Actuarial Valuation as at January 1, 2020 for Ontario Power Generation Inc. Pension Plan

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Empower Results®

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Executive Summary

An actuarial valuation has been prepared for the Ontario Power Generation Inc. Pension Plan (the "Plan") as at January 1, 2020 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, 2023.

Summary of Principal Results

Financial Position

($000's)	January 1, 2020	January 1, 2019
Going Concern		
Assets	$ 14,593,562	$ 14,074,339
Liabilities	12,699,389	12,341,968
Financial Position	$ 1,894,173	$ 1,732,371
Adjustments[1]	(1,314,678)	(884,892)
Surplus/(Unfunded Liability)	**$ 579,495**	**$ 847,479**
Solvency		
Assets[2]	$ 14,829,700	$ 13,684,700
Liabilities	14,397,681	13,590,783
Financial Position	$ 432,019	$ 93,917
Adjustments[1]	-	-
Surplus/(Unfunded Liability)	**$ 432,019**	**$ 93,917**
Hypothetical Wind Up		
Assets[2]	$ 14,829,700	$ 13,684,700
Liabilities	22,845,391	21,030,447
Surplus/(Unfunded Liability)	**$ (8,015,691)**	**$ (7,345,747)**

Normal Cost

($000's)	January 1, 2020	January 1, 2019
Company Normal Cost	$ 186,097	$ 178,104
As a % of pensionable earnings	18.5%	16.8%

[1] Adjustments include Provision for Adverse Deviation, prior year credit balance, and all solvency liability and solvency asset adjustments, where applicable
[2] Net of estimated wind up expenses

Legislative Ratios

	January 1, 2020	January 1, 2019
Funded ratio (before Provision for Adverse Deviation)	1.15	1.14
Solvency ratio	1.04	1.01
Transfer ratio	0.65	0.65

Minimum Contribution Requirements

Considering the funding and solvency status of the Plan, the minimum Company contributions for the period from January 1, 2020 to January 1, 2023 in accordance with legislative requirements, are as follows:

($000's)	Jan 1, 2020 to Dec 31, 2020	Jan 1, 2021 to Dec 31, 2021	Jan 1, 2022 to Dec 31, 2022
Company normal cost	$ 186,097	$ 189,820	$ 193,427
Special payments toward amortizing unfunded liability	-	-	-
Adjustments	-	-	-
Minimum Required Company Contribution	**$ 186,097**	**$ 189,820**	**$ 193,427**

Key Assumptions

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

Going Concern	January 1, 2020	January 1, 2019
Discount rate	5.65% per year	5.90% per year
Provision for adverse deviation ("PfAD")	12.40% of non-indexed liabilities and normal cost	8.84% of non-indexed liabilities and normal cost
Inflation rate	1.75% per year	2.00% per year
Increase in pensionable earnings		
Active members	Variable salary scale table (Table A1 in Appendix C) plus promotion progression and merit ("PPM") scale (Table B in Appendix C)	Variable salary scale table (Table A in Appendix C) plus promotion progression and merit ("PPM") scale (Table B in Appendix C)
Disabled members	1.75% per year	2.00% per year
Increase in year's maximum pensionable earnings ("YMPE")	2.50% per year	2.75% per year
Increase in *Income Tax Act* ("ITA") maximum pension	2.50% per year	2.75% per year
Conversion rate for determining commuted values	3.40% per year	3.90% per year
Mortality table	OPG-specific mortality table (updated 2019) (Table C in Appendix C) with mortality improvements at Scale MI-2017	Same

Solvency/ Hypothetical Wind Up	January 1, 2020	January 1, 2019
Discount rate		
Solvency (excludes indexation)	Annuity purchases: 2.96% per year	Annuity purchases: 3.23% per year
	Transfers: 2.50% per year for 10 years, 2.60% per year thereafter	Transfers: 2.80% per year for 10 years, 3.20% per year thereafter
Hypothetical Wind Up (includes indexation)	Annuity purchases: -0.29% per year	Annuity purchases: 0.08% per year
	Transfers: 1.20% per year for 10 years, 1.20% per year thereafter	Transfers: 1.60% per year for 10 years, 1.70% per year thereafter
Mortality table	2014 Canadian Pensioner Mortality Table with generational improvements using scale 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, 2020 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, 2020;
- Determine the financial position of the Plan as at January 1, 2020 on a solvency and hypothetical wind up basis;
- Determine the funding requirements of the Plan as at January 1, 2020; and
- Provide the necessary actuarial certification required under the *Pension Benefits Act (Ontario)* (the "Act") and the ITA.

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, 2023.

Summary of Changes Since the Last Valuation

The last such actuarial valuation in respect of the Plan was performed as at January 1, 2019. Since the time of the last valuation, we note that the following events have occurred:

- Certain economic and demographic assumptions have been changed.

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, 2019;
- A copy of the Statement of Investment Policies and Procedures for the Plan;
- Membership data compiled as at January 1, 2020 by the Company;
- Asset data taken from the pension fund's audited financial statements;
- Asset mix information at December 31, 2019 provided by the Company for the purpose of calculating the PfAD; and
- A copy of the latest Plan text and amendments up to and including January 1, 2020.

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, 2020 will result in gains or losses which will be reflected in the next actuarial valuation report.
- Due to the COVID-19 pandemic, the financial markets experienced significant volatility after the valuation date. As with other experience emerging after the valuation date, any financial impact of this event on the Plan will be reflected in the next actuarial valuation report.
- The Canadian Institute of Actuaries has amended the Standards of Practice related to pension plans effective December 1, 2020. In particular, the amended Standards of Practice revise the way that commuted values are determined. The changes impact the interest rates and the retirement age assumption used in the determination of commuted values. As this change is not retroactive, it does not impact the Plan as at January 1, 2020 and the change will be reflected in future valuations.
- 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

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 reflect 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, 2020 is shown in the following table. The results as at January 1, 2019 are also shown for comparison purposes.

Going Concern Financial Position

($000's)	January 1, 2020	January 1, 2019
Assets		
Market Value of Assets	$ 14,903,000	$ 13,758,000
Asset Smoothing Adjustment	(309,438)	316,339
Actuarial Value of Assets	**$ 14,593,562**	**$ 14,074,339**
Going Concern Liabilities		
Active and disabled members	$ 4,289,233	$ 4,223,388
Deferred vested members	106,760	106,830
Retired members and beneficiaries	8,303,305	8,011,664
Voluntary contributions with interest	91	86
Total Liabilities	**$ 12,699,389**	**$ 12,341,968**
Going Concern Position	**$ 1,894,173**	**$ 1,732,371**
Additional liabilities due to PfAD	(1,314,678)	(884,892)
Prior year credit balance	-	-
Surplus/(Unfunded Liability)	**$ 579,495**	**$ 847,479**
Funded ratio (Before PfAD)	**1.15**	**1.14**

The PfAD is not required to be applied to the liabilities in respect of post retirement indexation of $2,099,857,000 as at January 1, 2020 and $2,327,685,000 as at January 1, 2019.

Going Concern Normal Cost

On the basis of the Plan provisions, membership data, going concern assumptions and methods, asset information and legislative requirement described in the Appendices, the going concern normal cost of the Plan as at January 1, 2020 is shown in the following table. The normal cost as at January 1, 2019 is also shown for comparison purposes.

($000's)	January 1, 2020	January 1, 2019
Normal Cost		
Current service cost	$ 250,235	$ 254,080
Provision for non-investment expenses	-	-
Additional normal cost due to PfAD	24,633	17,437
Total Normal Cost	**$ 274,868**	**$ 271,517**
Required member contributions	(88,771)	(93,413)
Company Normal Cost	**$ 186,097**	**$ 178,104**
Total pensionable earnings (in year following valuation date)	$ 1,007,000	$ 1,061,129
Company Normal Cost		
As a % of total pensionable earnings	18.5%	16.8%

The PfAD is not required to be applied to the normal cost in respect of post retirement indexation of $51,628,000 as at January 1, 2020 and $56,829,000 as at January 1, 2019.

Change in Financial Position

The major components of the change in the Surplus/(Unfunded Liability) for the period from January 1, 2019 to January 1, 2020 are summarized in the following table.

($000's)

Surplus/(Unfunded Liability) as at January 1, 2019	**$**	**847,479**
Expected interest on Surplus/(Unfunded Liability)		50,001
Company special payments in inter-valuation period with interest		-
Expected Surplus/(Unfunded Liability) as at January 1, 2020	**$**	**897,480**
Change in liabilities due to experience gains/(losses)		
Gain from investment earnings greater than expected	$	148,835
Loss due to salary increases greater than expected		(20,827)
Loss due to retirement experience		(13,762)
Gain due to mortality experience		10,256
Gain due to disability experience		4,447
Loss due to termination experience including impact of lump sum payments		(8,464)
Gain on YMPE/ITA maximum pension different from expected		1,139
Net gain due to other experience and miscellaneous items		8,145
Surplus/(Unfunded Liability) After Experience Gains/(Losses) as at January 1, 2020	**$**	**1,027,249**
Gain due to change in salary scale	$	11,789
Gain due to change in inflation assumption		318,884
Loss due to change in lump sum conversion rate		(32,410)
Loss due to change in discount rate		(386,384)
Loss due to change in PfAD		(359,633)
Surplus/(Unfunded Liability) as at January 1, 2020	**$**	**579,495**

Discussion of Changes in Assumptions

Effective January 1, 2020, the following assumptions were changed:

- The assumed inflation rate has been changed from 2.00% per year to 1.75% per year reflecting updated market expectations of inflation implicit in the bond yields;
- The nominal discount rate has been changed from 5.90% per year to 5.65% per year, reflecting the lower inflation assumption. There is no overall change in the real discount rate of 3.90% per year;
- The assumed increase in pensionable earnings for active members has been updated to reflect OPG's long term outlook as described in Appendix C; and
- The assumed nominal (real) conversion rate for determining commuted values has been changed from 3.90% (1.90%) per year to 3.40% (1.65%) per year.

In combination, these changes in economic assumptions increased the going concern liabilities by $88,121,000 and the 2020 total normal cost by $9,600,000.

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 (prior to the application of the Provision for Adverse Deviation) of using a discount rate 1% lower and 1% higher than that used for the going concern valuation.

			Effect	
January 1, 2020		**($000's)**	**$**	**%**
Going concern liabilities	$	12,699,389		
Going concern liabilities (discount rate – 1%)	$	14,479,015	1,779,626	14.0%
Going concern liabilities (discount rate + 1%)	$	11,269,785	(1,429,604)	(11.3%)
Current service cost	$	250,235		
Current service cost (discount rate – 1%)	$	305,340	55,105	22.0%
Current service cost (discount rate + 1%)	$	202,482	(47,753)	(19.1%)

Plausible Adverse Scenarios

In accordance with the Canadian Institute of Actuaries Standards of Practice specific to pension plans, the tables below summarized scenarios of adverse but plausible assumptions, relative to the best estimate assumptions otherwise selected for the valuation.

Interest Rate Sensitivity

The table below presents the sensitivity of the going concern position to interest rates 1% lower than the current level. In order to calculate the impact on the Going Concern Liabilities and Total Normal Cost, the going concern discount rate was reduced by 1%[1]. All other assumptions were not changed. In order to calculate the impact on the Actuarial Value of Assets, the decrease in interest rates has been applied to fixed income assets only, with the sensitivity of the Market Value of Assets taken from the pension fund's audited financial statements at December 31, 2019. The Actuarial Value of Assets was then calculated using the smoothing method reflected in the going concern valuation.

($000's)	**Base Scenario**	**Adverse Scenario**	**Impact ($)**
Market Value of Assets	$ 14,903,000	$ 15,469,000	$ 566,000
Asset Smoothing Adjustment	(309,438)	(762,238)	(452,800)
Actuarial Value of Assets	$ 14,593,562	$ 14,706,762	$ 113,200
Going Concern Liabilities	(12,699,389)	(14,479,015)	(1,779,626)
Going Concern Position	$ 1,894,173	$ 227,747	$ (1,666,426)
Additional liabilities due to PfAD	(1,314,678)	(1,592,550)	(277,872)
Surplus/(Unfunded Liability)	**$ 579,495**	**$ (1,364,803)**	**$ (1,944,298)**
Total Normal Cost			
January 1, 2020 to December 31, 2020	$ 274,868	$ 335,157	$ 60,289
January 1, 2021 to December 31, 2021	$ 280,366	$ 341,860	$ 61,494
January 1, 2022 to December 31, 2022	$ 285,693	$ 348,355	$ 62,662

[1] The PfAD was also unchanged; a PfAD of 12.4% was used.

Deterioration in Asset Value

In assessing the risk related to the deterioration in asset value we have chosen an adverse scenario equal to a 20% reduction in the non-fixed income asset values, assuming no change in future return expectations.

The table below presents the sensitivity of the going concern position to a 20% reduction in non-fixed income Market Value of Assets. The Actuarial Value of Assets was then calculated using the smoothing method reflected in the going concern valuation.

($000's)	**Base Scenario**	**Adverse Scenario**	**Impact ($)**
Market Value of Assets	$ 14,903,000	$ 12,977,532	$ (1,925,468)
Asset Smoothing Adjustment	(309,438)	1,230,936	1,540,374
Actuarial Value of Assets	$ 14,593,562	$ 14,208,468	$ (385,094)
Going Concern Liabilities	(12,699,389)	(12,699,389)	-
Going Concern Position	$ 1,894,173	$ 1,509,079	$ (385,094)
Additional liabilities due to PfAD	(1,314,678)	(1,314,678)	-
Surplus/(Unfunded Liability)	**$ 579,495**	**$ 194,401**	**$ (385,094)**
Total Normal Cost			
January 1, 2020 to December 31, 2020	$ 274,868	$ 274,868	$ -
January 1, 2021 to December 31, 2021	$ 280,366	$ 280,366	$ -
January 1, 2022 to December 31, 2022	$ 285,693	$ 285,693	$ -

Mortality Sensitivity

The table below presents the sensitivity of the going concern position of the Plan to a mortality assumption with a 10% improvement to the base mortality rates. For the purposes of this analysis, we have used 90% of the rates of the base table reflected in the going concern valuation.

($000's)	Base Scenario	Adverse Scenario	Impact ($)
Market Value of Assets	$ 14,903,000	$ 14,903,000	$ -
Asset Smoothing Adjustment	(309,438)	(309,438)	-
Actuarial Value of Assets	$ 14,593,562	$ 14,593,562	$ -
Going Concern Liabilities	(12,699,389)	(12,839,859)	(140,470)
Going Concern Position	$ 1,894,173	$ 1,753,703	$ (140,470)
Additional liabilities due to PfAD	(1,314,678)	(1,322,564)	(7,886)
Surplus/(Unfunded Liability)	**$ 579,495**	**$ 431,139**	**$ (148,356)**
Total Normal Cost			
January 1, 2020 to December 31, 2020	$ 274,868	$ 276,535	$ 1,667
January 1, 2021 to December 31, 2021	$ 280,366	$ 282,066	$ 1,700
January 1, 2022 to December 31, 2022	$ 285,693	$ 287,425	$ 1,732

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, 2020 is shown in the following table. The solvency financial position of the Plan as at January 1, 2019 is shown for comparison purposes.

Solvency Financial Position

($000's)	January 1, 2020	January 1, 2019
Assets		
Solvency assets	$ 14,903,000	$ 13,758,000
Estimated wind up expenses	(73,300)	(73,300)
Total Assets	**$ 14,829,700**	**$ 13,684,700**
Solvency Liabilities		
Active and Disabled members	$ 5,182,546	$ 4,939,532
Deferred vested members	132,749	131,126
Retired members and beneficiaries	9,082,295	8,520,039
Voluntary contributions with interest	91	86
Total Liabilities	**$ 14,397,681**	**$ 13,590,783**
Solvency Position	**$ 432,019**	**$ 93,917**
Prior year credit balance	-	-
Present value of special payments	-	-
Solvency Surplus/(Deficiency)	**$ 432,019**	**$ 93,917**
Solvency ratio [1]	**1.04**	**1.01**

The solvency liabilities exclude the value of future indexation. The liability of these excluded benefits is $8,447,710,000.

[1] Solvency Assets divided by Solvency Liabilities

Statutory Solvency Financial Position

The minimum funding requirements under the Regulation are based on the reduced solvency deficiency as at the valuation date which is calculated as follows:

($000's)	January 1, 2020	January 1, 2019
The amount by which the sum of:		
85% of solvency liabilities	$ 12,238,029	$ 11,552,166
85% of solvency liability adjustment	-	-
Prior year credit balance	-	-
	$ 12,238,029	$ 11,552,166
Exceeds the sum of:		
Solvency assets net of wind-up expenses	$ 14,829,700	$ 13,684,700
Solvency asset adjustment	-	-
	$ 14,829,700	$ 13,684,700
Reduced Solvency Deficiency	**$ -**	**$ -**

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 is equal to 1.04, 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, 2020	**($000's)**	**$**	**%**
Solvency liabilities	$ 14,397,681		
Solvency liabilities (discount rate – 1%)	$ 16,640,438	$ 2,242,757	15.6%
Solvency liabilities (discount rate + 1%)	$ 12,649,164	$ (1,748,517)	(12.1%)

Pension Benefits Guarantee Fund ("PBGF")

The development of the PBGF Assessment Base is as follows:

PBGF Assessment Base ($000's)		January 1, 2020
(1) Solvency assets	$	14,903,000
(2) PBGF liabilities	$	14,397,681
(3) Solvency liabilities	$	14,397,681
(4) Ontario asset ratio: [(2) divided by (3)]		1.0000
(5) Ontario portion of fund: [(1) multiplied by the ratio in (4)]	$	14,903,000
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, 2020 is shown in the following table. The hypothetical wind up financial position of the Plan as at January 1, 2019 is shown for comparison purposes.

Hypothetical Wind Up Financial Position

($000's)	January 1, 2020	January 1, 2019
Assets		
Hypothetical wind up assets	$ 14,903,000	$ 13,758,000
Estimated wind up expenses	(73,300)	(73,300)
Total Assets	**$ 14,829,700**	**$ 13,684,700**
Hypothetical Wind Up Liabilities		
Active and Disabled members	$ 9,111,148	$ 8,398,313
Deferred vested members	228,485	206,727
Retired members and beneficiaries	13,505,667	12,425,321
Voluntary contributions with interest	91	86
Total Liabilities	**$ 22,845,391**	**$ 21,030,447**
Hypothetical Wind Up Surplus/(Deficiency)	**$ (8,015,691)**	**$ (7,345,747)**

Transfer Ratio

The transfer ratio is determined as follows:

($000's)			January 1, 2020		January 1, 2019
(1) Hypothetical wind up assets		$	14,903,000	$	13,758,000
Prior year credit balance	(A)	$	-	$	-
Total company normal cost and required special payments until next mandated valuation	(B)	$	569,344	$	542,367
(2) Asset adjustment	Lesser of (A) and (B)	$	-	$	-
(3) Hypothetical wind up liabilities		$	22,845,391	$	21,030,447
Transfer Ratio [(1)-(2)] / (3)			**0.65**		**0.65**

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, 2020		**($000's)**		**$**	**%**
Hypothetical wind up liabilities	$	22,845,391			
Hypothetical wind up liabilities (discount rate – 1%)	$	27,653,621	$	4,808,230	21.0%
Hypothetical wind up liabilities (discount rate + 1%)	$	19,228,534	$	(3,616,857)	(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, 2020 of the expected aggregate change in the hypothetical wind up liabilities between January 1, 2020 and the next calculation date, being January 1, 2023. 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)	Jan 1, 2020 to Dec 31, 2020	Jan 1, 2021 to Dec 31, 2021	Jan 1, 2022 to Dec 31, 2022
Incremental cost on a hypothetical wind up basis	$ 506,391	$ 651,504	$ 586,007

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 3 years following the valuation date; and
- The portion of the going concern normal cost that is to be paid by the members.

($000's)	Jan 1, 2020 to Dec 31, 2020	Jan 1, 2021 to Dec 31, 2021	Jan 1, 2022 to Dec 31, 2022
Normal Cost			
Current service cost	$ 250,235	$ 255,240	$ 260,090
Provision for non-investment expenses	-	-	-
Additional normal cost due to PfAD	24,633	25,126	25,603
Total Normal Cost	**$ 274,868**	**$ 280,366**	**$ 285,693**
Required member contributions	(88,771)	(90,546)	(92,266)
Company Normal Cost	**$ 186,097**	**$ 189,820**	**$ 193,427**
Total pensionable earnings	$ 1,007,000	$ 1,027,140	$ 1,046,656
Company Normal Cost			
As a % of pensionable earnings	18.5%	18.5%	18.5%

In the event an updated funding range in accordance with legislative requirements is not certified before January 1, 2023, 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, 2023. 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

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

Prior Year Credit Balance ("PYCB")

The PYCB is nil as at January 1, 2020.

Available Actuarial Surplus

As at January 1, 2020 the Available Actuarial Surplus is calculated as follows ($000's):

Going Concern Basis			
(A)	Total assets	$	14,593,562
(B)	Total liabilities		12,699,389
(C)	Additional liabilities due to PfAD		1,314,678
(D)	Prior year credit balance		-
(E)	**Available surplus: maximum (A – B – C – D); 0)**	**$**	**579,495**
Solvency Basis[1]			
(F)	**Assets in excess of a solvency ratio of 105%**	**$**	**-**
(G)	**Available Actuarial Surplus: minimum (E; F)**	**$**	**-**

As at January 1, 2020 the Available Actuarial Surplus is determined to be NIL.

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 plus PfAD, there is no excess surplus and therefore no impact the development of the company contribution requirements.

[1] The 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 fund the normal cost as a percentage of pensionable earnings.

($000's)	Jan 1, 2020 to Dec 31, 2020	Jan 1, 2021 to Dec 31, 2021	Jan 1, 2022 to Dec 31, 2022
Company normal cost	$ 186,097	$ 189,820	$ 193,427
Special payments toward amortizing unfunded liability	-	-	-
Special payments toward amortizing solvency deficiency	-	-	-
Required application of excess surplus	-	-	-
Permitted application of available actuarial surplus	-	-	-
Minimum Required Company Contribution	**$ 186,097**	**$ 189,820**	**$ 193,427**

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 fund the normal cost as a percentage of pensionable earnings.

($000's)	Jan 1, 2020 to Dec 31, 2020	Jan 1, 2021 to Dec 31, 2021	Jan 1, 2022 to Dec 31, 2022
Company normal cost	$ 186,097	$ 189,820	$ 193,427
Greater of the Unfunded liability and the hypothetical wind up deficiency	8,015,691	-	-
Required application of excess surplus	-	-	-
Maximum Deductible Company Contribution	**$ 8,201,788**	**$ 189,820**	**$ 193,427**

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, 2020. We confirm that we have prepared an actuarial valuation of the Plan as at January 1, 2020 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, 2023.

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.

Original Signed By

Linda Byron, FCIA, FSA
Senior Partner

Original Signed By

Nathan LaPierre, FCIA, FSA
Partner

Aon
20 Bay Street, Suite 2300
Toronto, ON M5J 2N9

September 2020

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 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 by CIBC Mellon Trust Company as at January 1, 2020. For comparison purposes, the composition at the previous valuation date of January 1, 2019 is also shown.

	January 1,2020	**January 1, 2019**
Cash	0.7%	0.2%
Nominal bonds	9.8%	9.3%
Credit	6.3%	5.4%
Real return bonds	19.3%	19.1%
Canadian equities	7.8%	8.3%
Global equities	15.1%	19.2%
Emerging market equities	3.4%	3.4%
Real assets	21.0%	19.4%
Return diversifying assets	13.0%	12.8%
Special opportunities	3.6%	2.9%
Total Invested Assets	**100.0%**	**100.0%**

Target Asset Mix

The target asset mix of the Plan is contained in the Plan's Statement of Investment Policies and Procedures ("SIPP") dated May 12, 2020, and is as follows:

	Target
Cash	1.0%
Nominal bonds	11.0%
Credit	9.0%
Real return bonds	14.0%
Canadian equities	9.0%
Global equities	17.0%
Emerging Market equities	2.0%
Real assets	26.0%
Return diversifying assets	8.0%
Special Opportunities	3.0%
	100.0%

Reconciliation of Changes in Market Value of Assets

The table below reconciles changes in the market value of assets between January 1, 2019 and January 1, 2020.

($000's)		Jan 1, 2019 to Dec 31, 2019
Market Value of Assets, Beginning of Plan Year	**$**	**13,758,000**
Contributions During Plan Year		
Member	$	94,000
Company normal cost		178,000
Company special payments		-
Total	**$**	**272,000**
Benefit Payments During Plan Year		
Non-retired members[1]	$	102,000
Retired members		617,000
Total	**$**	**719,000**
Transfers During Plan Year		
Into plan	$	-
Out of plan		-
Total	**$**	**-**
Fees/Expenses		
Investment fees/expenses	$	68,000
Non-investment fees/expenses		12,000
Total	**$**	**80,000**
Investment Income	**$**	**1,672,000**
Market Value of Assets, End of Plan Year	**$**	**14,903,000**

[1] Includes members who have terminated employment or died

Development of Actuarial 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, 2020 is shown below:

($000's) Year Ending	**Original Amount of (Gain) Loss**	**(Gain) Loss Admitted in Prior Years**	**(Gain) Loss Admitted in 2019**	**(Gain) Loss to be Admitted in Future Years**
December 31, 2016	$ (13,076)	$ (7,845)	$ (2,615)	$ (2,616)
December 31, 2017	$ (490,848)	$ (196,341)	(98,169)	(196,338)
December 31, 2018	$ 873,813	$ 174,763	174,762	524,288
December 31, 2019	$ (793,465)	$ -	(158,693)	(634,772)
		$ (29,423)	**$ (84,715)**	**$ (309,438)**
Market Value of Assets, January 1, 2020				**$ 14,903,000**
Actuarial Value of Assets, January 1, 2020				**$ 14,593,562**

Appendix B: Membership Data

Source of Data

This valuation was based on member data provided by the Company as of January 1, 2020. 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 1 year of credited service from January 1, 2019. This test also revealed any members who accrued less than 1 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 accrued benefits against the corresponding amounts provided for the last valuation to identify any unusual benefit accruals;
- A reconciliation of any stated benefit payments since January 1, 2019 (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, 2020 with the number of members as of January 1, 2019 and the changes due to experience in the period.

	Active	Disabled	Deferred Vested	Pensioners	Survivors and Children	Total
Members, January 1, 2019	**8,913**	**342**	**713**	**10,006**	**2,196**	**22,170**
New Entrants	162	-	-	-	-	162
Reenrollment	3	-	(3)	-	-	-
Return to Active from disability	11	(11)	-	-	-	-
To Disability	(31)	31	-	-	-	-
Terminations						
Lump sum Payments	(67)	(3)	(38)	-	-	(108)
Deferred Vested	(69)	(3)	72	-	-	-
Retirements	(376)	(19)	(45)	440	-	-
Deaths						
Lump Sum Payments	(5)	-	(2)	-	-	(7)
With Survivor	(2)	(1)	(2)	(129)	-	(134)
No further benefits	-	-	-	(94)	(132)	(226)
New Survivors	-	-	-	-	134	134
New Former Spouses[1]	-	-	-	-	2	2
Data correction	-	-	1	-	2	3
Net change	(374)	(6)	(17)	217	6	(174)
Members, January 1, 2020	**8,539**	**336**	**696**	**10,223**	**2,202**	**21,996**

[1] Due to marriage breakdown

Active Members

	January 1, 2020	January 1, 2019
Number	8,539	8,913
Average age (years)	46.6	46.3
Average credited service (years)	14.9	14.7
Average pensionable earnings for the following year	$ 118,612	$ 114,529
Accumulated contributions with interest	$ 877,178,247	$ 860,776,938
Proportion female	22.8%	22.8%

Disabled Members

	January 1, 2020	January 1, 2019
Number	336	342
Average age (years)	55.5	55.5
Average credited service (years)	24.4	24.5
Average pensionable earnings for the following year	$ 96,528	$ 93,319
Accumulated contributions with interest	$ 24,312,046	$ 24,185,165
Proportion female	40.2%	40.4%

Deferred Vested Members

	January 1, 2020	January 1, 2019
Number	688[1]	686[2]
Average age (years)	53.5	53.9
Average annual lifetime pension	$ 10,181	$ 10,051
Proportion female	31.4%	29.9%

[1] Excludes 8 in-transit commuted value transfers (commuted value reflected in liabilities)
[2] Excludes 27 in-transit commuted value transfers (commuted value reflected in liabilities)

Retired Members

		January 1, 2020		January 1, 2019
Number		10,223		10,006
Average age (years)		70.6		70.3
Average annual lifetime pension	$	52,937	$	51,604
Total annual bridge pension	$	49,808,163	$	49,978,530
Proportion female		18.5%		18.2%

Survivors (excluding children)

		January 1, 2020		January 1, 2019
Number		2,195		2,188
Average age (years)		79.1		78.8
Average annual pension	$	27,932	$	26,930
Proportion female		94.8%		95.2%

Children

		January 1, 2020		January 1, 2019
Number		7		8
Average age (years)		31.3		28.8
Total annual temporary pension	$	248,522	$	243,670
Proportion female		28.6%		25.0%

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 two or less members.

Age	< 5	5–10	10–15	15–20	20–25	25–30	>=30	Total
< 30	463	80	1					544
	$ 82,752	$ 102,683	$ *	$	$	$	$	$ 85,691
30–35	310	224	252					786
	$ 96,511	$ 114,054	$ 124,335	$	$	$	$	$ 110,431
35–40	266	164	694	152	1			1,277
	$ 107,822	$ 112,010	$ 121,830	$ 124,342	$ *	$	$	$ 117,942
40–45	160	107	450	486	47			1,250
	$ 109,281	$ 118,287	$ 119,780	$ 126,021	$ 131,260	$	$	$ 121,167
45–50	128	83	359	386	101	69	6	1,132
	$ 113,550	$ 111,210	$ 118,507	$ 121,207	$ 133,571	$ 130,611	$ 125,178	$ 120,449
50–55	114	55	319	356	107	420	170	1,541
	$ 114,465	$ 120,306	$ 119,565	$ 120,298	$ 129,609	$ 132,925	$ 126,858	$ 124,527
55–60	73	47	281	311	130	250	301	1,393
	$ 124,922	$ 117,638	$ 115,353	$ 114,527	$ 126,338	$ 129,166	$ 127,022	$ 121,773
60–65	34	21	143	184	64	114	176	736
	$ 133,084	$ 109,814	$ 115,381	$ 114,607	$ 118,677	$ 122,696	$ 113,553	$ 116,829
>=65	6	4	41	42	42	35	46	216
	$ 104,347	$ 90,480	$ 119,353	$ 114,960	$ 120,974	$ 123,854	$ 125,873	$ 119,980
Total Count	**1,554**	**785**	**2,540**	**1,917**	**492**	**888**	**699**	**8,875**
Average Earnings	**$ 100,548**	**$ 113,163**	**$ 119,828**	**$ 120,653**	**$ 127,520**	**$ 130,016**	**$ 123,499**	**$ 117,776**

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	Retired Members and Survivors
< 50	209	16
Average Annual Lifelong Pension	$ 7,764	$ 12,840
Average Annual Bridge Pension	$ 1,541	$ 2,371
50–55	124	177
Average Annual Lifelong Pension	$ 15,900	$ 57,633
Average Annual Bridge Pension	$ 3,311	$ 17,129
55–60	167	1,003
Average Annual Lifelong Pension	$ 9,822	$ 57,511
Average Annual Bridge Pension	$ 1,939	$ 17,676
60–65	134	1,826
Average Annual Lifelong Pension	$ 10,018	$ 58,779
Average Annual Bridge Pension	$ 1,974	$ 17,182
65[1]–70	54	2,458
Average Annual Lifelong Pension	$ 7,913	$ 53,290
Average Annual Bridge Pension	$ N/A	$ N/A
70–75	N/A	2,613
Average Annual Lifelong Pension	N/A	$ 48,446
Average Annual Bridge Pension	N/A	$ N/A
75–80		1,757
Average Annual Lifelong Pension	N/A	$ 43,709
Average Annual Bridge Pension	N/A	$ N/A
>=80		2,568
Average Annual Lifelong Pension	N/A	$ 36,094
Average Annual Bridge Pension	N/A	$ N/A
Total		
Count	**688**	**12,418**
Average Lifetime Pension	**$ 10,181**	**$ 48,517**
Average Bridge Pension	**$ 2,083**	**$ 17,080**

[1] 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, 2020	January 1, 2019
Economic Assumptions		
Discount rate	5.65% per year	5.90% per year
Inflation rate	1.75% per year	2.00% per year
Real discount rate	3.90% per year	3.90% per year
Increases in pensionable earnings		
Active members	Variable salary scale by year (Table A1 following) plus PPM scale (Table B following)	Variable salary scale by year (Table A following) plus PPM scale (Table B following)
Disabled members	1.75% per year	2.00% per year
Increases in YMPE	2.50% per year	2.75% per year
Increases in *Income Tax Act* maximum pension	2.50% per year	2.75% per year
Interest on member contributions	1.90% per year	Same
Conversion rate for determining commuted values	3.40% per year	3.90% per year
Real conversion rate for determining commuted values	1.65% per year	1.90% per year
Investment and non-investment expenses	Implicit in discount rate	Same
Provision for adverse deviation	12.40% of non-indexed liabilities and normal cost	8.84% of non-indexed liabilities and normal cost
Demographic Assumptions		
Mortality table	OPG-specific mortality table (updated 2019) (Table C following) with mortality improvements at Scale MI-2017	Same
Retirement		
Active participants	Variable by age (Table D following)	Same
Disabled participants	Age 65	Same
Deferred vested participants	Earliest Unreduced Age	Same
Termination rates	Variable by age (Table E following)	Same
Disability rates	None	Same

	January 1, 2020	January 1, 2019
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 female spouse	Same
Proportion of members assumed to elect commuted value		
Retirement eligible	10%	Same
Not 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—Variable Salary Scale

Variable rates by year are in accordance with the following table:

Year	Salary Increase
2019	2.0% per year
2020	1.5% per year
2021	1.5% per year
2022	1.0% per year
2023	1.5% per year
2024-2026	2.0% per year
2027 +	2.5% per year

Table A1—Variable Salary Scale

Variable rates by year are in accordance with the following table:

Year	Salary Increase
2020	2.0% per year
2021	1.9% per year
2022	1.3% per year
2023	1.0% per year
2024	1.5% per year
2025-2026	2.0% per year
2027 +	2.25% per year

Table B— Promotion, Progression and Merit ("PPM") Scale

Sample service based 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 C—OPG-Specific Mortality Table (2019)

The OPG-Specific Mortality Table (2019) has been set at 103% of the CPM 2014 (Public) table with the 103% adjustment at each age, based on an experience study conducted during 2019 using data from 2012 to 2018. Mortality rates per 1,000 lives at selected ages under this table and the prior table are summarized below. The mortality improvement scale has been applied to the OPG-Specific Mortality Table (2019) starting from year 2014.

	OPG-Specific Mortality Table (2019) before Mortality Improvement (Base Year 2014)	
Age	**Male**	**Female**
20	0.783	0.185
25	1.030	0.247
30	1.143	0.309
35	1.143	0.433
40	1.298	0.618
45	1.813	0.886
50	2.534	1.318
55	3.739	2.122
60	5.469	3.584
65	7.849	5.747
70	12.041	9.064
75	20.590	15.028
80	38.471	27.923
85	74.335	54.755
90	139.462	105.400

Table D— 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 E— 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 5.82% per year, which is based on an inflation rate of 1.75% per year, yielding a real rate of return on the pension fund assets of 4.07% per year. The 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 over 30 years 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 for the entire pension fund. Gains from rebalancing and diversification are implicit to this return.

The rate of return has been established based on the Company's investment policy in effect at the date of this report.

Development of Discount Rate	
Overall expected return	5.82%
Non-investment expenses	(0.10)%
Investment expenses (Passive)	(0.07%)
Discount Rate	**5.65%**

Inflation Rate

The Bank of Canada has set a target range from 1% to 3% for inflation with monetary policy aimed at a 2.00% target midpoint. The assumed inflation rate of 1.75% per year recognizes that inflation expectations implied in market yields on long-term Government of Canada bonds are lower than the mid-point of the Bank of Canada target range. The assumed inflation rate is used to determine the other economic assumptions that are inflation-based. Since benefits under the Plan are directly related to inflation (before retirement, through salary increases and after termination/retirement, through the indexation formula), it is the difference between the inflation rate and the other economic assumptions that is the most important variable.

Increases in Pensionable Earnings

We have assumed future salary increases will be lower in the short-term (through 2026) due to current wage pressures based on OPG's long-term outlook and will be 2.25% per year thereafter, which is the long-term assumed increase in earnings.

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 2.50% per year. This is comprised of an annual increase of 1.75% 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 Maximum Pension Limit

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 $3,092.22 in 2020. It is assumed that the maximum limit will increase at the rate of 2.50% per year. This is comprised of an annual increase of 1.75% 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 1.90% 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 expenses, no explicit assumption is required for expenses.

Conversion Rate

The conversion rate for commuted values is assumed to be 3.40% nominal (1.65% real) per year. 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 of the discount rate for the select period of 10 years and ultimate rate.

Provision for Adverse Deviation

The PfAD is established in accordance with Regulations to the *Act*. The PfAD is established based on the target asset allocation for each category of investments set out in the Plan's SIPP in effect at the date of this report.

Asset Mix Component	Investment Categorization under Regulation 76 (12)	Categorization under Regulation 11.2 (8)	Target Asset Allocation(%)
Cash and short term	4	Fixed Income ("L")	1.0%
Investment-grade[1] Fixed-income	15 & 16	Fixed Income ("L")	30.0%
Non investment-grade fixed income	15 & 16	Alternative Investment ("M")	2.0%
Canadian stocks	13	Non-Fixed Income	8.0%
Non-Canadian stocks	14	Non-Fixed Income	18.0%
Real estate	7	Alternative Investment ("M")	11.0%
Other Investments	17	Alternative Investment ("M")	30.0%
			100.0%

Fixed income ("L")	31.0%
Alternative Investment and non-investment grade fixed-income ("M")	43.0%
(a) Percentage of fixed income for PfAD ["L" + 50%* "M"]	52.50%
(b) Percentage of non-fixed income for PfAD [100%-(a)]	47.50%
(c) Asset mix component (see table below)[2]	2.75%

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%

[1] Satisfying the minimum credit rating requirements under Regulation 11(9)
[2] Based on linear-interpolation

Benchmark Discount Rate (BDR)

(d) V39056 rate at the valuation date	1.70%
(e) BDR [(d)+1.5%*(a)+5.0%*(b)+0.5%]	5.36%
(f) Best estimate discount rate[1]	5.82%
(g) Plan duration	12.36

PfAD is Determined as Follows:

Fixed component (open 4% or closed 5%)	4.00%
Asset mix component (c)	2.75%
BDR component [Max [0, (g)*((f)-(e))]]	5.65%
Total	**12.40%**

[1] Gross of non-investment expenses and passive investment management fees.

Demographic Assumptions

Mortality

During 2019, Aon undertook a study of the mortality experience of OPG's pensioners. (The previous study was undertaken in 2013). Aon updated the OPG-specific base mortality table to reflect the experience of OPG's pensioners over the period from 2012 to 2018. The updated mortality table was used in this valuation and the prior valuation.

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 2014 onward (the base year for the table). This improvement scale was developed by the CIA in 2017 and reflects updated expectations of improvement in mortality and was also used in 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 2016 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

Ten percent of retirement eligible members and 50% of members not eligible to retire are assumed to elect a commuted value in lieu of immediate or deferred monthly pension payments upon retirement/termination. This assumption is consistent with observed Plan experience.

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. The PfAD that is required by Ontario Regulation is discussed in the preceding section.

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, 2020	January 1, 2019
Economic Assumptions		
Discount rate		
—Solvency (excludes indexation)		
Benefits assumed to be settled by commuted value	2.50% per year for 10 years; 2.60% per year thereafter	2.80% per year for 10 years; 3.20% per year thereafter
Benefits assumed to be settled by annuity purchase	2.96% per year	3.23% per year
—Hypothetical wind up (includes indexation)		
Benefits assumed to be settled by commuted value	1.20% per year for 10 years; 1.20% per year thereafter	1.60% per year for 10 years; 1.70% per year thereafter
Benefits assumed to be settled by annuity purchase	-0.29% per year	0.08% per year
Demographic Assumptions		
Mortality table[1]	CPM2014 with generational improvements using Scale CPM-B (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 assumed

	January 1, 2020	January 1, 2019
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.
Future Indexing	Not included in the valuation.	Included in the valuation.

Hypothetical Wind Up Incremental Cost Assumptions

	January 1, 2020	January 1, 2019
Increases in pensionable earnings		
Active	Variable salary scale (Table A1 in Appendix C) plus PPM scale (Table B in Appendix C)	Variable salary scale (Table A in Appendix C) plus PPM scale (Table B in Appendix C)
Disabled	1.75% per year	2.00% per year
Increases in YMPE	2.50% per year	2.75% per year
Increases in *Income Tax Act* maximum pension	2.50% per year	2.75% per year
Inflation rate	1.75% per year	2.00% per year
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]	2.50% per year	2.80% per year
Benefits assumed to be settled by annuity purchase[2]	1.46% per year	2.08% per year

[1] The select nominal solvency discount rate for benefits assumed to be settled by commuted value
[2] The indexed annuity purchase discount rate plus expected inflation of 1.75%

Justification for Valuation Assumptions

The development of the discount rates is shown below.

Solvency lump-sum discount rate for 10 years	= V122542[1] + 90 bps = 1.64% + 0.90% **= 2.54% (rounded to 2.50%) per year**
Solvency lump-sum discount rate thereafter	= V122544[1]+ 0.5 x (V122544[1] – V122542[1]) + 90 bps = 1.68% + 0.5 x (1.68% – 1.64%) + 0.90% **= 2.60% per year**
Solvency annuity purchase discount rate	= V39062 + Duration Adjustment = 1.76% +1.20% **= 2.96% per year**

We have set the aforementioned assumptions based on guidance prepared by the CIA Committee on Pension Plan Financial Reporting ("PPFRC") in Educational Note – Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates between December 31, 2019 and December 30, 2020 ("CIA Guidance") released on January 30, 2020.

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, 2020.

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 11.15 years and the resulting duration adjustment to the unadjusted CANSIM series V39062 interest rate is 1.20%.

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;
- Increases in CPP (2020 amount was used) and OAS benefits (Q1 2020 amount was used);
- Increases in YMPE (2020 amount was used)
- Increases in *Income Tax Act* maximum pension limit (2020 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, 2020. 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, and not limited to, PWU Term 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.

Early Retirement (continued)

Eligibility

(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.

(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

Early Retirement (continued)

Benefit

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).

(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	$274,275 in 2019; 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 but excluding the amount of any letter of credit held in trust for the pension plan, exceeds 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 ten (10) years beginning one year from the date on which the unfunded liability was established; plus
  - Special payments toward amortizing any solvency deficiency over five years beginning no later than 12 months (24 months if the company elected temporary funding relief option 8) from the date on which the solvency deficiency was established (this period of years may be longer if the Company has elected temporary funding relief options 3, 5, and/or 7); 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.
- **Reduced solvency deficiency** the difference between the sum of 85% of the solvency liability, 85% of solvency liability adjustment and the PYCB to the sum of the solvency asset and solvency asset adjustment.
- **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. This period of years may be longer if the Company has elected temporary funding relief options 3, 5, 7, and/or 8.
- 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 for purposes of Subsections 14(2) and (3) of the Regulations of the *Act* to determine the latest effective date of the next required valuation.

- 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 ten (10) years beginning one 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 (24 months if company elected temporary funding relief option 8) 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, 2020, 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, 2020;
- 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.

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