ONTARIO POWER GENERATION INC.

TORONTO, ONTARIO

ASSESSMENT OF REGULATED ASSET DEPRECIATION RATES AND GENERATING STATION LIVES NOVEMBER 2013

Gannett Fleming

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November 29, 2013

Ontario Power Generation Inc.
700 University Avenue
Toronto, Ontario
M5G1X6

Attention:
Mr. David Bell
Senior Manager, Accounting and Reporting
Ontario Power Generation Inc.

Pursuant to your request, we have conducted a review and assessment of the Regulated Asset Depreciation Rates and Generating Station Lives of Ontario Power Generation Inc. ("OPG"). Our report presents a description of the methods used in the estimation of service life and our recommendations for average service life estimates.

We gratefully acknowledge the assistance of OPG personnel in the completion of the review.

Respectfully submitted,
GANNETT FLEMING CANADA ULC.

LARRY E. KENNEDY
VICE PRESIDENT

LEK/hac
Project: 057677

Gannett Fleming, Inc.
Valuation and Rate Division
Suite 277 • 200 Rivercrest Drive S.E. • Calgary, AB T2C 2X5 • Canada
t: 403.257.5946 • f: 403.257.5947
www.gannettfleming.com www.gfvrd.com

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PART I. INTRODUCTION

ONTARIO POWER GENERATION

ASSESSMENT OF REGULATED ASSET DEPRECIATION RATES AND GENERATING STATION LIVES

PART I. INTRODUCTION

SCOPE

This report sets forth the results of the Gannett Fleming Canada ULC ("Gannett Fleming") review of the Ontario Power Generation Inc. ("OPG" or "the Company") average service life estimates based on December 31, 2012 asset values and for Niagara Tunnel placed in-service in 2013. The average service life estimates recommended in this report are considered in OPG's depreciation review process in establishing the asset depreciation rates and generating station lives for the Property, Plant and Equipment ("PP&E") of OPG's prescribed facilities, including directly assigned corporate PP&E balances. As the depreciation and amortization expense is calculated for revenue requirement purposes, the assets for which average service lives were analyzed include intangible assets.

The facilities for which average service lives were analyzed consist of two nuclear generating stations (Pickering and Darlington) and 54 hydroelectric stations, including six stations (the "previously regulated hydroelectric facilities") that were prescribed by *Ontario Regulation 53/05* under the *Ontario Energy Board Act, 1998* effective 2005 (Sir Adam Beck I, II and the Pump Generating Station; DeCew Falls I and II; R.H. Saunders) and 48 stations (the "newly regulated hydroelectric facilities")

that are proposed to be prescribed, as announced by the Government of Ontario in a proposed amendment to *Ontario Regulation 53/05*.[1]

Given the similarity of the plant making up both the previously and newly regulated hydroelectric facilities, the assets of both groups of facilities are categorized by OPG using the same asset classes, with the same average service lives. As part of this study, Gannett Fleming specifically reviewed the operating considerations and typical station configurations of the newly regulated hydroelectric facilities in order to determine if this approach is reasonable, or if there is a need for additional componentization or changes to average service lives specific to these facilities. This review included site tours of 16 newly regulated facilities and operational staff discussions.

REPORT STRUCTURE

Part I, Introduction, contains statements with respect to the scope and plan of the report and the basis of the study. Part II, Methods Used in the Estimation of Average Service Life, presents the methods used in the estimation of average service lives. Part III, Results of Study, presents a summary of the service life estimates and the comparable peer data used in the development of the average service life estimates. Schedule 1A of this report summarize the average service life estimates for the accounts making up the previously and newly regulated hydroelectric facilities. Schedule 1B of this report summarizes the average service life estimates for all

[1] Notice of proposed amendment can be found in OPG's application to the Ontario Energy Board for new payment amounts under EB-2013-0321 Ex. A1-6-1, Attachment 3.

accounts of the prescribed nuclear assets and also separates the nuclear Asset Retirement Costs ("ARC"), which are depreciated over station lives.

BASIS OF THE STUDY

Background. In March 2007, Gannett Fleming submitted a report titled "Review of the Ontario Power Generation Inc. Depreciation Review Process" (the "2007 Report"). The 2007 Report presented a summary of the findings of an independent review of the processes, procedures and methods used by OPG to review its depreciation expense. The 2007 Report indicated that "Gannett Fleming has found that the processes, procedures and methods followed by Ontario Power Generation Inc. adequately meet regulatory objectives regarding depreciation generally accepted by Canadian regulatory authorities."[2] Additionally, Gannett Fleming found that "OPG's current Depreciation Review Process results in the depreciation expense component of the revenue requirement that reasonably and appropriately reflects the consumption of the average service life of OPG's regulated assets. Gannett Fleming also views that, overall, the DRC process is adequate in meeting the generally accepted regulatory objectives regarding depreciation for regulated North American utilities."[3] Overall, the 2007 Report concluded that the procedural foundation upon which OPG's Depreciation Review Committee ("DRC") has developed average service life estimates is robust and appropriate. The 2007 Report contributed, in part, to the Ontario Energy Board ("OEB") Decision EB-2007-0905 finding that the approach employed by OPG in the development of its depreciation expenses is reasonable.

[2] Cover Letter to the 2007 Report.
[3] 2007 Report, page III-2.

In 2011, Gannett Fleming was retained by OPG to complete a comprehensive assessment of the asset depreciation rates and generating station lives of OPG's regulated assets as of December 31, 2010. As noted in the report titled "Assessment of Regulated Asset Depreciation Rates and Generating Station Lives" dated December 16, 2011 (the "2011 Depreciation Study"), the DRC had continued to follow the methods as outlined in the 2007 Report in the four years since the issuance of that report. Furthermore, Gannett Fleming found that OPG had modified and adapted its processes to address the key recommendations in the 2007 Report. As such, Gannett Fleming viewed that the then currently approved average service life estimates continued to be based on a procedurally sound and reasonable DRC process. In light of this, Gannett Fleming found much of the work prepared by the DRC over the preceding several years to be a reliable information source in the course of conducting the 2011 Depreciation Study. The 2011 Depreciation Study recommended the continuation of the currently approved average service life estimates for all plant accounts for OPG's regulated assets, with three modifications to the average service life estimates to the hydroelectric accounts, including the creation of a new plant account for security systems. OPG implemented these modifications for all of its hydroelectric operations effective January 1, 2012.

The 2011 Depreciation Study also recommended the continuation of the then current life span dates for the regulated stations, including the Pickering A and Pickering B nuclear units (now more generally described as Pickering to reflect the consolidation of the units into a single station), pending the technical results of a pressure tube study. Specifically, Gannett Fleming noted the following: "Gannett Fleming believes that until

the review of the Pickering B plant is completed it is premature to adjust the life span date of Pickering A from the current date of December 31, 2021. Gannett Fleming also believes that the use of a life span of September 30, 2014 for Pickering B is appropriate until such time as reviews to determine the economic feasibility of a major pressure tube program are completed, which Gannett Fleming understands is expected in 2012. In the circumstance that the assessment of the condition of the Pickering pressure tubes results in a decision that the Pickering plant cannot continue operations, future depreciation reviews may be required to adjust the life span date of the Pickering A units."[4]

As anticipated in the 2011 Depreciation Study, the results of the work program related to the Pickering B (now known as Pickering Units 5 through 8) pressure tubes confirmed in 2012 that these units could operate beyond September 30, 2014. In addition, the Niagara Tunnel, which represents a significant new addition to the PP&E of OPG's regulated assets, was placed in-service in 2013, and 48 additional OPG hydroelectric facilities are proposed to become subject to OEB regulation. In light of these developments, OPG issued a Request for Proposal in 2013 for a new independent depreciation study. Gannett Fleming was retained to provide an independent professional opinion regarding the average service life estimates used by OPG for the previously and newly regulated assets, leading to the recommendations and conclusions as contained in this report. Gannett Fleming used a similar approach to the 2011 Depreciation Study in arriving at these recommendations and conclusions.

The DRC has continued to follow the methods outlined in the 2007 Report,

[4] 2011 Depreciation Study, page II-12.

having modified and adapted its processes to address key recommendations in that report. As such, the currently approved average service life estimates, as modified by the results of the 2011 Depreciation Study, continue to be based on a procedurally sound and reasonable DRC process. Given this previously-reviewed DRC process, the prior Gannett Fleming findings regarding this process, and the review of the DRC work by Gannett Fleming as part of the 2011 Depreciation Study, Gannett Fleming, to a large extent, continues to find the work prepared over the past several years by the DRC to be a reliable information source. While the 2007 Report and the 2011 Depreciation Study were focused on the prescribed facilities, OPG's internal DRC review process applies to all of OPG's hydroelectric facilities, including the newly regulated hydroelectric plants. In light of this and given the similarity of plant assets and asset management programs across OPG's hydroelectric fleet, Gannett Fleming also finds the DRC work to be, to a large extent, a reliable source of information for the newly regulated hydroelectric facilities.

With the exception of minor fixed assets, which represent approximately 2% of OPG's total regulated investment excluding ARC, OPG continues to depreciate its regulated assets using a straight line method of depreciation, with the depreciation rates being calculated based on the Average Life Group – Whole Life Procedure. The Average Life Group – Whole Life procedure has been used by OPG for a number of years and has previously been approved by the OEB.

Service Life Estimates. The service life estimates presented herein are based on commonly accepted methods and procedures for determining average service life estimates for electric utility plant, and consideration of information obtained about

condition assessments through discussion with OPG operating staff and site tours. The service life estimates were based on in-service asset values through December 31, 2012 (with the exception of the Niagara Tunnel which was placed in-service in 2013), a review of the Company's practices and outlook as they relate to plant operation and retirement, and the service life estimates for other electric generation companies.

The average service life estimates for each depreciable group were reviewed based on the professional judgment of Gannett Fleming. In reviewing the average service lives, Gannett Fleming gave consideration to the average service lives currently approved for use by OPG; the results of the 2011 Depreciation Study; the approved service life estimates for a peer group of electric generation companies; the experience of internal OPG operating and management staff; assessment of asset conditions; and the experience of Gannett Fleming in selecting average service lives for similar plant. Gannett Fleming's review of the average service lives for the Niagara Tunnel is discussed specifically in Part II of this report.

Depreciation Policy. In the review of OPG's plant account structure, Gannett Fleming considered the expectation of the diversity of asset retirement ages within each account in the development of the average service life estimate for each account. The use of the Average Life Group - Whole Life Procedure applies the same annual accrual rate to all vintages of plant, which is calculated by dividing 100% by the average service life estimate. As such, a common life estimate is applied to each of the asset vintages, and each of the assets within each vintage. This procedure is widely used by a number of regulated electric utilities throughout North America, and results in a reasonable recovery of capital investment.

Depreciation related to the nuclear asset classes continues to be based on the lesser of the generation station life or asset class life. Hydroelectric generating stations' lives, including those of the newly regulated hydroelectric stations, are considered to be limited by the service lives of the dams; however, since the dams have service lives that exceed those of most other asset classes, Gannett Fleming is of the view that they are not a significant limiting factor at this time.

As discussed later in this report, based on its review, Gannett Fleming has recommended that two new hydroelectric plant accounts and two new nuclear plant accounts be created in order to separate certain assets currently recorded in other accounts. Gannett Fleming also understands that, for ease of future average service life reviews, the DRC is considering a recommendation for a disaggregation of Account 15340000 – Nuclear Process Systems into separate, new plant accounts for major types of systems. The new accounts would have the same average service life of 55 years as Account 15340000. Gannett Fleming agrees with this approach, as it would facilitate future service life reviews.

RECOMMENDATIONS

The average service life estimates set forth herein apply specifically to the PP&E (including intangible assets) of OPG's previously and newly regulated hydroelectric facilities and prescribed nuclear facilities, including directly assigned corporate PP&E, as of December 31, 2012 and the Niagara Tunnel placed in-service in 2013. The average service life recommendations contained in this report should be applied to all assets within each group of assets. As described in the Results section of this report,

Gannett Fleming is recommending six changes to the average service life estimates, as follows:

- Account 10318000 – Hydroelectric – Gates, Stoplogs and Operating Mechanisms – Change average service life estimate from the currently approved 50 years to 55 years;
- New Account – Hydroelectric – Roofing – Create a new plant account with an average service life estimate of 30 years;
- New Account – Hydroelectric – Fencing – Create a new plant account with an average service life estimate of 25 years;
- New Account – Nuclear – Roofing – Create a new plant account with an average service life estimate of 25 years;
- New Account – Nuclear – Large Circulating Water Motors (greater than 200Hp) – Create a new plant account with an average service life estimate of 30 years; and
- Reclassification of assets for nuclear turbine generator controls from existing Account 15411100 – Turbines and Auxiliaries with a 55-year average service life to existing Account 15600000 – Nuclear – Instrumentation and Control with a 15-year average service life.

Gannett Fleming is also of the view that, as recommended by the DRC in 2012, a new hydroelectric plant account with an average service life estimate of 90 years should be established for the tunnel lining of the new Niagara Tunnel.

Continued surveillance and periodic revisions are required to maintain use of appropriate average service lives and depreciation rates. Each account should be subjected to a complete depreciation study which re-evaluates 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.

PART II. METHODS USED IN THE ESTIMATION OF AVERAGE SERVICE LIFE

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DEPRECIATION

Depreciation, in public utility regulation, is the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of electric generation plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, deterioration, action of the elements, inadequacy and obsolescence.

Depreciation, as used in accounting, is a method of distributing fixed capital costs, less net salvage, over a period of time by allocating annual amounts to expense. Each annual amount of such depreciation expense is part of that year's total cost of providing utility service. Normally, the period of time over which the fixed capital cost is allocated to the cost of service is equal to the period of time over which an item renders service, that is, the item's service life. The most prevalent method of allocation is to distribute an equal amount of cost to each year of service life. This method is known as the Straight Line method of depreciation.

As described in earlier sections of this report, the recommendations of this report are to continue to incorporate the depreciation practices historically used at OPG, namely that the depreciation expense be calculated in accordance with the Straight Line method of depreciation, incorporating the Average Life Group - Whole Life procedure in the calculation of the depreciation rate. The calculation of annual depreciation expense based on the Straight Line - Average Life Group - Whole Life procedure requires the estimation of average life as discussed in the sections that follow.

AVERAGE SERVICE LIFE

The use of an average service life for property groups that include large numbers of similar assets implies that the various units in the group have different lives. Thus, the average life may be obtained by determining the separate lives of each of the units, or by constructing a life estimate that considers the retirements of units which survive at successive ages. The average service life estimates reviewed by Gannett Fleming were based on judgment which considered a number of factors, including:

- Understanding of the processes used in the development of the currently used average service life estimates through the completion of a prior review of the DRC process filed in EB-2007-0905, and through the completion of the 2011 Depreciation Study;
- Understanding of the assets currently in service through discussions with company staff, including representatives of the nuclear and hydroelectric generation operating units;
- Physical site tours of nuclear and newly regulated hydroelectric generation sites;
- Review of current accounting practices and procedures applied and their consistency with those in place during the review submitted in EB-2007-0905 and those reflected in the 2011 Depreciation Study;
- Review of analyses provided to DRC;
- Average service life estimates from other peer electric generation companies; and,
- The general experience and professional judgment of Gannett Fleming.

Prior Assignments and Review of the DRC Process. Gannett Fleming had been previously retained in 2007 to review the practices and procedures used by the DRC in the completion of prior depreciation studies, and, in 2011, for the completion of a full depreciation study. The 2007 review resulted in a report of the findings of Gannett Fleming which were submitted to the management of OPG in 2007. The 2011 Depreciation Study resulted in a report dated December 16, 2011, which was submitted to management of OPG in 2011 and, in 2013, filed by OPG in OEB proceeding EB-2013-0321. These prior reviews provided Gannett Fleming with an understanding of the processes used by OPG in the determination of average service life estimates, a general understanding of the type of generation plant in service at OPG, and an understanding of the regulatory oversight of the Ontario Energy Board.

Operating Discussions and Site Tours. Discussions with operating representatives and the physical site tours undertaken by Gannett Fleming provided Gannett Fleming with an understanding of the type of assets in service for both nuclear and hydroelectric service. The site tours provide Gannett Fleming with the necessary background to make an assessment of the physical installations of the OPG plant, and to understand the type of plant in service and the operating conditions of the facilities. The operating interviews are undertaken to understand the historic operating conditions that have led to retirement of plant in the past and to understand the current condition of the assets which may impact future retirement plans. The operating interviews were conducted both during the Gannett Fleming tours of the physical facilities and

immediately following the tours, and again after Gannett Fleming completed an initial analysis of the average service life expectations.

In conducting the 2011 Depreciation Study, Gannett Fleming toured the following generation sites:

- R.H. Saunders Hydroelectric Generating Station;
- Sir Adam Beck I Hydroelectric Generating Station;
- Sir Adam Beck II Hydroelectric Generating Station; and
- Darlington Nuclear Generating Station.

The scope of this report includes the review of the newly regulated hydroelectric generation plants. In order to gain a better understanding of these assets and as part of the assessment of nuclear assets, Gannett Fleming toured the generation plants listed below in the course of this assignment. Gannett Fleming toured a total of 16 newly regulated hydroelectric facilities, representing a range of different types and sizes of the facilities.

- Chats Falls Hydroelectric Generating Station;
- Arnprior Hydroelectric Generating Station;
- Stewartville Hydroelectric Generating Station;
- Calabogie Hydroelectric Generating Station;
- Barrett Chute Hydroelectric Generating Station;
- Chenaux Hydroelectric Generating Station;
- Des Joachims Hydroelectric Generating Station;
- Otto Holden Hydroelectric Generating Station;

- Bingham Chutte Hydroelectric Generating Station;
- Big Chute Hydroelectric Generating Station;
- Ragged Rapids Hydroelectric Generating Station;
- Hanna Chute Hydroelectric Generating Station;
- South Falls Hydroelectric Generating Station;
- Elliot Chute Hydroelectric Generating Station;
- Tretheway Falls Hydroelectric Generating Station;
- Big Eddy Hydroelectric Generating Station;
- Darlington Nuclear Generating Station; and
- Pickering Nuclear Generating Station.

Tours of the above generating stations provided Gannett Fleming with the necessary background to complete this assignment. During and immediately following each of the above site tours, interviews of the operational representatives were undertaken by Gannett Fleming. These interviews were conducted at the time of the site tours and covered the following topics, including, where applicable, inquiries regarding operational or other changes since the 2011 Depreciation Study:

- Operating history of both the plant being toured and of other similar plant not toured;
- Replacement history of major plant components and review of significant retirement programs;
- General operating experience of the major plant components;
- Review of any life restricting operational issues;

- Review of any issues that have emerged during the DRC process;
- Review of changes where advancements in technology may cause changes to average service life indications; and
- Discussions of the manner in which OPG's hydroelectric plants may be different than other peer hydroelectric generation plants.

In addition, following the plant tours, discussions were conducted through a number of telephone interviews held between Gannett Fleming and operational representatives of OPG.

Review of Accounting Policies. Gannett Fleming had discussions with management representatives during prior assignments to understand OPG's depreciation and accounting policies and practices. As part of the current assignment, Gannett Fleming confirmed with management representatives whether there had been changes to these policies and practices since the 2011 Depreciation Study and whether these policies and practices are also applied to the newly regulated hydroelectric plant.

An understanding of the accounting policies is required to:

- Understand the accounting entries associated with the retirement of plant. In particular, Gannett Fleming required an understanding of the accounting entries associated with gains and losses on retirement;
- Understand any thresholds or policies with regard to capitalization of major component as compared to the replacement of minor components of plant through operating and maintenance budgets; and

- Determine if a review of the adequacy of the accumulated depreciation reserve is required.

Gannett Fleming notes that, notwithstanding OPG's of adoption of US GAAP, the current DRC and depreciation policies and practices for the previously regulated assets are the same as those reflected in the 2011 Depreciation Study. Gannett Fleming also notes that starting in 2011, all gains and losses on retirement transactions are booked by OPG for all of its assets to the income statement in the year of the retirement transaction. In this manner, the accumulated depreciation account does not include embedded gains or losses from previous retirement transactions. Gannett Fleming understands that, on an OPG-wide basis, the total cumulative undepreciated value of embedded past losses, which OPG removed from the net book value of fixed and intangible assets in 2011, is less than $1M.

Gannett Fleming also notes that any amount of cost of removal (that is not associated with the retirement of an asset for which an Asset Retirement Obligation ["ARO"] is established) is charged directly to the income statement in the year of the transaction. Both the recording of gains and losses to income and the charging of cost of removal to income is in accordance with the provisions of US GAAP. As previously noted in the 2011 Depreciation Study (page II-7), while these are not the traditional practices of regulated utilities, Gannett Fleming believes that the nature of the large plant components and small amount of retirement transactions make this policy viable and reasonable for OPG. Additionally, because the accumulated depreciation account does not include adjustments for past retirement transactions the need to test the adequacy of the accumulated depreciation accounts is eliminated.

Gannett Fleming confirmed that the same DRC and depreciation policies and practices are applied by OPG both to the previously and newly regulated hydroelectric assets.

Analysis and Results of DRC Reviews. OPG is the world's largest operator of CANada Deuterium Uranium ("CANDU") nuclear units, has some of the oldest CANDU units, and has the most extensive operational knowledge of all CANDU operators in the world. OPG is heavily involved in technical exchanges with other CANDU operators, and closely monitors equipment degradation issues in order to assess potential impacts on OPG's units. OPG is often the "lead" utility in terms of the knowledge of degradation issues, which may impact unit and component lives. In the particular circumstance of the CANDU nuclear installations, OPG internal staff is recognized as experts in the technology.

The DRC has continued to complete detailed reviews of the average service life expectations for OPG's plant accounts. The DRC's technical reviews are conducted by internal and external experts in the specific areas associated with a number of accounts. As indicated above, the OPG operational staff is considered to be the world experts in the operational aspects of the CANDU units. As part of the current assignment and the 2011 Depreciation Study, Gannett Fleming reviewed these analyses which provided a significant background on the physical condition of the assets, a meaningful history of the manner in which plant assets have provided electric generation service over the past many years, and identified major upcoming replacement or retirement programs.

Peer Analysis. In order to provide a comparison for each account grouping, Gannett Fleming selected a peer group of companies to use in the development of average service lives. The companies selected for comparison were all companies for which Gannett Fleming has recently completed depreciation studies relating to Canadian electric generation plants. As such, Gannett Fleming is able to make a meaningful comparison giving consideration to factors such as capitalization and retirement policies, maintenance practices, and general operational practices. The companies selected for comparison were:

- BC Hydro;
- Manitoba Hydro;
- New Brunswick Power;
- Newfoundland and Labrador Power Corporation (Nalcor);
- Northwest Territories Power Corporation; and
- SaskPower.

As noted in the 2011 Depreciation Study (page II-8), asset service lives for OPG's hydroelectric asset classes lend themselves to comparison with other utilities due to the similar nature of the technology used in hydroelectric energy production. This applies both to the previously and newly regulated hydroelectric assets. As such, the above utilities provided Gannett Fleming with a comparable base of average service life estimates to use in the development of the service life estimates for OPG's hydroelectric asset classes.

Professional Judgment. The use of professional judgment in the development of average service life estimates is a practice that is appropriate and has been used for many years before North American regulatory jurisdictions. When available, the use of statistical analysis of the historic retirement transactions combined with the use of professional judgment which includes the physical site inspections, review of accounting procedures and practices, use of operational staff interviews, review of prior studies, and review of the approved life estimates of peer companies, provides the most complete method of service life analysis. However, the use of professional judgment alone also provides an appropriate basis for developing average service life estimates, when appropriate factors are considered, and has been accepted as a valuable depreciation analysis tool in many North American jurisdictions.

In the specific circumstances of the OPG average service life estimation, the volume of historic retirement transactions available to be analyzed is not sufficient to undertake a detailed study of retirement history. As such, a retirement rate analysis was not completed by Gannett Fleming. However, all of the remaining life estimation tools were available and were used to develop appropriate average service life estimates.

Life Span Dates. Life expectancy of electric generation plant assets is impacted not only by physical wear and tear of the assets but also by economic factors including the feasibility of the economic replacement of major operating components or the economic viability of the plant as a whole. In circumstances where the replacement of major operating components is not economically feasible, the life of the major component can be the determining factor of the generation plant and all of the assets

within the plant. As such, the remaining depreciation life of electric generation plant assets is the lesser of the physical life expectation of the asset or the period to the end of the life span of the generation plant.

The use of life span dates for determining depreciable lives for regulated electric generation plant is common throughout many North American regulatory jurisdictions. The basis for the determination of the life span date is usually based on one or more of the following:

- the physical life estimation of the major and vital components of the generating plant;
- the duration of operating licenses;
- precedent and policy of the regulatory jurisdiction;
- expiration of the supply source for which the generation plant is dependent; and
- expiration of market demand upon which the generation plant is dependent.

In prior depreciation reviews, OPG has determined a life span date for each of the prescribed nuclear plants. The life span dates have been determined through a review of the expected life of the significant components at each nuclear site. Additionally, the life span dates historically have been influenced by the period through to any required major site refurbishment, as the continued operation of the plant is dependent upon the ability to economically refurbish the plant for continued use. It is the experience of Gannett Fleming that the depreciation schedules for most North American nuclear generation plants are dependent upon appropriately developed life

span dates. It continues to be the view of Gannett Fleming that the use of life span dates is appropriate for the OPG nuclear generation plants.

In the 2011 Depreciation Study, it was noted that an assessment of the condition of the Pickering Units 5 through 8 (formerly Pickering B) pressure tubes was underway at that time. In that report, Gannett Fleming noted that the use of a life span date of September 30, 2014 for Pickering Units 5 through 8 was appropriate until such time as reviews to determine the economic feasibility of a major pressure tube program are completed, which was expected to occur in 2012. It was also noted that the operation of Pickering Units 1 and 4 (formerly Pickering A) requires the joint operation of certain components of both sets of units. As such, both physical and economic considerations may result in the circumstance that should Pickering Units 5 through 8 be shut down before Pickering Units 1 and 4, there is a significant likelihood that the operation of Pickering Units 1 and 4 would not be viable following the shutdown. At that time, Gannett Fleming was of the view that until the review of pressure tubes at Pickering Units 5 through 8 was sufficiently complete, it was premature to adjust the life span date of Pickering Units 1 and 4 from the then current date of December 31, 2021.

In 2012, the DRC considered the impact of the results of the substantial completion in 2012 of the work program necessary to determine the feasibility of achieving extended service lives of the pressure tubes at Pickering. Upon receiving confirmation that the work program indicated high confidence that the operation of the pressure tubes at Pickering Units 5 through 8 could be extended, the DRC concluded that the following dates, which were reflected in materials submitted by OPG in OEB proceeding EB-2012-0002, appropriately recognize the expected average life spans of

the nuclear stations, for depreciation purposes, effective December 31, 2012:

- Pickering Units 1 and 4 (formerly Pickering A) – December 31, 2020; and
- Pickering Units 5 through 8 (formerly Pickering B) – April 30, 2020.

The above station life span dates reflect the following expected life span dates for the individual Pickering units:

- Units 1, 4, 7 and 8 – Q4 2020
- Unit 5 – Q1 2020
- Unit 6 – Q2 2019

The life span dates for Pickering Units 1 and 4 were aligned with the last two units of Pickering Units 5 through 8 in recognition of the technical and economic considerations that likely would have prevailed against the operation of Units 1 and 4 in the absence of continued operation of at least two units of Pickering Units 5 through 8.

Gannett Fleming has reviewed the DRC's analysis in establishing the above station and unit life span dates and has concluded that they are reasonable for use in this study. Gannett Fleming is also of the view that the factors considered and methods used by the DRC in the assessment of life span dates remain appropriate and consistent with common regulatory practices and should continue to be used in future reviews.

As recognized in the previous DRC reviews and the 2011 Depreciation Study, a major refurbishment program is expected to be undertaken at the Darlington nuclear site. This continues to be reflected in the life span date of December 31, 2051 for the Darlington station. Given that the major operating components at the Darlington plant are expected to be refurbished in the near future, Gannett Fleming finds that the

December 31, 2051 date continues to be reasonable, as recommended in the 2012 DRC review.

The previously and newly regulated hydroelectric plant dams are considered to be the life-limiting component of these stations, but since the dams have service lives that exceed that of most other classes, Gannett Fleming is of the view that they are not a significant limiting factor.

Niagara Tunnel. In March 2013, the Niagara Tunnel Project was placed in-service. The scope of the project included the design, construction and commissioning of a new, 10.2 kilometer long diversion tunnel from a new intake under the existing International Niagara Tunnel Works structure in the upper Niagara River above Niagara Falls to a new outlet canal feeding into the existing Sir Adam Beck ("SAB") Pump Generating Station canal. This tunnel supplements the diversion capacity of the two existing tunnels that bring water from the Niagara Falls to the SAB stations, and therefore enables additional generation from these facilities. The new diversion tunnel and related works were delivered under a Design-Build Agreement between OPG and its main contractor.

The new tunnel was constructed using a two-pass tunneling system, with the initial pass consisting of the excavation of the tunnel using a tunnel boring machine and the installation of the initial lining using steel supports in the tunnel roof and a full circumference layer of shortcrete (sprayed concrete). The permanent lining comprised of an impermeable membrane generally surrounding un-reinforced concrete locked in place by cement grout was installed as part of the second pass.

The Niagara Tunnel is a significant investment of approximately $1.5 billion in OPG's rate base. This cost largely related to the tunneling activity (approximately $900 million) and to the installation of the tunnel lining (approximately $375 million)[5]. The life expectation of the investment associated with the tunneling is considered to be the same as the life expectations of the two existing tunnels at the Niagara Falls. As such the investment associated with the tunneling for the project has been grouped with the investment associated with the existing tunnels. Gannett Fleming agrees with this treatment. The material and installation techniques used for the lining of the new tunnel are significantly different than the linings of the existing two tunnels. Based on its review of the technical specifications and requirements for the new tunnel as well as other documentation and discussions, Gannett Fleming supports the recommendation of the 2012 OPG DRC that a longer service life of 90 years (as compared to the 75-year life applied to the lining material in the existing tunnels) be used for the investment specific to the tunnel lining of the new tunnel. A further discussion of the recommended service life for the new tunnel lining is found in Appendix 1.

[5] Amounts are for the Niagara Tunnel addition placed in-service in March 2013.

PART III. RESULTS OF STUDY

PART III. RESULTS OF STUDY

QUALIFICATION OF RESULTS

The review of the reasonableness, and recommended alternative average service life estimates related to plant in service as of December 31, 2012 and the Niagara Tunnel placed in service in 2013 is the principal result of the study. Continued surveillance and periodic revisions are required to maintain continued use of appropriate average service lives. An assumption that life estimates can remain unchanged over a long period of time implies a disregard for the inherent variability in service lives and for the change of the composition of property in service.

SUMMARY OF RESULTS

Gannett Fleming has reviewed the life span dates and average service life estimates for all regulated generation plants and asset categories, considering the factors as identified in Part II of this report. While this review included an analysis of all asset categories, additional focus was placed on the investment categories that comprise the majority of the plant in service.

Gannett Fleming recommends the use of the life span dates as discussed in Part II of this report. Furthermore, Gannett Fleming recommends the continued use of the currently approved average service life estimates, as modified for the results of the 2011 Depreciation Study, for all accounts with the following exceptions:

- Account 10318000 – Hydroelectric Head Gates, Stoplogs and Operating Mechanisms – Average service life to be changed from the currently approved 50 years to 55 years;

- New Account – Hydroelectric – Roofing – Create a new plant account with a 30-year average service life to separate roofing from other plant accounts;
- New Account – Hydroelectric – Fencing – Create a new plant account with a 25-year average service life to separate fencing from other plant accounts;
- New Account – Nuclear – Roofing – Create a new plant account with a 25-year average service life to separate roofing from other plant accounts;
- New Account – Nuclear – Large Circulating Water Motors – Create a new plant account with a 30-year average service life to separate large motors (greater than 200 Hp) from other plant accounts; and
- Reclassification Between Accounts – Nuclear –Turbine Generator Controls – Reclassify nuclear turbine generator controls from Account 15411100 – Nuclear – Turbines and Auxiliaries with a 55-year average service life to Account 15600000 – Nuclear – Instrumentation and Control with a 15-year average service life.

The above recommendations for the hydroelectric plant accounts apply both to the previously and newly regulated hydroelectric assets. Gannett Fleming also agrees with the 2012 DRC recommendation that a new, separate hydroelectric plant account with an average service life estimate of 90 years be established for the tunnel lining of the new Niagara Tunnel placed in service in 2013.

A detailed discussion of the reasons and factors considered leading to the recommended changes for the above accounts is provided in Appendix 1 to this report.

Additionally, Gannett Fleming is satisfied that it is appropriate for OPG to categorize the assets making up both the previously and newly regulated hydroelectric facilities into the same plant accounts, with the same average service lives. In order for this approach to remain reasonable over time, future reviews of asset service lives for the hydroelectric plant accounts should continue to consider whether the conclusions of such reviews and the underlying analysis are applicable to both groups of assets.

DESCRIPTION OF APPENDICES

Appendix 1 to this report provides a summary of the factors considered in the review of each of the major accounts in which Gannett Fleming is recommending a change, as well as the lining of the new Niagara Tunnel. While Gannett Fleming reviewed all accounts listed in Schedule 1A and Schedule 1B, Appendix 1 only provides detailed analyses of the accounts in which a change to the average service life estimate is recommended, as well as the lining of the new Niagara Tunnel.

Appendix 2 to this report provides a listing of the newly regulated hydroelectric stations.

ONTARIO POWER GENERATION

SCHEDULE 1A - SUMMARY OF THE CURRENT AVERAGE SERVICE LIFE ESTIMATES AND GANNETT FLEMING RECOMMENDED AVERAGE SERVICE LIFE ESTIMATES

PREVIOUSLY AND NEWLY REGULATED HYDROELECTRIC ASSETS AS AT DECEMBER 31, 2012

ASSET CLASS #	DESCRIPTION	NBV	% AGE	CURRENT	RECOMMENDED
10200000	HYDROELECTRIC - SUBSTRUCTURES AND SUPERSTRUCTURES	$ 1,227,972,792	19.79%	100	100
10101000	HYDROELECTRIC - EXCAVATION, DREDGING, RIPRAPPING AND GROUTING	$ 1,380,649,053	22.25%	100	100
10312000	HYDROELECTRIC - DAMS - CONCRETE	$ 991,676,359	15.98%	100	100
10318000	HYDROELECTRIC - GATES, STOPLOGS AND OPERATING MECHANISMS	$ 361,275,033	5.82%	50	55
10306000	HYDROELECTRIC - SURGETANK, PIPELINE, CONDUIT, PENTSTOCK	$ 292,982,384	4.72%	75	75
10400000	HYDROELECTRIC - TURBINES AND GOVERNORS	$ 213,248,856	3.44%	70	70
10501000	HYDROELECTRIC - MAIN ROTATIONAL ELECTRICAL EQUIPMENT - LESS WINDINGS	$ 221,787,828	3.57%	75	75
10301000	HYDROELECTRIC - LINING OF TUNNELS AND PERMANENT SHAFTS	$ 219,912,108	3.54%	75	75
10510000	HYDROELECTRIC - MAIN POWER AND STATION SERVICE - TRANSMISSION	$ 175,590,706	2.83%	50	50
10500000	HYDROELECTRIC - MAIN ROTATIONAL ELECTRICAL EQUIPMENT - WINDINGS	$ 114,912,729	1.85%	40	40
10311000	HYDROELECTRIC - DAMS - EARTH AND ROCKFILL	$ 106,329,529	1.71%	100	100
10405000	HYDROELECTRIC - TURBINE RUNNERS	$ 96,535,236	1.56%	40	40
10210000	HYDROELECTRIC - SERVICE AND EQUIPMENT BUILDINGS	$ 101,137,556	1.63%	55	55
10502000	HYDROELECTRIC - BUS, SWITCHING AND POWER CABLE	$ 85,327,386	1.37%	45	45
10300000	HYDROELECTRIC - CANAL, FOREBAY, RETAINING WALL LINING	$ 83,670,918	1.35%	75	75
10504000	HYDROELECTRIC - CONTROL BOARDS AND SWITCHBOARDS	$ 77,122,794	1.24%	25	25
10700000	HYDROELECTRIC - AUXILIARY SYSTEMS	$ 72,291,792	1.16%	30	30
10302000	HYDROELECTRIC - SPILLWAYS, SLUICES, FLUMES	$ 72,513,556	1.17%	75	75
10100000	HYDROELECTRIC - LAND	$ 37,317,826	0.60%	100	100
10709000	HYDROELECTRIC - OWNED BRIDGES, RAILWAY TRACK, WHARVES	$ 54,666,182	0.88%	65	65
10505000	HYDROELECTRIC - STATION SERVICE ELECTRICAL EQUIPMENT	$ 44,045,969	0.71%	50	50
10601000	HYDROELECTRIC - MECHANICAL EQUIPMENT - CRANES AND FOLLOWERS	$ 45,064,408	0.73%	55	55
10205000	HYDROELECTRIC - OUTDOOR STRUCTURES	$ 20,878,634	0.34%	75	75
10710000	HYDROELECTRIC - FIRE PROTECTION SYSTEMS	$ 27,019,773	0.44%	20	20
10503000	HYDROELECTRIC - HIGH VOLTAGE SWITCHING	$ 16,335,367	0.26%	40	40
10503100	HYDROELECTRIC - REVENUE METERING - HIGH VOLTAGE SWITCHING, CONTROL BOARDS AND SWITCHBC	$ 13,162,790	0.21%	30	30
10311100	HYDROELECTRIC - DAMS - TIMBER CRIB	$ 8,624,328	0.14%	60	60
16210000	ADMINISTRATION AND SERVICE BUILDINGS - PERMANENT BLDGS. ROADS AND SITE IMPROVEMENT	$ 7,852,168	0.13%	50	50
10991000	HYDROELECTRIC - MAJOR SPARES	$ 7,207,631	0.12%	100	100
10315000	HYDROELECTRIC - STEEL RACKS	$ 6,220,914	0.10%	40	40
10302100	HYDROELECTRIC - PUBLIC SAFETY/WARNING BOOMS	$ 4,066,117	0.07%	15	15
16550000	ADMINISTRATION AND SERVICE BUILDINGS - LAN CABLE	$ 3,922,188	0.06%	10	10
10531000	HYDROELECTRIC - CIRCUIT BREAKERS	$ 4,048,211	0.07%	50	50
10720000	HYDROELECTRIC - SECURITY SYSTEMS	$ 1,987,371	0.03%	10	10
16100000	ADMINISTRATION AND SERVICE BUILDINGS - LANDS	$ 591,758	0.01%	N/A	N/A
16560100	ADMINISTRATION AND SERVICE BUILDINGS - ADMINSTRATIVE SYSTEMS SW	$ 830,257	0.01%	5	5
16230000	ADMINISTRATION AND SERVICE BUILDINGS - FRAME & METAL	$ 11,000	0.00%	25	25
18400000	COMMUNICATIONS - POWER LINE EQUIPMENT	$ 591,742	0.01%	15	15
18460000	COMMUNICATIONS - DATA ACQ. EQUIP., MAN MACHINE INTERFACE EQUIPMENT	$ 105,828	0.00%	15	15
18630000	COMMUNICATIONS - OPTICAL WIRE	$ 644,287	0.01%	25	25
16551000	ADMINISTRATION AND SERVICE BUILDINGS - LAN ELECTRICAL CONNECTING DEVICES	$ 777,362	0.01%	5	5
18633000	COMMUNICATIONS - OPTICAL WIRE - REVENUE METERING	$ 715,860	0.01%	30	30
18540000	COMMUNICATIONS - ADMINISTRATIVE TELEPHONE EQUIPMENT	$ 216,553	0.00%	7	7

ONTARIO POWER GENERATION

SCHEDULE 1A - SUMMARY OF THE CURRENT AVERAGE SERVICE LIFE ESTIMATES AND GANNETT FLEMING RECOMMENDED AVERAGE SERVICE LIFE ESTIMATES
PREVIOUSLY AND NEWLY REGULATED HYDROELECTRIC ASSETS AS AT DECEMBER 31, 2012

ASSET CLASS #	DESCRIPTION	NBV	% AGE	CURRENT	RECOMMENDED
18600000	COMMUNICATIONS - WOOD POLE, COMMUNICATION CABLE APPARATUS AND BOOTHS	$ 77,039	0.00%	40	40
18530000	COMMUNICATIONS - TIMBER AND STEEL STRUCTURES	$ 17,738	0.00%	40	40
18100000	COMMUNICATIONS - LAND	$ 879	0.00%	100	100
16630000	ADMINSITRATION AND SERVICE BUILDINGS - SYSTEMS & EQUIPMENT	$ 132,754	0.00%	20	20
18200000	COMMUNICATIONS - BUILDINGS	$ 58,601	0.00%	50	50
18500000	COMMUNICATIONS - RADIO EQUIPMENT	$ 5,974	0.00%	15	15
	MINOR FIXED ASSETS	$ 4,094,653	0.07%		
NEW	HYDROELECTRIC - NIAGARA FALLS - NEW TUNNEL LINING	$ -	0.00%	N/A	90
NEW	HYDROELECTRIC - BUILDINGS - ROOFING	$ -	0.00%	N/A	30
NEW	HYDROELECTRIC - FENCING	$ -	0.00%	N/A	25
	GRAND TOTAL	**$ 6,206,228,777**	**100.00%**		

ONTARIO POWER GENERATION

SCHEDULE 1B. SUMMARY OF CURRENT AVERAGE SERVICE LIFE ESTIMATES AND GANNETT FLEMING RECOMMENDED AVERAGE SERVICE LIFE ESTIMATES

PRESCRIBED NUCLEAR ASSETS AS AT DECEMBER 31, 2012

ASSET CLASS #	DESCRIPTION	NBV	% AGE	CURRENT	RECOMMENDED
15200000	NUCLEAR - BUILDINGS AND STRUCTURES	202,581,250	13.84%	55	55
15340000	NUCLEAR - PROCESS SYSTEMS	165,034,350	11.27%	55	55
15600000	NUCLEAR - INSTRUMENTATION AND CONTROL - PA&BG	163,390,095	11.16%	15	15
15701000	NUCLEAR - SERVICE WATER AND FIRE PROTECTION SYSTEM	122,983,880	8.40%	25	25
15720000	NUCLEAR - COMMON SERVICE SYSTEMS	94,104,574	6.43%	35	35
15121000	NUCLEAR - ELECTRONIC SITE SECURITY SYSTEM	77,170,667	5.27%	15	15
15120000	NUCLEAR - YARD FACILITIES	62,632,092	4.28%	50	50
15450000	NUCLEAR - CONDENSER TUBING	59,936,357	4.09%	30	30
15561000	NUCLEAR - AC STANDBY POWER - PB&DG	45,936,441	3.14%	55	55
15361000	NUCLEAR - IRRADIATED FUEL BAYS - PICKERING B	36,512,986	2.49%	65	65
15550000	NUCLEAR - REACTOR BUILDING CABLING	31,313,114	2.14%	40	40
16310000	ADMINISTRATION AND SERVICE BUILDINGS - NUCLEAR TRAINING SIMULATORS	29,502,112	2.02%	45	45
15991000	NUCLEAR - MAJOR / STRATEGIC SPARES	23,310,388	1.59%	100	100
15341100	NUCLEAR - MODERATOR HEAT EXCHANGERS-PICKERING	21,664,508	1.48%	25	25
16560100	ADMINISTRATION AND SERVICE BUILDINGS - INTANGIBLES ADMINISTRATION SYSTEM SOFTWARE	20,482,148	1.40%	5	5
15510000	NUCLEAR - STATION SERVICE MAIN TRANSFORMERS AND AC POWER DISTRIBUTION SYSTEMS-PA&BG	18,723,596	1.28%	40	40
15460000	NUCLEAR - AUXILIARY SYSTEMS - PB&DG	17,433,082	1.19%	40	40
15500000	NUCLEAR - MAIN POWER OUTPUT SYSTEM	17,311,287	1.18%	35	35
15421000	NUCLEAR - GENERATOR ROTORS, STATORS AND AUXILIARY SYSTEMS - PB&DG	14,463,334	0.99%	55	55
15560000	NUCLEAR - AC STANDBY POWER - PA&BG	12,946,426	0.88%	40	40
15710000	NUCLEAR - WATER TREATMENT PLANT	11,755,949	0.80%	20	20
15352100	NUCLEAR - SHUTDOWN COOLING SYSTEM HEAT EXCHANGERS-DARLINGTON	7,180,243	0.49%	30	30
16540000	ADMINSTRATION AND SERVICE BUILDINGS - ADMINISTRATIVE TELECOM EQUIPMENT	6,817,736	0.47%	7	7
15330000	NUCLEAR - REACTIVITY CONTROL UNITS	6,428,607	0.44%	40	40
15461000	NUCLEAR - AUXILIARY SYSTEMS - PB&BG	5,888,839	0.40%	55	55
15711000	NUCLEAR - CIRCULATING WATER - PA&BG	5,645,173	0.39%	55	55
16210000	ADMINSTRATION AND SERVICE BUILDINGS - PERMANENT BUILDINGS, ROADS AND SITE IMPROVEMENTS	5,189,964	0.35%	50	50
15501000	NUCLEAR - REVENUE METERING - MAIN POWER OUTPUT, INSTRUMENTION AND CONTROL-PICK/DARL	4,420,168	0.30%	30	30
15990000	NUCLEAR - ALTERNATE SPARES	3,870,028	0.26%	100	100
15300000	NUCLEAR - REACTOR VESSELS	3,255,283	0.22%	40	40
16211000	ADMINISTRATION AND SERVICE BUILDINGS - BUILDINGS - LEASED	3,053,583	0.21%	10	10
15700000	NUCLEAR - CIRCULATING WATER	2,967,609	0.20%	40	40
16630000	ADMINISTRATION AND SERVICE BUILDINGS - BUILDING SYSTEMS AND EQUIPMENT	2,378,027	0.16%	20	20
15370000	NUCLEAR - TRITIUM REMOVAL FACILITY	2,367,846	0.16%	30	30
15411100	NUCLEAR - TURBINES, AUXILIARY EQUIPMENT, STEAM REHEATER TUBE - PB&DG	1,920,354	0.13%	55	55
15531000	NUCLEAR - BUILDING ELECTRICAL SERVICE SUPPLIES - PB&DG	1,586,505	0.11%	55	55
15352000	NUCLEAR - SHUTDOWN COOLING SYSTEM HEAT EXCHANGERS-PICKERING	1,259,362	0.09%	25	25
16550000	ADMINISTRATION AND SERVICE BUILDINGS - LAN CABLE	1,147,295	0.08%	10	10
18500000	COMMUNICATIONS - RADIO EQUIPMENT	1,030,056	0.07%	15	15
16230000	ADMINISTRATION AND SERVICE BUILDINGS - BUILDINGS- FRAME AND METAL CLAD	1,005,387	0.07%	25	25

ONTARIO POWER GENERATION

SCHEDULE 1B. SUMMARY OF CURRENT AVERAGE SERVICE LIFE ESTIMATES AND GANNETT FLEMING RECOMMENDED AVERAGE SERVICE LIFE ESTIMATES
PRESCRIBED NUCLEAR ASSETS AS AT DECEMBER 31, 2012

ASSET CLASS #	DESCRIPTION	NBV	% AGE	CURRENT	RECOMMENDED
15511000	NUCLEAR - STATION SERVICE MAIN TRANSFORMERS AND AC POWER DISTRIBUTION SYSTEMS - PB&DG	896,419	0.06%	55	55
15541000	NUCLEAR - ELECTRICAL AUXILIARY SYSTEM-PB&DG	791,287	0.05%	55	55
15400000	NUCLEAR - TURBINES, AUXILIARY EQUIPMENT, STEAM REHEATER TUBE -PA&BG	693,921	0.05%	40	40
16311000	ADMINISTRATION AND SERVICE BUILDINGS - NUCLEAR SIMULATORS - DESIGN UPGRADES	456,887	0.03%	10	10
15360000	NUCLEAR - IRRADIATED FUEL BAYS - PICKERING A	400,039	0.03%	40	40
15311000	NUCLEAR - FUEL CHANNEL ASSEMBLIES	154,089	0.01%	25	25
15430000	NUCLEAR - EXCITERS	75,910	0.01%	30	30
18633000	COMMUNICATIONS - OPTICAL WIRE - REVENUE METERING	38,917	0.00%	30	30
18460000	COMMUNICATIONS - DATA ACQ. EQUIP., MAN MACHINE INTERFACE EQUIPMENT	24,631	0.00%	15	15
18630000	COMMUNICATIONS - OPTICAL WIRE	8,636	0.00%	25	25
	MINOR FIXED ASSETS - SERVICE EQUIPMENT	134,697,036	9.20%		
	MINOR FIXED ASSETS - OTHER	8,923,873	0.61%		
NEW	NUCLEAR - ROOFING		0.00%	N/A	25
NEW	NUCLEAR - LARGE CIRCULATING WATER MOTORS - OVER 200 HP		0.00%	N/A	30
	TOTAL	**1,463,762,346**	**100.00%**		
	ASSET RETIREMENT COSTS (ARC)	1,510,363,609			
	GRAND TOTAL	**2,974,125,954**			

APPENDIX 1

ONTARIO POWER GENERATION INC.
Detailed Discussion Related To Accounts Where An
Average Service Life Change Is Recommended

Account 10318000 – Hydroelectric Gates, Stoplogs and Operating Mechanisms

Current Average Service Life Estimate – 50 years

Recommended Average Service Life Estimate – 55 years

Average of Peer Average Service Lives – 72 years (Range from 50 to 100 years)

Discussion:

This account includes the investment in a number of the operating mechanisms related to the hydroelectric dams, including the head gates and stoplogs. Since the 1990's, OPG has been engaged in a significant gate replacement program. The average replacement age of the original gates has been 40 to 60 years. OPG's Dam Safety Program mandates rigorous annual functional testing, inspection and gate maintenance. Experience gained through these monitoring and assessment programs has shown that after 40-60 years of service life, the gates typically require an extensive rebuild. Replacement parts or components may no longer be commercially available requiring extensive and costly re-engineering to restore original functionality. Replacing with a current gate design takes full advantage of improvements in manufacturing processes, operating mechanism design, material properties, electronic controls, etc. that have occurred over the past 50 years.

Integration of wind and other intermittent renewable sources of generation has increased over time and is expected to continue into the future. As a result, increased cycling of hydro generating units has been experienced, along with a similar increase in gate operation cycles.

In making the recommendation for an increase to the average service life estimate, Gannett Fleming has specifically noted that the life estimates of the peer group have been increasing in recent depreciation studies. A review of peer companies has indicated average service life estimates for the peer group of companies now range from 50 years to as long as 100 years. However, it is noted that the peer companies at the longer end of this range include this investment in their overall dam structures accounts. With the removal of the longer life peer indications from the peer analysis the comparable life estimates of the peer group range from 50 to 80 years with an overall average of 55 years.

The recommended 55-year average service life estimate has been developed giving consideration to all of the above influences. It is expected that improvements in gate design and reliability will be partially offset by moderately increasing frequency of operation, thus the currently assigned life of 50 years can be increased to 55 years, which is consistent with the indications from the adjusted peer analysis.

ONTARIO POWER GENERATION INC.
Detailed Discussion Related To Accounts Where An
Average Service Life Change Is Recommended

NEW ACCOUNT – Hydroelectric Fencing

Current Average Service Life Estimate – 100 years

Recommended Average Service Life Estimate – 25 years

Average of Peer Average Service Lives – 25 to 30 years

Discussion:

This account would include the OPG investment related to site parameter fencing at the hydroelectric facilities. During the operational tours conducted by Gannett Fleming it was specifically noted that OPG had recently undergone a significant program to upgrade its site parameter fencing. OPG intends to continue its focus on public safely through the planned continuation of this program. As such, it is appropriate to set up a separate account for fencing.

A review of the peer companies has indicated average service life estimates ranging from 25 to 30 years with most peer utilities using 25 years. Therefore, based on a peer analysis, an average service life of 25 years is reasonable. Discussions with OPG operational staff have also confirmed that the use of a 25-year average service life for this new account is reasonable.

ONTARIO POWER GENERATION INC.
Detailed Discussion Related To Accounts Where An
Average Service Life Change Is Recommended

NEW ACCOUNT – Hydroelectric Roofing

Current Average Service Life Estimate – 75 to 100 years

Recommended Average Service Life Estimate – 30 years

Average of Peer Average Service Lives – 30 years

Discussion:

This proposed new account relates to the OPG investment in roofing which has shown to have a materially shorter life than the associated buildings. Historically, several of OPG hydroelectric plant roofing systems have reached between 25 to 50 year service life milestones before complete replacement. However, the service life is dependent on the type of roofing material utilized and exposure conditions. The original multi-layer tar and felt roofing systems (with gravel protection) have averaged over 40 years, while the newer roofing systems (EPDM, PVC and TPO) have averaged about 25 to 30 years. The past issues (e.g., premature joint failures, cracking, poor wear resistance, etc.) with the newer systems have been partially resolved through modern material formulations and installation improvements.

A review of the peer companies that have componentized roofing into a separate category has indicated average service life estimates of 30 years. It is also the view of the OPG operational staff that the roofing materials and installations systems currently in place systems will achieve an average service life of 30 years. Therefore, based on the peer analysis, discussions with OPG operational staff, and Gannett Fleming's experience the use of a 30-year average service life for this new account is proposed.

ONTARIO POWER GENERATION INC.
Detailed Discussion Related To Accounts Where An
Average Service Life Change Is Recommended

NEW ACCOUNT – Nuclear Large Circulating Water Motors

Current Average Service Life Estimate – 40 to 55 years

Recommended Average Service Life Estimate – 30 years

Average of Peer Average Service Lives –N/A

Discussion:

This proposed new account relates to the OPG investment in large electric motors of more than 200 horsepower with operating voltages between 2kV and 15kV being used for critical operations and safety systems. A review of operational benchmark information from the Electric Power Research Institute ("EPRI") and the United States Nuclear Regulatory Commission ("US NRC") indicates that the expected life of a large high voltage motor ranges from 24 years to 40 years. Due to the high voltages and large rotating masses involved, the electrical and mechanical wear and tear occurs in these motors at a higher rate than experienced by smaller motors. OPG operational experience has shown that large motors, such as the Darlington Heat Transport Pump Motors, are approaching failure at the rates predicted by the US NRC-sponsored research and EPRI. A complete teardown and rebuild is required to extend the life of these motors. In the case of the Darlington motors, spare motors are being purchased to facilitate the rebuild of the 16 in-service motors.

Given the different average service life expectations associated with these motors, Gannett Fleming recommends the creation of a new account for the investment in large circulating water motors with an average service life of 30 years. The recommended life of 30 years is consistent with the mid-point of the expected lives in the US NRC-sponsored and EPRI reports and OPG's operational experience.

ONTARIO POWER GENERATION INC.
Detailed Discussion Related To Accounts Where An
Average Service Life Change Is Recommended

NEW ACCOUNT – Nuclear Roofing

Current Average Service Life Estimate – 55 years

Recommended Average Service Life Estimate – 25 years

Average of Peer Average Service Lives – N/A

Discussion:

This proposed new account relates to the OPG investment in roofing of Nuclear Buildings and Structures which has shown to have a materially shorter life than the associated buildings. A 2012 Station Roof Replacement Project was initiated as the station roofs were reaching the end of their 25-year design life. OPG's internal assessments have indicated that station roofing requires repair or replacement, with the condition of the roofing deteriorating due to its age. A number of work orders associated with the condition of the roofs been initiated.

Based on the design life and the operating experience of OPG, Gannett Fleming recommends that OPG should create a new account for nuclear roofing, with a 25-year average service life.

ONTARIO POWER GENERATION INC.
Detailed Discussion Related To Accounts Where An
Average Service Life Change Is Recommended

Reclassification of Nuclear Turbine Generator Controls from Account 15411100 – Nuclear Turbines and Auxiliaries to Account 15600000 – Nuclear Instrumentation and Control

Current Average Service Life Estimate – 55 years as part of Account 15411100

Recommended Average Service Life Estimate – 15 years as part of Account 15600000

Average of Peer Average Service Lives – 15 to 25 years

Discussion:

Gannett Fleming recommends a change in the coding of the nuclear turbine generator controls from Account 15411100 – Nuclear Turbines and Auxiliaries to Account 15600000 – Nuclear Instrumentation and Control. It is the view of Gannett Fleming that the emergence of digital technology for turbine generator control equipment results in the 55-year life estimate associated with Account 15411100 being no longer appropriate for these specific assets. It is also noted that, in general, the turbine generator control systems are more similar in technology and life characteristics to the assets recorded in Account 15600000. As such, Gannett Fleming recommends that these assets be reclassified to Account 15600000.

ONTARIO POWER GENERATION INC.
Detailed Discussion Related To Niagara Tunnel Lining

NEW ACCOUNT – Hydroelectric – Niagara Falls- New Tunnel Lining

Current Average Service Life Estimate – N/A

Recommended Average Service Life Estimate – 90 years

Average of Peer Average Service Lives – N/A

Discussion:

The investment in this account relates to the lining material of the Niagara Tunnel that was placed into service in the first quarter of 2013. The 2011 Depreciation Study conducted by Gannett Fleming and internal OPG depreciation reviews have recommended a life estimate of 75 years for the linings associated with the two original tunnels at Niagara Falls. This estimated service life for existing OPG tunnel linings of 75 years is consistent with industry practice.

The Niagara Tunnel Project ("NTP") was an extremely large, complex, and challenging construction project with an estimated total capital cost of approximately $1.5 Billion. Most of the investment was placed in service in March 2013. Based on its review of the NTP, it is the view of Gannett Fleming that the tunnel excavation investment would have a similar life of 100 years as expected for the existing two Niagara tunnels and other hydroelectric excavation. However, Gannett Fleming's review also specifically noted that the NTP tunnel lining material installation procedures, were specifically designed and the tunnel was specifically constructed for a service life of 90 years. In fact, the 90-year design life was a specific requirement of the NTP to be considered by contractors working on this project. As such, the technical specifications and material used in both the new tunnel construction and tunnel lining have a stated mandatory requirement for a service life of 90 years for the lining system and structures of the Niagara Tunnel Facility.

In making the above recommendation associated with the new tunnel lining, Gannett Fleming's review included:

- A tour of the new tunnel construction activity in 2011 as part of the Sir Adam Beck facility tour conducted as part of the 2011 Depreciation Study;
- Technical design specifications for the project;
- Owner's mandatory requirements for the tunnel facility contained in OPG's Design and Build Contract with Strabag AG;
- A number of discussions with NTP staff regarding the project (and specifically the tunnel lining);
- DRC work and documentation related to the lining investment for the new tunnel; and

- OPG's evidence with respect to the NPT filed with the OEB as part of the EB-2013-0321 proceeding (Ex. D1-2-1).
  .

Gannett Fleming considers the above reviews as sufficient evidence to establish the average service life for the new Niagara Tunnel lining at 90 years, as recommended by the 2012 DRC. As the two existing tunnels are recommended to continue to be depreciated over 75 years, the investment associated with the 2013 tunnel lining should be segregated into a separate account.

APPENDIX 2

APPENDIX 2

ONTARIO POWER GENERATION

NEWLY REGULATED HYDROELECTRIC FACILITIES

Ottawa-St. Lawrence Plant Group:

Arnprior Station
Barrett Chute Station
Calabogie Station
Mountain Chute Station
Stewartville Station
Chats Falls Station
Chenaux Station
Des Joachims Station
Otto Holden Station

Northeast Plant Group:

Abitibi Canyon Station
Otter Rapids Station
Lower Notch Station
Matabitchuan Station
Indian Chute Station

Central Hydro Plant Group:

Auburn Station
Big Chute Station
Big Eddy Station
Bingham Chute Station
Coniston Station
Crystal Falls Station
Elliot Chute Station
Eugenia Falls Station
Frankford Station
Hagues Reach Station
Hanna Chute Station
High Falls Station
Lakefield Station
McVittie Station
Merrickville Station
Meyersburg Station
Nipissing Station
Ragged Rapids Station
Ranney Falls Station
Seymour Station
Sidney Station
Sills Island Station
South Falls Station
Stinson Station
Trethewey Falls Station

Northwest Plant Group:

Aquasabon Station
Alexander Station
Cameron Falls Station
Caribou Falls Station
Kakabeka Falls Station
Manitou Falls Station
Pine Portage Station
Silver Falls Station
Whitedog Falls Station