DRIVERS OF DEFICIENCY

1.0 PURPOSE

This evidence presents the major drivers of revenue deficiency for the nuclear facilities over the 2022-2026 period as determined in Ex. I1-1-1, Table 3.

2.0 OVERVIEW

The revenue deficiency for the nuclear facilities over the 2022-2026 period is largely driven by lower nuclear production, which reflects incremental outages to complete the Darlington Refurbishment Program ("DRP") by 2026 (Ex. D2-2-1), and the planned Pickering shutdown (Ex. F2-1-1). Other major drivers of deficiency include an increase in rate base for the Darlington Refurbishment Program ("DRP") as Units 3, 1, and 4 refurbishments are completed, and higher non-DRP depreciation expense. The impact of reduced generation due to the planned Pickering shutdown is partly offset by the associated reduction in OM&A expenses.

The annual revenue deficiency impact of the production and revenue requirement drivers are detailed in Chart 1 and explained in section 3.0 below.

To determine the revenue deficiency for the nuclear facilities, OPG calculated an indicated production revenue for each year between 2022 and 2026 by multiplying each year's production forecast by the 2021 nuclear payment amount approved in EB-2016-0152. Comparing the indicated production revenue in each year to the annual revenue requirements proposed in this application shows revenue deficiencies of $633.3M in 2022, $775.6M in 2023, $657.2M in 2024, $616.6M in 2025 and $621.4M in 2026.[1]

3.0 DRIVERS OF DEFICIENCY FOR THE NUCLEAR FACILITIES

3.1 Lower Production (+76% of revenue deficiency)

Relative to the annual OEB approved nuclear production for 2021, forecast nuclear production declines by 2.2TWh in 2022, 4.6TWh in 2023, 2.0TWh in 2024, 5.2 MWh in 2025,

[1] Chart 1, Line 15

and 13.9TWh in 2026. The primary drivers of lower production are the incremental DRP outages and the planned Pickering shutdown of two units in 2024 and four units at the end of 2025, as discussed in Ex. E2-1-2. These production differences are reflected in the revenue at current rates shown in Chart 1.

3.2 Darlington Refurbishment (+23% of revenue deficiency)

The DRP impacts primarily reflect an increase in the cost of capital and depreciation expense, resulting from requested rate base in-service additions. OPG forecasts approximately $6.4B[2] in such rate base additions over the 2022-2026 period, reflecting the return to service of Units 3, 1, and 4 in 2024, 2025 and 2026, respectively.

3.3 Heavy Water Storage and Drum Handling Facility (+6% of revenue deficiency)

The Heavy Water Storage and Drum Handling Facility ("D2O Storage Project") impacts reflect an increase in the cost of capital and depreciation expense, resulting from rate base in-service additions of $494.7M requested in this application.[3] The D2O Storage Project was placed into service at various times leading up to this application and was not included in the EB-2016-0152 rate base (other than the previously approved $14.6M placed in-service in 2014). The primary purpose of the D2O Storage Project is to support heavy water management for the DRP and for the management of heavy water over the life of the Ontario nuclear fleet. Additional detail on the D2O Storage Project is provided in Ex. D2-2-10.

3.4 Capacity Refurbishment Variance Account Eligible OM&A Expenses (+2% of revenue deficiency)

The Capacity Refurbishment Variance Account ("CRVA") eligible OM&A expenses include base, project and outage OM&A costs, as appropriate, for the Fuel Channel Life Extension Project, Fuel Channel Life Extension ongoing costs, and Pickering Optimization Shutdown enabling costs. The cumulative CRVA eligible OM&A costs are forecast to be approximately $60M higher over the 2022-2026 period relative to the EB-2016-0152 approved level for

[2] Ex. B3-3-1 Table 2 col. (b) lines 2, 10, 18, 26, and 34.
[3] Ex. D2-2-10, Chart 2.

2021. Additional details on the CRVA eligible OM&A costs are provided in Ex. F2-2-1, Ex. F2-3-1 and Ex. F2-4-1.

3.5 Outage OM&A Expenses (-15% of revenue deficiency)

Outage OM&A costs are forecast to decrease by approximately $0.5B[4] in the 2022-2026 period relative to EB-2016-0152 approved level for 2021. The decrease primarily reflects the transition to a four-unit nuclear fleet with the planned shutdown of Pickering by the end of 2025.

Pickering outage OM&A costs are forecast to be approximately $0.8B lower in the 2022-2026 period relative to EB-2016-0152 approved level for 2021. In addition to the planned Pickering shutdown, the decrease is due to a reduced number of outages with the transition to a 30-month outage cycle. Pickering's outage OM&A costs for 2021 approved in EB-2016-0152 include expenditures associated with a six-unit Vacuum Building Outage, which has been subsequently rescheduled to 2022 based on 12-year regulatory test interval, consistent with Darlington, as accepted by the CNSC in March 2019.

The decreasing Pickering outage OM&A costs above are partially offset by an increase of $0.3B in forecast Darlington outage OM&A costs relative to EB-2016-0152 approved level for 2021. The increase primarily reflects a higher number of planned outage days at the station for various inspection and maintenance activities in accordance with OPG's aging and life cycle management programs, and an additional outage taken in 2025 in connection with the installation of turbine generator controls for Unit 2. These outages are in addition to and separate from the refurbishment of the Darlington units.

Additional detail on outage activities and costs is provided in Ex. F2-4-1 and Ex. F2-4-2. The nuclear production forecast is discussed in Ex. E2-1-1.

[4] Other than CRVA eligible outage OM&A included in section 3.4 above.

3.6 Impact of Changes in Nuclear Liabilities (+4% of revenue deficiency)

OPG's nuclear liabilities costs in the proposed revenue requirements for earlier years of the 2022-2026 period are forecast to increase relative to the EB-2016-0152 approved level for 2021. This primarily reflects the extension of the Pickering end-of-life ("EOL") dates for accounting purposes subsequent to EB-2016-0152, the impact of which is being recorded in the Impact Resulting from Changes to Pickering Station End-of-Life Dates (December 31, 2017) Deferral Account over the present IR term.

Based on accounting EOL date assumptions of December 31, 2020 used in EB-2016-0152, the forecast Pickering asset retirement costs ("ARC") were fully deprecated prior to 2021, resulting in no ARC depreciation in the 2021 approved revenue requirement. The extension of the accounting lives effective to December 31, 2022 for Units 1 and 4 and December 31, 2024 for Units 5-8, effective December 31, 2017, has resulted in lower depreciation in years leading up to 2021 and higher depreciation in the subsequent years.

3.7 Remaining Depreciation and Amortization Expense (+20% of revenue deficiency) and Cost of Capital (+10% of revenue deficiency)

Remaining nuclear depreciation and amortization expense is the change in depreciation and amortization expense for the nuclear facilities excluding that related to the DRP, D2O Storage Project, and nuclear liabilities costs. Remaining nuclear depreciation and amortization expense and cost of capital are forecast to be overall higher over the 2022-2026 period, reflecting an increase in the non-DRP rate base from forecast capital in-service additions. The additions are driven by the need for capital expenditures to replace obsolete and/or life-expired plant equipment at Darlington and prepare for Darlington's "second life" operations. This is partially offset by the reduction in the Pickering rate base by the end of 2025.

In the earlier years of the IR term, the higher depreciation and amortization expense and higher cost of capital relative to 2021 OEB approved levels are also due to the extension of the Pickering EOL dates for accounting purposes effective December 31, 2017. Similar to ARC, the non-ARC assets were fully depreciated prior to 2021 in the EB-2016-0152 forecast,

resulting in no such depreciation in the 2021 approved revenue requirement. As noted above, the accounting life extension thus results in lower depreciation in years leading up to 2021 and higher depreciation in subsequent years.[5] Depreciation and amortization expense is presented in Ex. F4-1-1.

3.8 Remaining/Other OM&A Expenses (-25% of revenue deficiency)

Remaining/Other OM&A expenses are changes in OM&A expenses that do not include DRP, CRVA Eligible, outage and nuclear liabilities related changes in OM&A costs. The primary driver of the decrease in remaining/other OM&A is a decrease in forecast nuclear station, Operations and Project support and corporate Support Services OM&A expenses relative to 2021 OEB approved levels. In addition to the reduction in direct costs associated with Pickering commercial operations, this reflects the challenging business plan targets that OPG has set for the support functions in order to mitigate the diseconomies of scale associated with transitioning to a smaller organization post Pickering shutdown. These targets are discussed in Ex. A2-2-1. Nuclear base OM&A costs are presented in Ex. F2-2-1 and Corporate Support Services OM&A costs are presented Ex. F3-1-1.

Additionally, pension and OPEB costs requested in the revenue requirements on an accrual basis are lower than the pension and OPEB cash amounts included in the OEB approved 2021 level. The accrual costs are projected to decline over the IR term reflecting earnings on the pension asset, at the expected rate of return, that are increasing faster than the interest cost on the benefit obligation, at the current discount rate, and lower amortizations of net actuarial losses. The accrual costs also decline toward the end of the IR term due to the planned Pickering shutdown and associated reduction in the workforce. Pension and OPEB costs are discussed in Ex. F4-3-2.

[5] The revenue requirement impact of these differences is being recorded in the Impact Resulting from Changes to Pickering Station End-of-Life Dates (December 31, 2017) Deferral Account over the present IR term.

3.9 Fuel Costs (-3% of revenue deficiency)

The forecast decrease in nuclear fuel costs (excluding those related to changes in nuclear liabilities) relative to the OEB approved level for 2021 reflects lower generation, as discussed above. Nuclear fuel costs are presented in Ex. F2-5-1 and Ex. F2-5-2.

Chart 1: Nuclear Deficiency for 2022 - 2026 Period

Line No		($M) 2022	($M) 2023	($M) 2024	($M) 2025	($M) 2026	Reference
1	**EB-2016-0152 Approved 2021 Revenue Requirement**	**3,174.1**	**3,174.1**	**3,174.1**	**3,174.1**	**3,174.1**	Note 1a
2	Revenue at EB-2016-0152 Payment Amount ($89.70/MWh)	**2,978.1**	**2,765.2**	**2,987.0**	**2,708.0**	**1,929.6**	Note 2a
3	Lower Production (line 1 - line 2)	**196.0**	**408.8**	**187.1**	**466.1**	**1,244.5**	
	Changes in Revenue Requirement:						
4	Darlington Refurbishment Program	(37.0)	(50.3)	182.6	293.6	352.6	Note 3a
5	Heavy Water Storage and Drum Handling Facility	41.1	40.0	39.4	38.5	37.6	Note 4a
6	CRVA Eligible OM&A Expenses	44.8	16.1	11.9	(7.1)	(7.5)	Note 5a
7	Outage OM&A Expenses (other than line 6)	(60.3)	37.5	(108.4)	(114.4)	(245.7)	Note 6a
8	Impact of Changes on Nuclear Liabilities	74.3	51.1	51.5	(17.2)	(22.4)	Note 7a
9	Remaining Depreciation and Amortization Expense (other than lines 4, 5 and 8)	180.0	130.2	150.9	91.6	102.9	Note 8a
10	Cost of Capital (other than lines 4, 5 and 8)	34.1	50.9	67.4	78.6	90.8	Note 9a
11	Remaining/Other OM&A Expenses (other than lines 4, 6, 7 and 8)	127.2	97.0	66.4	(236.5)	(870.3)	Note 10a
12	Fuel Costs (other than line 8)	(20.8)	(26.0)	(2.1)	(8.5)	(47.7)	Note 11a
13	Other	53.9	20.3	10.5	31.8	(13.6)	Note 12a
14	**Total Change in Revenue Requirement** (lines 4 through 12)	**437.3**	**366.7**	**470.1**	**150.4**	**(623.2)**	
15	**Total Revenue Deficiency** (line 3 + line 13)	**633.3**	**775.6**	**657.2**	**616.6**	**621.4**	

Notes

1a Ex. I1-1-1 Table 2, Line 13, col (e)

2a

REDUCED PRODUCTION	2022	2023	2024	2025	2026
Test Period Production (Ex. E2-1-1 Table 1, line 3, cols. (g) to (k)) **(TWh)**	33.2	30.8	33.3	30.2	21.5
Nuclear Base Payment Amount (EB-2016-0152 Payment Amount Order, App C, Table 1, line 3) **($/MWh)**	$89.70	$89.70	$89.70	$89.70	$89.70
Forecast Revenue ($M)	2,978.1	2,765.2	2,987.0	2,708.0	1,929.6

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Note	Driver of Revenue Requirement Change	EB-2020-0290 *(references shown are to EB- 2020- 0290 exhibits except where noted)*		EB-2016-0152 *(references shown are to EB- 2020- 0290 exhibits except where noted)*	
3a	**Darlington Refurbishment Program (DRP)**	**DRP revenue requirement impact comprises the sum of:**		**DRP revenue requirement impact comprises the sum of:**	
		OM&A Expenses	Ex. F2-1-1 Table 1, line 5, cols. (g) to (k)	OM&A Expenses	Ex. F2-7-1 Table 2 line 9 col (a) plus Ex. F2-7-1 Table 2 Note 3 (portion attributable to DRP OM&A in 2021)
		Cost of Capital	Ex. B3-1-1 Table 2, line 2, cols. (c), (f) and (i) and line 10 cols. (c) and (f)) x Ex. C1-1-1 Tables 1-5 cols. (c), line 6	Cost of Capital	EB-2016-0152 Ex. B3-1-1 Table 1 line 16, col (i) x EB-2016-0152 Ex. C1-1-1 Table 1, line 6 col. (c)
		Depreciation	Ex. F4-1-1 Table 2, line 2, cols. (g) to (k)	Depreciation	EB-2016-0152 Ex. F4-1-1 Table 2, line 2, col (i)
4a	**Heavy Water Storage and Drum Handling Facility (D2O)**	**D2O revenue requirement impact comprises the sum of:**		**D2O revenue requirement impact comprises the sum of:**	
		Cost of Capital	Ex. B3-1-1 Table 2, line 3, cols. (c), (f) and (i) and line 11 cols. (c) and (f)) x Ex. C1-1-1 Tables 1-5 cols. (c), line 6	Cost of Capital	(Ex B3-3-1 Table 1 line 3 col (a) less (B3-4-1 Table 1 line 3 col (a) plus (B3-4-1 Table 1 line 3 col (b) x 6))) x EB-2016-0152 Ex C1-1-1 Table 1 line 6 col (c)
		Depreciation	Ex. F4-1-1 Table 2, line 3, cols. (g) to (k)	Depreciation	Ex B3-4-1 Table 1 line 3, col (b)
5a	**CRVA Eligible OM&A Expenses**	**CRVA Eligible OM&A expenses revenue requirement impact comprises the sum of:**		**CRVA Eligible OM&A expenses revenue requirement impact comprises the sum of:**	
		Base OM&A Expenses	Ex. F2-2-1 Table 1, line 13, cols (g) to (k)	Base OM&A Expenses	Ex. F2-2-1 Table 8a, line 12, col (c)
		Project OM&A Expenses	Ex. F2-3-1 Table 1, lines 10 and 12, cols (g) to (k)	Project OM&A Expenses	Ex. F2-3-2 Table 1a, lines 43 and 45, col (a)
		Outage OM&A Expenses	Ex. F2-4-1 Table 1, line 10, cols (g) to (k)	Outage OM&A Expenses	Ex. F2-4-1 Table 2a, line 32, col (h)
6a	**Outage OM&A Expenses**	**Outage OM&A expenses revenue requirement impact comprises of:**		**Outage OM&A expenses revenue requirement impact comprises of:**	
		Outage OM&A	Ex. F2-4-1 Table 1 lines 3 and 6, col (g) to (k)	Outage OM&A	Ex. F2-4-1 Table 2a lines 25 and 28, col (h)
7a	**Impact of Changes on Nuclear Liabilities**	**Change in Nuclear Liabilities revenue requirement impact comprises the sum of:**		**Change in Nuclear Liabilities revenue requirement impact comprises the sum of:**	
		Depreciation and Amortization	Ex. C2-1-1 Table 1 line 1 col (g) to (k)	Depreciation and Amortization	EB-2016-0152 Ex. C2-1-1 Table 1 line 1 col (i)
		Used Fuel Storage and Disposal Variable	Ex. C2-1-1 Table 1 line 2 col (g) to (k)	Used Fuel Storage and Disposal Variable	EB-2016-0152 Ex. C2-1-1 Table 1 line 2 col (i)
		Low & Intermediate Level Waste Management Variable Expenses	Ex. C2-1-1 Table 1 line 3 col (g) to (k)	Low & Intermediate Level Waste Management Variable Expenses	EB-2016-0152 Ex. C2-1-1 Table 1 line 3 col (i)
		Cost of Capital	Ex. C2-1-1 Table 1 line 4-5, col (g) to (k)	Cost of Capital	EB-2016-0152 Ex. C2-1-1 Table 1 line 4-5 col (i)
8a	**Remaining Depreciation and Amortization Expense**	**Remaining Depreciation and Amortization Expense revenue requirement impact is calculated as:**		**Remaining Depreciation and Amortization Expense revenue requirement impact is calculated as:**	
		Total Depreciation and Amort.	Ex. I1-1-1 Table 1, line 17, cols (a) to (e)	Total Depreciation and Amort.	Ex. I1-1-1 Table 2, line 4, col (e)
		Less: DRP Depreciation	As calculated in Note 3a	Less: DRP Depreciation	As calculated in Note 3a
		Less: D20 Depreciation	As calculated in Note 4a	Less: D20 Depreciation	As calculated in Note 4a
		Less: Nuclear Liabilities Depreciation	As calculated in Note 7a	Less: Nuclear Liabilities Depreciation	As calculated in Note 7a
9a	**Cost of Capital**	**Cost of capital revenue requirement impact is calculated as:**		**Cost of capital revenue requirement impact is calculated as:**	
		Total Cost of Capital	Ex. I1-1-1 Table 1, line 14, cols. (a) to (e)	Total Cost of Capital	Ex. I1-1-1 Table 2 line 1 col (e)
		Less: DRP Cost of Capital	As calculated in Note 3a	Less: DRP Cost of Capital	As calculated in Note 3a
		Less: D2O Cost of Capital	As calculated in Note 4a	Less: D2O Cost of Capital	As calculated in Note 4a
		Less: Nuclear Liabilities Cost of Capital	As calculated in Note 7a	Less: Nuclear Liabilities Cost of Capital	As calculated in Note 7a
10a	**Remaining/Other OM&A Expenses**	**Remaining/Other OM&A Expenses revenue requirement impact is calculated as:**		**Remaining/Other OM&A Expenses revenue requirement impact is calculated as:**	
		Total OM&A Expenses	Ex. I-1-1 Table 1, line 15, cols. (a) to (e)	Total OM&A Expenses	Ex. I1-1-1 Table 2, line 2, col (e)
		Less: DRP OM&A Expenses	As calculated in Note 3a	Less: DRP OM&A Expenses	As calculated in Note 3a
		Less: CRVA Eligible OM&A Expenses	As calculated in Note 5a	Less: CRVA Eligible OM&A Expenses	As calculated in Note 5a
		Less: Outage OM&A Expenses	As calculated in Note 6a	Less: Outage OM&A Expenses	As calculated in Note 6a
		Less: Nuclear Liabilities OM&A Expenses	As calculated in Note 7a	Less: Nuclear Liabilities OM&A Expenses	As calculated in Note 7a
11a	**Fuel Costs**	**Fuel Costs revenue requirement impact is calculated as:**		**Fuel Costs revenue requirement impact is calculated as:**	
		Total Fuel Costs	Ex. I1-1-1 Table 1, line 16, cols. (a) to (e)	Total Fuel Costs	Ex. I1-1-1 Table 2, line 3, col (e)
		Less: Nuclear Liabilities Fuel Costs	As calculated in Note 7a	Less: Nuclear Liabilities Fuel Costs	As calculated in Note 7a
12a	**Other**	**Other revenue requirement impact is calculated as:**		**Other revenue requirement impact is calculated as:**	
		Total Revenue Requirement	Ex. I1-1-1 Table 1, line 26, cols. (a) to (e)	Total Revenue Requirement	Ex. I1-1-1 Table 2, line 13, col (e)
		Less: Revenue Requirement Change Factors Identified	Notes 3a to 11a	Less: Revenue Requirement Change Factors Identified	Notes 3a to 11a

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