN	Decrease the current average service life from 40 to 15 years.
15460 - Nuclear Auxiliary Systems - PA&BN	No change to average service life.
15521 - Station Service Main Transformers & Power Distribution Systems	No change to average service life.
15550 - Reactor Building Cabling - PA&BN	No change to average service life.
15560 - AC Standby Power - PA&BN	No change to average service life.
15700 - Nuclear Circulating Water - PA&BN	No change to average service life.
15710 - Water Treatment Plant	No change to average service life.
15711 - Nuclear Circulating Water - PB&DN	No change to average service life.
16210 - Admin & Service Bldgs - Permanent Buildings, Roads, Site Improvements	No change to average service life.
16230 - Admin & Service Bldgs - Buildings - Frame & Metal Clad	No change to average service life.
165601 - Admin & Service Bldgs - Buildings - Admin System Software	No change to average service life.

These asset class average service life recommendations are expected to have a minimal impact (i.e. less than $100,000 per annum) on the annual depreciation expense for the nuclear facilities.

Minor Fixed Assets (MFA)

The DRC recommends that the currently approved average service life estimate of 10 years for the MFA asset classes of Service Equipment and Removal Tools for Darlington Refurbishment be retained. The 10-years service life estimate for Removal Tools for Darlington Refurbishment continues to be based on the planned feeder removal time periods for the four Darlington units, consistent with the treatment of removal costs that OPG expenses in the period incurred in accordance with US GAAP. The remaining MFA asset classes, with a net book value totaling approximately $5M, did not meet the materiality considerations and were not reviewed.

Excluding asset retirement costs, 99% of the total (major and minor) in-service net book value of the fixed asset classes of the nuclear business as at December 31, 2016 have been covered by the 2013 to 2017 DRC reviews.

BACKGROUND

The DRC convenes annually to review the service lives for depreciation purposes of OPG's major facilities and/or a selection of asset classes in those facilities with the general objective of reviewing all significant asset classes over a five year period. OPG's practice of reviewing asset classes over an approximate five-year cycle to re-evaluate the average service life estimates was considered appropriate by Gannett Fleming ULC (GF), an external consultant. In the recommendation section of their report dated November 29, 2013 that was accepted by the OEB as part of OPG's application for 2014/15 payment amounts, GF noted that

"[c]ontinued surveillance and periodic revisions are required to maintain use of appropriate average service lives and depreciation rates. Each [asset class] account should be subjected to a complete depreciation study to re-evaluate its average service life estimates periodically. Gannett Fleming notes that the practice of OPG to review its various asset accounts and depreciation service lives over an approximate five-year cycle meets this common depreciation practice." The current five year review period began in 2013.

The 2013 independent depreciation study performed by GF reviewed the estimated average asset class lives and station service lives for the property, plant and equipment, including intangible assets, of the nuclear and hydroelectric prescribed facilities, including the hydroelectric facilities that were prescribed for regulation beginning in 2014, based on in-service balances as at December 31, 2012, as well as the Niagara Tunnel. GF's findings in their November 29, 2013 report were accepted by the OEB.

SCOPE OF 2017 DRC REVIEW FOR NUCLEAR

The focus of the 2017 DRC for the nuclear business was on reviewing OPG's nuclear station service lives as well as a selection of asset class service lives. The review focused on the following main areas:

Nuclear Station Service Lives Review

As part of the plan to extend Pickering operations beyond 2020, OPG has been undertaking a set of initiatives to confirm that the units would remain fit to operate to 2024. Under the plan announced in early 2016, all six units at the station would operate until 2022, at which point two units (Units 1 & 4) would be shut down and the remaining four units (Units 5-8) would continue to operate to 2024. OPG's approved business plans have been reflecting resource levels and work programs necessary for the operation of the station to these dates. In 2016, the DRC concluded that it was premature to extend the accounting EOL date of the station from the currently approved date of December 31, 2020, based on the status of technical and regulatory work to confirm the unit's fitness for service to achieve the additional life at that time. The 2017 DRC assessed whether the current status of this work and other factors indicates that sufficient high confidence has been achieved to extend the accounting EOL date.

Although not a primary focus of this year's review, the 2017 DRC also considered whether it is aware of any evidence justifying a change in the lives of the Darlington, Bruce A or Bruce B stations.

Asset Class Review (Major Fixed Assets)

Thirteen nuclear Major Fixed Asset classes were selected for the 2017 DRC review. Eleven asset classes to be reviewed were determined by selecting the higher value asset classes (net book value greater than $5M) that had not been previously reviewed by the DRC as part of the current review cycle that began in 2013. The business unit/site contacts identified two additional asset classes for review.

Minor Fixed Assets

Minor Fixed Asset classes are defined as portable assets used in administration, construction, and transport or maintenance / service activities. They are not used directly for the generation of electricity, and do not form integral components of a building or other structures. Material MFA classes that had not been included in previous DRC reviews were reviewed as part of the 2017 DRC. The current methods of depreciation for MFA classes are as follows:

Computers [1]	40% Declining Balance[1]
Transportation and Work Equipment	10 Year Straight Line
Service Equipment	10 Year Straight Line
Removal Tools for Darlington Refurbishment	10 Year Straight Line

[1] 40% declining balance over the first three years, then straight line the last two years (total of 5 years)

The net book values of the MFA asset classes Computers and Transportation and Work Equipment directly assigned to the nuclear facilities were nil and $5M, respectively, as at December 2016. Based on materiality considerations, these asset classes were not included in the 2017 DRC review.

The Service Equipment and Removal Tools for Darlington Refurbishment MFA asset classes reviewed by the 2017 DRC represented approximately 98% of the total Nuclear MFA net book values as at December 31, 2016.

Sources of Information

The main sources of information considered by the DRC in developing the recommendations included:

- reviews conducted primarily by technical staff in the Nuclear business unit;
- information obtained from past DRC reviews; and
- industry experience

SUMMARY OF RECOMMENDATIONS

Nuclear Station Service Lives Review

Pickering Station

A technical assessment has been completed to determine the ability of Pickering units to continue to be fit for service in order to support continued operation to 2024, with fuel channels having been determined to be the life-limiting major component. In the fourth quarter of 2017, the DRC received confirmation that there is high technical confidence that Units 1 & 4 can be safely operated to the end of 2022 and Units 5-8 to the end of 2024, based on the programs and provisions in place to assure fitness-for-service of fuel channel components, up to 286,000 effective full power hours (EFPH) for the lead unit. The work program to support fitness-for-service of fuel channels includes the Fuel Channel Life Assurance project (FCLA) to address the elongation of the fuel channels, which is considered to be the specific life-limiting degradation mechanism that could impact station operation beyond 2020. Based on the results of the FCLA, completed earlier in 2017, OPG has selected a strategy to manage fuel channel elongation and has incorporated it into the life cycle management plans.

The above high technical confidence is consistent with the safety case reflected in OPG's submission of the Pickering licence application to the Canadian Nuclear Safety Commission (CNSC) in 2017. The licence application spans the operating period to 2024 and the period to prepare the station for safe storage. In support of the licence application, OPG has completed a Periodic Safety Review (PSR) for the station. The final major element of the PSR was submitted to the CNSC in November 2017. The CNSC review of OPG's PSR submission and licence application is underway, with a decision expected to be rendered by about August 2018, following a public hearing.

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The DRC observed that OPG has taken a number of steps to be in a good position to achieve a successful licence renewal, which support high confidence in the continued safe operation of the station to the above noted dates. These include a strong record of operational safety; the highest possible safety rating from the CNSC over the last two years; a program in place to support the provision of safe and reliable service; and completion of the PSR process. The PSR has confirmed that extending station operation to 2024 will continue to pose minimal risk to the health, safety and security of workers, the public and the environment. The PSR also includes component condition assessments to ensure that the major plant components have sufficient life to operate through the end of 2024, as well as an assessment against modern codes and standards.

OPG's 2017-2021 payment amounts application to the OEB reflected the company's plans to continue Pickering commercial operation to 2024 and requested inclusion of the corresponding cost and generation impacts in the determination of the nuclear regulated prices. In its December 2017 decision on the application, the OEB approved the inclusion of cost and generation impacts associated with station operations beyond 2020 in the nuclear payment amounts, providing further certainty to the plans for the continued operation of the station. The DRC also noted that the work program to support continued operation to 2024 is similar in nature and scope to the work program previously completed by 2014 to extend station operation to 2020. That work program was completed successfully within the identified budget, achieving all necessary regulatory approvals.

The DRC noted that the Province of Ontario has consistently endorsed OPG's plans to pursue operation of the Pickering station until 2024, citing the socio-economic benefits of continued operation. Among others, this includes the Government's January 2016 announcement approving OPG's plan to pursue continued operation, the Minster of Energy's May 2017 Letter concurring with OPG's 2017-2019 Business Plan that reflected operation of the station beyond 2020, and, most recently, the inclusion of continued operation of Pickering to 2024 in Ontario's Long-Term Energy Plan, which was published in October 2017. The IESO's independent analysis has confirmed the economic benefits to the electricity system of continued Pickering operation.

The DRC concludes that, taken together, the technical confidence associated with the programs and provisions in place to assure fitness-for-service of fuel channel components, the current status of CNSC and OEB regulatory approvals, and the Province's endorsement of OPG's plans for continued operation of the station provide sufficient high confidence that Pickering Units 1 & 4 are expected to operate to December 31, 2022 and Units 5-8 to December 31, 2024. The DRC recommends adopting these EOL dates for depreciation purposes effective from December 31, 2017.

Based on actual asset values as of November 30, 2017, the impact on depreciation expense of the above service life changes is an estimated annual reduction of approximately $120M for years 2018 to 2020 inclusive. Of this amount, approximately $33M relates to the existing ARC asset balances and approximately $87M to the non-ARC balances. In 2021, the estimated annual impact on depreciation expense is an increase of approximately $125M, of which approximately $33M relates to the existing ARC balances and approximately $92M to the non-ARC balances. The impact of the anticipated year-end 2017 adjustment to the ARO / ARC balances and any future capital additions is not included in these figures.

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Darlington and Bruce Nuclear Generating Stations

There is no recommendation to change the station EOL dates for Darlington, Bruce A and Bruce B Nuclear Generating Stations. The current approved Darlington EOL date reflects the previously approved schedule for the four-unit refurbishment, assuming a 30-year post-refurbishment operating life. The current approved Bruce A and Bruce B EOL dates are based on the Amended and Restated Bruce Power Refurbishment Implementation Agreement between the Independent Electricity System Operator and Bruce Power made public in December 2015. No information has come to the 2017 DRC's attention to justify a change in these dates.

Asset Class Review (Major Fixed Assets)

The 2017 DRC review of the average service lives of the nuclear facilities determined that, with the exception of asset class 15411-Nuclear Turbine Blades & Diaphragms-PN, the currently approved average service life estimates for all reviewed asset classes remain appropriate. These recommendations were reviewed with and endorsed by business and technical staff responsible for overseeing the nuclear assets. Below is a summary of conclusions for the reviewed asset classes.

Asset Class	Recommendation
15110 - Site Improvements	Retain the current 75 years average service life.
15361 - Irradiated Fuel Bays - PB&DN	Retain the current 65 years average service life.
15411 - Turbine Blades & Diaphragms - PN	Decrease the current average service life from 40 to 15 years.
15460 - Nuclear Auxiliary Systems - PA&BN	Retain the current 40 years average service life.
15521 - Station Service Main Transformers & Power Distribution Systems	Retain the current 20 years average service life.
15550 - Reactor Building Cabling - PA&BN	Retain the current 40 years average service life.
15560 - AC Standby Power - PA&BN	Retain the current 40 years average service life.
15700 - Nuclear Circulating Water - PA&BN	Retain the current 40 years average service life.
15710 - Water Treatment Plant	Retain the current 20 years average service life.
15711 - Nuclear Circulating Water - PB&DN	Retain the current 55 years average service life.
16210 - Admin & Service Bldgs - Permanent Buildings, Roads, Site Improvements	Retain the current 50 years average service life.
16230 - Admin & Service Bldgs - Buildings - Frame & Metal Clad	Retain the current 25 years average service life.
165601 - Admin & Service Bldgs - Buildings - Admin System Software	Retain the current 5 years average service life.

Minor Fixed Assets Review

The DRC recommends that the currently approved average service life estimate of 10 years for the Service Equipment asset class is appropriate.

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The DRC also recommends retaining the 10-year service life for the Removal Tools for Darlington Refurbishment asset class.

DRC MEMBERS AND APPROVALS COMMITTEE

The DRC includes representatives from the operating business units as well as representatives having experience in finance and accounting, investment planning, and rate regulation.

The Approvals Committee is responsible for approving the DRC recommendations and, as it relates to the nuclear business, is comprised of the following individuals:

- Glenn Jager, Nuclear President and Chief Nuclear Officer
- Ken Hartwick, Chief Financial Officer and Senior Vice President, Finance
- Chris Ginther, Chief Administrative Officer

The 2017 DRC for the nuclear business is comprised of the following members:

- Michael Gore, Director, External Reporting & Accounting Policy (DRC Chair)
- John Blazanin, Vice President, Nuclear Finance
- Cynthia Domjancic, Director, Controllership, Business Support, Central Nuclear
- Randy Pugh, Director, Ontario Regulatory Affairs
- John Mauti, Vice President, Chief Controller & Accounting Officer
- Louisa Kwan, Senior Manager, Corporate Accounting & Reporting