UNDERTAKING JT1.1

Undertaking

To provide the final AON Hewitt report supporting H-Staff-12 with explanation of correction. OPG to flow corrections through to responses in H-Staff-12 and H-Staff-8.

Response

As discussed by Mr. Kogan at the Technical Conference[1], subsequent to the filing of the interrogatory responses on November 19, 2018 but shortly before the Technical Conference, held on November 29, 2018, OPG was advised by its independent actuary, Aon Hewitt, who had prepared the projections of pension and OPEB accrual costs and cash amounts provided in interrogatory response at Ex. L-H-Staff-12, that subsequent to the filing of the interrogatory responses they identified a modelling inaccuracy impacting the accrual cost forecast for the registered pension plan for the 2019-2024 period. At the time of the Technical Conference, Aon Hewitt was in the process of working through the specific impacts of the change. They have since then completed this work and provided OPG with a corrected forecast of registered pension plan accrual costs, which is set out below as attributed to the prescribed facilities using the same methodology as in Ex. L-H-Staff-12 and prior proceedings.

As anticipated, the revised pension accrual cost forecast is somewhat higher than initially submitted in Ex. L-H-Staff-12, although it continues to display a declining trend over the period and does not alter the conclusions OPG draws from the forecast. Also as anticipated, forecast cash amounts for the registered pension plan as well as both forecast accrual costs and cash amounts for the OPEB plans provided in Ex. L-H-Staff-12 were not impacted by this revision.[2] Aon Hewitt also confirmed that the modelling inaccuracy giving rise to the revision had no impact on actual accrual costs for prior years as provided to the OEB and reflected in the actual

[1] EB-2018-0243, November 29, 2018 Technical Conference Tr. p. 3, line 28 to p. 5, line 24.
[2] The updated Chart 1 of Ex. L-H-Staff-8 (updated December 7, 2018) set out below includes correction of an OPG typographical error in the "Total" column of the "Cash (Funding Contribution)" that is unrelated to the revised forecast of pension accrual costs provided by Aon Hewitt.

balances of the Pension & OPEB Cash Versus Accrual Differential Deferral Account, including as of December 31, 2017 as set out in Ex. H1-1-1, and that forecast information provided to the OEB in previous proceedings was similarly not impacted by this inaccuracy.

Set out below are revisions to OPG's interrogatory response at Ex. L-H-Staff-12 and associated response at Ex. L-H-Staff-8 that referenced Ex. L-H-Staff-12 to reflect the revised forecast of accrual costs for the registered pension plan. Under separate cover, OPG is providing corrected versions of these interrogatory responses in full.

Attachment 1 to this response provides the Aon Hewitt report supporting the updated forecasts reflected below.

Update to Ex. L-H-Staff-8 *(starting at p. 9, line 12)*

[…] the below chart shows that cash funding contributions attributed to the regulated facilities are projected to cumulatively exceed accrual costs by approximately $560M between 2018 and 2024, compared to approximately $360M by which accrual costs cumulatively exceeded cash funding contributions between 2008 and 2017.

Chart 1: Accrual-to-Cash Differential for Pension Costs ($M)

Cost Recovery Basis	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Accrual (Recoverable Costs)	121.4	141.4	150.1	195.0	286.1	383.3	440.0	482.7	339.9	221.3	252.6	134.7	106.2	83.2	65.0	48.3	48.6	3,499.8
Cash (Funding Contributions)	149.0	206.1	208.5	235.5	297.1	242.9	300.5	331.3	234.0	196.7	180.6	184.3	188.3	180.6	184.2	187.9	188.1	3,695.6
Accrual less Cash	(27.6)	(64.7)	(58.3)	(40.5)	(10.9)	140.3	139.5	151.4	105.9	24.6	72.1	(49.6)	(82.1)	(97.4)	(119.3)	(139.6)	(139.5)	(195.8)

While these projections are subject to inherent variability due to the impact of actuarial assumptions and economic and financial market conditions, they demonstrate that the recent years' decline in accrual costs is expected to continue into the future, while cash funding amounts are expected to levelize and remain relatively steady. By 2024, cash funding contributions are projected at approximately $190M, compared to accrual costs of approximately $50M (which is approximately 10% of the accrual costs at their peak in 2014/2015).

As shown in the updated Ex. L-H-Staff-12, the reversal of the accrual-to-cash differential trend for registered pension plan costs is expected to more than offset the accrual-to-cash differential for OPEB costs starting in 2020. By 2024, the combined pension and OPEB accrual costs are projected to be approximately $55M lower than the combined cash amounts (Nuclear and Regulated Hydroelectric).

Update to Ex. L-H-Staff-12 *(Charts 3 through 6)*[3]

Chart 3

Pension and OPEB Accrual Costs – Nuclear ($M)							
	2018 Projection	**2019 Projection**	**2020 Projection**	**2021 Projection**	**2022 Projection**	**2023 Projection**	**2024 Projection**
Pension	217.4	115.7	91.1	71.2	55.5	41.3	41.6
OPEB	170.2	157.4	160.9	163.7	167.1	171.9	177.4
Total	**387.6**	**273.1**	**251.9**	**234.8**	**222.6**	**213.2**	**219.0**

Chart 4

Pension and OPEB Accrual Costs – Regulated Hydroelectric ($M)							
	2018 Projection	**2019 Projection**	**2020 Projection**	**2021 Projection**	**2022 Projection**	**2023 Projection**	**2024 Projection**
Pension	35.2	19.0	15.1	12.1	9.4	7.0	7.1
OPEB	27.5	25.8	26.7	27.7	28.3	29.1	30.1
Total	**62.7**	**44.8**	**41.8**	**39.8**	**37.8**	**36.2**	**37.1**

[3] Numbers may not calculate due to rounding

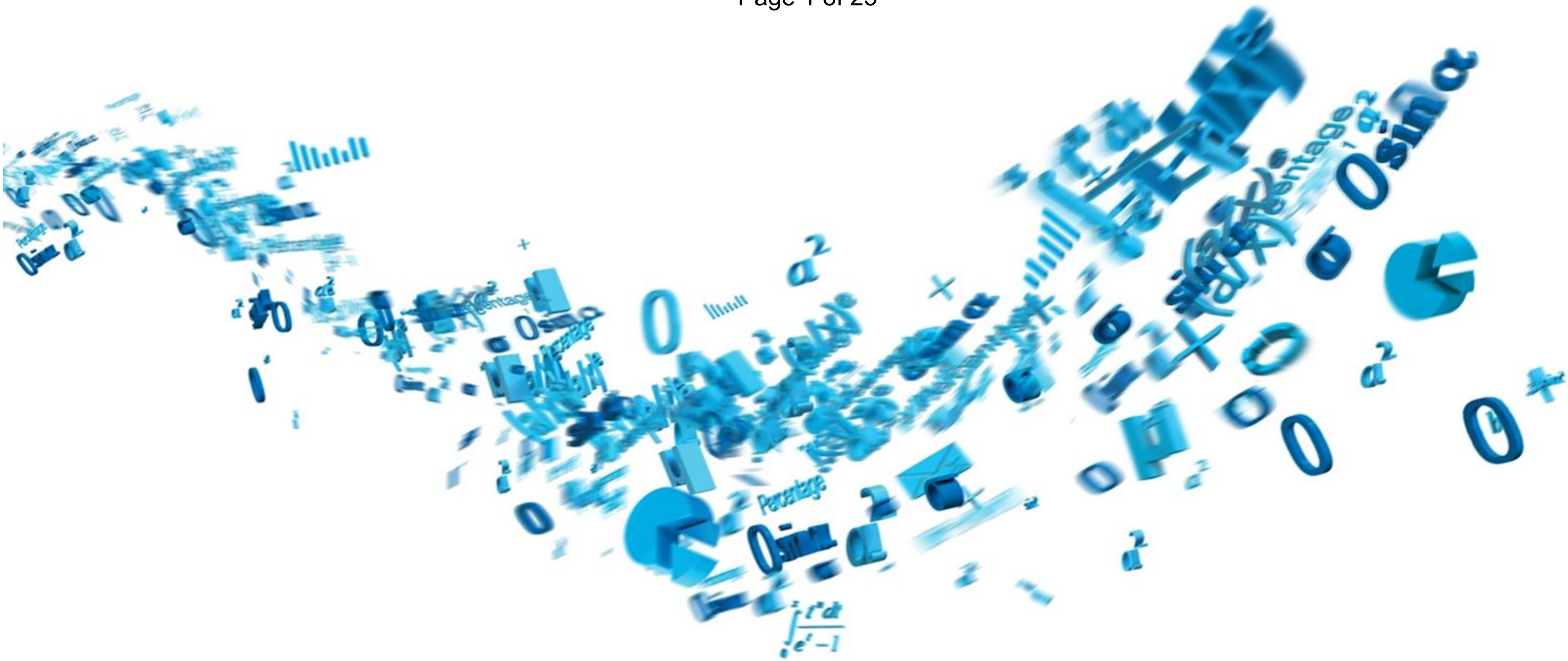
Chart 5

Pension and OPEB Accrual-Cash Differential – Nuclear ($M)							
	2018 Projection	**2019 Projection**	**2020 Projection**	**2021 Projection**	**2022 Projection**	**2023 Projection**	**2024 Projection**
Pension	62.0	(42.6)	(70.4)	(83.3)	(102.0)	(119.4)	(119.3)
OPEB	80.6	64.8	65.1	66.1	68.4	70.0	72.8
Total	**142.7**	**22.2**	**(5.3)**	**(17.2)**	**(33.6)**	**(49.3)**	**(46.5)**

Chart 6

Pension and OPEB Accrual-Cash Differential – Regulated Hydroelectric ($M)							
	2018 Projection	**2019 Projection**	**2020 Projection**	**2021 Projection**	**2022 Projection**	**2023 Projection**	**2024 Projection**
Pension	10.0	(7.0)	(11.7)	(14.1)	(17.3)	(20.2)	(20.2)
OPEB	13.0	10.6	10.8	11.2	11.6	11.9	12.3
Total	**23.1**	**3.6**	**(0.9)**	**(2.9)**	**(5.7)**	**(8.4)**	**(7.9)**

The total accrual-to-cash differential is projected to decline through the forecast period, with cash amounts exceeding accrual costs starting in 2020.



Report on the Estimated Accounting Cost for Post Employment Benefit Plans for Fiscal Years 2018 to 2024

Ontario Power Generation Inc.

January 1, 2018 to December 31, 2024

December 2018

AON
Empower Results®

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Introduction

This report summarizes the estimated accounting costs for fiscal years 2018 through 2024 for the post employment benefit plans sponsored by Ontario Power Generation Inc. ("OPG").

This report covers the following plans sponsored by OPG:

- Ontario Power Generation Inc. Pension Plan ("RPP");
- Ontario Power Generation Inc. Supplementary Pension Plan ("SPP") ;
- Non-pension Post Retirement Plan which provides other post retirement benefits ("OPRB") including retiree medical, dental, life insurance, and retirement bonus benefits; and
- Post Employment Plan which provides long-term disability benefits ("LTD") including sick leave benefits before LTD begins and the continuation of medical, dental and life insurance while on LTD.

Collectively SPP, OPRB and LTD are known as Other Post Employment Benefits ("OPEB").

The results cover the fiscal years from January 1, 2018 to December 31, 2024. The results have been developed in accordance with US generally accepted accounting principles ("US GAAP") under ASC 715, 712 and 710.

The results in this report do not include amounts related to the benefit plans of the Nuclear Waste Management Organization, which are included in OPG's consolidated financial statements.

Unless otherwise stated all assumptions, data elements, methodologies, plan provisions, and information about assets reflected in this report are the same as those underlying and/or contained in the December 31, 2017 disclosure reports ("the Reports") prepared by Aon in accordance with US GAAP for the post employment benefit plans sponsored by OPG. These disclosure reports were dated March 2018 and are titled as follows:

- US GAAP Accounting Information Non-pension Post-retirement and Post-employment Benefits Plans; and
- US GAAP Accounting Information – Pension Plans

Sincerely,

Aon

Linda M. Byron
Fellow of the Society of Actuaries
Fellow of the Canadian Institute of Actuaries

Aon

Gregory W. Durant
Fellow of the Society of Actuaries
Fellow of the Canadian Institute of Actuaries

December 2018

Actuarial Report

Results for Fiscal Years 2018 to 2024

OPG's total estimated pension and OPEB costs for fiscal years 2018 through 2024 as determined in accordance with US GAAP are as follows:

(in Canadian $000s)	2018	2019	2020	2021	2022	2023	2024
RPP	$ 272,514	$ 145,198	$ 114,271	$ 89,422	$ 69,783	$ 51,923	$ 52,254
SPP	25,875	24,919	24,932	24,979	25,062	25,177	25,321
OPRB	175,290	154,889	159,324	162,979	167,149	172,960	179,585
LTD	12,116	17,665	17,643	17,670	17,745	17,860	18,021
Total	$ 485,795	$ 342,671	$ 316,170	$ 295,050	$ 279,739	$ 267,920	$ 275,181

Further details of the above OPG-wide estimated costs, by plan, as well as OPG's estimated contributions to the RPP fund and benefit payments for OPEB are provided in Schedules 3A through 3G to this report.

The estimated 2018 costs for the RPP, SPP and OPRB plans are not expected to change, unless a significant event, such as a curtailment or settlement or other unexpected changes to OPG's operations, were to take place prior to December 31, 2018. The final 2018 cost under US GAAP for the LTD plan will be determined at December 31, 2018 based on applicable information and assumptions at that date.

The final 2019 to 2024 costs for all plans under US GAAP will be determined based on applicable information, experience and assumptions in the future.

We have conducted a new comprehensive accounting valuation of OPG's plans in 2018 using data as of December 31, 2017, including updated plan membership information, to reflect the most recent census data available as a result of the filed funding valuation as at January 1, 2018 for the RPP, and updated best estimate assumptions in accordance with US GAAP based on plan experience and current expectations. The estimated results of the new comprehensive accounting valuation are reflected in the estimated pension and OPRB obligations and 2019 to 2024 costs contained in this report. The final results of this comprehensive accounting valuation will be reflected in the actual pension and OPRB obligations as at December 31, 2018. Further details of the membership information as at December 31, 2017 used to determine the estimated pension and OPRB obligations and 2019 to 2024 costs are provided in Schedules 1A to 1C. We continue to update membership for the LTD plan annually.

Actuarial Methods and Assumptions

As part of the new comprehensive accounting valuation, we reviewed all assumptions and have recommended that updated assumptions be used in the calculation of OPG's pension and OPRB obligations as at December 31, 2018, and 2019 to 2024 estimated costs for these plans. The updated assumptions reflected in the estimate of the results of the comprehensive accounting valuation contained in this report include mortality improvement scale as published by the Canadian Institute of Actuaries ("CIA"), and health care benefit claims costs, health care cost trend rates and health care utilization rates used in the OPRB valuation. The updated assumptions reflect OPG's actual plan experience and current outlook, and, in our opinion, represent a better estimate of future events. The updated assumptions are detailed in the Actuarial Methods and Assumptions section of this report.

The actuarial methodology and accounting policies used in the development of the estimated costs for fiscal years 2018 through 2024 under US GAAP are summarized below.

- Benefit obligations for RPP, SPP and OPRB are determined using the projected benefit method prorated on service;
- Benefit obligations for LTD are determined using the projected benefit method on a terminal basis such that the total estimated future benefit is attributed to the year of service in which a disability occurs;
- The discount rates have been determined in accordance with US GAAP, with reference to those representative of AA corporate bond yields in Canada having duration similar to the liabilities of the plans. For the estimated RPP, SPP and OPRB costs for 2018, the discount rates were set using the applicable bond yields used to determine the corresponding benefit obligations as of December 31, 2017. For the estimated costs for LTD for 2018 and for the estimated costs for all pension and OPEB plans for 2019 through 2024, the discounts rates were set with reference to the applicable bond yields as of June 30, 2018, plus 25 basis points to reflect subsequently observed trends in bond yields and overall interest rate environment;
- The following effective discount rates (per annum) were used to estimate OPG's 2018 RPP, SPP and OPRB costs under the full yield curve approach[1]:

	RPP and SPP	**OPRB**
Current Service Cost	3.69%	3.73%
Interest Cost[2]	3.25%	3.38%

[1] A series of individual spot rates applied to projected cash flows under the full yield curve approach is expressed as a single effective discount rate for disclosure purposes.
[2] The rates shown apply to interest cost on the projected benefit obligations at the beginning of the year. Under the full yield curve approach, a separate rate is used to calculate the interest cost on the current service cost recognized during the year. This rate is 3.54% for RPP and SPP costs, 3.69% for OPRB costs.

- The following effective discount rates (per annum) were used to estimate 2018 LTD costs and 2019 to 2024 pension and OPEB costs under the full yield curve approach:

	RPP and SPP	OPRB	LTD
Current Service Cost	4.05%	4.09%	3.57%
Interest Cost[1]	3.70%	3.81%	3.23%

  The discount rates used to determine the projected benefit obligations as at December 31, 2018 and subsequent fiscal year-ends are 3.96% per annum for RPP and SPP, 4.01% per annum for OPRB and 3.57% per annum for LTD.

  Under the full yield curve approach, individual spot discount rates along the yield curve are applied to the projected cash flows at the relevant maturity, resulting in a more precise measurement of interest cost. The service cost is also more precisely determined under the full yield curve approach, based on duration specific spot rates applied to discount the service cost projected cash flows.

- A building block approach is used in determining the expected long-term rate of return on plan assets. Historical markets are studied and long-term historical relationships between equities and fixed-income are preserved consistent with the widely accepted capital market principle that assets with higher volatility generate a greater return over the long run. Current market factors such as inflation and interest rates are evaluated before long-term capital market assumptions are determined. The long-term portfolio return is established using the fund's asset allocations, via a building block approach with proper consideration of diversification and rebalancing. Aon calculated the expected return based on this methodology. An expected rate of return on assets of 6.00% per annum determined using the above approach was used for determining the estimated 2018 through 2024 RPP costs;
- The projected asset values for the RPP as at December 31, 2018 and subsequent fiscal year-ends used to estimate the 2019-2024 RPP costs are based on the actual asset value at June 30, 2018, projected using the expected rate of return on assets of 6.0% per annum. The actual asset value for the RPP as at December 31, 2017 was used to determine the estimated 2018 RPP costs;
- In estimating the 2019-2024 costs, the assumed mortality improvement rates have been changed from Canadian Pensioners Mortality Improvement Scale B ("CPM-B") to the MI-2017 Improvement Scale ("MI-2017") effective December 31, 2018. This updated improvement scale was published by the CIA in September 2017 for use by Canadian pension and benefit plan sponsors. It is based on a new comprehensive study of observed Canadian pensioner experience reflecting updated expectations of improvement in mortality;

[1] The rates shown apply to interest cost on the projected benefit obligations at the beginning of the year. Under the full yield curve approach, a separate rate is used to calculate the interest cost on the current service cost recognized during the year. This rate is 3.94% for RPP and SPP costs, 4.06% for OPRB costs and 3.23% for LTD costs.

- Health care cost trend rates for the estimated December 31, 2018 OPRB valuation have been updated to reflect new best estimate assumptions, which are based on the heath care trend assumption model published by the CIA in March 2018. The CIA model was developed for use by Canadian benefit plan sponsors and reflects a short-term forecast and long-term projection of Canadian national health care spending, based on macroeconomic and fiscal policy factors and historical experience;
- Health care benefit claims costs for the estimated December 31, 2018 OPRB valuation have been updated to reflect actual OPRB plan experience in 2016 and 2017. The health care utilization rates that are applied to the per capita cost basis (at age 65) to determine the health care benefit claims costs by age have also been updated, based on a comprehensive study of OPG's plan experience over the last five years. Further details of the updated health care claims costs at age 65 and the age-based health care utilization factors are provided in Schedule 2;
- Other actuarial assumptions are management's best estimate of future events, as determined in consultation with us and as set out in the Reports. These assumptions include the inflation rate, which was established at 2.00% per annum, and the salary scale increase rates, which, for determining 2019 through 2024 costs, was established at 2.00% per annum to the end of 2024 for all employee representations, with the exception of 1.00% per annum to end of 2018 for employees represented by the Society of United Professionals consistent with the provision of the existing collective agreement, and 2.50% per annum for all employee representations thereafter, (plus Promotion, Progression, Merit for all years). For the 2018 costs, the same assumed salary scale increase rates were used, with the exception of 2.50% per annum used for the 2022-2024 period for all employee representations;

- The active membership headcount is first calculated for each business unit based on the assumed decrements, and then compared to the estimated active December 31, 2017 to December 31, 2024 headcounts for each business unit. If the calculated headcounts exceed the estimated headcounts at year-end, additional employees are assumed to retire or terminate to reduce the headcounts. Conversely, new entrants are assumed to be added to the plan in order to achieve anticipated headcounts, if the calculated headcounts are lower than the estimated headcounts at year-end. The estimated December 31 active headcounts used to estimate the corresponding subsequent year's pension and OPRB costs are as follows:

	2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Nuclear	5,973	5,875	5,691	5,586	5,465	5,360	5,360	5,360
Renewable Generation	1,458	1,485	1,460	1,460	1,460	1,483	1,483	1,483
Support Services	1,828	1,666	1,609	1,533	1,493	1,394	1,394	1,394
Total	9,259	9,026	8,760	8,579	8,418	8,237	8,237	8,237

- Actuarial gains or losses for RPP, SPP and OPRB have been amortized using the 10% corridor method, except where immediate recognition is required under US GAAP for non-routine events during the year (none expected during 2018 through 2024);
- Past service costs for RPP, SPP and OPRB have been amortized on a straight-line basis over the expected average remaining service lifetime at the amendment date, except where immediate recognition is required under US GAAP during the year (none expected during 2018 through 2024);
- For LTD, all actuarial gains and losses and past service costs are required to be recognized immediately in the cost. Therefore, under US GAAP, the cost is equal to the change in the benefit obligation plus benefit payments; and
- Expected return on assets and amortization of actuarial gains/losses are based on a market-related value of assets where investment gains and losses on equity assets in excess of an expected return of 6.0% per annum plus the increase in Consumer Price Index are smoothed over five years.

The 2018 to 2020 contributions to the RPP fund are based on the latest filed actuarial valuation for funding purposes as of January 1, 2018 of the RPP. The next actuarial valuation for funding purposes must have an effective date no later than January 1, 2021. We have assumed that based on a triennial filing, the next actuarial valuations for funding purposes would have effective dates of January 1, 2021 and January 1, 2024.

In order to project contributions to the RPP for 2021 to 2024, an estimate of the going concern and solvency positions of the RPP is required. The estimated contributions for 2021 to 2024 are based on the projected going concern and solvency funded status as of January 1, 2021 and January 1, 2024.

The assumptions and methods used for the determination of the projected going concern funded status as of January 1, 2021 and January 1, 2024 are the same as those used for the funding valuation as of January 1, 2018, except that a provision for adverse deviation of 7.0% of non-indexed liabilities as at January 1, 2021 and January 1, 2024 was used.

The assumptions and methods used for the determination of the projected solvency funded status as of January 1, 2021 and January 1, 2024 are the same as those used for the funding valuation as of January 1, 2018, as updated to reflect the following prescribed non-indexed solvency discount rates in effect as of July 1, 2018: 2.90% per annum for the first 10 years and 3.20% per annum thereafter for commuted values, and 3.07% per annum for annuity purchases.

The projected benefit payments for the OPEB plans reflect the estimated cash flows of the underlying benefit obligations.

Schedule 1A – Summary of Registered Pension Plan Membership at December 31, 2017

		December 31, 2017
Active Members		
Number		9,231
Average age (years)		46.3
Average credited service (years)		14.7
Average pensionable earnings for the following year	$	112,927
Accumulated contributions with interest	$	846,554,844
Members on Long-Term Disability		
Number		346
Average age (years)		55.1
Average credited service (years)		24.4
Average pensionable earnings for the following year	$	91,159
Accumulated contributions with interest	$	23,417,107
Deferred Vested Members		
Number		708[1]
Average age (years)		53.9
Average annual lifetime pension[2]	$	10,015

[1] Excludes 34 in-transit commuted value transfers (commuted value reflected in liabilities)
[2] Includes increases for 2017 effective January 1, 2018 of 100% of the increase in the Consumer Price Index

Schedule 1A – Summary of Registered Pension Plan Membership at December 31, 2017 (continued)

	December 31, 2017
Retired Members	
Number	9,759
Average age (years)	70.0
Average annual lifetime pension[1]	$ 50,036
Average annual bridge pension[2]	$ 17,018
Survivors (excluding children)	
Number	2,162
Average age (years)	78.4
Average annual pension[2]	$ 25,948
Children	
Number	7
Average age (years)	30
Average annual temporary pension[2]	$ 32,344

[1] Includes increases for 2017 effective January 1, 2018 of 100% of the increase in the Consumer Price Index
[2] As at December 31, 2017, there were 2,939 retired members with an average age of 60.5 receiving a bridge benefit

Schedule 1B – Summary of Supplementary Pension Plan Membership at December 31, 2017

	SPS	ESPS	DSPS Canadian Obligations	DSPS Other Obligations
Active Members[1]				
Number	293	215	-	-
Average age (years)	49.3	51.8	-	-
Average pensionable service (years)	21.4	13.9	-	-
Average pensionable earnings	$ 187,651	$ 188,561	-	-
Nuclear Authorized Management Members				
Number	-	-	46	-
Average age (years)	-	-	48.6	-
Average pensionable service (years)	-	-	22.5	-
Average pensionable earnings	-	-	$ 214,230	-
Deferred Vested Members				
Number	4	65	-	1[2]
Average age (years)	53.1	51.8	-	*
Average annual lifetime pension	$ 15,456	$ 4,932	-	*
Pensioners and Survivors				
Number	585	125	59	1[2]
Average age (years)	67.2	67.0	65.9	*
Average annual lifetime pension	$ 10,632	$ 13,404	$ 48,528	*

[1] Includes only members whose accrued benefits under the RPP as at December 31, 2017 would be limited to the projected maximum pension under the *Income Tax Act* (Canada). Includes members on long-term disability.
[2] Data withheld for confidentiality.

Schedule 1C – Summary of Other Post Retirement Benefit Plan Membership at December 31, 2017

	PWU	Society	Management Heritage	Management Millennium	Total
Active Members					
Number	4,857	3,253	753	368	9,231
Average age (years)	46.8	45.2	49.1	45.0	46.3
Average eligibility service (years)	15.2	13.8	19.8	4.8	14.7
Average basic earnings	$ 102,543	$ 118,986	$ 149,268	$ 122,052	$ 112,927
Number with health and dental coverage	4,716	3,159[1]	714	335	8,924[2]
Members on Long-Term Disability					
Number	282	49	13	2	346
Average age (years)	55.2	54.1	57.4	48.5	55.1
Average eligibility service (years)	24.4	26.0	29.1	11.9	24.4
Average deemed basic earnings	$ 86,855	$ 116,117	$ 94,645	$ 63,999	$ 91,159
Number with health and dental coverage	263	46	11	2	322
RPP Retirees					
Number	4,466	3,036	1,632	30	9,164
Average age (years)	69.4	70.3	71.1	65.1	70.0
Number of covered spouses	3,667	2,676	1,409	27	7,779
Number with health and dental coverage	4,392	2,990	1,614	30	9,026
RPP Surviving Spouses and Dependent Children					
Number	1,037	549	343	2	1,931
Average age (years)	78.1	77.3	81.9	65.5	78.5
Number with health and dental coverage	1,034[3]	547	342	2	1,925[4]

[1] 3,518 with Dental coverage
[2] 8,923 with Dental coverage
[3] 1,026 with Dental coverage
[4] 1,917 with Dental coverage

Schedule 1C – Summary of Other Post Retirement Benefit Plan Membership at December 31, 2017 (continued)

	PWU	Society	Management Heritage	Management Millennium	Total
Non-RPP Members, Surviving Spouses and Dependent Children					
Number	122	250	93	7	472
Average age (years)	64.1	63.9	63.8	62.7	63.9
Number with health and dental coverage	0	250	93	7	350
Deferred Vested Members Entitled to Coverage					
Number	23	66	15	4	108
Average age (years)	58.7	57.9	58.6	59.8	58.2

Schedule 2 – Summary of Updated Actuarial Assumptions

Post-Retirement Health Care Claims Costs[1] at Age 65 – December 31, 2017

	PWU	Society	Management (Heritage)	Management (Millennium)
Hospital	$ 71	$ 62	$ 61	$ 60
Prescription Drugs[2]	677	515	525	420
Prescription Drugs – Ontario Drug Benefit program[3]	369	267	227	227
Vision Care	188	194	136	81
Other Medical	524	671	747	689
Dental	928	1,070	999	688
Total	$ 2,757	$ 2,779	$ 2,695	$ 2,165

Post-Retirement Health Care Cost Trend Rates[4]

Hospital	3.83% in 2019 grading up to 5.30% in 2026 and grading down to 4.05% from 2031 through 2040
Prescription Drugs	3.83% in 2019 grading up to 5.30% in 2026 and grading down to 4.05% from 2031 through 2040
Ontario Drug Benefit Program	0.00%
Vision Care	0.00%
Other Medical	3.90% in 2019 grading up to 5.30% in 2026 and grading down to 4.05% from 2031 through 2040
Dental	4.28% in 2019 grading up to 5.30% in 2026 and grading down to 4.05% from 2031 through 2040

[1] Amounts shown include administration expenses and taxes.
[2] Reflects drug cost offset assumptions at age 65 and thereafter due to the provincial drug plan.
[3] Represents reimbursement of Ontario Drug Benefit program deductible and dispensing fees, applicable from age 65 onwards.
[4] For the estimated December 31, 2018 OPRB valuation, the following 2018 cost trend rates were also used: 3.80% for Hospital and Prescription Drugs, 3.90% for Other Medical, and 4.30% for Dental.

Schedule 2 – Summary of Updated Actuarial Assumptions (continued)

Post-Retirement Health Care Utilization Rates

	Costs at Age						
	55	**60**	**65**	**70**	**75**	**80**	**85**
Hospital	48%	69%	100%	144%	207%	299%	400%
Prescription Drugs	67%	87%	100%	110%	110%	110%	110%
Ontario Drug Benefit Program	0%	0%	100%	100%	100%	100%	100%
Other Medical	71%	86%	100%	98%	96%	94%	93%
Vision Care	100%	100%	100%	100%	100%	98%	88%
Dental Care	79%	97%	100%	103%	104%	98%	93%

Schedule 3A – Summary of Estimated 2018 US GAAP Results

The following table provides a summary of the estimated US GAAP results for 2018 for the post employment benefit plans sponsored by OPG. The estimated net periodic pension/benefit cost for the period January 1, 2018 to December 31, 2018 is determined based on the actual balance sheet items at January 1, 2018.

(in Canadian $000's)	**RPP**	**SPP**	**OPRB**	**LTD**
Net Asset (Liability) Recognized as at January 1, 2018				
Projected Benefit Obligation	$ (17,249,198)	$ (350,412)	$ (2,969,382)	$ (202,310)
Fair Value of Plan Assets	14,157,418	0	0	0
Net Asset (Liability) Recognized	$ (3,091,780)	$ (350,412)	$ (2,969,382)	$ (202,310)
Amounts Recognized in Accumulated Other Comprehensive Income as at January 1, 2018				
Unrecognized Past Service Costs (Credits)	$ 0	$ 0	$ 4,685	$ 0
Unrecognized Net Actuarial Loss (Gain)	3,637,508	115,589	371,901	0
Total Accumulated Other Comprehensive Loss (Income)	$ 3,637,508	$ 115,589	$ 376,586	$ 0
Components of Estimated Net Periodic Pension/Benefit Cost, January 1, 2018 to December 31, 2018				
Employer Current Service Cost	$ 325,127	$ 7,628	$ 67,271	$ 11,127
Interest Cost	563,169	11,421	101,670	5,388
Expected Return on Plan Assets	(813,266)	0	0	0
Recognition of LTD Actuarial (Gain) Loss	0	0	0	(4,399)
Amortization of Past Service Cost	0	0	583	0
Amortization of Net (Gain) Loss	197,484	6,826	5,766	0
Total Cost	$ 272,514	$ 25,875	$ 175,290	$ 12,116
2018 Estimated Employer Pension Contributions / Benefit Payments				
Amounts used for developing net period pension/benefit costs	$ 214,730	$ 14,619	$ 69,654	$ 27,762
2018 Projected Employer Pension Contributions / Benefit Payments	$ 194,782	$ 14,804	$ 69,654	$ 27,762

Schedule 3B – Summary of Estimated 2019 US GAAP Results

The following table provides a summary of the estimated US GAAP results for 2019 for the post employment benefit plans sponsored by OPG. The estimated net periodic pension/benefit cost for the period January 1, 2019 to December 31, 2019 is determined based on the projected balance sheet items at January 1, 2019.

(in Canadian $000's)	**RPP**	**SPP**	**OPRB**	**LTD**
Projected Net Asset (Liability) Recognized as at January 1, 2019				
Projected Benefit Obligation	$ (16,667,522)	$ (339,601)	$ (2,598,189)	$ (186,664)
Fair Value of Plan Assets	14,674,987	0	0	0
Net Asset (Liability) Recognized	$ (1,992,535)	$ (339,601)	$ (2,598,189)	$ (186,664)
Estimated Amounts Recognized in Accumulated Other Comprehensive Income as at January 1, 2019				
Unrecognized Past Service Costs (Credits)	$ 0	$ 0	$ 4,102	$ 0
Unrecognized Net Actuarial Loss (Gain)	2,460,531	93,707	(104,345)	0
Total Accumulated Other Comprehensive Loss (Income)	$ 2,460,531	$ 93,707	$ (100,243)	$ 0
Components of Estimated Net Periodic Pension/Benefit Cost, January 1, 2019 to December 31, 2019				
Employer Current Service Cost	$ 299,112	$ 7,481	$ 54,513	$ 11,077
Interest Cost	616,810	12,581	99,793	5,960
Expected Return on Plan Assets	(853,725)	0	0	0
Recognition of LTD Actuarial (Gain) Loss	0	0	0	628
Amortization of Past Service Cost	0	0	583	0
Amortization of Net (Gain) Loss	83,001	4,857	0	0
Total Cost	$ 145,198	$ 24,919	$ 154,889	$ 17,665
2019 Estimated Employer Pension Contributions / Benefit Payments				
Amounts used for developing net period pension/benefit costs	$ 198,679	$ 15,100	$ 74,663	$ 26,430

Schedule 3C – Summary of Estimated 2020 US GAAP Results

The following table provides a summary of the estimated US GAAP results for 2020 for the post employment benefit plans sponsored by OPG. The estimated net periodic pension/benefit cost for the period January 1, 2020 to December 31, 2020 is determined based on the projected balance sheet items at January 1, 2020.

(in Canadian $000's)	**RPP**	**SPP**	**OPRB**	**LTD**
Projected Net Asset (Liability) Recognized as at January 1, 2020				
Projected Benefit Obligation	$ (17,035,408)	$ (345,596)	$ (2,683,870)	$ (177,899)
Fair Value of Plan Assets	15,104,134	0	0	0
Net Asset (Liability) Recognized	$ (1,931,274)	$ (345,596)	$ (2,683,870)	$ (177,899)
Estimated Amounts Recognized in Accumulated Other Comprehensive Income as at January 1, 2020				
Unrecognized Past Service Costs (Credits)	$ 0	$ 0	$ 3,519	$ 0
Unrecognized Net Actuarial Loss (Gain)	2,452,751	89,883	(98,307)	0
Total Accumulated Other Comprehensive Loss (Income)	$ 2,452,751	$ 89,883	$ (94,788)	$ 0
Components of Estimated Net Periodic Pension/Benefit Cost, January 1, 2020 to December 31, 2020				
Employer Current Service Cost	$ 299,641	$ 7,631	$ 55,762	$ 11,343
Interest Cost	630,164	12,803	103,023	5,700
Expected Return on Plan Assets	(885,838)	0	0	0
Recognition of LTD Actuarial (Gain) Loss	0	0	0	600
Amortization of Past Service Cost	0	0	539	0
Amortization of Net (Gain) Loss	70,304	4,498	0	0
Total Cost	$ 114,271	$ 24,932	$ 159,324	$ 17,643
2020 Estimated Employer Pension Contributions / Benefit Payments				
Amounts used for developing net period pension/benefit costs	$ 202,652	$ 15,402	$ 79,255	$ 25,521

Schedule 3D – Summary of Estimated 2021 US GAAP Results

The following table provides a summary of the estimated US GAAP results for 2021 for the post employment benefit plans sponsored by OPG. The estimated net periodic pension/benefit cost for the period January 1, 2021 to December 31, 2021 is determined based on the projected balance sheet items at January 1, 2021.

(in Canadian $000's)	RPP	SPP	OPRB	LTD
Projected Net Asset (Liability) Recognized as at January 1, 2021				
Projected Benefit Obligation	$ (17,385,575)	$ (351,681)	$ (2,766,846)	$ (170,021)
Fair Value of Plan Assets	15,547,623	0	0	0
Net Asset (Liability) Recognized	$ (1,837,952)	$ (351,681)	$ (2,766,846)	$ (170,021)
Estimated Amounts Recognized in Accumulated Other Comprehensive Income as at January 1, 2021				
Unrecognized Past Service Costs (Credits)	$ 0	$ 0	$ 2,980	$ 0
Unrecognized Net Actuarial Loss (Gain)	2,447,810	86,438	(94,861)	0
Total Accumulated Other Comprehensive Loss (Income)	$ 2,447,810	$ 86,438	$ (91,881)	$ 0
Components of Estimated Net Periodic Pension/Benefit Cost, January 1, 2021 to December 31, 2021				
Employer Current Service Cost	$ 302,264	$ 7,783	$ 56,298	$ 11,615
Interest Cost	643,011	13,028	106,142	5,478
Expected Return on Plan Assets	(916,542)	0	0	0
Recognition of LTD Actuarial (Gain) Loss	0	0	0	577
Amortization of Past Service Cost	0	0	539	0
Amortization of Net (Gain) Loss	60,689	4,168	0	0
Total Cost	$ 89,422	$ 24,979	$ 162,979	$ 17,670
2021 Estimated Employer Pension Contributions / Benefit Payments				
Amounts used for developing net period pension/benefit costs	$ 194,053	$ 15,710	$ 82,789	$ 24,067

Schedule 3E – Summary of Estimated 2022 US GAAP Results

The following table provides a summary of the estimated US GAAP results for 2022 for the post employment benefit plans sponsored by OPG. The estimated net periodic pension/benefit cost for the period January 1, 2022 to December 31, 2022 is determined based on the projected balance sheet items at January 1, 2022.

(in Canadian $000's)	RPP	SPP	OPRB	LTD
Projected Net Asset (Liability) Recognized as at January 1, 2022				
Projected Benefit Obligation	$ (17,731,711)	$ (357,854)	$ (2,850,134)	$ (163,624)
Fair Value of Plan Assets	15,997,004	0	0	0
Net Asset (Liability) Recognized	$ (1,734,707)	$ (357,854)	$ (2,850,134)	$ (163,624)
Estimated Amounts Recognized in Accumulated Other Comprehensive Income as at January 1, 2022				
Unrecognized Past Service Costs (Credits)	$ 0	$ 0	$ 2,441	$ 0
Unrecognized Net Actuarial Loss (Gain)	2,449,196	83,342	(91,224)	0
Total Accumulated Other Comprehensive Loss (Income)	$ 2,449,196	$ 83,342	$ (88,783)	$ 0
Components of Estimated Net Periodic Pension/Benefit Cost, January 1, 2022 to December 31, 2022				
Employer Current Service Cost	$ 304,498	$ 7,939	$ 57,289	$ 11,894
Interest Cost	655,234	13,257	109,319	5,293
Expected Return on Plan Assets	(945,208)	0	0	0
Recognition of LTD Actuarial (Gain) Loss	0	0	0	558
Amortization of Past Service Cost	0	0	541	0
Amortization of Net (Gain) Loss	55,259	3,866	0	0
Total Cost	$ 69,783	$ 25,062	$ 167,149	$ 17,745
2022 Estimated Employer Pension Contributions / Benefit Payments				
Amounts used for developing net period pension/benefit costs	$ 197,934	$ 16,024	$ 84,765	$ 23,268

Schedule 3F – Summary of Estimated 2023 US GAAP Results

The following table provides a summary of the estimated US GAAP results for 2023 for the post employment benefit plans sponsored by OPG. The estimated net periodic pension/benefit cost for the period January 1, 2023 to December 31, 2023 is determined based on the projected balance sheet items at January 1, 2023.

(in Canadian $000's)	**RPP**	**SPP**	**OPRB**	**LTD**
Projected Net Asset (Liability) Recognized as at January 1, 2023				
Projected Benefit Obligation	$ (18,069,642)	$ (364,116)	$ (2,937,535)	$ (158,101)
Fair Value of Plan Assets	16,439,889	0	0	0
Net Asset (Liability) Recognized	$ (1,629,753)	$ (364,116)	$ (2,937,535)	$ (158,101)
Estimated Amounts Recognized in Accumulated Other Comprehensive Income as at January 1, 2023				
Unrecognized Past Service Costs (Credits)	$ 0	$ 0	$ 1,900	$ 0
Unrecognized Net Actuarial Loss (Gain)	2,472,393	80,566	(85,666)	0
Total Accumulated Other Comprehensive Loss (Income)	$ 2,472,393	$ 80,566	$ (83,766)	$ 0
Components of Estimated Net Periodic Pension/Benefit Cost, January 1, 2023 to December 31, 2023				
Employer Current Service Cost	$ 301,444	$ 8,098	$ 59,828	$ 12,179
Interest Cost	667,263	13,489	112,669	5,140
Expected Return on Plan Assets	(970,884)	0	0	0
Recognition of LTD Actuarial (Gain) Loss	0	0	0	541
Amortization of Past Service Cost	0	0	463	0
Amortization of Net (Gain) Loss	54,100	3,590	0	0
Total Cost	$ 51,923	$ 25,177	$ 172,960	$ 17,860
2023 Estimated Employer Pension Contributions / Benefit Payments				
Amounts used for developing net period pension/benefit costs	$ 201,893	$ 16,344	$ 89,361	$ 22,317

Schedule 3G – Summary of Estimated 2024 US GAAP Results

The following table provides a summary of the estimated US GAAP results for 2024 for the post employment benefit plans sponsored by OPG. The estimated net periodic pension/benefit cost for the period January 1, 2024 to December 31, 2024 is determined based on the projected balance sheet items at January 1, 2024.

(in Canadian $000's)	**RPP**	**SPP**	**OPRB**	**LTD**
Projected Net Asset (Liability) Recognized as at January 1, 2024				
Projected Benefit Obligation	$ (18,393,433)	$ (370,469)	$ (3,027,209)	$ (153,644)
Fair Value of Plan Assets	16,893,808	0	0	0
Net Asset (Liability) Recognized	$ (1,499,625)	$ (370,469)	$ (3,027,209)	$ (153,644)
Estimated Amounts Recognized in Accumulated Other Comprehensive Income as at January 1, 2024				
Unrecognized Past Service Costs (Credits)	$ 0	$ 0	$ 1,437	$ 0
Unrecognized Net Actuarial Loss (Gain)	2,492,235	78,087	(79,128)	0
Total Accumulated Other Comprehensive Loss (Income)	$ 2,492,235	$ 78,087	$ (77,691)	$ 0
Components of Estimated Net Periodic Pension/Benefit Cost, January 1, 2024 to December 31, 2024				
Employer Current Service Cost	$ 319,579	$ 8,260	$ 62,980	$ 12,471
Interest Cost	680,233	13,724	116,142	5,021
Expected Return on Plan Assets	(998,565)	0	0	0
Recognition of LTD Actuarial (Gain) Loss	0	0	0	529
Amortization of Past Service Cost	0	0	463	0
Amortization of Net (Gain) Loss	51,007	3,337	0	0
Total Cost	$ 52,254	$ 25,321	$ 179,585	$ 18,021
2024 Estimated Employer Pension Contributions / Benefit Payments				
Amounts used for developing net period pension/benefit costs	$ 202,123	$ 16,671	$ 93,429	$ 21,323

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UNDERTAKING JT1.2

Undertaking

To update the Chart 1 in L-H-Staff-10, Attachment 1, to reflect what will be the updated forecast of pension, OPEB differential in H-Staff-12.

Response

Three charts have been provided in Attachment 1 to this response: Chart 1 covers pension and OPEB accrual to cash differences for the period up to December 31, 2017; Chart 2 covers such differences for the period between January 1, 2018 to December 31, 2021; and Chart 3 aggregates Chart 1 and Chart 2.

Chart 1 is as provided in Ex. L-H-Staff-10, Attachment 1.

Chart 2, which uses the same format as Chart 1, reflects the financial impact on OPG from a different treatment of the funding of pension and OPEB costs in rates in respect of the period January 1, 2018 to December 31, 2021, using the updated forecast of pension and OPEB accrual costs and cash amounts provided in Ex. JT1.1. As OPG's rates continue to temporarily recover pension and OPEB costs on a cash basis until 2021 (and assumed to be on an accrual basis thereafter), the cash to accrual differential for 2018 to 2021 will be recorded in the Interim Account until 2021 and, for the purposes of this example, these amounts will be recovered over the subsequent five-year rate period (2022 to 2026)[1]. Chart 2 also reflects the updated accrual to cash differential for the remainder of the forecast period in Ex. L-H-Staff-12 to 2024.

[1] Ex L-H-Staff 11, "OPG believes it would be a consistent and fair application of policy to capture such amounts in the New Differential Account if and when those amounts are recovered."

The incremental financial impacts resulting from financing cash flow differences arising from the timing of recovery of January 1, 2018 to December 31, 2021 accrual to cash differences totals $32.0M[2] per Chart 2, line 5. For purposes of aggregating the amounts with Chart 1, the incremental financial impact of carrying charges on the New Differential Account for the 2022-2026 period are shown as a net credit of $2.5M, assuming no further additions to the New Differential Deferral Account beyond accrual to cash differences in respect of 2024. However, if OPG's request to exempt Interim Account balances as of December 31, 2017 from the carrying charges treatment in the New Differential Treatment is approved, there would be no annual credit amounts expected to be recorded in the New Differential Account in respect of post-2017 amounts given the asymmetrical nature of the account outlined in the Report.

As OPG noted during the Technical Conference, the above financial impacts are based on forecasts of costs that are inherently variable[3].

Chart 3 combines the December 31, 2017 Interim Account balance recovery in Chart 1 with the 2018 to 2024 updated forecast pension and OPEB accrual to cash differential information in Chart 2.

The inclusion of the 2018 to 2024 forecast information does not mitigate the fairness and consistency issues resulting from applying carrying charges to the recovery of the December 31, 2017 balance in the Interim Account, as identified by OPG. In particular, the $123.3M total impact shown in Chart 1, line 8 reduces by $2.5M[4] in Chart 2, line 11 to $120.9M in Chart 3, line 11. With the forecast cash amounts and accrual costs being on average within $2M per year[5] during the 2018 to 2024 period (i.e., subsequent to the effective date of January 1, 2018 of the New Differential Account for utilities that

[2] OPG is not requesting recovery of the financial impacts of cash flows in this application.
[3] Technical Conference Tr. pp. 15, 71-72.
[4] Numbers may not calculate due to rounding.
[5] Ex JT1.1 Chart 5 line 3 plus JT1.1 Chart 6 line 3 = $13.9M /7 years =$2M per year.

have been collecting pension and OPEB costs on an accrual basis), the New Differential Account principal balance is approximately $630M at the end of 2026. In effect, until OPG pays $630M more in pension and OPEB costs than it collects from customers in subsequent periods, OPG would continue to be subject to carrying charges.

Chart 1: OPG Interest Cost Impact of Different Rate Treatments for Pre-2018 Pension and OPEB Cost Recovery
Copy of Ex. L, H-Staff-10, Attachment 1, Chart 1

Line	Particulars ($M)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
	Timing of Recovery Interest Costs:[#]												
1	Pre-2018 Rates on Accrual Amounts*	613.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	613.7
2	Pre-2018 Rates on Cash Amounts; Cash to Accrual Diff. in Riders[##]		76.7	76.7	76.7	76.7	76.7	76.7	76.7	76.8	0.0	0.0	613.7
3	Annual Cash Flow Difference (line 1 - line 2)*	613.7	(76.7)	(76.7)	(76.7)	(76.7)	(76.7)	(76.7)	(76.7)	(76.8)	0.0	0.0	0.0
4	Cumulative Cash Flow Difference / Interim Account Balance*	613.7	537.0	460.3	383.6	306.9	230.2	153.5	76.8	0.0	0.0	0.0	n/a
5	Annual simple interest impact on cumulative cash flow differences due to timing of recovery**		19.3	16.7	14.1	11.6	9.0	6.4	3.9	1.3	0.0	0.0	**82.2**
	New Differential Account:												
6	Annual Amount Recorded (equal to line 2)		76.7	76.7	76.7	76.7	76.7	76.7	76.7	76.8	0.0	0.0	613.7
7	Cumulative Account Balance***		76.7	153.4	230.1	306.8	383.5	460.2	536.9	613.7	613.7	613.7	n/a
8	Annual simple interest impact on cumulative account balance due to carrying charges****		1.3	3.9	6.4	9.0	11.6	14.1	16.7	19.3	20.6	20.6	**123.3**
9	**Total Incremental Cost Impact** (line 5 + line 8)		20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	**205.6**

Notes:

* 2018 value is December 31, 2017 Interim Account balance, comprised of $83.2M for regulated hydroelectric (Ex H1-2-1 Table 1, line 10, col (c)) and $530.5M for nuclear (Ex H1-2-1 Table 2, line 13, col (c)). Subsequent years at line 4 are prior year's Cumulative Cash Flow (line 4) plus current year's Annual Cash Flow Difference (line 3).

** [Prior year's Cumulative Cash Flow Difference (line 4) plus current year's Cumulative Cash Flow Difference (line 4)] / 2 * 3.35% Q4 2018 CWIP interest rate prescribed by the OEB.

*** Prior year's Cumulative Account Balance (line 7) plus current year's Annual Amount Recorded (line 6).

**** [Prior year's Cumulative Account Balance (line 7) plus current year's Cumulative Account Balance (line 7)] / 2 * 3.35% Q4 2018 CWIP interest rate prescribed by the OEB.

[#] To focus the analysis on the treatment of cash to accrual differences arising prior to the January 1, 2018 effective date of the New Differential Account, OPG assumed accrual costs equal to cash amounts starting in 2018 and continuing until 2028.

[##] Proposed recovery on a straight-line basis over an 8 year period from 2019 to 2026, with annual recovery amount of $76.7M comprised of $10.4M for regulated hydroelectric (Ex. H1-2-1 Table 1, line 10, cols (g, h, i)) and $66.3M for nuclear (Ex H1-2-1 Table 2, line 13, cols (g, h, i)).

Chart 2: OPG Interest Cost Impact of Different Rate Treatments for 2018-2021 Pension and OPEB Cost Recovery

Line	Particulars ($M)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
	Timing of Recovery Interest Costs:												
1	2018-2021 Rates on Accrual Amounts*	165.8	25.8	(6.2)	(20.1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	165.3
2	2018-2021 Rates on Cash Amounts; Cash to Accrual Diff. in Riders[#]		0.0	0.0	0.0	33.1	33.1	33.1	33.1	33.1	0.0	0.0	165.3
3	Annual Cash Flow Difference (line 1 - line 2)	165.8	25.8	(6.2)	(20.1)	(33.1)	(33.1)	(33.1)	(33.1)	(33.1)	0.0	0.0	0.0
4	Cumulative Cash Flow Difference[##]	165.8	191.6	185.4	165.3	132.2	99.2	66.1	33.1	0.0	0.0	0.0	n/a
5	Annual simple interest impact on cumulative cash flow differences due to timing of recovery**		6.0	6.3	5.9	5.0	3.9	2.8	1.7	0.6	0.0	0.0	**32.0**
	New Differential Account (Post-2017 Transactions):												
6	Annual Amount Recorded in Respect of Riders (equal to line 2)		0.0	0.0	0.0	33.1	33.1	33.1	33.1	33.1	0.0	0.0	165.3
7	Annual Amount Recorded in Respect of Post-2021 Period*		0.0	0.0	0.0	(39.3)	(57.7)	(54.4)	0.0	0.0	0.0	0.0	(151.4)
8	Annual Account Entry (line 6 + line 7)		0.0	0.0	0.0	(6.2)	(24.6)	(21.3)	33.1	33.1	0.0	0.0	13.9
9	Cummulative Account Balance		0.0	0.0	0.0	(6.2)	(30.9)	(52.2)	(19.2)	13.9	13.9	13.9	n/a
10	Annual simple interest impact on cumulative account balance due to carrying charges***		0.0	0.0	0.0	(0.1)	(0.6)	(1.4)	(1.2)	(0.1)	0.5	0.5	**(2.5)**
11	**Total Incremental Cost Impact** (line 5 + line 10)		6.0	6.3	5.9	4.9	3.3	1.4	0.5	0.5	0.5	0.5	**29.5**

Notes:

* EB-2018-0243, Ex JT1.1, Chart 5 and 6, Rows 3, respectively: Pension and OPEB Accrual-Cash Differential - Nuclear and Regulated Hydroelectric.

** [Prior year's Cumulative Cash Flow Difference (line 4) plus current year's Cumulative Cash Flow Difference (line 4)] / 2 * 3.35% Q4 2018 CWIP interest rate prescribed by the OEB.

*** [Prior year's Cumulative Account Balance (line 9) plus current year's Cumulative Account Balance (line 9)] / 2 * 3.35% Q4 2018 CWIP interest rate prescribed by the OEB.

[#] Assumed recovery on a straight-line basis over a 5 year period from 2022 to 2026.

[##] Subsequent years at line 4 are prior year's Cumulative Cash Flow (line 4) plus current year's Annual Cash Flow Difference (line 3).

Chart 3: OPG Interest Cost Impact of Different Rate Treatments for Pension and OPEB Cost Recovery for November 1, 2014 to December 31, 2021

Line	Particulars ($M)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
	Timing of Recovery Interest Costs:												
1	Annual Cash Flow Difference: Pre Jan 1, 2018 (Chart 1, line 3)	613.7	(76.7)	(76.7)	(76.7)	(76.7)	(76.7)	(76.7)	(76.7)	(76.8)	0.0	0.0	n/a
2	Annual Cash Flow Difference: Post Dec 31, 2017 (Chart 2, line 3)	165.8	25.8	(6.2)	(20.1)	(33.1)	(33.1)	(33.1)	(33.1)	(33.1)	0.0	0.0	n/a
4	Annual Cash Flow Difference	779.5	(50.9)	(82.9)	(96.8)	(109.8)	(109.8)	(109.8)	(109.8)	(109.9)	0.0	0.0	n/a
5	Cumulative Cash Flow Difference[#]	779.5	728.6	645.7	548.9	439.1	329.4	219.6	109.9	0.0	0.0	0.0	n/a
6	Annual simple interest impact on cumulative cash flow differences due to timing of recovery*		25.3	23.0	20.0	16.5	12.9	9.2	5.5	1.8	0.0	0.0	**114.3**
	New Differential Account:												
7	Annual Amounts Recorded in Respect of Dec 31, 2017 Balance (Chart 1, line 6)		76.7	76.7	76.7	76.7	76.7	76.7	76.7	76.8	0.0	0.0	613.7
8	Annual Amounts Recorded in Respect of Post-2017 Period (Chart 2, line 8)		0.0	0.0	0.0	(6.2)	(24.6)	(21.3)	33.1	33.1	0.0	0.0	13.9
9	Annual Account Entry (line 7 + line 8)		76.7	76.7	76.7	70.5	52.1	55.4	109.8	109.9	0.0	0.0	627.6
10	Cummulative Account Balance		76.7	153.4	230.1	300.6	352.6	408.0	517.7	627.6	627.6	627.6	n/a
11	Annual simple interest impact on cumulative account balance due to carrying charges**		1.3	3.9	6.4	8.9	10.9	12.7	15.5	19.2	21.0	21.0	**120.9**
12	**Total Incremental Cost Impact** (line 6 + line 11)		26.5	26.9	26.4	25.4	23.8	21.9	21.0	21.0	21.0	21.0	**235.1**

Notes:

* [Prior year's Cumulative Cash Flow Difference (line 4) plus current year's Cumulative Cash Flow Difference (line 4)] / 2 * 3.35% Q4 2018 CWIP interest rate prescribed by the OEB.

** [Prior year's Cumulative Account Balance (line 10) plus current year's Cumulative Account Balance (line 10)] / 2 * 3.35% Q4 2018 CWIP interest rate prescribed by the OEB.

[#] Subsequent years at line 5 are prior year's Cumulative Cash Flow (line 5) plus current year's Annual Cash Flow Difference (line 4).

UNDERTAKING JT1.3

Undertaking

OPG to consider whether to file the DRP Report on the record in this proceeding.

Response

OPG declines to provide the requested information on the basis of relevance. This undertaking seeks information on the current status of the Darlington Refurbishment Program. OPG has provided the audited December 31, 2017 balances in the Capacity Refurbishment Variance Account in Ex. H1-1-1 Table 1 as well as the portion of those balances previously approved by the OEB (in EB-2016-0152) in Ex. H1-2-1 Tables 1 and 2, cols. (b), but is not applying to recover those balances. Accordingly, the requested information is not relevant to the determination of issues or approvals being sought as part of this application.

UNDERTAKING JT1.4

Undertaking

To consider whether OPG will provide their SBG forecasts or related information; if not, to indicate why not.

Response

OPG declines to provide the requested information on the basis of relevance. Surplus Baseload Generation ("SBG") forecasts are not part of the OEB-approved methodology used to record entries to the Hydroelectric Surplus Generation Variance Account. As such, SBG forecasts would not provide any information relevant to the clearance of the balance in the Surplus Baseload Generation Variance Account as at December 31, 2017, or otherwise for the determination of issues or approvals being sought as part of this application.

UNDERTAKING JT1.5

Undertaking

To consider providing information on the steps taken to mitigate SBG spill, if they are available, and to provide that to the extent possible.

Response

The IESO is responsible for the overall management of the market, including Surplus Baseload Generation ("SBG") conditions. The IESO's role and OPG's actions in this context are as previously summarized below[1]:

> OPG explained that the IESO is responsible for mitigating SBG, but when SBG is anticipated OPG establishes offer prices so that any output reductions are based on market economics and a variety of operational constraints. OPG stated that historically it has used all available hydroelectric storage prior to spilling water, but also noted that its use of the Pump Generating Station ("PGS") is always based on the comparative economics of the pump/generate cycle in terms of the associated market prices.

[1] EB-2010-0008 Decision with Reasons, p. 21.

UNDERTAKING JT1.6

Undertaking

To provide annual information with respect to A to E and E to I on a monthly basis.

Response

The preamble to Ex. KT1.1, question 1, parts (a) to (d), references OPG's response to L-H-Staff-4. Below, OPG sets out the information that it relied upon in preparing the response to L-H-Staff-4. Where applicable, this information was sourced from the IESO website.[1] The information below pertains to drivers of the excess Ontario baseload generation supply over Ontario grid supplied demand.

a. Total transmission-connected hydroelectric production in Ontario was 37.7 TWh in 2017 compared to 35.7 TWh in 2016.

b. Nuclear production at Bruce Power was 49.9 TWh in 2017 compared to 46.1 TWh in 2016.

c. Nuclear production at Darlington Unit 2 was 0.0 TWh in 2017 compared to 5.8 TWh in 2016.

d. Ontario's grid supplied demand in 2017 was 132.1 TWh compared to 137.0 TWh in 2016.

With respect to Ex. KT1.1, question 1, parts (e) to (i), the tables in Attachment 1 to this response summarize the requested information for previously regulated hydroelectric facilities (Table 1) and newly regulated hydroelectric facilities (Table 2).

[1] See http://www.ieso.ca/Corporate-IESO/Media/Year-End-Data

Numbers may not add due to rounding.

Table 1
2017 Actual Foregone Production due to SBG Conditions by Month - Previously Regulated Hydroelectric (GWh)

Line No.		Note	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1	**Total Spill**		493	534	671	552	695	687	647	518	399	555	791	678	7,221
2	**Water Conveyance Constraints**		131	141	150	53	147	77	115	104	19	26	11	200	1,175
3	**Production Capability Constraints**		0	16	51	75	85	155	110	48	91	143	357	74	1,205
4	**Market Constraints**		48	59	77	14	7	20	43	52	38	21	56	68	503
5	**Contractual Obligations**		20	17	16	13	14	11	7	7	10	5	9	17	146
6	**Subtotal of Constraints**		199	234	295	155	253	263	275	211	157	195	433	359	3,029
7	**Potential SBG Spill** (line 1 - line 6)		294	300	377	397	442	424	372	307	241	360	359	319	4,192
8	**Other Spill**	1	72	84	79	18	12	11	23	28	32	9	49	54	471
9	**SBG Spill** (line 7 - line 8)	2	222	216	298	378	430	413	350	279	210	351	310	265	3,721

Notes
1 Represents the portion of potential spill excluded from SBG spill because it occurred when the Ontario market price was above the level of the GRC.
2 Total 2017 SBG spill for the previously regulated faciltities, in col. (m), corresponds to Ex. H1-1-1 Table 5, line 1, col. (d).

Numbers may not add due to rounding.

Table 2
2017 Actual Foregone Production due to SBG Conditions by Month - Newly Regulated Hydroelectric (GWh)

Line No.		Note	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1	**Total Spill**		76	77	130	712	1,333	581	231	115	77	215	222	154	3,922
2	**Water Conveyance Constraints**		0	0	0	0	0	0	0	0	0	0	0	0	0
3	**Production Capability Constraints**		43	37	55	386	856	249	84	40	41	82	55	27	1,955
4	**Market Constraints**		4	18	27	29	31	41	39	19	9	18	29	20	284
5	**Contractual Obligations**		0	0	0	0	0	0	0	0	0	0	0	0	0
6	**Subtotal of Constraints**		46	56	83	415	886	290	123	58	50	101	84	47	2,239
7	**Potential SBG Spill** (line 1 - line 6)		29	21	47	297	446	291	108	56	27	115	138	107	1,683
8	**Other Spill**	1	7	5	15	10	17	10	20	28	9	12	19	29	179
9	**SBG Spill** (line 7 - line 8)	2	23	15	32	287	430	281	89	29	18	103	119	78	1,504

Notes
1 Represents the portion of potential spill excluded from SBG spill because it occurred when the Ontario market price was above the level of the GRC.
2 Total 2017 SBG spill for the newly regulated faciltities, in col. (m), corresponds to Ex. H1-1-1 Table 5, line 6, col. (d).

UNDERTAKING JT1.7

Undertaking

To provide breakdown between the pension and OPEB costs of the December 31, 2017 balance in the interim account of $613.7 million.

Response

The breakdown between the registered pension plan portion and other post-employment benefit ("OPEB") portion of the December 31, 2017 debit balance in the Pension & OPEB Cash Versus Accrual Differential Deferral Account ("Interim Account") accumulated since November 1, 2014 is $307.3M and $306.4M, respectively.[1]

As outlined in Ex. F1-1-1, p. 6, lines 1-10 (as well as EB-2016-0152 and EB-2015-0040), OPG must begin to recover amounts recorded in the Interim Account (in relation to OPEB) no later than November 2019, or be required to write-off the regulatory asset for the affected amounts against net income in accordance with US GAAP. This requirement stems from US GAAP provisions (set out in the KPMG report and OPG's submissions in EB-2015-0040[2]) that require amounts recorded in relation to OPEB to begin to be recovered within five years of the underlying costs being incurred.

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[1] Consistent with the presentation in previous proceedings (for example, EB-2016-0152, Ex. F4-3-2, p. 1, footnote 1), OPEB information as presented in this undertaking and elsewhere in materials filed by OPG in this application includes all post retirement benefits other than the registered pension plan, as well as long term disability benefits.

[2] OPG Submission on Pension and OPEB Cost Recovery, dated September 22, 2016, pp. 12, 14-15. KPMG Report, pp. 155-156.

Additionally, as also set out in EB-2015-0040[3] and discussed at the EB-2018-0243 Technical Conference[4], these US GAAP provisions include restrictions on the pattern of recovery of amounts related to OPEB that must be met in order to avoid writing off the balance even if its recovery is otherwise approved by the OEB within the stipulated periods. The provisions are generally intended to restrict against “back-end loading” of recoveries within the stipulated period and explicitly state that a straight-line pattern of recovery (which OPG proposes in this application) would be compliant with this requirement. As noted by Mr. Kogan at the Technical Conference (Tr. p. 57, lines 10-15), patterns of recovery other than the straight-line basis would need to be assessed for compliance with this restriction based on specific details, in order to ensure that the affected balance would not be required to be written off. OPG’s auditors would need to be in agreement that a given non-straight line pattern of recovery would support continued recognition of the regulatory asset for the OPEB amounts in accordance with US GAAP.

[3] OPG Submission on Pension and OPEB Cost Recovery, dated September 22, 2016, pp. 12, 14-15. KPMG Report, pp. 75-76 and 155-156.
[4] Technical Conference Tr. pp. 55-57.

UNDERTAKING JT1.8

To provide the AON Hewitt report requested in Compendium KT1.1, Question 9.

Response

Please see JT1.1, Attachment 1 for a copy of the AON Hewitt report.

UNDERTAKING JT1.9

Undertaking

OPG to provide the actuarial valuation filed with FSCO in September 2018.

Response

Please see Attachment 1 to this response for a copy of the actuarial valuation as at January 1, 2018 for OPG's pension plan filed with the Financial Services Commission of Ontario ("FSCO") in September 2018.

Actuarial Valuation as at January 1, 2018 for Ontario Power Generation Inc. Pension Plan

Canada Revenue Agency Registration Number: 1059120

Provincial Registration Number: 1059120

September 2018

Table of Contents

Executive Summary

An actuarial valuation has been prepared for the Ontario Power Generation Inc. Pension Plan (the "Plan") as at January 1, 2018 for the primary purpose of establishing a funding range in accordance with legislative requirements for the Plan until the next actuarial valuation is performed. This section provides an overview of the important results and the key valuation assumptions which have had a bearing on these results. The next actuarial valuation for the purposes of developing funding requirements should be performed no later than as at January 1, 2021.

Summary of Principal Results

Financial Position

($000's)	January 1, 2018	January 1, 2017
Going Concern		
Assets	$ 13,506,676	$ 12,793,910
Liabilities	12,468,647	12,897,270
Financial Position	**1,038,029**	**(103,360)**
Adjustments[1]	(781,424)	-
Surplus/(Unfunded Liability)	**$ 256,605**	**$ (103,360)**
Solvency		
Assets[2]	$ 14,206,700	$ 13,393,700
Liabilities	13,512,668	13,261,162
Financial Position	**$ 694,032**	**$ 132,538**
Adjustments[3]	-	-
Surplus/(Unfunded Liability)	**$ 694,032**	**$ 132,538**
Hypothetical Wind Up		
Assets[1]	$ 14,206,700	$ 13,393,700
Liabilities	21,444,936	21,146,084
Surplus/(Unfunded Liability)	**$ (7,238,236)**	**$ (7,752,384)**

Normal Cost

($000's)	January 1, 2018	January 1, 2017
Company normal cost	$ 194,782	$ 200,096
As a % of pensionable earnings	18.0%	18.7%

[1] Adjustments include Provision for Adverse Deviation as required under Regulation 250/18 and prior year credit balance, where applicable
[2] Net of estimated wind up expenses
[3] Adjustments include prior year credit balance and all solvency liability and solvency asset adjustments, where applicable

Special Payments

($000's)	January 1, 2018	January 1, 2017
Special payments to reduce going concern unfunded liability or solvency deficiency	$ -	$ 11,640

Legislative Ratios

	January 1, 2018	January 1, 2017
Funded ratio (before Provision for Adverse Deviation)	1.08	0.99
Solvency ratio	1.06	1.02
Transfer ratio	0.67	0.64

Key Assumptions

The principal assumptions to which the valuation results are most sensitive are outlined in the following table.

Going Concern	January 1, 2018	January 1, 2017
Discount rate	5.80% per year	5.40% per year
Margin for adverse deviation in discount rate	None	0.40% per year
Provision for adverse deviation	7.78% of non-indexed liabilities	Not applicable
Inflation rate	2.00% per year	Same
Increase in pensionable earnings		
Active members	2.00% per year for 6 years, 2.50% per year thereafter; plus promotion, progression and merit ("PPM") scale (Table A in Appendix C)	2.00% per year for 5 years, 2.50% per year thereafter; plus PPM scale (Table A in Appendix C)
Disabled members	2.00% per year	Same
Increase in year's maximum pensionable earnings ("YMPE")	2.75% per year	Same
Increase in *Income Tax Act* maximum pension	2.75% per year	Same
Conversion rate for determining commuted values	3.80% per year	4.00% per year
Mortality table	OPG-specific mortality table (Table B in Appendix C) with generational mortality improvements using scale MI-2017 ("MI-2017")	OPG-specific mortality table (Table B in Appendix C) with generational mortality improvements using Canadian Pensioner Mortality Improvement Scale B ("CPM-B")

Solvency/ Hypothetical Wind Up	**January 1, 2018**	**January 1, 2017**
Discount rate		
Solvency (excludes indexation):		
Commuted value	2.80% per year for 10 years, 3.30% per year thereafter	2.30% per year for 10 years, 3.70% per year thereafter
Annuity purchase	3.08% per year	3.17% per year
Hypothetical wind up (includes indexation):		
Commuted value	1.30% per year for 10 years, 1.50% per year thereafter	1.30% per year for 10 years, 1.60% per year thereafter
Annuity purchase	-0.13% per year	-0.09% per year
Mortality table	2014 Canadian Pensioner Mortality Table (“CPM2014”) with generational mortality improvements using CPM-B	Same

Section 1: Introduction

Purpose and Terms of Engagement

We have been engaged by Ontario Power Generation Inc., and hereafter referred to as the Company, to conduct an actuarial valuation of the Plan, registered in Ontario, as at January 1, 2018 for the general purpose of determining the minimum and maximum funding contributions required by pension standards, based on the actuarial assumptions and methods summarized herein. Specifically, the purposes of the valuation are to:

- Determine the financial position of the Plan on a going concern basis as at January 1, 2018;
- Determine the financial position of the Plan as at January 1, 2018 on a solvency and hypothetical wind up basis;
- Determine the funding requirements of the Plan as at January 1, 2018 with consideration of Ontario Regulation 250/18; and
- Provide the necessary actuarial certification required under the *Pension Benefits Act (Ontario)* (the "*Act*") and the *Income Tax Act.*

The results of this report may not be appropriate for accounting purposes or any other purposes not listed above.

The next required valuation will be as at January 1, 2021.

Ontario Funding Reform

This report reflects new Ontario Regulation 250/18 that modifies the funding rules for Ontario registered defined benefit pension plans for actuarial valuations effective from December 31, 2017. In particular, this report reflects:

- The funding of a reserve in the going concern liabilities and normal cost for the Plan, referred to as a Provision for Adverse Deviation ("PfAD");
- The amortization of a going concern unfunded liability over 10 years, instead of 15 years, and a "fresh start" at each valuation; and
- The funding of a solvency deficiency up to the level that the plan would be 85% funded on a solvency basis.

Summary of Changes Since the Last Valuation

The last such actuarial valuation in respect of the Plan was performed as at January 1, 2017. Since the time of the last valuation, we note that the following events have occurred:

- Effective April 1, 2017, required member contributions for participants represented by the Power Workers' Union ("PWU") increased to 7.50% of pensionable earnings below the YMPE, plus 10.00% of pensionable earnings above the YMPE. The increase was reflected in the prior valuation;
- Amendments to the Plan were filed in 2017 affecting benefits for service accrued on and after January 1, 2025 for non-represented members and March 31, 2025 for represented members. These amendments provide lower projected benefits for future service than the current provisions. Since they impact service accruals beyond the period covered by this valuation, these amendments have not been reflected in this valuation and will be reflected in future valuations as appropriate;
- The Canadian Institute of Actuaries ("CIA") has completed a study of expected improvements in life expectancy and released a new mortality improvement scale – MI-2017. This new mortality improvement scale is being used for the January 1, 2018 going concern valuation; and
- Certain economic assumptions have been changed and the PfAD has been added to the going concern liabilities and normal cost. The PfAD is required under Regulation 250/18. The implicit margin for adverse deviation previously included in the discount rate in prior valuations has been removed.

Company Information and Inputs

In order to prepare our valuation, we have relied upon the following information:

- A copy of the previous valuation report as at January 1, 2017;
- A copy of the Statement of Investment Policies and Procedures for the Plan;
- Membership data compiled as at January 1, 2018 by the Company;
- Asset data taken from the Plan's audited financial statements
- The asset mix at December 31, 2017 for the purpose of calculating the PfAD provided by the Company; and
- A copy of the latest Plan text and amendments up to and including January 1, 2018.

Furthermore, our actuarial assumptions and methods have been chosen to reflect our understanding of the Company's desired funding objectives with due respect to accepted actuarial practice and regulatory constraints.

Subsequent Events

As of the date of this report, we have not been made aware of any subsequent events which would have an effect on the results of this valuation. However, the following points should be noted in this regard:

- Actual experience deviating from expected after January 1, 2018 will result in gains or losses which will be reflected in the next actuarial valuation report.
- To the best of our knowledge, the results contained in this report are based on the regulatory and legal environment in effect at the date of this report and do not take into consideration any potential changes that may be currently under review. To the extent that actual changes in the regulatory and legal environment transpire, any financial impact on the Plan as a result of such changes will be reflected in future valuations.

Section 2: Going Concern Valuation Results

Going Concern Financial Position of the Plan

The going concern valuation provides an assessment of the Plan's financial position at the valuation date on the premise that the Plan continues on into the future indefinitely.

The selection of the applicable actuarial assumptions and methods reflects the Plan's funding objectives, as communicated by the Company, actuarial standards of practice, and pension standards.

On the basis of the Plan provisions, membership data, going concern assumptions and methods, and asset information described in the Appendices, the going concern financial position of the Plan as at January 1, 2018 is shown in the following table. The results as at January 1, 2017 are also shown for comparison purposes.

Going Concern Financial Position

($000's)	January 1, 2018	January 1, 2017
Assets		
Market Value of Assets	$ 14,280,000	$ 13,467,000
Asset Smoothing Adjustment	(773,324)	(673,090)
Actuarial Value of Assets	**$ 13,506,676**	**$ 12,793,910**
Going Concern Liabilities		
Active members and disabled members	$ 4,526,441	$ 4,904,631
Deferred vested members	119,611	141,146
Retired members and beneficiaries	7,822,514	7,851,415
Voluntary contributions with interest	81	78
Total Liabilities	**$ 12,468,647**	**$ 12,897,270**
Going Concern Position	**$ 1,038,029**	**$ (103,360)**
Additional liabilities due to PfAD	(781,424)	N/A
Prior year credit balance	-	-
Surplus/(Unfunded Liability)	**$ 256,605**	**$ (103,360)**
Funded Ratio (Before PfAD)	**1.08**	**0.99**

The PfAD of 7.78% is not required to be applied and has not been applied to the liabilities in respect of future indexation of $2,424,631,000.

On the basis of the Plan provisions, membership data, going concern assumptions and methods, asset information and legislative requirements described in the Appendices, the going concern normal cost of the Plan as at January 1, 2018 is shown in the following table. The normal cost as at January 1, 2017 is also shown for comparison purposes.

Going Concern Normal Cost

($000's)		**January 1, 2018**		**January 1, 2017**
Normal Cost				
Total normal cost	$	273,850	$	293,477
Additional normal cost due to PfAD		16,464		N/A
Required member contributions		(95,532)		(93,381)
Company Normal Cost	**$**	**194,782**	**$**	**200,096**
Total pensionable earnings (in year following valuation date)	$	1,083,664	$	1,071,453
Company Normal Cost				
As a % of total pensionable earnings		18.0%		18.7%

The PfAD of 7.78% is not required to be applied and has not been applied to the normal cost in respect of future indexation which is $62,227,000 in 2018.

Change in Financial Position

The major components of the change in the Surplus/(Unfunded Liability) for the period from January 1, 2017 to January 1, 2018 are summarized in the following table.

($000's)		
Surplus/(Unfunded Liability) as at January 1, 2017	**$**	**(103,360)**
Expected interest on Surplus/(Unfunded Liability)		(5,581)
Company special payments in inter-valuation period with interest		12,320
Surplus/(Unfunded Liability) as at January 1, 2018	**$**	**(96,621)**
Change in liabilities due to experience gains/(losses)		
Gain from investment earnings greater than expected		479,779
Gain due to salary increases lower than expected		19,525
Gain due to indexation experience		58,043
(Loss) due to retirement experience		(26,319)
Gain due to mortality experience		23,228
Gain due to disability experience		3,954
(Loss) due to termination experience		(23,301)
Net gain/(loss) due to other experience and miscellaneous items		19,509
Surplus/(Unfunded Liability) After Experience Gains/(Losses) as at January 1, 2018	**$**	**457,797**
Gain due to removal of implicit margin from discount rate (0.4% increase)		682,570
(Loss) due to new mortality improvement assumption		(96,640)
(Loss) due to changes in other economic assumptions		(5,698)
Change due to Surplus/(Unfunded Liability) as at January 1, 2018	**$**	**1,038,029**
Change due to addition of PfAD		(781,424)
Surplus/(Unfunded Liability) as at January 1, 2018 with PfAD	**$**	**256,605**

Discussion of Changes in Assumptions

Effective January 1, 2018, the following assumptions were changed:

Demographic Assumptions

- The mortality improvement scale has been changed from CPM-B to MI-2017, as published by the CIA, to reflect updated expected improvements in life expectancy.

This change in demographic assumption increased the going concern liabilities by $96,640,000 and the total normal cost by $2,544,000.

Economic Assumptions

- The nominal discount rate has been changed from 5.40% per year to 5.80% per year reflecting the removal of the implicit margin prior to the application of the PfAD. The net impact of the change in the nominal discount rate is a change in the real discount rate from 3.40% per year to 3.80% per year;
- The assumed increase in pensionable earnings for active members has been changed from 2.00% per year for five years and 2.50% thereafter, plus PPM scale to 2.00% per year for six years and 2.50% thereafter, plus PPM scale;
- The assumed nominal conversion rate for determining commuted values has been changed from 4.00% per year to 3.80% per year; and
- The assumed interest on member contributions has been changed from 4.40% per year to 1.70% per year.

In combination, these changes in economic assumptions decreased the going concern liabilities by $676,872,000 and the total normal cost by $24,484,000.

In addition, the introduction of PfAD increased the going-concern liability by $781,424,000 and total normal cost by $16,464,000.

Going Concern Valuation Sensitivity Results

In accordance with the CIA Standards of Practice specific to pension plans, the table below presents the sensitivity of the going concern liabilities and the total normal cost of using a discount rate 1% lower and 1% higher than that used for the going concern valuation.

			Effect		
January 1, 2018		($000's)		**$**	**%**
Going concern liabilities	$	12,468,647			
Going concern liabilities (discount rate – 1%)	$	14,336,030	$	1,867,383	15.0%
Going concern liabilities (discount rate + 1%)	$	11,040,051	$	(1,428,596)	(11.5)%
Total normal cost	$	273,850			
Total normal cost (discount rate – 1%)	$	341,472	$	67,622	24.7%
Total normal cost (discount rate + 1%)	$	223,898	$	(49,952)	(18.2)%

Section 3: Solvency Valuation Results

Solvency Financial Position of the Plan

The solvency valuation is a financial assessment of the Plan that is required by the *Act* and is performed in accordance with requirements prescribed by that legislation. It is intended to provide an assessment of the Plan's financial position at the valuation date on the premise that certain obligations as prescribed by the *Act* are settled on the valuation date for all members. The liabilities must be calculated based on a postulated scenario that maximizes liabilities on wind up of the Plan. Contingent benefits are included in the liabilities that would be payable under the postulated scenario, unless permitted to be omitted under the definition of solvency liabilities under the Regulations to the *Act.* Liabilities in respect of future indexation are excluded from the solvency liabilities below. All assumptions for the solvency valuation are listed in Appendix D.

On the basis of the Plan provisions, membership data, solvency assumptions and methods and asset information described in the Appendices, as well as the requirements of the *Act*, the solvency financial position of the Plan as at January 1, 2018 is shown in the following table. The solvency financial position of the Plan as at January 1, 2017 is shown for comparison purposes.

Solvency Financial Position

($000's)	January 1, 2018	January 1, 2017
Assets		
Solvency assets	$ 14,280,000	$ 13,467,000
Estimated wind up expenses	(73,300)	(73,300)
Total Assets	**$ 14,206,700**	**$ 13,393,700**
Solvency Liabilities		
Active members and disabled members	$ 5,156,546	$ 5,234,172
Deferred vested members	130,666	129,645
Retired members and beneficiaries	8,225,375	7,897,267
Voluntary contributions with interest	81	78
Total Liabilities	**$ 13,512,668**	**$ 13,261,162**
Solvency Position	**$ 694,032**	**$ 132,538**
Prior year credit balance	-	-
Present value of special payments	-	-
Solvency Surplus/(Deficiency)	**$ 694,032**	**$ 132,538**
Solvency ratio	1.06	1.02

Statutory Solvency Financial Position

The minimum funding requirements under the Regulations to the *Act* are based on the statutory solvency financial position as at the valuation date. New regulations released in 2018 that require funding of a reduced solvency deficiency became effective for valuations after December 31, 2017. The reduced solvency deficiency is based upon 85% of the solvency liabilities and 85% of the solvency liability adjustment.

($000's)	January 1, 2018	January 1, 2017
85% of total liabilities	$ 11,485,768	$ 13,261,162[1]
85% of solvency liability adjustment	-	-
Prior year credit balance	-	-
Total assets	(14,206,700)	(13,393,700)
Solvency asset adjustment		
Present value of special payments	-	-
Solvency asset smoothing	-	-
Reduced Solvency Deficiency	**$ 0[2]**	**$ 0[2]**

Solvency Concerns

A report indicates solvency concerns under the *Act* if the ratio of the solvency assets to solvency liabilities is less than 0.85.

Where a report indicates solvency concerns, the effective date of the next valuation that needs to be filed under the *Act* is one year from the valuation date of the valuation that gave rise to the solvency concerns.

Since the ratio of solvency assets to solvency liabilities ($14,280,000,000/ $13,512,668,000) is equal to 1.06, this report does not indicate solvency concerns.

Solvency Valuation Sensitivity Results

In accordance with the CIA Standards of Practice specific to pension plans, the table below presents the sensitivity of the solvency liabilities to using a discount rate of 1% lower and 1% higher than that used for the solvency valuation.

		Effect	
January 1, 2018	($000's)	**$**	**%**
Solvency liabilities	$ 13,512,668		
Solvency liabilities (discount rate – 1%)	$ 15,586,413	$ 2,073,745	15.3%
Solvency liabilities (discount rate + 1%)	$ 11,896,205	$ (1,616,463)	(12.0)%

[1] 100% of solvency liability under regulations in effect prior to December 31, 2017
[2] Cannot be less than $0

Pension Benefits Guarantee Fund ("PBGF")

The development of the PBGF Assessment Base is as follows:

PBGF Assessment Base ($000's)		**January 1, 2018**
(1) Solvency assets	$	14,280,000
(2) PBGF liabilities	$	13,512,668
(3) Solvency liabilities	$	13,512,668
(4) Ontario asset ratio: [(2) divided by (3)]		1.0000
(5) Ontario portion of fund: [(1) multiplied by the ratio in (4)]	$	14,280,000
PBGF assessment base: [(2) subtract (5); if negative, enter zero]	$	-

Section 4: Hypothetical Wind Up Valuation Results

Hypothetical Wind Up Financial Position of the Plan

A hypothetical wind up valuation is performed to determine the financial position of the Plan as at the valuation date on a wind up basis, reflecting market settlement rates as of the valuation date. Unlike the solvency valuation, all benefits (including future indexation) are included that would be payable under the postulated scenario that would maximize benefits. The hypothetical wind up valuation is determined using benefit entitlements on the assumption that the Plan has neither a surplus nor a deficit. Contingent benefits are included in the liabilities that would be payable under the postulated scenario. Assets are set equal to market value net of estimated wind up expenses. All assumptions for the hypothetical wind up valuation are listed in Appendix D.

On the basis of Plan provisions, membership data, hypothetical wind up assumptions and methods, and asset information described in the Appendices, as well as the requirements of the *Act*, the hypothetical wind up financial position of the Plan as at January 1, 2018 is shown in the following table. The hypothetical wind up financial position of the Plan as at January 1, 2017 is shown for comparison purposes.

Hypothetical Wind Up Financial Position

($000's)	January 1, 2018	January 1, 2017
Assets		
Hypothetical wind up assets	$ 14,280,000	$ 13,467,000
Estimated wind up expenses	(73,300)	(73,300)
Total Assets	**$ 14,206,700**	**$ 13,393,700**
Hypothetical Wind Up Liabilities		
Active members and disabled members	$ 9,037,513	$ 9,120,238
Deferred vested members	214,902	230,916
Retired members and beneficiaries	12,192,440	11,794,852
Voluntary contributions with interest	81	78
Total Liabilities	**$ 21,444,936**	**$ 21,146,084**
Hypothetical Wind Up Surplus/(Deficiency)	**$ (7,238,236)**	**$ (7,752,384)**

Transfer Ratio

The transfer ratio is determined as follows:

($000's)			January 1, 2018		January 1, 2017
(1) Hypothetical wind up assets		$	14,280,000	$	13,467,000
Prior year credit balance	(A)	$	-	$	-
Total company normal cost and required special payments until next mandated valuation	(B)	$	596,113	$	645,258
(2) Asset adjustment	Lesser of (A) and (B)	$	-	$	-
(3) Hypothetical wind up liabilities		$	21,444,936	$	21,146,084
Transfer Ratio [(1)-(2)] / (3)			**0.67**		**0.64**

Hypothetical Wind Up Valuation Sensitivity Results

In accordance with the CIA Standards of Practice specific to pension plans, the table below presents the sensitivity of the hypothetical wind up liabilities to using a discount rate of 1% lower and 1% higher than that used for the hypothetical wind up valuation.

			Effect		
January 1, 2018		($000's)		**$**	**%**
Hypothetical wind up liabilities	$	21,444,936			
Hypothetical wind up liabilities (discount rate – 1%)	$	25,931,096	$	4,486,160	20.9%
Hypothetical wind up liabilities (discount rate + 1%)	$	18,063,961	$	(3,380,975)	(15.8%)

Incremental Cost on a Hypothetical Wind Up Basis

The incremental cost on a hypothetical wind up basis represents the present value at January 1, 2018 of the expected aggregate change in the hypothetical wind up liabilities between January 1, 2018 and the next calculation date that is January 1, 2021. Appendix D gives more details on the calculation methodology and on assumptions.

Based on this methodology and on these assumptions, the incremental cost on a hypothetical wind up basis can be found in following table.

($000's)	**January 1, 2018 to December 31, 2018**	**January 1, 2019 to December 31, 2019**	**January 1, 2020 to December 31, 2020**
Incremental cost on a hypothetical wind up basis	$ 644,839	$ 655,147	$ 644,072

Section 5: Contribution Requirements

Contribution Requirements in Respect of the Normal Cost

The annual going concern cost of benefits in respect of service accruing after the valuation date is known as the normal cost. The following table sets out:

- The development of the rule to determine the normal cost;
- An estimate of the normal cost for the three years following the valuation date; and
- The portion of the going concern normal cost that is to be paid by the members.

($000's)	January 1, 2018 to December 31, 2018	January 1, 2019 to December 31, 2019	January 1, 2020 to December 31, 2020
Normal Cost			
Total normal cost	$ 273,850	$ 279,327	$ 284,914
Additional normal cost due to PfAD	16,464	16,794	17,129
Required member contributions	(95,532)	(97,442)	(99,391)
Company Normal Cost	**$ 194,782**	**$ 198,679**	**$ 202,652**
Total pensionable earnings	$ 1,083,664	$ 1,105,337	$ 1,127,444
Company Normal Cost			
As a % of pensionable earnings	18.0%	18.0%	18.0%

In the event an updated funding range in accordance with legislative requirements is not certified before January 1, 2021, the rule for determining the company normal cost contributions outlined in the above table will continue to be appropriate for the plan year commencing on the next valuation date of January 1, 2021. Adjustment to the company contributions may be required once the next actuarial funding range in accordance with legislative requirements is certified.

Development of Special Payments

The following table summarizes previously established amortization schedules of special payments before adjustment to reflect any gains or losses due to the going concern and solvency valuation results.

Nature of Deficiency	Effective Date	End Date	Annual Special Payment ($000's)
Going concern	January 1, 2014	December 31, 2028	$ 11,640
			$ 11,640

There are no special payments required after adjustments for gains or losses due to the going concern and solvency valuation results.

Prior Year Credit Balance ("PYCB")

The PYCB is nil as at January 1, 2018.

Available Actuarial Surplus

As at January 1, 2018 the Available Actuarial Surplus is calculated as follows;

($000's)			
Going Concern Basis			
(A)	Total assets	$	13,506,676
(B)	Total liabilities	$	12,468,647
(C)	Additional liabilities due to PfAD	$	781,424
(D)	Prior year credit balance		-
(E)	**Available surplus: maximum (A – B – C – D); 0)**	**$**	**256,605**
Solvency Basis			
(F)	**Assets in excess of a solvency ratio[1] of 105%**	**$**	**91,698**
(G)	**Available Actuarial Surplus: minimum (E; F)**	**$**	**91,698**

As at January 1, 2018 the Available Actuarial Surplus is determined to be $91,698,000.

Excess Surplus

The *Income Tax Act* requires that any excess surplus first be applied to reduce or eliminate the company contribution requirements. Excess surplus is defined in Section 147.2(2)(d) of the *Income Tax Act*, as the portion of surplus (if any) that exceeds 25% of the going concern liabilities plus PfAD.

Since the surplus is less than 25% of the going concern liabilities, there is no excess surplus and therefore no impact on the development of the company contribution requirements.

[1] The OPG Pension Plan is a broader public sector pension plan and therefore the solvency ratio threshold applies rather than the transfer ratio

Development of Minimum Required Company Contribution

The table below presents the development of the minimum required company contribution for each of the plan years covered by this report.

While we have shown a fixed company normal cost in the table below, the Company may actually fund the normal cost as a percentage of pensionable earnings.

($000's)	**January 1, 2018 to December 31, 2018**	**January 1, 2019 to December 31, 2019**	**January 1, 2020 to December 31, 2020**
Company normal cost	$ 194,782	$ 198,679	$ 202,652
Special payments toward amortizing unfunded liability	-	-	-
Special payments toward amortizing solvency deficiency	-	-	-
Required application of excess surplus	-	-	-
Minimum Required Company Contribution Prior to Application of Available Actuarial Surplus	**$ 194,782**	**$ 198,679**	**$ 202,652**

Under Regulations 7.0.3(1), 7.0.3(3) and 7.0.3(4) of the *Pension Benefits Act* (Ontario), which came into effect May 1, 2018, it may be permissible to use Available Actuarial Surplus to reduce the required Company normal cost contribution shown above.

The permitted application of Available Actuarial Surplus is determined on an annual basis and is subject to the filing of an actuarial cost certificate within the first 90 days of the fiscal year showing a solvency ratio greater than 105% as of the beginning of the fiscal year. In addition, members must be advised within the first six months of the fiscal year, and in the manner prescribed in Regulation 8.(1), 8.(2), 8.(3), and 8.(4), of the Company's intention to use Available Actuarial Surplus. The total reduction in Company normal cost taken by the Company over the period covered by this report may not exceed the Available Actuarial Surplus.

Development of Maximum Deductible Company Contribution

The table below presents the development of the maximum deductible company contribution for each of the plan years covered by this report.

The maximum deductible company contribution presented in the table below for a given plan year is calculated assuming that the Company makes the maximum deductible company contribution in the first plan year covered by this report.

While we have shown a fixed company normal cost in the table below, the Company may actually fund the normal cost as a percentage of pensionable earnings.

($000's)	**January 1, 2018 to December 31, 2018**	**January 1, 2019 to December 31, 2019**	**January 1, 2020 to December 31, 2020**
Company normal cost	$ 194,782	$ 198,679	$ 202,652
Greater of the unfunded liability and the hypothetical wind up deficiency	7,238,236	-	-
Required application of excess surplus	-	-	-
Maximum Deductible Company Contribution	**$ 7,433,018**	**$ 198,679**	**$ 202,652**

If the Company wishes to make the maximum deductible company contribution, it is advisable to contact the Plan's actuary before making such contribution to ensure that the contribution will be permissible and deductible and that any regulatory requirements are considered.

Section 6: Actuarial Certificate

Actuarial Opinion, Advice and Certification for the Ontario Power Generation Inc. Pension Plan

Canada Revenue Agency Registration Number: 1059120

Opinion

This actuarial certification forms an integral part of the actuarial valuation report for the Plan as at January 1, 2018. We confirm that we have prepared an actuarial valuation of the Plan as at January 1, 2018 for the purposes outlined in the Introduction section to this report and consequently:

Our advice on funding is the following:

- The Company should contribute the amounts within the range of minimum and maximum contribution amounts as outlined in Section 5 of this report, in accordance with legislative requirements.
- The next actuarial valuation for the purpose of developing funding requirements should be performed no later than as at January 1, 2021.

We hereby certify that, in our opinion:

- The contribution range as outlined in this report is expected to be sufficient to satisfy the Plan's funding requirements.
- The company contribution range outlined in this report qualifies as eligible contributions under Section 147.2(2) of the *Income Tax Act.*
- The pre-1990 maximum pension restrictions in Subsection 8504(6) of the Regulations to the *Income Tax Act* do not apply to any members of the Plan
- For the purposes of the valuation:
  - The data on which this valuation is based are sufficient and reliable;
  - The assumptions used are appropriate; and
  - The actuarial cost methods and the asset valuation methods used are appropriate.
- This report and its associated work have been prepared, and our opinion given, in accordance with accepted actuarial practice in Canada and in compliance with the requirements outlined in subparagraphs 147.2(2)(a)(iii) and (iv) of the *Income Tax Act*.

- Notwithstanding the above certifications, emerging experience differing from the assumptions will result in gains or losses that will be revealed in subsequent valuations.

Linda M. Byron, FCIA, FSA
Senior Partner

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September 2018

Appendix A: Assets

Asset Data

The Plan's assets are held by CIBC Mellon Trust Company. The asset information presented in this report is based on the audited financial statements of the pension fund audited by Ernst & Young LLP.

Tests of the sufficiency and reliability of the asset data were performed and the results were satisfactory. The tests included:

- A reconciliation of actual cash flow with expected cash flow from the previous actuarial report; and
- A reconciliation of any anticipated benefit payments (for retirees, terminated or deceased members) against the financial statements of the pension fund for confirmation of payments.

Market Value of Assets

The following is a summary of the composition of the Plan's assets by asset type as reported in the audited financial statements of the pension fund audited by Ernst & Young LLP as at January 1, 2018. For comparison purposes, the composition at the previous valuation date of January 1, 2017 is also shown.

		January 1, 2018[1]		January 1, 2017[1]
Cash and short term		1.4%		1.3%
Structured fixed income		9.4%		17.5%
Real return bonds		19.0%		11.5%
Canadian equities		12.8%		14.6%
Global equities		26.1%		28.2%
Emerging market equities		3.2%		0.7%
Real assets		15.2%		12.4%
Return diversifying assets		12.9%		13.8%
Total Invested Assets	**-**	**100.0%**	**-**	**100.0%**

[1] Distribution is based on a roll up of investment strategies/accounts.

Target Asset Mix

The target asset mix of the Plan is contained in the Plan's Statement of Investment Policies and Procedures ("SIPP") dated November 7, 2017 and is as follows:

	Target
Cash and short term	1.0%
Structured fixed income	16.0%
Real return bonds	17.0%
Canadian equities	10.0%
Global equities	19.0%
Emerging market equities	2.0%
Real assets	20.0%
Return diversifying assets	15.0%
	100.0%

Reconciliation of Changes in Market Value of Assets

The table below reconciles changes in the market value of assets between January 1, 2017 and January 1, 2018.

($000's)		**January 1, 2017 to December 31, 2017**
Market Value of Assets, Beginning of Plan Year	**$**	**13,467,000**
Contributions During Plan Year		
Member	$	94,000
Company normal cost		200,000
Company special payments		12,000
Total	**$**	**306,000**
Benefit Payments During Plan Year		
Non-retired members[1]	$	183,000
Retired members		569,000
Total	**$**	**752,000**
Fees/Expenses		
Investment fees/expenses	$	88,000
Non-investment fees/expenses		5,000
Total	**$**	**93,000**
Investment Income	**$**	**1,352,000**
Market Value of Assets, End of Plan Year	**$**	**14,280,000**

[1] Includes members who have terminated employment or died

Development of Adjusted Market Value of Assets

The actuarial value of assets has been determined by modifying the market value of assets to recognize asset gains/(losses) (i.e., the difference between actual investment return and expected investment return based on the best estimate long term rate of return) over a five year period. Because gains and losses are determined with reference to the best estimate long term rate of return, there is an equal probability of deferred gains or losses developing.

The development of the actuarial value of assets as of January 1, 2018 is shown below:

($000's) Year Ending	**Original Amount of (Gain) Loss**	**(Gain) Loss Admitted in Prior Years**	**(Gain) Loss Admitted in 2017**	**(Gain) Loss to be Admitted in Future Years**
December 31, 2014	$ (1,034,281)	$ (620,569)	$ (206,856)	$ (206,857)
December 31, 2015	$ (414,861)	(165,944)	(82,972)	(165,945)
December 31, 2016	$ (13,076)	(2,615)	(2,615)	(7,846)
December 31, 2017	$ (490,848)	0	(98,172)	(392,676)
		$ (789,128)	**$ (390,615)**	**$ (773,324)**
Market Value of Assets, January 1, 2018				**14,280,000**
Actuarial Value of Assets, January 1, 2018				**$ 13,506,676**

Appendix B: Membership Data

Source of Data

This valuation was based on member data provided by the Company as of January 1, 2018. Tests of the sufficiency and reliability of the member data were performed and the results were satisfactory. The tests included:

- A reconciliation of membership status against the membership status at the last valuation. This test was performed to ensure that all members were accounted for. A summary of this reconciliation follows on the next page;
- A reconciliation of birth, hire, and participation dates against the corresponding dates provided for the last valuation to ensure consistency of data;
- A reconciliation of credited service against the corresponding amount provided for the last valuation to ensure that no member accrued more than one year of credited service from January 1, 2017. This test also revealed any members who accrued less than one year of credited service;
- A reconciliation of pensionable earnings against the corresponding amounts provided for the last valuation to identify any unusual increases or decreases;
- A reconciliation of any stated benefit payments in 2017 (for retired, terminated or deceased members) against the financial statements of the pension fund for confirmation of the payments; and
- A reconciliation of inactive member benefit amounts against the corresponding amounts provided for the last valuation to ensure consistency of data.

There was no information missing from the data, so no assumptions were required with respect to such data.

A copy of the administrator certification certifying the accuracy and completeness of the member data (and the Plan provisions summarized in this report) is included in Appendix G of this report.

Membership Summary

The table below reconciles the number of members as of January 1, 2018 with the number of members as of January 1, 2017 and the changes due to experience in the period.

	Active	Disabled	Deferred Vested	Pensioners	Survivors and Children	Total
Members, January 1, 2017	**9,302**	**358**	**759**	**9,518**	**2,146**	**22,083**
New Entrants	528	0	0	0	0	528
Return to Active from Disability	14	(14)	0	0	0	0
To Disability	(40)	40	0	0	0	0
Terminations						
- Lump-sum Payments	(96)	(3)	(44)	0	0	(143)
- Deferred Vested	(82)	(3)	85	0	0	0
Retirements	(385)	(24)	(56)	465	0	0
Deaths						
- Lump-sum Payments	(8)	(6)	0	0	0	(14)
- With Survivor	(2)	(2)	0	(120)	0	(124)
- No Further Benefit	0	0	0	(104)	(105)	(209)
New Survivors	0	0	0	0	124	124
New Former Spouses[1]	0	0	0	0	2	2
Data correction	0	0	(2)	0	2	0
Net change	(71)	(12)	(17)	241	23	164
Members, January 1, 2018	**9,231**	**346**	**742**	**9,759**	**2,169**	**22,247**

[1] Due to marriage breakdown.

Active Members

	January 1, 2018	January 1, 2017
Number	9,231	9,302
Average age (years)	46.3	46.5
Average credited service (years)	14.7	15.1
Average pensionable earnings for the following year	$ 112,927	$ 110,984
Accumulated contributions with interest	$ 846,554,844	$ 828,551,107
Proportion female	23.0%	22.8%

Disabled Members

	January 1, 2018	January 1, 2017
Number	346	358
Average age (years)	55.1	55.2
Average credited service (years)	24.4	24.5
Average pensionable earnings for the following year	$ 91,159	$ 88,029
Accumulated contributions with interest	$ 23,417,107	$ 23,411,428
Proportion female	42.5%	42.5%

Deferred Vested Members

	January 1, 2018	January 1, 2017
Number	708[1]	728[2]
Average age (years)	53.9	53.8
Average annual lifetime pension	$ 10,015	$ 10,047
Proportion female	27.1%	27.7%

[1] Excludes 34 in-transit commuted value transfers (commuted value reflected in liabilities)
[2] Excludes 31 in-transit commuted value transfers (commuted value reflected in liabilities)

Retired Members

	January 1, 2018	January 1, 2017
Number	9,759	9,518
Average age (years)	70.0	69.8
Average annual lifetime pension	$ 50,036	$ 49,303
Total annual bridge pension[1]	$ 50,014,720	$ 50,259,512
Proportion female	17.8%	17.0%

Survivors (excluding children)

	January 1, 2018	January 1, 2017
Number	2,162	2,138
Average age (years)	78.4	78.1
Average annual pension	$ 25,948	$ 25,337
Proportion female	95.4%	95.4%

Children

	January 1, 2018	January 1, 2017
Number	7	8
Average age (years)	30.0	22.8
Total annual temporary pension	$ 226,408	$ 202,895

[1] As at January 1, 2018, there were 2,939 retired members with an average age of 60.5 receiving a bridge benefit. As of January 1, 2017, there were 2,973 retired members with an average age of 60.4 receiving a bridge benefit.

Active/Disabled Membership Distribution

The following table provides a detailed summary of the active/disabled membership at the valuation date by years of credited service and by age group. For privacy reasons, average pensionable earnings is not shown for groups with 2 or fewer members.

Age	< 5	5–10	10–15	15–20	20–25	25–30	>=30	Total
< 30	549	76	2					627
	$ 78,599	$ 109,207	*					$ 82,411
30–35	322	446	213	1				982
	$ 89,803	$ 109,866	$ 114,982	$ *				$ 104,372
35–40	223	365	595	131				1,314
	$ 99,395	$ 106,104	$ 117,285	$ 118,252				$ 111,239
40–45	141	190	372	396	2	2		1,103
	$ 105,454	$ 107,053	$ 115,881	$ 121,096	*	*		$ 114,893
45–50	123	179	378	325	49	281	6	1,341
	$ 101,445	$ 107,661	$ 116,338	$ 116,033	$ 119,976	$ 124,157	$ 128,302	$ 115,565
50–55	110	175	317	337	66	768	139	1,912
	$ 104,706	$ 110,202	$ 111,362	$ 115,789	$ 123,068	$ 125,362	$ 121,607	$ 118,426
55–60	50	111	234	305	34	413	247	1,394
	$ 123,237	$ 108,339	$ 110,790	$ 111,153	$ 121,554	$ 121,027	$ 129,192	$ 117,677
60–65	17	53	107	159	22	188	166	712
	$ 116,472	$ 115,363	$ 110,332	$ 109,490	$ 108,978	$ 113,532	$ 110,194	$ 111,436
>=65	1	10	34	53	4	61	29	192
	$ *	$ 120,604	$ 107,012	$ 112,319	$ 123,210	$ 119,069	$ 118,982	$ 115,211
Total								
Count	1,536	1,605	2,252	1,707	177	1,713	587	9,577
Average Earnings	$ 92,028	$ 108,580	$ 114,676	$ 115,715	$ 120,035	$ 122,587	$ 121,510	$ 112,140

Deferred Vested/Retired Membership Distribution

The following table provides a detailed summary of the deferred vested/retired membership at the valuation date by age group.

Age	Deferred Vested Members[1]	Retired Members and Survivors[2]
< 50	191	17
Average Annual Lifetime Pension	$ 7,720	$ 16,771
Average Annual Bridge Pension	$ 1,625	$ 3,063
50–55	151	192
Average Annual Lifetime Pension	$ 12,264	$ 49,400
Average Annual Bridge Pension	$ 2,375	$ 16,146
55–60	176	1,095
Average Annual Lifetime Pension	$ 9,619	$ 55,923
Average Annual Bridge Pension	$ 1,994	$ 16,916
60–65	153	1,874
Average Annual Lifetime Pension	$ 11,228	$ 56,129
Average Annual Bridge Pension	$ 2,118	$ 16,475
65[3]–70	37	2,496
Average Annual Lifetime Pension	$ 9,550	$ 49,490
Average Annual Bridge Pension	N/A	N/A
70–75	N/A	2,338
Average Annual Lifetime Pension	N/A	$ 44,943
Average Annual Bridge Pension	N/A	N/A
75–80	N/A	1,528
Average Annual Lifetime Pension	N/A	$ 39,425
Average Annual Bridge Pension	N/A	N/A
>=80	N/A	2,381
Average Annual Lifetime Pension	N/A	$ 33,331
Average Annual Bridge Pension	N/A	N/A
Total		
Count	708	11,921
Average Annual Lifetime Pension	$ 10,015	$ 45,667
Average Annual Bridge Pension	$ 1,928	$ 16,339

[1] Excludes 34 in-transit commuted value transfers (commuted value reflected in liabilities)
[2] Excluding children
[3] Includes all deferred vested members over age 65

Appendix C: Going Concern Assumptions and Methods

Assumptions and Methods

A member's entitlements under a pension plan are generally funded during the period over which service is accrued by the member. The cost of each member's benefits is allocated in some fashion over the member's service. An actuarial valuation provides an assessment of the extent to which allocations relating to periods prior to a valuation date (often referred to as the actuarial liabilities) are covered by the plan's assets.

The going concern valuation provides an assessment of a pension plan on the premise that the plan continues on into the future indefinitely based on assumptions in respect of future events upon which a plan's benefits are contingent and methods that effectively determine the way in which a plan's costs will be allocated over the members' service. The true cost of a plan, however, will emerge only as experience develops, investment earnings are received, and benefit payments are made.

This appendix summarizes the going concern assumptions and methods that have been used for the going concern valuation of the Plan at the valuation date. The going concern assumptions and methods have been chosen to reflect our understanding of the Plan's funding objectives with due respect to accepted actuarial practice and regulatory constraints. For purposes of this valuation, the going concern methods and assumptions were reviewed and changes as indicated were made.

The actuarial assumptions and methods used in the current and previous valuations are summarized below and described on the following pages.

	January 1, 2018	**January 1, 2017**
Economic Assumptions		
Discount rate	5.80% per year	5.40% per year
Margin in discount rate	None	0.40% per year
Best estimate expected rate of return (used for development of the actuarial value of assets)	5.80% per year	Same
Inflation rate	2.00% per year	Same
Real discount rate	3.80% per year	3.40% per year
Increases in pensionable earnings		
Active members	2.00% per year for 6 years, 2.50% per year thereafter; plus PPM scale (Table A following)	2.00% per year for 5 years, 2.50% per year thereafter; plus PPM scale (Table A following)
Disabled members	2.00% per year	Same
Increases in YMPE	2.75% per year	Same
Increase in *Income Tax Act* maximum pension	2.75% per year	Same
Interest on member contributions	1.70% per year	4.40% per year
Conversion rate for determining commuted values	3.80% per year	4.00% per year
Real conversion rate for determining commuted values	1.80% per year	2.00% per year
Investment and non-investment expenses	Implicit in discount rate	Same
Provision for adverse deviation	7.78% of non-indexed liabilities	Not applicable
Demographic Assumptions		
Mortality table	OPG-specific mortality table (Table B following) with generational mortality improvements using scale MI-2017	OPG-specific mortality table (Table B following) with generational mortality improvements using scale CPM-B
Retirement		
Active participants	Variable by age (Table C following)	Same
Disabled participants	Age 65	Same
Deferred vested participants	Earliest Unreduced Age	Same
Termination rates	Variable by age (Table D following)	Same
Disability rates	None	Same

	January 1, 2018	January 1, 2017
Proportion Married		
Non-retired proportion with spouse	90%	Same
Non-retired spousal age differential	Male spouse three years older than female spouse	Same
Retired members	Actual marital status and spousal ages are used where known; otherwise male spouse is assumed to be three years older than a female spouse	Same
Proportion of members assumed to elect commuted value		
Retirement eligible	10%	Same
Retirement eligible	50%	Same

Methods

Actuarial cost method	Projected unit credit prorated on credited service	Same
Asset valuation method	Smoothed value of assets with gains/losses deferred and amortized over 5 years	Same

Table A— Promotion, Progression and Merit (“PPM”) Scale

Sample age based retirement rates are in accordance with the following table:

Service (Years)	PPM Increase
Under 4	7.00%
4 to 9	2.75%
10 to 19	1.00%
20 +	0.50%

Table B—OPG-Specific Mortality Table

Mortality rates per 1,000 lives at selected ages are summarized in the table below:

	OPG-Specific Mortality Table before Morality Improvement	
Age	**Male**	**Female**
20	0.463	0.305
25	0.525	0.257
30	0.683	0.328
35	0.725	0.440
40	0.876	0.617
45	1.201	0.835
50	1.828	1.208
55	3.091	2.204
60	3.381	4.668
65	7.165	8.519
70	12.656	12.955
75	22.040	19.633
80	43.436	32.751
85	78.201	54.145
90	141.309	91.669

Table C— Retirement Rates

Age based retirement rates are in accordance with the following table:

	Eligible for Reduced Pension		Eligible for Unreduced Pension
Age	**Male**	**Female**	**Male and Female**
20	0.00%	0.00%	n/a
25	0.00%	0.00%	n/a
30	0.00%	0.00%	n/a
35	0.00%	0.00%	n/a
40	0.00%	0.00%	n/a
45	0.00%	0.00%	n/a
50	0.00%	0.00%	20.00%
55	2.00%	5.00%	20.00%
56	2.00%	5.00%	20.00%
57	2.00%	5.00%	20.00%
58	2.00%	5.00%	20.00%
59	2.00%	5.00%	20.00%
60	2.00%	5.00%	20.00%
61	7.00%	10.00%	25.00%
62	7.00%	10.00%	25.00%
63	7.00%	10.00%	25.00%
64	7.00%	10.00%	25.00%
65	100.00%	100.00%	100.00%

Table D— Termination Rates

Sample rates used in this valuation are shown in the following table:

Age	Male	Female
20	2.90%	3.30%
25	2.20%	2.50%
30	1.60%	2.40%
35	1.30%	2.00%
40	1.00%	1.60%
45	0.90%	1.40%
50	0.90%	1.40%
55 +	0.00%	0.00%

Justification of Actuarial Assumptions and Methods

Economic Assumptions

Discount Rate

The overall expected return is 6.00% per year, which is based on an inflation rate of 2.00% per year, yielding a real rate of return on the pension fund assets of 4.00% per year. This overall expected return was developed using best-estimate returns for each major asset class in which the pension fund is invested. A Monte Carlo simulation is performed where the portfolio returns are projected assuming annual rebalancing. The average of the 30-year geometric return is used to develop an overall best-estimate rate of return. Gains from rebalancing and diversification are implicit to this return.

The rate of return has been established based on the Company's investment policy at the valuation date. We note a new investment policy was approved in August 2018. The new investment policy results in a discount rate that is substantially similar to that derived below.

Development of Discount Rate	
Overall expected return	6.00%
Non-investment expenses	(0.13)%
Investment expenses (Passive)	(0.07)%
Margin for adverse deviations	0.00%
Unrounded Discount Rate	**5.80%**
Rounded Discount Rate	**5.80%**

Therefore, we have arrived at a best-estimate discount rate of 5.80% per year.

Inflation Rate

The assumption reflects the 1.00% to 3.00% band that Bank of Canada has set for inflation, with monetary policy aimed at a 2.00% target midpoint.

Increases in Pensionable Earnings

We have assumed future salary increases will be 2.00% per year for six years and 2.50% per year thereafter. The assumption reflects a long-term assumed increase in earnings similar to the long-term assumption for increases in average industrial wage. In the short-term, we have assumed salary increases will be lower due to current wage pressures.

In addition to the base rate, we assume rates of increase as a result of individual employee promotion, progression and merit based on a scale which varies by service as shown in Table A.

Increases in YMPE

As the benefits paid to a member from the Plan are dependent on the future YMPE, it is necessary to make an assumption regarding the future increases in the YMPE.

The YMPE is assumed to increase up until the time the member retires, dies or terminates from active employment at the rate of 2.75% per year. This is comprised of an annual increase of 2.00% on account of inflation, plus 0.75% in the long-term on account of productivity growth, which is consistent with historical real economic growth.

Increases in the *Income Tax Act* Maximum Pension

Pensions are limited to the maximum limits under the *Income Tax Act*. The maximum lifetime annual pension per year of pensionable service payable under the *Income Tax Act* is $2,944.44 in 2018. It is assumed that the maximum limit will increase at the rate of 2.75% per year. This is comprised of an annual increase of 2.00% on account of inflation, plus 0.75% in the long-term on account of productivity growth, which is consistent with historical real economic growth.

Interest on Member Contributions

Interest is credited on member contributions at 1.70% per year. The assumption reflects the best-estimate expectations of future yield of five-year personal fixed term chartered bank deposits.

Expenses

Since the discount rate has been established net of all investment expenses, no explicit assumption is required for all expenses.

Conversion Rate

The conversion rate for commuted values is assumed to be 3.80% nominal (1.80% real). This rate was derived based on the weighted-average time to expected payout of commuted value payments, using best-estimate expectations of future conversion rates determined in a manner consistent with the expected returns of the fixed income asset classes used for the derivation of the discount rate in accordance with the CIA guidance. This is a blended rate using the rate for the first 10 years and the rate thereafter.

Provision for Adverse Deviation

The PfAD is determined in accordance with new Regulations to the *Act* which came into effect May 1, 2018. For the purpose of this valuation, the PfAD is established based on the actual asset allocation at the valuation date for each category of investments set out in the SIPP, as permitted by the regulations.

Asset Category	Actual Asset Allocation(%)
(A) Fixed income[1]	28.00%
(B) Non-fixed income[2]	43.80%
(C) Other	28.20%
Total	100.00%
(D) Percentage of fixed income for PfAD [(A)+50%*(C)]	42.10%
(E) Percentage of non-fixed income for PfAD [100%-(D)]	57.90%

Benchmark Discount Rate (BDR)	
(F) Plan duration	15.0
(G) V39056 rate at the valuation date	2.26%
(H) Best estimate discount rate, gross of expenses	6.00%
(I) Allowance for diversification	0.50%
(J) BDR [(G)+1.5%*(D)+5.0%*(E)+(I)]	6.29%

PfAD is determined as follows:	
(K) Fixed component (4% for open plan or 5% for closed plan)	4.00%
(L) Asset mix component (Interpolate from Table E below)	3.78%
(M) BDR component [Max[0, (F)*[(H)-(J)]]]	0.00%
Total	**7.78%**

[1] Satisfying the minimum credit rating requirements under Regulation 11(9)
[2] Includes non-investment grade fixed income

Table E—Component of the PfAD

One component of the PfAD varies with the percentage of plan assets invested in non-fixed income assets (Line E on the prior page). This component is derived from the following table (interpolated as necessary) which is detailed in the Regulations to the *Act*:

Percent of Non-Fixed Income Assets	PfAD for Closed Plans	PfAD for Open Plans
0%	0%	0%
20%	2%	1%
40%	4%	2%
50%	5%	3%
60%	7%	4%
70%	11%	6%
80%	15%	8%
100%	23%	12%

Economic Margins for Adverse Deviations

The actuary has discussed the Plan's experience with the Company and compared it to the expected experience. Based on this review a decision was made not to include any margins for adverse deviation in addition to the PfAD.

Demographic Assumptions

Mortality

During 2013, Aon undertook a study of the mortality experience of OPG's pensioners. Aon developed an OPG-specific base mortality table, which has been used for the prior valuation and this valuation that reflects the experience of OPG's pensioners over the period from 2005 to 2012. Future mortality improvements on a generational basis are assumed in accordance with improvement scale MI-2017 and are applied to the base mortality rates from 2009 onward (the mid-point of the study). This improvement scale was developed by the CIA in 2017 and reflects updated expectations of improvement in mortality. The mortality improvement scale CPM-B published by the CIA was used for the prior valuation.

Retirement

The rates of retirement have been developed as our expectation of the best-estimate rates of retirement based on the plan provisions and the historical retirement experience of the Plan. We continue to believe the assumed retirement rates reflect the long term anticipated retirement pattern in the Plan.

Disabled members are assumed to retire at age 65, since their company-provided disability benefits are assumed to continue to that age, and earlier retirement election could jeopardize those disability benefits.

Termination of Employment

A member's benefit entitlement under the Plan is affected by whether the member terminates employment prior to retirement for reasons other than death. In order to account for this in the calculation of the actuarial liability, an assumption regarding the probability that a member will terminate employment for reasons other than death has been made.

The termination rates were developed based on a recent review of Plan experience since 2010. Consequently, the termination rates are considered to be best estimate.

Disability

If an active Plan member becomes disabled, service continues to accrue until pension commencement age, but employee contributions are waived. Disabled members are assumed to stay disabled until the age of 65.

Based on our recent review of OPG's disability experience since 2010, and materiality, an assumption of no incidence of disability has been made.

Proportion of Members with Spouses and Spousal Age Differential

These assumptions are relevant to the valuation of benefits since there is a subsidized joint and survivor benefit available for members with a spouse. The spousal age differential is based on an analysis of pensioner data. The proportion of members who are assumed to have a spouse at retirement is consistent with observed plan experience.

Proportion of Members Electing a Commuted Value at Termination or Retirement

We recently reviewed OPG's historical experience and have included in this valuation an assumption that 10% of retirement eligible members and 50% of members not eligible to retire will elect a commuted value in lieu of immediate or deferred monthly pension payments upon retirement/termination.

Other

Actuarial Cost Method

An actuarial cost method is a technique used to allocate in a systematic and consistent manner the expected cost of a pension plan over the years of service during which plan members earn benefits under the Plan. By funding the cost of a pension plan in an orderly and rational manner, the security of benefits provided under the terms of the plan in respect of service that has already been rendered is significantly enhanced.

The projected unit credit actuarial cost method (prorated on credited service) has been used for this valuation. Under this method, the actuarial present value of benefits in respect of service prior to the valuation date, but based on pensionable earnings projected to retirement, is compared with the actuarial asset value, revealing either a surplus or an unfunded actuarial liability.

With respect to service after the valuation date, the expected value of benefits for service in the year following the valuation date (i.e., the normal cost) net of any required employee contributions is expressed as a percentage of the expected value of participating payroll for that year. The employer normal cost contributions are determined each year by applying this percentage to the actual participating payroll for the year.

When calculating the actuarial present value of benefits at the valuation date, the present value of all retirement, withdrawal and preretirement death benefits are included. For each member, the retirement, withdrawal and preretirement death benefits for a particular period of service are first projected each year into the future taking into account future vesting, early retirement entitlements and minimum pension/value entitlements. These projected benefits for each future year are then capitalized, multiplied by the probability of the member leaving the Plan in that year and discounted with interest and survivorship to the valuation date. The actuarial present value of benefits for the particular period of service is then determined by summing the present values of these projected benefits.

The pattern of future contributions necessary to pre-fund future benefit accruals for any one particular individual will increase gradually as a percentage of their pensionable earnings as the individual approaches retirement. For a stable population (i.e., one where the demographics of the group remain constant from year to year), the normal cost will remain relatively level as a percentage of payroll. The projected unit credit actuarial cost method therefore allocates contributions among different periods in an orderly and rational manner for a stable population group.

In the event of future adverse experience, contributions in addition to the normal cost calculated under the projected unit credit actuarial cost method may be required to ensure that the Plan assets are adequate to provide the benefits. Conversely, favourable experience may generate surplus which may serve to reduce future contribution requirements.

Asset Valuation Method

The Company uses asset-smoothing which can reduce the volatility in the Company's contribution requirements.

Appendix D: Solvency and Hypothetical Wind Up Assumptions and Methods

Valuation Assumptions

	January 1, 2018	January 1, 2017
Economic Assumptions		
Discount rate		
—Solvency (excludes indexation)		
Benefits assumed to be settled by commuted value	2.80% per year for 10 years; 3.30% per year thereafter	2.30% per year for 10 years; 3.70% per year thereafter
Benefits assumed to be settled by annuity purchase	3.08% per year	3.17% per year
—Hypothetical wind up (includes indexation)		
Benefits assumed to be settled by commuted value	1.30% per year for 10 years; 1.50% per year thereafter	1.30% per year for 10 years; 1.60% per year thereafter
Benefits assumed to be settled by annuity purchase	-0.13% per year	-0.09% per year

Demographic Assumptions		
Mortality table	CPM2014 with generational improvements using Scale CPM-B[1] (sex-distinct rates)	Same
Termination rates	Not applicable	Same
Retirement age		
Active and disabled members	Age that produces the highest lump-sum value	Same
Deferred vested members	Age that produces the highest lump-sum value	Same
Retired members and beneficiaries	Not applicable	Same
Termination of employment	Terminate with full vesting	Same
Marital status		
Non-retired spousal proportion	90% assumed to have a spouse at retirement	Same
Non-retired spousal age differential	Male spouses assumed to be three years older than female spouses	Same
Retired members	Actual marital status and spousal ages are used where known; if not known, a male spouse is assumed to be three years older than a female spouse	Same

[1] No preretirement mortality was applied

	January 1, 2018	January 1, 2017
Other		
Wind up expenses	$73.3 million	Same
Actuarial cost method	Unit credit	Same
Asset valuation method	Market value of assets adjusted to reflect contributions, benefit payments, transfers and fees/expenses in transit as of the valuation date	Same

Settlement of Benefits on Plan Wind Up

Based on the CIA's Guidance and information such as pension legislation, Plan provisions and Plan experience, we have made the following assumptions regarding how the Plan's benefits would be settled on Plan wind up:

	Percent of Liability Assumed to be Settled By Purchase of Annuities	Percent of Liability Assumed to be Settled By Lump-Sum Transfer
Active and Disabled Members		
Not retirement eligible	50%	50%
Retirement eligible	90%	10%
Deferred Vested Members		
Not retirement eligible	50%	50%
Retirement eligible	90%	10%
Retired Members and Beneficiaries	100%	0%

Postulated Scenario

The postulated scenario is the assumption of immediate termination of employment for the active group at the valuation date. Therefore, no allowance for future salary increases or demographic experience are reflected.

Benefits Valued

	Solvency Valuation	Hypothetical Wind Up Valuation
Vesting	We have treated all accrued benefits as vested on Plan wind up.	We have treated all accrued benefits as vested on Plan wind up.
Grow-in Benefits	Active members employed in Ontario with at least 55 age-plus-service points are eligible to receive grow-in benefits.	Active members employed in Ontario with at least 55 age-plus-service points are eligible to receive grow-in benefits.
Indexing	Not included in the valuation.	Included in the valuation.

Hypothetical Wind Up Incremental Cost Assumptions

	January 1, 2018	January 1, 2017
Increases in pensionable earnings		
Active	2.00% per year, plus PPM scale (Table A preceding)	Same
Disabled	2.00% per year	Same
Increases in YMPE	2.75% per year	Same
Increases in *Income Tax Act* maximum pension	2.75% per year	Same
Inflation rate	2.00% per year	Same
Discount rate (for calculating the present value of projected Hypothetical Wind Up liabilities and expected benefit payments)		
Benefits assumed to be settled by commuted value[1]	2.80% per year	2.30% per year
Benefits assumed to be settled by annuity purchase[2]	1.87% per year	1.91% per year

[1] The select nominal solvency discount rate for benefits assumed to be settled by commuted value
[2] The select nominal solvency discount rate for benefits assumed to be settled by commuted value plus expected inflation of 2.00%

Justification for Valuation Assumptions

Development of Discount Rates

The development of the discount rates is shown below.

Solvency lump-sum discount rate for 10 years	= V122542[1] + 90 bps = 1.90% + 0.90% **= 2.80% (rounded to 2.80%) per year**
Solvency lump-sum discount rate thereafter	= V122544[1] + 0.5 x (V122544[1] – V122542[1]) + 90 bps = 2.21% + 0.5 x (2.21% – 1.91%) + 0.90% **= 3.26% (rounded to 3.30%) per year**
Solvency annuity purchase discount rate	= V39062 + Duration Adjustment = 2.22% +0.86% **= 3.08% per year**

We have set the aforementioned assumptions based on guidance prepared by the CIA Committee on Pension Plan Financial Reporting ("PPFRC") in the Educational Note Assumptions for Hypothetical Wind Up and Solvency Valuations with Effective Dates Between December 31, 2017 and December 30, 2018 ("CIA Guidance") released on March 5, 2018

For benefit entitlements that are expected to be settled by lump-sum transfer, we based the assumptions on Section 3500 (Pension Commuted Values) of the CIA Standards of Practice, using rates corresponding to a valuation date of January 1, 2018.

For benefit entitlements that are expected to be settled by purchase of annuities, we based the assumptions on information compiled by the PPFRC from insurance companies active in the group annuity market as described in the educational note.

The CIA's Guidance indicates that the cost of purchasing non-indexed annuities would be estimated based on the duration of the liabilities expected to be settled through annuity purchase. The duration of this Plan was estimated to be 12.65 years and the resulting duration adjustment to the unadjusted CANSIM series V39062 interest rate is 0.86%.

Mortality Table

We have used the CPM2014 mortality table with generational improvements using CPM-B in accordance with the CIA Guidance.

Preretirement Mortality

We have made no allowance for preretirement mortality. The impact of including such an assumption would not have a material impact on the valuation, since the value of the death benefit is approximately equal to the value of the accrued pension.

[1] CANSIM Series (annualized)

Pensionable Earnings

To estimate active and disabled members' best average earnings, we have used actual historical member earnings.

Assumptions Not Needed

The following are not relevant to the solvency or hypothetical wind up valuation:

- Increases in pensionable earnings;
- Termination of employment rates;
- Increase in YMPE (2018 amount was used)
- Increases in *Income Tax Act* maximum pension limit (2018 amount was used); and
- Disability rates

Estimated Wind Up Expenses

Plan wind up expenses would normally include such items as fees related to preparation of the actuarial wind up report, fees imposed by a pension supervisory authority, legal fees, administration, custodial and investment management expenses. We have assumed these fees would total $73.3 million.

Calculation of Special Solvency Payments

Since there is a Solvency Surplus, there are no solvency special payments.

Unisex Assumption

The liabilities are valued on a sex-distinct basis.

Actuarial Cost Methods

Unit credit (accrued benefit) cost method has been used as prescribed.

Asset Valuation Method Considerations

Assets for solvency purposes have been determined using market value.

Incremental Cost

The incremental cost on the Hypothetical Wind Up basis represents the present value, at the calculation date (time 0), of the expected aggregate change in the liabilities between time 0 and the next calculation date (time t), adjusted upwards for expected benefit payments between time 0 and time t.

An educational note was published in December 2010 by the CIA Committee on PPFRC to provide guidance for actuaries on the calculation of this new information.

The calculation methodology can be summarized as follows:

- The present value at time 0 of expected benefit payments between time 0 and time t, discounted to time 0,

  plus

- Projected liabilities at time t, discounted to time 0, allowing for, if applicable to the pension plan being valued:
  - expected decrements and related changes in membership status between time 0 and time t,
  - accrual of service to time t,
  - expected changes in benefits to time t,
  - a projection of pensionable earnings to time t,

  minus

- The liabilities at time 0.

The projection calculations take into account the following assumptions and additional considerations:

- The assumptions for the expected benefit payments and decrement probabilities, service accruals, and projected changes in benefits and/or pensionable earnings would be consistent with the assumptions used in the pension plan's going concern valuation, with the exception that the conversion rate for members who are assumed to elect commuted value lump sum payments is equal to the discount rate for the hypothetical wind up valuation, rather than the conversion rate specified for going concern valuations.
- The assumptions used to calculate the projected liability at time t are consistent with the assumptions for the Hypothetical Wind Up liabilities at time 0, assuming that interest rates remain at the levels applicable at time 0, that the select period is reset at time t for interest rate assumptions that are select and ultimate and that the Standards of Practice for the calculation of commuted values and the guidance for estimated annuity purchase costs in effect at time 0 remain in effect at time t.
  - Active and inactive Plan members as of time 0 are considered in calculating the incremental cost.

Appendix E: Summary of Plan Provisions

This funding valuation was based on Plan design information provided by the Company as of January 1, 2018. The following is a summary of the main provisions of the Plan.

Plan Provisions—DB Provision

Effective Date	January 1, 2000.
Jurisdiction of Registration	Ontario.
Eligibility for Membership	
Regular Employees	(a) All regular and probationary employees join the Plan on the date of hire; (b) Employees for whom the Office and Professional employees International Union was the bargaining agent prior to July 30, 1982 joined the Plan in accordance with the Plan rules at the time of hire; and, (c) Employees who became continuing construction clerical employees after July 29, 1982 and before August 8, 1984 joined the Plan in accordance with the Plan rules at the time of hire.
Other Employees	Other employees (with the exception of construction trades, machinists, hotel and restaurant employees, and temporary Management Group employees who were not eligible to join effective July 1, 2014) may join the Plan after completion of 24 months of continuous service, and either (a) earning 35% of the YMPE; or (b) having 700 hours of employment in each of the two preceding calendar years.

Normal Retirement

Eligibility

The attainment of age 65 (age 60 for female employees hired before January 1, 1976 or any subsequent day when she in fact retires which is not later than her 65th birthday).

Benefit

Annual benefit equal to (a) minus (b) below:

(a) For members represented by the PWU or Society – 2.0% of Highest Three-Year Average Earnings times Credited Service prior to March 31, 2025 plus 2.0% of Highest Five-Year Average Earnings times Credited Service on and after March 31, 2025; or

For Management Group employees – 2.0% of Highest Three-Year Average Earnings times Credited Service.

For all members, Credited Service is limited to 35 years unless member elects to contribute beyond 35 years and earn Credited Service.

(b) 0.5% of Highest Five-Year Average Earnings up to the Average YMPE times Credited Service after December 31, 1965.

Early Retirement

Eligibility

(a) For members represented by the PWU or Society – Attainment of 82 age-plus-continuous service points prior to March 31, 2025, or attainment of 85 age-plus-continuous service points on or after March 31, 2025; or

For Management Group employees – Attainment of 84 age-plus-continuous service points prior to January 1, 2025 for employees hired before July 1, 2014, or attainment of 90 age-plus-continuous service points for Management Group employees hired on or after July 1, 2014 or attainment of 90 age-plus-continuous service points on or after January 1, 2025 for Management Group employees hired before July 1, 2014.

(b) For members represented by the PWU or Society – Attainment of 82 age-plus-continuous service points but less than 85 age-plus- continuous service points, and with 25 or more years of continuous service on or after March 31, 2025.

(c) For members represented by the PWU or Society – Attainment of 82 age-plus-continuous service points but less than 85 age-plus- continuous service points, and with less than 25 years of continuous service on or after March 31, 2025.

Early Retirement (continued)
Eligibility

(d) For Management Group employees hired before July 1, 2014 – Attainment of 84 age-plus-continuous service points but less than 90 age-plus-continuous service points and with more than 25 years of continuous service on or after January 1, 2025.

(e) For Management Group employees hired before July 1, 2014 – Attainment of 84 age-plus-continuous service points but less than 90 age-plus-continuous service points and with less than 25 years of continuous service on or after January 1, 2025.

(f) Age 55 with 25 years of continuous service.

(g) A female employee whose continuous employment commenced prior to 1976 with age 50 and at least 15 years of continuous service or any other employee with age 55 and at least 15 years of continuous service, but less than 25 years of continuous service.

(h) Age 55.

Benefit

(a) Normal retirement benefit earned to early retirement date, unreduced for early commencement.

(b) Normal retirement benefit earned for service prior to March 31, 2025 unreduced for early commencement plus normal retirement benefit earned for service on or after March 31, 2025 reduced by 3% for each year that early retirement date precedes age 60. Notwithstanding the aforementioned, for members represented by the PWU or Society who have 20 or more years of service on March 31, 2025, the normal retirement benefit earned for service on or after March 31, 2025 will be reduced by 3% per year prior to the date the member's age-plus-continuous service would equal 85 (growing service and age).

(c) Normal retirement benefit earned for service prior to March 31, 2025 unreduced for early commencement plus normal retirement benefit earned for service on or after March 31, 2025 reduced by 2% for each year up to 5 years and by 3% for each additional year that early retirement date precedes age 65 (age 60 for females hired prior to 1976). Notwithstanding the aforementioned, for members represented by the PWU or Society who have 20 or more years of service on March 31, 2025, the normal retirement benefit earned for service on or after March 31, 2025 will be reduced by 3% per year prior to the date the member's age-plus-continuous service would equal 85 (growing service and age).

Early Retirement (continued)

(d) Normal retirement benefit earned for service prior to January 1, 2025 unreduced for early commencement plus normal retirement benefit earned for service on or after January 1, 2025 reduced by 3% for each year that early retirement date precedes age 60.

(e) Normal retirement benefit earned for service prior to January 1, 2025 unreduced for early commencement plus normal retirement benefit earned for service on or after January 1, 2025 reduced by 2% for each year up to 5 years and by 3% for each additional year that early retirement date precedes age 65 (age 60 for females hired prior to 1976).

(f) Normal retirement benefit earned to early retirement date, reduced by 3% for each year that early retirement date precedes age 60.

(g) Normal retirement benefit earned to early retirement date, reduced by 2% for each year up to five years and by 3% for each additional year that early retirement date precedes age 65 (age 60 for females hired prior to 1976).

(h) Normal retirement benefit earned to early retirement date, actuarially reduced for early commencement.

Supplement (Bridge Pension)

Eligibility

(a), (b), (c), (d), (e), (f), (g), and (h) as described under Early Retirement.

Benefit

0.625% of Highest Five-Year Average Earnings up to the Average YMPE times Credited Service (maximum 30 years), multiplied by the ratio 35/30, plus the number of years that the member contributed beyond 35 years, payable from early retirement date to age 65.

The supplement is subject to the same early retirement reductions as the lifetime pension.

Under (h), the lifetime pension plus the supplement are the actuarial equivalent of the defined benefit lifetime pension payable at age 65.

Disability Benefit

Eligibility	Qualification for benefits from an income replacement plan.
Benefit	Credited Service continues to accrue. Member required contributions cease. Base Annual Earnings prior to disability is indexed on an annual basis by 100% of the increase in CPI (Ontario) for the 12 month period ending on the preceding June 30th, subject to a maximum increase of 8% with carry forward provisions. Actual YMPE at retirement date is used (subject to maximum indexation provisions).

Termination of Employment

Eligibility

(a) Less than 25 years of continuous service and not a Management Group employee hired on or after July 1, 2014.

(b) Management Group employee hired on or after July 1, 2014 with less than 25 years of continuous service.

(c) Twenty-five or more years of continuous service.

Benefit

(a) Accrued Normal Retirement Benefit payable and reduced in accordance with the provisions described under Early Retirement (a), (b), (c), (d), and (e) for members meeting those requirements using service at termination and age at retirement, or as early as age 55 on an actuarially reduced basis.

(b) Accrued Normal Retirement Benefit payable at age 65, or as early as age 55 on an actuarially reduced basis.

(c) Accrued Normal Retirement Benefit payable at age 65, or as early as age 55. The pension is reduced by 0.25% for each month that Early Retirement Date precedes age 60.

In lieu of the deferred pension described in (a), (b) and (c) above, the member may be eligible to transfer the commuted value of the deferred pension to a locked-in RRSP or other retirement vehicle or be entitled to a refund of contributions.

Portions of the pre-1987 benefit may be taken as a cash payment by members.

Preretirement Survivor Benefit

Eligibility

(a) Less than 10 years of continuous service.

(b) Ten or more years of continuous service.

Benefit

(a) Commuted value of accrued Normal Retirement Pension.

(b) (i) Member with a Spouse.

Greater of an immediate pension of 66-2/3% of accrued Normal Retirement Benefit (with no early retirement reductions), or an immediate pension equivalent in value to the commuted value of the member's accrued Normal Retirement Pension.

In lieu of (i) the surviving spouse may elect a deferred pension equivalent in value to the commuted value of the member's accrued pension at the date of death or may elect to receive the commuted value of the accrued Normal Retirement Pension.

(ii) Member with Eligible Children but no Spouse.

Immediate pension of 66-2/3% of accrued Normal Retirement Benefit paid to the children until age 18 (longer if in school or disabled).

(iii) Member without a Spouse or Eligible Children.

Commuted value of accrued Normal Retirement Benefit.

Required Member Contributions

(a) For members represented by the PWU – Effective April 1, 2017, 7.50% of Base Annual Earnings up to the YMPE, plus 10.00% of Base Annual Earnings in excess of the YMPE.

(b) For members represented by the Society – Effective January 1, 2017, 9.00% of Base Annual Earnings.

(c) For Management Group employees– Effective January 1, 2017, 7.60% of Base Annual Earnings up to YMPE, plus 9.50% of Base Annual Earnings in excess of the YMPE, but not exceeding the Earnings Limit, plus 4.50% of Base Annual Earnings above the Earnings Limit.

Maximum Pension	The benefits in respect of continuous employment after 1991 are limited to the maximum allowable under the *Income Tax Act*.
Excess Contributions	On retirement, death, or termination, the required member contributions made on or after January 1, 1987 with interest cannot provide more than 50% of the commuted value of the benefit earned for Credited Service after January 1, 1987 In the event the required member contributions with interest provide more than 50% of the benefit, the excess will be refunded to the member (to the spouse, beneficiary or estate in the case of death). On retirement, death, or termination of a member who was not represented by the PWU, the required member contributions made prior to January 1, 1987 with interest cannot exceed the commuted value of the benefits earned for Credited Service prior to January 1, 1987. The excess is refunded to the member (to the spouse, beneficiary or estate in the case of death).
Normal Form of Payment	
Member without a Spouse or Dependent Children at Retirement	Life annuity with a guarantee of at least 60 monthly payments.
Member With a Spouse or Dependent Children at Retirement	Joint and 66-2/3% survivor annuity (no reduction for survivor benefit).
Indexation	Pensions to retired and deferred vested members (and their survivors) are increased each January 1st (while in payment or during the deferral period) by 100% of the increase in CPI (Ontario) for the 12 month period ending on the preceding June 30th, subject to a maximum increase of 8% with carry forward provisions.

Definitions

Base Annual Earnings	Member's Base Annual Earnings include Performance Incentive Plan Payments up to: ▪ a maximum of 5% of a member's base annual earnings for Management Group employees in Bands A to M; ▪ a maximum of 28% of a member's base annual earnings for Authorized Nuclear Operators; ▪ a maximum of 25.2% of a member's base annual earnings for Certified Unit 0 Control Room Operators; ▪ a monthly maximum of 28% of a member's base annual earnings divided by 12 for Society-represented control Room Shift Supervisors and Control Room Shift Operating Supervisors; ▪ a maximum of 21% of a member's base annual earnings for Society-represented Authorization Training Supervisors; and ▪ a maximum of 18.9% of a member's base annual earnings for Unit 0 Training Specialists who were formerly certified Unit 0 control Room Operators.
Highest Three-Year Average Earnings	The average of a member's Base Annual Earnings during the 36 consecutive months which gives the highest amount, up to the date of retirement, termination, or death.
Highest Five-Year Average Earnings	The average of a member's Base Annual Earnings during the 60 consecutive months which gives the highest amount, up to the date of retirement, termination, or death.
Credited Interest	Average yield of five-year personal fixed term chartered bank deposits as determined under CANSIM B 14045 for the 12-month period ending June 30th.
Credited/Established Service	Credited service under the Prior Plan plus credited service while a member of the Plan on and after January 1, 2000, to a maximum of 35 years of credited service. Members may elect to contribute beyond 35 years and receive additional credited service.
Earnings Limit	$266,921 in 2018; the Earnings Limit increases at the same percentage as the increase in the *Income Tax Act* maximum pension.
Average YMPE	The average YMPE (i.e., Year's Maximum Pensionable Earnings under the Canada/Quebec Pension Plan) during the 60 consecutive months when Base Annual Earnings were highest.

A copy of a letter from the Company certifying the accuracy and completeness of the Plan provisions summarized in this report is included in Appendix G of this report.

Appendix F: Glossary of Terms

- The **actuarial value of assets** is the asset value used for going concern valuation purposes. Smoothing methods are sometimes used to smooth investment gains and losses over a certain period.
- The **estimated wind up expenses** is an estimate of the administrative and other expenses expected to be charged against the pension fund if the Plan were to terminate on the valuation date.
- The **going concern excess/(unfunded liability)** is the difference between the actuarial value of assets and sum of the going concern liabilities, the amount equal to the provision for adverse deviations in respect of the going concern liabilities of the pension plan, and the prior year credit balance of the pension plan.
- The **going concern funded ratio** compares the value of the assets of the pension plan determined on the basis of a going concern valuation, including accrued and receivable income, excluding the amount of any letter of credit held in trust for the pension plan, less the prior year credit balance, to the total amount of the going concern liabilities of the pension plan.
- The **going concern liabilities** are the actuarial present value of benefits earned in respect of service prior to the valuation date. The going concern liabilities are calculated using the going concern assumptions and methods summarized in Appendix C of this report.
- The **going concern position** is the difference between the actuarial value of assets and the going concern liabilities.
- The **maximum deductible company contribution** refers to an eligible contribution pursuant to Section 147.2(2) of the *Income Tax Act*. Under Subsection 8502(b) of the Regulations to the *Income Tax Act*, each Company contribution made after January 1, 1991 in respect of a defined benefit provision of a registered pension plan must be such eligible contribution.

  In a company's fiscal year, the following contributions are eligible under Section 147.2(2) of the *Income Tax Act*.

  - The company normal cost, eligible under Section 147.2(2) subject to certification by the actuary and approval by the Canada Revenue Agency; plus
  - Special payments eligible under Section 147.2(2) up to the amount of the unfunded liability, the solvency deficiency, or the hypothetical wind up deficiency, whichever is greater, subject to certification by the actuary and approval by the Canada Revenue Agency; less
  - Required application of excess surplus.

  The company normal cost and special payments for this Plan will be deductible under Section 147.2(2) of the *Income Tax Act*, subject to the approval of the Canada Revenue Agency.

  Note that contributions to a plan are still permissible and deductible if there is an excess surplus, providing there is simultaneously a solvency or hypothetical wind up deficiency in the Plan or the contributions are required as minimum contributions under provincial or federal *Act* legislation, pursuant to Subsections 8516(2) and (3) of the Regulations to the *Income Tax Act*.

One restriction under the *Income Tax Act* is that if there is an excess surplus, and a solvency or hypothetical wind up deficiency, the maximum deductible contribution is restricted to the full amount of the deficiency without allowance for interest or any other contributions such as company normal cost and/or transfer deficiency payments.

In order to be deductible in a given fiscal year, company contributions must be made not later than 120 days after the end of the fiscal year.

- The **minimum required company contribution** for each plan year is equal to:
  - The company normal cost; plus
  - Special payments toward amortizing any unfunded liability over 10 years beginning 1 year from the date on which the unfunded liability was established; plus
  - Special payments toward amortizing any reduced solvency deficiency over five years beginning no later than 12 months from the date on which the reduced solvency deficiency was established; less
  - Required application of excess surplus; less
  - Permitted application of surplus; less
  - Permitted application of PYCB.

  In order to satisfy the requirements of the *Act* and its Regulations, contributions to the fund must be made in accordance with the following rules:

  - Required member contributions (if any) must be remitted to the pension fund within 30 days following the month in which the contributions were received from the member or deducted from his or her remuneration.
  - Company normal cost contributions must be remitted to the pension fund within 30 days after the end of the month for which the contributions are payable.
  - Special payments must be remitted to the pension fund in the month for which they are payable.
- The **prior year credit balance** is
  - The PYCB stated in the last report in respect of the Plan under the Regulation; plus
  - The total amount of contributions made to the Plan by the Company after the valuation date of the last report in respect of the Plan and before the valuation date for the report being prepared; less
  - The total minimum amount of contributions required to have been made after the valuation date of the last report in respect of the Plan and before the valuation date for the report being prepared, if the contributions had been calculated without reference to any PYCB.

  The Company may choose to set the PYCB between nil and the amount as calculated above, but may not recapture the amount forfeited at any time.
- **Solvency/Hypothetical wind up assets** are the market value of pension fund assets adjusted to reflect contributions, benefit payments, transfers and fees/expenses in-transit at the valuation date.
- The **solvency asset adjustment** is an adjustment that may be made to the solvency assets to reflect:
  - The impact of using an averaging method that stabilizes short-term fluctuations in the market value of the Plan’s assets calculated over a period of not more than five years; plus

  - The present value of any remaining special payments required to liquidate any unfunded liability (for service not previously recognized for benefit determination purposes) established after December 31, 1987; plus
  - The present value of any remaining special payments other than those above that are scheduled for payment within six years after the valuation date.

- The **solvency liabilities** are the actuarial present value of benefits earned in respect of service prior to the valuation date determined as if the Plan were wound up on the valuation date and taking into account Section 74 of the *Act* (i.e., grow-in). In calculating the solvency liabilities, which includes plant closure benefits or permanent layoff benefits that would be immediately payable if the Plan sponsor's business was discontinued on the valuation date, the *Act* and its Regulations permit the exclusion of the following benefits:
  - Any escalated adjustments;
  - "Excluded plant closure benefits" that the Company elected on November 26, 1992 to exclude;
  - "Excluded permanent layoff benefits" that the Company elected on November 26, 1992 to exclude;
  - Special allowances other than those where the member has met all age and service eligibility requirements;
  - Consent benefits other than those where the member has met all eligibility requirements except the consent of the employer, or in the case of a jointly sponsored pension plan, the consent of the employer or the administrator;
  - Prospective benefit increases;
  - Potential early retirement window benefit values; and
  - Pension and ancillary benefits payable under a qualifying annuity contract.

  The solvency liabilities are determined using benefit entitlements on the assumption that the Plan has neither a surplus nor a deficit. The solvency liabilities are calculated using the solvency valuation assumptions summarized in Appendix D of this report.

- The **solvency liability adjustment** is an adjustment that may be made to the solvency liabilities to reflect the impact of using a solvency valuation discount rate for discounting the liability that is the average of market discount rates calculated over the same period of time as that used in the calculation of the solvency asset adjustment.
- The **solvency position** is the difference between the solvency assets (net of estimated wind up expenses) and the solvency liabilities.
- The **solvency ratio** compares the solvency assets (plus any letters of credit held in trust exceeding the prior year credit balance) to the solvency liabilities.
- The **solvency excess/(deficiency)** is the solvency position, increased by the solvency asset adjustment and the solvency liability adjustment, then decreased by the PYCB.

- The **special payments** are payments required to liquidate the unfunded liability and/or reduced solvency deficiency:
  - The going concern special payments are payments required to liquidate the unfunded liability, with interest at the going concern valuation discount rate, by equal monthly instalments over a period of 10 years beginning 1 year from the valuation date of the report in which the going concern unfunded liability was determined.
  - The solvency special payments are payments required to liquidate the reduced solvency deficiency, with interest at the solvency valuation discount rate, by equal monthly instalments over a period of five years beginning no later than 12 months from the valuation date of the report in which the solvency deficiency was determined. This period of years may be longer if the Company has elected temporary funding relief options 3, 5 and/or 7.
- The **total normal cost** is the actuarial present value of benefits expected to be earned in respect of service for each year starting on the valuation date. Required member contributions (if any) are deducted from the total normal cost to determine the company normal cost. The total normal cost is calculated using the going concern valuation assumptions and methods summarized in Appendix C of this report.
- The **transfer ratio** compares the solvency assets, minus the lesser of the PYCB and the required company contributions until the next required valuation (before application of the PYCB), to the solvency liabilities plus the liability of any excluded benefits (except for pension benefits and ancillary benefits payable under a qualifying annuity contract). If the transfer ratio is less than 1.00, lump-sum transfers from the pension fund under Section 42 of the *Act* are limited to the commuted value of the member's pension multiplied by the transfer ratio. The administrator may transfer the entire commuted value if:
  - The administrator is satisfied that an amount equal to the transfer deficiency has been remitted to the pension fund; or
  - The aggregate of transfer deficiencies for all transfers made since the last valuation date does not exceed 5% of the Plan's assets at that time.

  In June 2009, Subsection 19 of the Regulations of the *Act* was amended and Policy T800-402 was released. The Policy imposes additional restrictions for payment of commuted values under certain circumstances.

Appendix G: Administrator Certification

With respect to the Ontario Power Generation Inc. Pension Plan, forming part of the actuarial report as at January 1, 2018, I hereby certify that, to the best of my knowledge and belief:

- The asset data provided or made available to the actuary is complete and accurate;
- The membership data and subsequent query answers provided or made available to the actuary are complete and accurate for all persons who are entitled to benefits under the terms of the Plan in respect of service up to the date of the valuation;
- The Plan provisions provided or made available to the actuary are complete and accurate up to January 1, 2018;
- The actuary has been notified of all relevant events subsequent to the valuation measurement date; and
- The terms of engagement contained in Section 1 of this report are accurate and reflect the plan administrator's direction.

Name (print) of Authorized Signatory	Title
Signature	Date

About Aon

Aon plc (NYSE:AON) is a leading global professional services firm providing a broad range of risk, retirement and health solutions. Our 50,000 colleagues in 120 countries empower results for clients by using proprietary data and analytics to deliver insights that reduce volatility and improve performance.