

**OPG**  
**EB-2016-0152**  
**AMPCO Compendium**  
**Panel 5B**

values are rolled forward based on a forecast of in-service additions (including adjustments to ARC, if any), retirements/transfers, and depreciation/amortization on these assets.

Exhibits D2-1-3 Table 4, Ex. D2-2-10 Table 5, and Ex. D3-1-2 Table 4 summarize the forecast in-service additions for all nuclear operations, DRP, and support services, respectively. Exhibit D3-1-2 Table 5 separately presents forecast support services in-service additions that are included in total regulated rate base, and those that impact the asset service fees and therefore are not included in rate base.

A summary of the forecast nuclear in-service additions for 2016 to 2021 is provided below in Chart 1.

**Chart 1**

**Forecast Nuclear In-service Capital Additions\* (\$M)**

\*Amounts may not add due to rounding.

	Reference	2016	2017	2018	2019	2020	2021
Nuclear operations capital projects	Ex. D2-1-3 Table 4, line 17 & 26	497.0	389.0	315.2	239.3	300.4	215.6
Darlington Refurbishment Program	Ex. D2-2-10 Table 5, line 12 & 17	350.4	374.4	8.9	0.0	4,809.2	0.4
Support services capital projects entering rate base	Nuclear Portion of Ex. D3-1-2 Table 5, lines 7,9,13 & 15	10.5	8.1	18.0	5.0	5.0	5.0
<b>Total nuclear in-service additions, excluding ARC</b>	Ex. B3-3-1 Table 1 & 2, col. (b)	<b>857.9</b>	<b>771.5</b>	<b>342.1</b>	<b>244.3</b>	<b>5,114.7</b>	<b>221.1</b>

The depreciation/amortization forecasts for 2016 to 2021 are determined by applying the estimated service lives and depreciation/amortization policy to the opening in-service fixed/intangible asset values and planned additions during the year. These depreciation/amortization forecasts are presented in Ex. F4-1-1 Table 2. The depreciation/amortization policy is described in Ex. F4-1-1.

Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit B3  
Tab 1  
Schedule 1  
Table 1

Table 1  
Prescribed Facility Rate Base - Nuclear (\$M)  
Years Ending December 31, 2013 to 2021

Line No.	Prescribed Facility	2013 Actual			2014 Actual			2015 Actual		
		Gross Plant at Cost (a)	Less: Accumulated Depreciation and Amortization (b)	Net Plant (c)	Gross Plant at Cost (d)	Less: Accumulated Depreciation and Amortization (e)	Net Plant (f)	Gross Plant at Cost (g)	Less: Accumulated Depreciation and Amortization (h)	Net Plant (i)
1	Darlington NGS	801.9	294.8	507.1	870.5	326.9	543.6	939.1	359.6	579.5
2	Darlington Refurbishment Program	61.3	1.1	60.2	125.9	4.7	121.2	203.1	10.5	192.6
3	Pickering NGS	2,008.1	1,145.8	862.3	2,094.3	1,279.0	815.3	2,170.9	1,422.5	748.4
4	Nuclear Support Divisions <sup>1</sup>	332.1	228.1	104.1	354.2	255.6	98.5	369.3	282.6	86.8
5	Nuclear - Excluding Asset Retirement Costs	3,203.5	1,669.9	1,533.6	3,444.8	1,866.2	1,578.7	3,682.5	2,075.1	1,607.4
6	Asset Retirement Costs	2,839.2	1,369.0	1,470.2	2,839.2	1,449.7	1,389.4	2,839.2	1,530.5	1,308.7
7	Total	6,042.7	3,038.9	3,003.8	6,284.0	3,315.9	2,968.1	6,521.7	3,605.6	2,916.1

Line No.	Prescribed Facility	2016 Budget			2017 Plan			2018 Plan		
		Gross Plant at Cost (a)	Less: Accumulated Depreciation and Amortization (b)	Net Plant (c)	Gross Plant at Cost (d)	Less: Accumulated Depreciation and Amortization (e)	Net Plant (f)	Gross Plant at Cost (g)	Less: Accumulated Depreciation and Amortization (h)	Net Plant (i)
8	Darlington NGS	1,190.5	393.7	796.7	1,461.3	434.2	1,027.1	1,724.6	482.0	1,242.6
9	Darlington Refurbishment Program	440.1	21.0	419.1	893.3	41.0	852.3	1,024.0	68.8	955.2
10	Pickering NGS	2,299.1	1,578.6	720.5	2,439.5	1,761.4	678.1	2,525.6	1,972.9	552.7
11	Nuclear Support Divisions <sup>1</sup>	389.8	309.2	80.6	411.3	336.0	75.3	427.0	361.3	65.7
12	Nuclear - Excluding Asset Retirement Costs	4,319.5	2,302.6	2,016.9	5,205.4	2,572.5	2,632.9	5,701.2	2,865.0	2,836.2
13	Asset Retirement Costs	2,421.7	1,596.0	825.7	2,421.7	1,646.3	775.4	2,421.7	1,696.5	725.1
14	Total	6,741.2	3,898.5	2,842.6	7,627.1	4,218.8	3,408.3	8,122.9	4,561.6	3,561.3

Line No.	Prescribed Facility	2019 Plan			2020 Plan			2021 Plan		
		Gross Plant at Cost (a)	Less: Accumulated Depreciation and Amortization (b)	Net Plant (c)	Gross Plant at Cost (d)	Less: Accumulated Depreciation and Amortization (e)	Net Plant (f)	Gross Plant at Cost (g)	Less: Accumulated Depreciation and Amortization (h)	Net Plant (i)
15	Darlington NGS	1,964.6	536.1	1,428.5	2,220.3	595.9	1,624.3	2,438.8	661.8	1,777.0
16	Darlington Refurbishment Program	1,028.4	98.7	929.7	5,224.7	193.3	5,031.4	5,937.9	361.7	5,476.2
17	Pickering NGS	2,562.3	2,197.8	364.4	2,427.8	142.0	2,285.8	2,802.3	2,571.0	31.4
18	Nuclear Support Divisions <sup>1</sup>	439.1	393.4	55.7	450.8	403.2	47.6	462.7	422.8	40.0
19	Nuclear - Excluding Asset Retirement Costs	5,994.4	3,216.1	2,778.3	10,465.6	3,820.2	6,645.3	11,341.8	4,017.2	7,324.6
20	Asset Retirement Costs	2,421.7	1,746.8	674.9	2,421.7	1,797.1	624.6	2,421.7	1,831.6	590.1
21	Total	8,416.1	4,962.9	3,453.2	12,887.2	5,417.3	7,469.9	13,763.5	5,848.8	7,914.7

Notes:

1 Includes support divisions within nuclear accountable for providing specialized services (e.g. Nuclear Engineering, Inspection and Maintenance Services).

1 current station EOL date of December 31, 2020 and is therefore close to fully depreciated  
2 toward the end of the test period. The Pickering EOL date and the proposed treatment of  
3 future changes to that date are discussed in further detail in Ex. F4-1-1 section 3.2.  
4  
5 The actual rate base for 2013, 2014 and 2015 was within approximately one percent of  
6 budgeted (2013) and OEB-approved amounts (2014 and 2015).  
7  
8 Additional detail regarding in-service additions for the nuclear facilities including DRP and  
9 support services projects impacting the nuclear rate base amounts is provided in Exhibits D2  
10 and D3, respectively.

Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit D3  
Tab 1  
Schedule 2  
Table 5

Table 5  
Comparison of In-Service Capital Additions - Support Services (\$M)

Line No.	Business Unit	2013 Budget (a)	(c)-(a) Change (b)	2013 Actual (c)	(g)-(c) Change (d)	2014 OEB Approved (e)	(g)-(e) Change (f)	2014 Actual (g)	(k)-(g) Change (h)	2015 OEB Approved (i)	(k)-(i) Change (j)	2015 Actual (k)
1	IT - Rate Base	7.6	(4.7)	2.8	(1.1)	2.0	(0.3)	1.7	1.1	6.8	(3.9)	2.9
2	IT - Asset Service Fee	4.9	2.6	7.5	(3.0)	16.1	(11.5)	4.6	50.2	52.7	2.0	54.7
3	Real Estate - Rate Base	1.0	(0.1)	0.9	(0.8)	0.6	(0.5)	0.1	(0.1)	0.5	(0.5)	0.0
4	Real Estate - Asset Service Fee	7.0	(2.9)	4.1	5.6	4.4	5.3	9.7	(6.8)	4.5	(1.6)	2.9
5	Minor Fixed Assets	2.3	(0.9)	1.4	(1.2)	1.8	(1.6)	0.2	1.4	1.8	(0.2)	1.6
6	Total Support Services	22.8	(6.1)	16.7	(0.5)	24.9	(8.6)	16.3	45.8	66.2	(4.1)	62.1

Line No.	Business Unit	2015 Actual (a)	(c)-(a) Change (b)	2016 Budget (c)	(e)-(c) Change (d)	2017 Plan (e)	(g)-(e) Change (f)	2018 Plan (g)	(i)-(g) Change (h)	2019 Plan (i)	(k)-(i) Change (j)	2020 Plan (k)
7	IT - Rate Base	2.9	6.0	8.9	(6.4)	2.5	11.3	13.8	(13.8)	0.0	0.0	0.0
8	IT - Asset Service Fee	54.7	(13.7)	41.0	(33.9)	7.1	4.6	11.7	5.3	17.0	0.0	17.0
9	Real Estate - Rate Base	0.0	5.1	5.1	0.5	5.6	(0.6)	5.0	0.0	5.0	0.0	5.0
10	Real Estate - Asset Service Fee	2.9	4.3	7.2	(5.2)	2.0	1.0	3.0	0.0	3.0	0.0	3.0
11	Minor Fixed Assets	1.6	(0.4)	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2
12	Total Support Services	62.1	1.3	63.4	(45.0)	18.4	16.3	34.7	(8.5)	26.2	0.0	26.2

Line No.	Business Unit	2020 Plan (a)	(c)-(a) Change (b)	2021 Plan (c)
13	IT - Rate Base	0.0	0.0	0.0
14	IT - Asset Service Fee	17.0	0.0	17.0
15	Real Estate - Rate Base	5.0	0.0	5.0
16	Real Estate - Asset Service Fee	3.0	0.0	3.0
17	Minor Fixed Assets	1.2	0.0	1.2
18	Total Support Services	26.2	0.0	26.2

Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit F3  
Tab 1  
Schedule 1  
Table 1

Table 1  
Corporate Support & Administrative Groups - OPG (\$M)

Line No.	Corporate Costs	2013 Actual (a)	2014 Actual (b)	2015 Actual (c)	2016 Budget (d)	2017 Plan (e)	2018 Plan (f)	2019 Plan (g)	2020 Plan (h)	2021 Plan (i)
1	Business and Administrative Service <sup>1</sup>	295.6	281.7	285.5	292.5	292.4	284.4	286.6	287.1	289.6
2	Finance	63.9	59.0	51.4	57.5	58.1	56.0	55.7	54.9	55.8
3	People and Culture	115.1	118.1	115.9	111.2	115.0	113.7	116.3	117.3	119.3
4	Commercial Operations and Environment	37.4	43.0	37.2	44.0	42.8	40.9	41.9	41.3	44.8
5	Corporate Centre	50.8	47.4	61.9	68.2	65.4	65.5	65.7	66.9	67.8
6	Total	562.8	549.2	551.9	573.4	573.7	560.5	566.2	567.5	577.3

Notes:

- 1 Business and Administrative Service costs exclude amounts captured in the Asset Service Fee.

Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit F3  
Tab 1  
Schedule 1  
Table 3

Table 3

Allocation of Corporate Support & Administrative Costs - Nuclear (\$M)

Line No.	Corporate Group	2013 Actual (a)	2014 Actual (b)	2015 Actual (c)	2016 Budget (d)	2017 Plan (e)	2018 Plan (f)	2019 Plan (g)	2020 Plan (h)	2021 Plan (i)
1	Business and Administrative Service	246.6	227.2	231.0	245.0	246.1	239.1	241.0	242.3	246.1
2	Finance	46.3	44.4	35.6	40.2	41.5	39.4	39.0	38.8	39.9
3	People and Culture	91.6	98.2	95.8	92.4	96.2	95.3	97.8	98.5	100.5
4	Commercial Operations and Environment	14.7	19.5	16.8	20.4	20.2	18.9	19.9	19.6	21.8
5	Corporate Centre	29.2	26.9	39.6	44.3	44.9	44.5	45.0	45.8	45.8
6	Total	428.4	416.2	418.8	442.3	448.9	437.2	442.7	445.0	454.1

Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit F3  
Tab 1  
Schedule 1  
Table 7

Table 7  
Allocation of Business and Administrative Service Costs - Nuclear (\$M)

Line No.	Costs	2013 Actual (a)	2014 Actual (b)	2015 Actual (c)	2016 Budget (d)	2017 Plan (e)	2018 Plan (f)	2019 Plan (g)	2020 Plan (h)	2021 Plan (i)
1	Infrastructure Management	27.3	26.7	25.8	22.9	22.2	21.4	21.4	20.6	20.0
2	Application Maintenance	12.2	11.9	11.5	10.2	9.9	9.5	9.5	9.2	8.9
3	Data Centre Services	12.4	12.1	11.7	10.4	10.0	9.7	9.7	9.3	9.0
4	Other Services	4.0	3.9	3.8	3.3	3.2	3.1	3.1	3.0	2.9
5	NHSS Base Costs	55.9	54.6	52.7	46.8	45.3	43.7	43.7	42.1	40.8
6	IT Support Costs	35.9	36.6	37.3	41.8	43.7	42.6	42.3	42.7	43.2
7	IT Costs (line 6 + line 7)	91.8	91.2	90.0	88.6	89.0	86.3	86.0	84.8	84.0
8	Supply Chain	48.6	42.5	41.1	47.6	47.3	46.7	47.8	49.2	50.3
9	Real Estate	88.4	83.3	82.5	89.9	94.5	92.8	95.0	95.5	98.7
10	OM&A Project Costs	17.8	10.2	17.4	18.9	15.3	13.3	12.2	12.8	13.1
11	Total	246.6	227.2	231.0	245.0	246.1	239.1	241.0	242.3	246.1



1                   **OM&A PURCHASED SERVICES – SUPPORT SERVICES**

2  
3       **1.0     PURPOSE**

4       This evidence presents the purchases of OM&A services and products by Support Services  
5       that meet the threshold in the OEB filing guidelines of 1 per cent of the total OM&A expense  
6       before taxes.

7  
8       **2.0     OVERVIEW**

9       An overview of OPG's procurement process is presented in Ex. F3-3-1. For Support  
10       Services, the threshold of 1 per cent of total OM&A expense before taxes is approximately  
11       \$6M in 2013, 2014, and 2015.

12  
13       Information on vendor contracts for OM&A purchased services by the Support Services for  
14       2013, 2014 and 2015 is presented in Chart 1. The information presented represents the total  
15       value of these contracts for Support Services groups, and not an allocation to the regulated  
16       facilities.

1  
2  
3

**Chart 1**

**Purchased Services – Support Services OM&A Contracts**

Vendor Name	Description/ Nature of Activities	Procurement Process	
		Competitive	Single Source
New Horizons System Solution	Provide OPG with information technology services as specified in Ex. F3-1-1.	✓  Until October 1, 2009	✓  Leveraged renegotiation after October 1, 2009
ARI Financial Services Inc	Transport and work equipment leasing	✓	

- 4 Total 2013 spend = \$104M  
 5 Total 2014 spend = \$96M  
 6 Total 2015 spend = \$97M

**AMPCO Interrogatory #114**

**Issue Number: 6.1**

**Issue:** Is the test period Operations, Maintenance and Administration budget for the nuclear facilities (excluding that for the Darlington Refurbishment Program) appropriate?

**Interrogatory**

**Reference:**

Ref: F2-6-1

- a) Please provide the forecast and actual purchases by vendor for the years 2013 to 2015.
- b) Please provide the OM&A Purchased Services Nuclear Operations forecast for 2016 to 2021.

**Response**

- a) OPG did not forecast purchases of OM&A services for nuclear operations by vendor for the period 2013-2015. Four vendors were identified in Chart 1 in Ex. F2-6-1, pp. 2-3 as having provided services in excess of a \$17M threshold over the period 2013-2015. These vendors are AMEC-NSS, Black & McDonald Ltd., ES Fox Ltd. and Candu Owners Group. Aggregated amounts were provided in Ex. F2-6-1. Chart 1 below sets out the actual purchases over the period 2013-2015 by vendor. For confidentiality reasons, the vendors have been identified as A, B, C and D. Please note that the correct 2014 total amount is \$129.4M as shown in Chart 1 below; the total amount for 2014 shown in Ex. F2-6-1, page 1, line 24 is incorrect.

**Chart 1 (\$M)**

Line No.	Vendor	2013	2014	2015
	(a)	(b)	(c)	(d)
1	A	45.0	46.2	65.2
2	B	44.4	42.8	75.7
3	C	23.4	23.5	25.9
4	D	23.4	16.8	n/a
5	Total	136.2	129.4	166.7

- b) Chart 2 below shows the Nuclear Operations OM&A Purchased Services forecast for each year from 2016-2021.

1

2

3

4

**Chart 2 (\$M)**

Line No.		<b>2016 Budget</b>	<b>2017 Plan</b>	<b>2018 Plan</b>	<b>2019 Plan</b>	<b>2020 Plan</b>	<b>2021 Plan</b>
		(a)	(b)	(c)	(d)	(e)	(f)
1	<b>Total OM&amp;A Purchased Service</b>	365.3	446.8	466.0	486.8	515.6	498.0

5

1 The reference amounts used to determine entries into the account are as follows:

- 2 • From January 1, 2015 until the effective date of the payment amounts order in this  
3 proceeding, for both the nuclear and regulated hydroelectric facilities: the average of  
4 the monthly income tax provision for 2014 and 2015 underpinning the revenue  
5 requirement that was approved by the OEB in EB-2013-0321. As per the EB-2014-  
6 0370 payment amounts order, the monthly reference amount is \$4.83M (Appendix B,  
7 page 7);
- 8 • As of the effective date of the payment amounts order in this proceeding, for the  
9 regulated hydroelectric facilities: OPG proposes the average of the monthly income  
10 tax provision for 2014-2015 underpinning the hydroelectric revenue requirement  
11 approved by the OEB in EB-2013-0321;
- 12 • As of the effective date of the payment amounts order in this proceeding, for nuclear  
13 facilities: OPG proposes on a monthly basis, 1/12 of the annual income tax provision  
14 underpinning the corresponding annual nuclear revenue requirements approved by  
15 the OEB in this proceeding.

16  
17 The derivation of the credit addition to the nuclear portion of this account of \$4.2M in 2015 is  
18 shown in Ex. H1-1-1 Table 6.<sup>13</sup> That addition to the nuclear portion of this account, which was  
19 recorded following the resolution during 2015 of the 2011 taxation year audit to reflect the  
20 related increase in the Scientific Research and Experimental Development ("SR&ED")  
21 Investment Tax Credits ("ITCs") recognition percentage from 75 per cent to 100 per cent for  
22 2011. The addition is the same in nature and calculation as the equivalent SR&ED ITCs  
23 impacts previously recorded in the account in relation to resolution of prior year tax audits.  
24 SR&ED ITCs are discussed further in Ex. F4-2-1.

## 25 26 **5.6 Capacity Refurbishment Variance Account**

27 The Capacity Refurbishment Variance Account was originally approved in EB-2007-0905  
28 and has been approved in all subsequent OPG applications. This account was established  
29 pursuant to section 6(2)4 of O. Reg. 53/05 to record variances between the actual capital  
30 and non-capital costs and firm financial commitments incurred to increase the output of,

---

<sup>13</sup> The credit addition to the regulated hydroelectric portion of the account in 2015 was less than \$0.05M.

1 refurbish or add operating capacity to a prescribed generation facility referred to in section 2  
2 of O. Reg. 53/05 and those forecast costs and firm financial commitments underpinning the  
3 revenue requirement that was approved by the OEB. In 2015, O. Reg. 53/05 was amended  
4 to affirm that the scope of this account includes the capital and non-capital costs and firm  
5 financial commitments incurred in respect of the Darlington Refurbishment Program ("DRP").  
6 As required by O. Reg. 53/05, Section 6(2)4, this account will continue to include  
7 assessment costs and pre-engineering costs and commitments.<sup>14</sup>

8  
9 Entries into the account will record variances as follows:

- 10 • Until the effective date of the payment amounts order in this proceeding, for both the  
11 nuclear and regulated hydroelectric facilities: the variance between actual capital and  
12 non-capital costs and firm financial commitments and those capital and non-capital  
13 forecast costs and firm financial commitments underpinning the revenue requirement  
14 approved by the OEB in EB-2013-0321<sup>15</sup>;
- 15 • As of the effective date of the payment amounts order in this proceeding, for the  
16 regulated hydroelectric facilities: OPG proposes the variance between actual capital  
17 and non-capital costs and firm financial commitments and the 2014-2015 average  
18 forecast capital and non-capital costs and firm financial commitments underpinning  
19 the hydroelectric revenue requirement approved by the OEB in EB-2013-0321;
- 20 • As of the effective date of the payment amounts order in this proceeding, for nuclear  
21 facilities: OPG proposes the variance between actual capital and non-capital costs  
22 and firm financial commitments and those forecast capital and non-capital costs and  
23 firm financial commitments underpinning the annual nuclear revenue requirements  
24 approved by the OEB in this proceeding.

25  
26 The derivation of the debit entry into the regulated hydroelectric portion of this account for  
27 2015 of \$1.2M is shown in Ex. H1-1-1 Table 7. That relatively small entry was due to

---

<sup>14</sup> The methodology used to record entries into this account is the same as previously approved by the OEB.

<sup>15</sup> OPG shall ensure that amounts recorded in the account do not include those that OPG indicated it is not seeking to recover from, or refund to, ratepayers as part of the differences between the revenue requirement in its pre-filed evidence dated September 27, 2013 and the information based on OPG's 2014-2016 Business Plan. These amounts are outlined in OPG's Impact Statement dated December 6, 2013, as found at EB-2013-0321, Ex. N1-1-1 Chart 1.

variances in respect of several projects across the regulated hydroelectric fleet. The December 31, 2015 regulated hydroelectric balance in the account is a debit of \$83.2M, as shown in Ex. H1-1-1 Table 1. The regulated hydroelectric balance relates largely to the Niagara Tunnel Project.

The derivation of the credit entry into the nuclear portion of this account for 2015 of \$68.9M is shown in Ex. H1-1-1 Table 11. That entry was largely due to a ratepayer credit recorded on account of the tax deduction for DRP-related SR&ED expenditures and non-capital credit additions (i.e., OM&A expenses) to the account associated with the DRP, the Fuel Channel Life Cycle Management Project and Pickering Continued Operations, partly offset by the debit non-capital additions for the Fuel Channel Life Extension Project. The DRP and associated capital expenditures and in-service amounts are discussed in Ex. D2-2-1 and accompanying exhibits. The DRP OM&A expenses are discussed in Ex. F2-7-1. Further information on the Pickering Extended Operations initiative and related fuel channel work can be found in Ex. F2-2-3.

#### **5.7 Pension and OPEB Cost Variance Account**

The Pension and OPEB Cost Variance Account was originally approved in EB-2011-0090 and was continued in subsequent proceedings. This account records the difference between:

- (1) the pension and OPEB costs, plus related income tax PILs, reflected in the current revenue requirement approved by the OEB (i.e., the reference amount); and,
- (2) OPG's actual pension and OPEB costs, and associated tax impacts, for the prescribed generation facilities.

Actual pension and OPEB costs used in the calculation of the difference are calculated on an accrual basis using the same accounting standards as those used to derive the reference amount.

The balance in this account as at December 31, 2012, including interest accrued to that date, was split into the Historic Recovery and Future Recovery components, as ordered by the OEB in EB-2012-0002. In order to facilitate the presentation of entries into the account, OPG

December 31, 2016 pursuant to the EB-2014-0370 payment amounts order (Ex. H1-2-1 Table 2, line 14). As such, OPG proposes to terminate this account as of the effective date of the payment amounts order in this proceeding and to transfer any remaining balance (expected to be nil) to the Nuclear Deferral and Variance Over/Under Recovery Variance Account.

#### **5.17 Nuclear Deferral and Variance Over/Under Recovery Variance Account**

The Nuclear Deferral and Variance Over/Under Recovery Variance Account was originally approved in EB-2009-0174 and has been approved in all subsequent OPG applications. This account records the difference between the amounts approved for recovery in the nuclear deferral and variance accounts and the actual amounts recovered based on the actual nuclear production and approved riders. Pursuant to OEB's orders, the account also captures the transfer of the nuclear portions of the balances remaining in other accounts as they expire from time to time.<sup>27</sup>

The derivation of the \$43.5M debit addition to the account for 2015 is shown in Ex. H1-1-1 Table 13. There were no transfers from expiring accounts in 2015.

#### **5.18 Impact Resulting from Changes in Station End-of-Life Dates (December 31, 2015) Deferral Account**

The Impact Resulting from Changes in Station End-of-Life Dates (December 31, 2015) Deferral Account was approved in EB-2015-0374. Effective January 1, 2016, this account records the revenue requirement impact arising from changes to nuclear liabilities and depreciation and amortization expense resulting from changes to station end-of-life ("EOL") dates for Bruce, Pickering and Darlington nuclear generating stations that are effective December 31, 2015.

Pursuant to the EB-20105-0374 decision and order, the account entries will continue until the effective date of the payment amounts order for this proceeding incorporating the extended nuclear station EOL dates in nuclear payment amounts.

---

<sup>27</sup> The methodology used to record entries into this account is the same as previously approved by the OEB.



1  
2 No interest is recorded on the balance of this account as per the EB-2015-0374 decision and  
3 order nor is proposed to be recorded in the future.  
4

5 Further details relating to the impact (a ratepayer credit) being recorded in this account  
6 effective January 1, 2016 as well as the 2017-2021 projected revenue requirement impact of  
7 the December 31, 2015 changes to the nuclear liabilities reflecting the above changes to  
8 station EOL dates are provided in Ex. C2-1-1.  
9

## 10 **6.0 PROPOSED NEW ACCOUNTS**

11 OPG proposes the following new deferral and variance accounts. Each account satisfies the  
12 OEB's deferral and variance account eligibility criteria of causation, materiality and prudence.  
13

### 14 **6.1 Rate Smoothing Deferral Account**

15 The Rate Smoothing Deferral Account is established in accordance with section 5.5 of O.  
16 Reg. 53/05. Effective January 1, 2017, this account will record the difference between: (i) the  
17 total annual nuclear revenue requirement approved by the OEB; and, (ii) the portion of that  
18 revenue requirement in (i) that is used in connection with setting the nuclear payment  
19 amounts in each year ("the annual deferral amount").  
20

21 According to O. Reg. 53/05, the annual deferral amount will be recorded in this account from  
22 January 1, 2017 until the DRP ends (the "deferral period"). The regulation requires the OEB  
23 to determine the revenue requirement for OPG's nuclear facilities on a five-year basis for the  
24 first ten years of the deferral period and, thereafter, on such periodic basis as the OEB  
25 determines. The regulation also requires the OEB to determine the annual deferral amount  
26 with a view to making more stable the year-over-year changes in the nuclear payment  
27 amount.  
28

29 OPG proposes to set the annual deferral amount to achieve annual smoothed payment  
30 amount increases of 11 per cent over the January 1, 2017 to December 31, 2021 period  
31 when combined with the OEB-approved nuclear production forecast in this Application. OPG

will record 1/12<sup>th</sup> of the annual deferral amount each month. OPG's rate smoothing proposal is described at Ex. A1-3-3 and the proposed annual deferral amounts are shown in Ex. A1-3-3, Chart 4.

The regulation stipulates that the OEB shall ensure that OPG recovers the balance recorded in the deferral account and shall authorize recovery of the account balance on a straight line basis over a period not to exceed ten years commencing at the end of the deferral period. The regulation also stipulates that the deferral account shall record interest on the balance of the account at a long-term debt rate reflecting OPG's cost of long-term borrowing approved by the OEB from time to time, compounded annually. OPG will record interest based on the monthly opening balance in the account.

## **6.2 Mid-term Nuclear Production Variance Account**

As set out in detail in Ex. A1-3-3, OPG seeks approval to file an application in the first half of 2019 to review and update the nuclear production forecast and corresponding fuel costs for the July 1, 2019 to December 31, 2021 period. To effect this proposal, OPG proposes establishing the Mid-term Nuclear Production Variance Account to record the impact of the production variance from July 1, 2019 to December 2021. The production variance will be the difference between: (i) the nuclear production forecast approved in this Application and, (ii) the nuclear production forecast approved in the mid-term review application. To determine entries into the account, the monthly production variance will be multiplied by the approved smoothed nuclear payment amount. The resulting amount would then be reduced by an amount determined as the monthly production variance multiplied by the average fuel cost in the approved revenue requirement for the applicable year.

OPG's 2017-2021 nuclear production forecast is presented in Ex. E2-1-1. OPG's rate smoothing and mid-term production review proposals are described at Ex. A1-3-3. As described in Ex. A1-3-3, the purpose of this account is to mitigate the significant production risk associated with setting nuclear payment amounts over the five-year term of this Application. That production risk is expected to increase during the second half of the five-year term in light of the DRP and work to enable Pickering Extended Operations.

1  
2 This account would protect both customers and OPG symmetrically, depending on whether  
3 OPG's nuclear production forecast approved at the mid-term production review application is  
4 higher or lower than the nuclear production forecast approved in this Application. If  
5 production is higher than currently forecast, the higher production would result in a credit  
6 balance in the account, to be refunded to customers. If production is lower than forecast,  
7 OPG may not recover its revenue requirement and a debit balance in the account would be  
8 required. Mitigating this risk benefits both customers and the company.

9  
10 Since the inception of regulation by the OEB, there have been a number of variances  
11 between OEB-approved production forecasts and actual production. It has proven difficult to  
12 forecast nuclear production in the past where OPG's Pickering and Darlington facilities were  
13 operating in a comparatively steady state when compared to the operating circumstances  
14 that will be facing these facilities during the upcoming application period. Even with the mid-  
15 term production review, the proposed ratemaking methodology will result in a substantial  
16 increase in production forecast risk compared to previous applications.<sup>28</sup>

17  
18 This account is proposed to take effect on July 1, 2019.

### 19 20 **6.3 Nuclear ROE Variance Account**

21 OPG proposes establishing the Nuclear ROE Variance Account to record the nuclear  
22 revenue requirement impact of the difference between the return on equity ("ROE") approved  
23 by the OEB for the nuclear business in 2018 to 2021 in this proceeding as part of the  
24 revenue requirements for those years and the actual annually updated ROE specified by the  
25 OEB.

26  
27 OPG's Application incorporates an ROE of 9.19 per cent for each year of the test period for  
28 the nuclear business, as this is the latest rate published by the OEB. The OEB's cost of  
29 capital parameters, including prescribed ROE, are updated on an annual basis. For the

---

<sup>28</sup> In previous applications, OPG's payment amounts have been based on forecast production of two years or less.

period January 1, 2018 to December 31, 2021, entries into this account would record the annual nuclear revenue requirement impact of the difference between the OEB's annually updated prescribed ROE and the annual ROE incorporated into the 2018 to 2021 annual revenue requirements approved by the OEB. .

To facilitate calculating the annual nuclear revenue requirement impact of the difference, OPG proposes to multiply the difference in ROE in each of 2018 to 2021 by the forecast nuclear rate base financed by capital structure for each year in 2018 to 2021 that is approved by the OEB in this Application.

OPG's ROE proposal is described at Ex. C1-1-1. This account is necessary to reduce the significant risk associated with relying on long-term forecasts of ROE, which protects both customers and OPG symmetrically. This type of account has been approved by the OEB in previous proceedings (e.g. in Hydro One's EB-2013-0416/EB-2014-0247 application).

This account is proposed to take effect on January 1, 2018.

#### **6.4 Hydroelectric Capital Structure Variance Account**

OPG proposes establishing the Hydroelectric Capital Structure Variance Account to record the hydroelectric revenue requirement impact of the difference between the capital structure approved by the OEB in this proceeding and the capital structure approved by the OEB in EB-2013-0321 that is underpinning the hydroelectric payment amounts in this proceeding for 2017 to 2021.

OPG's Application for hydroelectric to apply the price-cap formula (described in Ex. A1-3-2) to 2014-2015 hydroelectric payment amounts implicitly incorporates the capital structure of 45 per cent equity and 55 per cent debt that was approved by the OEB in EB-2013-0321 that would underpin the proposed hydroelectric payment amounts in the test period. However, in this Application OPG is proposing a capital structure of 49 per cent equity and 51 per cent debt, as described in Ex. C1-1-1. As of the effective date of the payment amounts order in this proceeding, entries into this account would record the annual hydroelectric revenue

Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit H1  
Tab 1  
Schedule 1  
Table 1

Table 1  
Deferral and Variance Accounts  
Closing Account Balances - 2014 to 2015 (\$M)

Line No.	Account	Audited Year End Balance 2014 <sup>1</sup>	Audited Year End Balance 2015 <sup>3</sup>
		(a)	(b)
	<b>Regulated Hydroelectric:</b>		
1	Hydroelectric Water Conditions Variance	(8.5)	(23.0)
2	Ancillary Services Net Revenue Variance - Hydroelectric	(16.5)	(24.2)
3	Hydroelectric Incentive Mechanism Variance	(7.5)	(1.7)
4	Hydroelectric Surplus Baseload Generation Variance	67.1	114.4
5	Income and Other Taxes Variance - Hydroelectric	(0.2)	(0.1)
6	Capacity Refurbishment Variance - Hydroelectric	232.6	83.2
7	Pension and OPEB Cost Variance - Hydroelectric - Future	10.5	9.5
8	Pension and OPEB Cost Variance - Hydroelectric - Post 2012 Additions	35.5	32.5
9	Pension & OPEB Cash Versus Accrual Differential Deferral - Hydroelectric <sup>2</sup>	4.6	44.2
10	Pension & OPEB Cash Payment Variance - Hydroelectric <sup>2</sup>	0.2	4.3
11	Hydroelectric Deferral and Variance Over/Under Recovery Variance	4.5	16.5
12	<b>Total</b>	322.4	255.5
	<b>Nuclear:</b>		
13	Nuclear Liability Deferral	285.7	190.5
14	Nuclear Development Variance	58.8	3.3
15	Ancillary Services Net Revenue Variance - Nuclear	1.7	2.1
16	Capacity Refurbishment Variance - Nuclear - Capital Portion	13.2	(32.5)
17	Capacity Refurbishment Variance - Nuclear - Non-Capital Portion	1.3	(30.8)
18	Bruce Lease Net Revenues Variance - Derivative Sub-Account	153.8	(4.5)
19	Bruce Lease Net Revenues Variance - Non-Derivative Sub-Account - EB-2012-0002	37.3	18.7
20	Bruce Lease Net Revenues Variance - Non-Derivative Sub-Account - Post 2012 Additions	123.8	103.1
21	Income and Other Taxes Variance - Nuclear	(13.2)	(13.1)
22	Pension and OPEB Cost Variance - Nuclear - Future	214.7	193.2
23	Pension and OPEB Cost Variance - Nuclear - Post 2012 Additions	678.6	622.0
24	Pension & OPEB Cash Versus Accrual Differential Deferral - Nuclear <sup>2</sup>	31.3	271.1
25	Pension & OPEB Cash Payment Variance - Nuclear <sup>2</sup>	6.2	23.4
26	Pickering Life Extension Depreciation Variance	7.8	5.2
27	Nuclear Deferral and Variance Over/Under Recovery Variance	56.4	81.7
28	<b>Total</b>	1,657.5	1,433.4
29	<b>Grand Total (line 12 + line 28)</b>	1,979.9	1,688.9

Notes:

- From EB-2014-0370, Payment Amounts Order, App. A, Table 1, col. (a) and Table 2, col. (a), unless otherwise noted.
- 2014 balance from EB-2014-0370, Ex. H1-1-2, Table 1, col. (d).
- From Ex. H1-1-1, Table 1a, col. (f).

Numbers may not add due to rounding

Filed: 2016-05-27  
EB-2016-0152  
Exhibit H1  
Tab 1  
Schedule 1  
Table 1a

Table 1a  
Deferral and Variance Accounts  
Continuity of Account Balances - Actual 2014 to 2015 (\$M)

Line No.	Account	Audited Year End Balance 2014 <sup>1</sup>	Actual 2015				(b)+(c)+(d)+(e) Audited Year End Balance 2015
			Transactions	Amortization <sup>2</sup>	Interest <sup>4</sup>	Transfers	
		(a)	(b)	(c)	(d)	(e)	(f)
	<b>Hydroelectric:</b>						
1	Hydroelectric Water Conditions Variance	(8.5)	(17.1)	2.8	(0.2)	0.0	(23.0)
2	Ancillary Services Net Revenue Variance - Hydroelectric	(16.5)	(12.9)	5.5	(0.3)	0.0	(24.2)
3	Hydroelectric Incentive Mechanism Variance	(7.5)	0.0	5.8	(0.1)	0.0	(1.7)
4	Hydroelectric Surplus Baseload Generation Variance	67.1	81.5	(35.2)	1.0	0.0	114.4
5	Income and Other Taxes Variance - Hydroelectric	(0.2)	(0.0)	0.1	(0.0)	0.0	(0.1)
6	Capacity Refurbishment Variance - Hydroelectric	232.8	1.2	(152.7)	2.1	0.0	83.2
7	Pension and OPEB Cost Variance - Hydroelectric - Future	10.5	0.0	(1.1)	0.0	0.0	9.5
8	Pension and OPEB Cost Variance - Hydroelectric - Post 2012 Additions	35.5	0.0	(3.0)	0.0	0.0	32.5
9	Pension & OPEB Cash Versus Accrual Differential Deferral - Hydroelectric <sup>2</sup>	4.6	39.5	0.0	0.0	0.0	44.2
10	Pension & OPEB Cash Payment Variance - Hydroelectric <sup>2</sup>	0.2	4.1	0.0	0.0	0.0	4.3
11	Hydroelectric Deferral and Variance Over/Under Recovery Variance	4.5	13.3	(1.5)	0.1	0.0	16.5
12	<b>Total</b>	<b>322.4</b>	<b>109.7</b>	<b>(179.2)</b>	<b>2.6</b>	<b>0.0</b>	<b>255.5</b>
	<b>Nuclear:</b>						
13	Nuclear Liability Deferral	265.7	0.0	(95.2)	0.0	0.0	190.5
14	Nuclear Development Variance	58.8	1.3	(57.3)	0.4	0.0	3.3
15	Ancillary Services Net Revenue Variance - Nuclear	1.7	0.9	(0.8)	0.0	0.0	2.1
16	Capacity Refurbishment Variance - Nuclear - Capital Portion	13.2	(37.5)	(8.2)	(0.1)	0.0	(32.5)
17	Capacity Refurbishment Variance - Nuclear - Non-Capital Portion	1.3	(31.5)	(0.4)	(0.1)	0.0	(30.8)
18	Bruce Lease Net Revenues Variance - Derivative Sub-Account	153.8	(168.7)	10.4	0.0	0.0	(4.5)
19	Bruce Lease Net Revenues Variance - Non-Derivative Sub-Account - EB-2012-0002	37.3	0.0	(18.7)	0.0	0.0	18.7
20	Bruce Lease Net Revenues Variance - Non-Derivative Sub-Account - Post 2012 Additions	123.8	20.8	(41.3)	0.0	0.0	103.1
21	Income and Other Taxes Variance - Nuclear	(13.2)	(4.2)	4.4	(0.1)	0.0	(13.1)
22	Pension and OPEB Cost Variance - Nuclear - Future	214.7	0.0	(21.5)	0.0	0.0	193.2
23	Pension and OPEB Cost Variance - Nuclear - Post 2012 Additions	878.6	0.0	(56.5)	0.0	0.0	822.0
24	Pension & OPEB Cash Versus Accrual Differential Deferral - Nuclear <sup>2</sup>	31.3	239.8	0.0	0.0	0.0	271.1
25	Pension & OPEB Cash Payment Variance - Nuclear <sup>2</sup>	6.2	17.0	0.0	0.2	0.0	23.4
26	Pickering Life Extension Depreciation Variance	7.8	0.0	(2.6)	0.0	0.0	5.2
27	Nuclear Deferral and Variance Over/Under Recovery Variance	56.4	43.5	(18.8)	0.8	0.0	81.7
28	<b>Total</b>	<b>1,657.5</b>	<b>81.4</b>	<b>(306.3)</b>	<b>0.9</b>	<b>0.0</b>	<b>1,433.4</b>
29	<b>Grand Total (line 12 + line 28)</b>	<b>1,979.9</b>	<b>191.0</b>	<b>(485.5)</b>	<b>3.5</b>	<b>0.0</b>	<b>1,688.9</b>

Notes:

- From EB-2014-0370, Payment Amounts Order, App. A, Table 1, col. (a) and Table 2, col. (a), unless otherwise noted.
- 2014 balance from EB-2014-0370, Ex. H1-1-2, Table 1, col. (d).
- Calculated as the value from EB-2014-0370 Payment Amounts Order, App. A, Tables 1 and 2, cols. (b) and (e).
- Per the EB-2014-0370 Payment Amounts Order, no interest is recorded on the Pension & OPEB Cash Versus Accrual Differential Deferral Account, Pension and OPEB Cost Variance Account, Bruce Lease Net Revenues Variance (from January 1, 2015 to December 31, 2015), Nuclear Liability Deferral Account, and Pickering Life Extension Depreciation Variance Account.

Numbers may not add due to rounding.

Filed: 2016-05-27

EB-2016-0152

Exhibit H1

Tab 1

Schedule 1

Table 11

Table 11  
Capacity Refurbishment Variance Account - Nuclear  
Summary of Account Transactions - 2015 (\$M)

Line No.	Particulars	Note	Actual 2015
			(a)
	<b>Non-Capital Addition to Variance Account:</b>		
	<b>Forecast Non-Capital Costs - EB-2013-0321:</b>		
1	Darlington Refurbishment	1	12.4
2	Fuel Channel Life Cycle Management Project	1	3.7
3	Pickering Continued Operations	1	18.6
4	Fuel Channel Life Extension Project	1	0.0
5	<b>Total (lines 1 through 4)</b>		<b>34.7</b>
	<b>Actual Non-Capital Costs:</b>		
6	Darlington Refurbishment	3	1.6
7	Fuel Channel Life Cycle Management Project	4	2.3
8	Pickering Continued Operations		2.2
9	Fuel Channel Life Extension Project	5	10.0
10	<b>Total (lines 6 through 9)</b>		<b>16.0</b>
	<b>Non-Capital Addition to Variance Account:</b>		
11	Darlington Refurbishment (line 6 - line 1)		(10.9)
12	Fuel Channel Life Cycle Management Project (line 7 - line 2)		(1.4)
13	Pickering Continued Operations (line 8 - line 3)		(16.3)
14	Fuel Channel Life Extension Project (line 9 - line 4)		10.0
15	<b>Non-Capital Addition to Variance Account Before Adjustment (lines 11 through 14)</b>		<b>(16.6)</b>
16	<b>Less: EB-2013-0321 Impact Statement (Ex. N1) Adjustment</b>	2	12.8
17	<b>Total Non-Capital Addition to Variance Account - Nuclear (line 15 - line 16)</b>		<b>(31.5)</b>
	<b>Capital Addition to Variance Account - Darlington Refurbishment:</b>		
18	<b>Forecast Cost of Capital Amount (from Note 6, line 3b, col. (c))</b>	6	11.0
19	<b>Actual 2015 Net Plant Rate Base Amount</b>	7	192.6
20	<b>Weighted Average Cost of Capital</b>	8	6.85%
21	<b>Actual Cost of Capital Amount (line 19 x line 20)</b>		13.2
22	<b>Cost of Capital Variance (line 21 - line 18)</b>		2.2
23	<b>Forecast Depreciation (from Note 6, line 5b, col. (c))</b>	6	4.5
24	<b>Actual Depreciation</b>	9	7.0
25	<b>Depreciation Variance (line 24 - line 23)</b>		2.5
	<b>Income Tax Impact:</b>		
26	<b>Forecast Capital Cost Allowance Deduction</b>	10	66.8
27	<b>Actual Capital Cost Allowance Deduction &amp; SR&amp;ED Qualifying Capital Expenditures</b>		182.0
28	<b>Difference (line 26 - line 27)</b>		(115.2)
29	<b>Net Increase (Decrease) in Regulatory Taxable Income</b>	11	(111.4)
30	<b>Income Tax Rate</b>	12	25.00%
31	<b>Income Tax Impact (line 29 x line 30 / (1 - line 30))</b>		(37.1)
32	<b>Capital Addition to Variance Account Before Adjustment (line 22 + line 25 + line 31)</b>		<b>(32.4)</b>
33	<b>Less: EB-2013-0321 Impact Statement (Ex. N1) Adjustment</b>	13	5.1
34	<b>Total Capital Addition to Variance Account - Nuclear (line 32 - line 33)</b>		<b>(37.5)</b>

For notes see Table 11a.

Table 11a  
Notes to Table 11Capacity Refurbishment Variance Account - Nuclear - 2015 (\$M)

## Notes:

- 1 In accordance with the EB-2013-0321 Payment Amounts Order (App. G, p. 10), and EB-2014-0370 Payment Amounts Order (App B, p. 12) the forecasts for 2015 have been determined as shown below at line 4a, on the basis of amounts underpinning the EB-2013-0321 payment amounts:

Table to Note 1 - EB-2013-0321 and OPG's 2014-2016 Business Plan Forecast Costs (\$M)					
Line No.		Darlington Refurbishment Non-Capital <sup>a</sup>	Fuel Channel Life Cycle Mgmt Project <sup>##</sup>	Pickering Continued Operations <sup>+</sup>	Fuel Channel Life Extension Project <sup>++</sup>
		(a)	(b)	(c)	(d)
1a	2014 Full Year Forecast Costs - EB-2013-0321	6.6	6.8	37.1	0.0
2a	2015 Full Year Forecast Costs - EB-2013-0321	18.2	0.6	0.0	0.0
3a	Total Forecast Costs - EB-2013-0321	24.9	7.4	37.1	0.0
4a	2015 Average Annual Forecast from EB-2013-0321 ((line 3a / 24 months) x 12 months)	12.4	3.7	18.6	0.0
5a	2014 Full Year Forecast Costs - OPG's 2014-2016 Business Plan	6.6	8.8	39.1	
6a	2015 Full Year Forecast Costs - OPG's 2014-2016 Business Plan	20.4	0.5	0.0	
7a	Total Forecast from OPG's 2014-2016 Business Plan	27.0	9.2	39.1	
8a	2015 Average Annual Forecast - OPG's 2014-2016 Business Plan ((line 7a / 24 months) x 12 months)	13.5	4.6	19.5	
9a	2015 EB-2013-0321 Impact Statement (Ex. N1) Adjustment (cols. (a)-(c): line 8a - line 4a)	1.1	0.9	1.0	9.9

# Lines 1a and 2a from EB-2013-0321 Decision with Reasons, p. 55.

## Lines 1a and 2a from EB-2013-0321 Ex. F2-3-1, Table 1, line 11, cols. (e) and (f).

+ Line 1a from EB-2013-0321 Ex. F2-2-3, p. 4, Chart 1, "Subtotal" line.

++ The Fuel Channel Life Extension Project was not reflected in OPG's 2013-2015 Business Plan underpinning the EB-2013-0321 payment amounts.

- 2 The adjustments are per the EB-2013-0321 Payment Amounts Order (App. G, p. 10), and EB-2014-0370 Payment Amounts Order (App B, p. 12) requirement that amounts recorded in the account do not include those that OPG indicated it is not seeking to recover from, or refund to, ratepayers as part of the differences between the revenue requirement in its EB-2013-0321 pre-filed evidence and the information based on OPG's 2014-2016 Business Plan, which was provided in the EB-2013-0321 Impact Statement at Ex. N1. The adjustments are 12/24 of the higher corresponding costs reflected in the total test period OM&A increase of \$26M (EB-2013-0321 Ex. N1-1-1, Chart 1) between OPG's EB-2013-0321 pre-filed evidence and its 2014-2016 Business Plan. This difference was not included in the updated revenue requirement in the Ex. N1 Impact Statement. The individual 2015 adjustments total \$9.9M and are shown in Note 1, line 9a, cols. (a) to (d). The Fuel Channel Life Cycle Extension Project was considered in OPG's 2014-2016 Business Plan (see EB-2013-0321 Ex. F2-3-3, Attachment 1, Tab 11) as part of the nuclear portfolio project OM&A. In addition to addressing requirements with respect to the EB-2013-0321 Ex. N1 Impact Statement, the adjustment also limits the amount recoverable from ratepayers for project cost variances to the variance in total nuclear portfolio project OM&A from OPG's 2014-2016 Business Plan.

3 As shown in Ex. F2-1-1 Table 1, Line 5, col. (c). These costs are discussed in Ex. F2-7-1.

4 As shown in Ex. F2-3-1 Table 1, Line 10, col. (c).

5 As shown in Ex. F2-3-1 Table 1, Line 11, col. (c).

6 The annual forecast (reference) amounts are determined as follows:

Table to Note 6- Darlington Refurbishment Forecast Capital Amounts - EB-2013-0321 (\$M)				
Line No.		2014	2015	((a)+(b)) / 2 Reference Amount
		(a)	(b)	(c)
1b	Forecast Net Plant Rate Base Amount <sup>a</sup>	118.0	204.6	
2b	Weighted Average Cost of Capital <sup>b</sup>	6.86%	6.85%	
3b	Cost of Capital Forecast Amount (line 1b x line 2b)	8.0	14.0	11.0
4b	ROE Component of Cost of Capital Amount <sup>c</sup>	4.9	8.6	6.7
5b	Depreciation <sup>d</sup>	3.0	5.1	4.5
6b	Capital Cost Allowance Deduction <sup>e</sup>	39.3	94.3	66.8

a Cols. (a) and (b) from EB-2013-0321 Ex. L-4.9-1 Staff-048, p. 2, Chart 1.

b Cols. (a) and (b) from EB-2013-0321 Payment Amounts Order, App. A, col. (c), line 6 of Tables 5b and 6b, respectively.

c Calculated as line 1b x equity portion (45%) of the EB-2013-0321 capital structure x EB-2013-0321 ROE rate of 9.36% (2014) and 9.30% (2015) (from EB-2013-0321 Payment Amounts Order, App. A, Tables 5b and 6b, col. (c), line 5).

d From EB-2013-0321 Ex. F4-1-1, Table 2, Note 1 and EB-2013-0321 Ex. L-4.9-1 Staff-048, p. 2, Chart 1.

e From EB-2013-0321 Ex. D2-2-1, p. 29, Note 2.

7 From Ex. B3-1-1 Table 1, col. (i), line 2.

8 From EB-2013-0321 Payment Amounts Order, App. A, Table 6b, col. (c), line 6.

9 From Ex. F4-1-1 Table 3, col. (c), line 2.

10 Col. (a) is from Note 6, col. (c), line 6b.

11 The decrease in regulatory taxable income in col. (a) is calculated as the sum of lines 25 and 28, plus the ROE component of the cost of capital variance at line 22. The ROE component of the variance is the difference between: (i) line 19 multiplied by the EB-2013-0321 OEB-approved equity portion (45%) of the capital structure, multiplied by the OEB-approved ROE rate of 9.30% and (ii) Note 6, line 4b, col. (c).

12 From EB-2013-0321 Payment Amounts Order, App. A, Table 8, line 31.

13 Amounts from EB-2014-0370 Ex. H1-1-2, Table 12, col. (b), line 33 x 6



Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit H1  
Tab 1  
Schedule 1  
Table 13

Table 13  
Nuclear Deferral and Variance Over/Under Recovery Variance Account  
Summary of Account Transactions - 2015

Line No.	Particulars	Note	Actual 2015 (a)
1	Nuclear Rider 2015 (\$/MWh)-EB-2013-0321	1	1.33
2	Nuclear Rider 2015/2016-A (\$/MWh)-EB-2014-0370	2	10.84
3	Nuclear Interim Period Shortfall Rider 2015/2016-B (\$/MWh)-EB-2014-0370	3	2.17
4	Jan 2015 - Dec 2015 Nuclear Production Forecast Used to Set Nuclear Rider 2015 (TWh)	4	46.6
5	Jan 2015 - Dec 2015 Actual Nuclear Production (TWh)	5	44.5
6	Actual Production Variance for Nuclear Rider 2015 (TWh) (line 4 - line 5)		2.0
7	Oct 2015 - Dec 2015 Nuclear Production Forecast Used to Set Rider 2015 (TWh)	6	12.0
8	Oct 2015 - Dec 2015 Actual Nuclear Production (TWh)	7	8.8
9	Actual Production Variance for Rider 2015/2016-A and Interim Period Shortfall Rider 2015/2016-B (TWh) (line 7 - line 8)		3.1
10	Addition To Variance Account (\$M) Rider 2015 (line 6 x line 1)		2.7
11	Addition to Variance Account (\$M) Rider 2015/2016-A (line 9 x line 2)		34.0
12	Addition to Variance Account (\$M) Interim Period Shortfall Rider 2015/2016-B (line 9 x line 3)		6.8
13	Addition to Variance Account (\$M) (line 10 through line 12)		43.5

Notes:

- From EB-2013-0321 Payment Amounts Order, App. F, Table 1, line 18, col. (e)
- From EB-2014-0370 Payment Amounts Order, App. A, Table 3, line 1, col. (b).
- From EB-2014-0370 Payment Amounts Order, App. A, Table 3, line 4, col. (b).
- From EB-2013-0321 Payment Amounts Order, App. A, Table 4, line 1 col. (h).
- As shown in Ex. E2-1-1 Table 1, line 3 col. (c).
- Calculated as the production forecast used to set the nuclear payment rider in EB-2014-0370 Payment Amounts Order, App. A Table 3, line 3, col. (b) x 3/18.
- As reported in OPG's 2015 Management's Discussion & Analysis (Ex. A2-1-1, Att. 3, p. 73).

Numbers may not add due to rounding.

Filed: 2016-05-27  
EB-2016-0152  
Exhibit D2  
Tab 2  
Schedule 10  
Table 2

Table 2  
Capital Project Listing - Darlington Refurbishment Program  
Projects ≥ \$20M Total Project Cost.<sup>1,2</sup>

Line No.	Facility	Project Name	Project Number	Category	Start Date	Final In-Service Date	Total Project Cost (\$M)	Partial/Dev't Release (\$M)	Initial Full Release (\$M)	Superseding Full Release (\$M)	In-Service 2016 (\$M)	In-Service 2017 (\$M)	In-Service 2018 (\$M)	In-Service 2019 (\$M)	In-Service 2020 (\$M)	In-Service 2021 (\$M)
			(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
1	DN	ONGOING PROJECTS FROM EB-2013-0321	Various	Unit Refurb - Unit 2	2010	Feb-20	4,800.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4,799.8	0.4
2	DN	Darlington Refurbishment - Unit Refurbishment - Unit 2		Unit Refurb - Early In-Service		May-16	87.0	0.0	0.0	0.0	87.0	0.0	0.0	0.0	0.0	0.0
3	DN	R&FR - Tooling for Removal Activities	73112	F&IP	Nov-06	May-17	381.1	0.0	110.0	381.1	0.0	365.9	0.0	0.0	0.0	0.0
4	DN	Heavy Water Storage Facility <sup>3</sup>	31555	F&IP	Jun-10	Nov-15	57.7	0.0	40.6	57.7	3.7	0.0	0.0	0.0	0.0	0.0
5	DN	Water & Sewer Project <sup>3</sup>	73802	F&IP	Mar-10	Jul-13	105.4	0.0	105.4	0.0	0.9	0.0	0.0	0.0	0.0	0.0
6	DN	Darlington Energy Complex <sup>2</sup>	73803	F&IP	Mar-10	Jul-13	105.4	0.0	105.4	0.0	40.4	0.0	0.0	0.0	0.0	0.0
7	DN	Refuge Feeder Replacement Island Support Annex <sup>3</sup>	73810	F&IP	Sep-11	Oct-15	40.7	0.0	40.7	0.0	7.6	0.0	0.0	0.0	0.0	0.0
8	DN	Refurbishment Project Office <sup>3</sup>	73815	F&IP	Jan-16	Jan-16	99.9	0.0	99.9	0.0	2.4	0.0	0.0	0.0	0.0	0.0
9	DN	Electrical Power Distribution System <sup>3</sup>	73821	F&IP	Nov-10	Oct-15	20.8	0.0	16.9	20.8	105.3	0.0	0.0	0.0	0.0	0.0
10	DN	Third Emergency Power Generator <sup>4</sup>	73360	SIO	Apr-12	Oct-16	120.4	0.0	77.2	120.4	80.1	0.5	0.0	0.0	0.0	0.0
11	DN	Containment Filtered Venting System <sup>4</sup>	73365	SIO	Aug-13	Aug-16	80.3	0.0	80.6	0.0	327.4	366.4	0.0	0.0	4,799.8	0.4
		<b>Subtotal</b>					<b>5,793.5</b>									
12		COMPLETED PROJECTS FROM EB-2013-0321														
13		No projects in this category						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		<b>Subtotal</b>					<b>0.0</b>									
14		PROJECTS NOT IN EB-2013-0321														
15		No projects in this category						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		<b>Subtotal</b>					<b>0.0</b>									
16		<b>Total - Projects ≥ \$20M Total Project Cost</b>									<b>327.4</b>	<b>366.4</b>	<b>0.0</b>	<b>0.0</b>	<b>4,799.8</b>	<b>0.4</b>

Notes:

- 1 Projects with expenditures during Test Period OR In-Service Amounts in Bridge or Test Period.
- 2 In-Service forecasts reflect RQE.
- 3 For F&IP, Total Project Cost and release information reflect approved Business Case Summary.
- 4 For SIO, Total Project Cost and release information reflect approved Gate Progression Form or Change Control Form.

**Board Staff Interrogatory #210**

**Issue Number: 9.1**

**Issue:** Is the nature or type of costs recorded in the deferral and variance accounts appropriate?

**Interrogatory**

**Reference:**

Ref: Exh H1-1-1, Table 11 and 11a Ref: Exh D2-2-10, Table 5

In the table referenced above the balance of the Capacity Refurbishment Variance Account (CRVA) for DRP is shown as \$41.6M-\$12.4 = (\$10.9M) for non-capital and (\$37.5M) for capital, for a total of (\$48.2M).

- a) Please confirm that the above numbers are correct.
- b) Please provide an explanation for the variance between forecast and actual non- capital amounts.
- c) Complete the following table with actual additions to rate base for 2014 and 2015:
- d) Please reconcile the Net Plant Rate Base Amounts of \$116M and \$204.6M with the actual in-service capital additions of \$43.5M and \$147.1M shown in the second reference above.

\$M	2014 Forecast	2014 Actual	2015 Forecast	2015 Actual
Darlington Energy Complex	92.0		89.6	
Water and Sewer Project	20.8		26.4	
Heavy Water Storage & Drum Handling Facility			20.3	
Darlington Operations Support Building Refurbishment			14.6	
Auxiliary Heating System			17.9	
Electric Power Distribution System	2.2		7.3	
Powerhouse Steam Venting System			5.0	
Third Emergency Power Generator Project			16.0	
Other Miscellaneous Projects	1.0		7.5	
Any other projects?				
Net Plant Rate Base Amount	116.0		204.6	

Witness Panel: Finance, D&V Accounts, Nuclear Liabilities, Cost of Capital

**Response**

a) Not confirmed.

The numbers cited in this question do not represent the balance of the Capacity Refurbishment Variance Account (CRVA) for the Darlington Refurbishment Program (DRP) as at December 31, 2015. Instead, Ex. H1-1-1 Table 11 and Table 11a outline additions to the account during 2015.

The amount of (\$37.5M) cited in the question and found at Ex. H1-1-1 Table 11, line 34 is the capital portion of the CRVA addition for DRP during 2015. The non-capital (OM&A) portion of the CRVA addition for the DRP during 2015 is (\$11.9M), not (\$10.9M) cited in the question. The (\$11.9M) addition represents (\$10.9M) found at Ex. H1-1-1 Table 11, line 11 less \$1.1M for the EB-2013-0321 Ex. N1 Impact Statement (Ex. N1) Adjustment. The \$1.1M adjustment, found at Ex. H1-1-1, Table 11a, Note 1, line 9a, col. (a) and explained in Note 2 of that table, is embedded in Ex. H1-1-1 Table 11, line 16.

b) An explanation of the variance of (\$16.7M) between actual and EB-2013-0321 forecast DRP OM&A for 2015 is found at Ex. F2-7-1, p. 1, lines 26-31. To arrive at the non-capital CRVA addition of (\$11.9M) from part (a), offsetting the variance of (\$16.7M) is the impact of averaging the 2014 and 2015 annual EB-2013-0321 forecast amounts in determining the reference amounts for calculating CRVA entries, as shown in Ex. H1-1-1 Table 11a, note 1, col. (a), lines 1a to 4a. This averaging approach to determining reference amounts is the same approach approved by the OEB for other variance accounts in the EB-2014-0370 and EB-2013-0321 Payment Amounts Orders (e.g., Ancillary Services Net Revenue Variance Account, Pension & OPEB Cash Payment Variance Account).

c) The requested information is provided in Table 1 of Attachment 1. To facilitate reconciliation with other evidence in this rate application and part (d) of the response, OPG has modified the table to include a sub-total for amounts excluding projects reclassified to Nuclear Operations subsequent to EB-2013-0321. This is discussed further in part (d). The 2014 Actual and 2015 Actual values shown are also found at Ex. L-2.2-1 Staff-9, Attachment 1.

1 d) The question requests a reconciliation of the forecast net plant rate base amounts to  
2 actual in-service capital additions. As in-service capital additions are one of the inputs into  
3 the computation of net plant rate base amounts, with other inputs being opening net plant  
4 values and depreciation expense, and as the amounts cited are of different vintages (i.e.  
5 forecast and actual), it is not possible to provide a direct reconciliation.  
6

7 To provide further detail on the amounts in question, OPG has prepared the following  
8 Tables 2 and 3 in Attachment 1 showing DRP rate base continuities, including in service  
9 additions and depreciation, for each of forecast and actual net plant rate base amounts for  
10 2014 and 2015.<sup>1</sup>  
11

12 The forecast DRP net plant rate base amounts of \$116.0M for 2014 and \$204.6M for 2015  
13 shown on line 9 of Table 2 in Attachment 1 (and detailed in part (c) of this response)  
14 represent the EB-2013-0321 approved forecasts underpinning the reference amounts  
15 used to calculate capital additions into the CRVA (Ex. H1-1-1 Table 11a, Note 6, line 1b).  
16 As the reclassification of certain projects to Nuclear Operations occurred subsequent to  
17 EB-2013-0321, these forecast amounts include the reclassified projects. The reclassified  
18 projects are further detailed and discussed in Ex. D2-2-10, section 2.4.4 and Ex. L-4.3-1  
19 Staff-71.  
20

21 The actual DRP net plant rate base amounts of \$121.2M for 2014 and \$192.6M for 2015  
22 shown at line 9 of Table 3 in Attachment 1 (and detailed in part (c) above) were used in  
23 the calculation of CRVA capital additions at EB-2014-0370 Ex. H1-1-2, Table 12, line 19  
24 for 2014 and EB-2016-0152 Ex. H1-1-1 Table 11, line 19 for 2015. These amounts  
25 exclude projects reclassified to Nuclear Operations, which effectively results in a CRVA  
26 ratepayer credit for the EB-2013-0321 revenue requirement impact associated with these  
27 projects.

---

<sup>1</sup> Information for 2013 is included to support the 2014 opening net plant amounts.

Numbers may not add due to rounding

Filed: 2016-10-26  
EB-2016-0152  
Exhibit L  
Tab 9.1  
Schedule 1 Staff-210  
Attachment 1  
Table 1

Table 1  
Net Plant Rate Base Amounts (\$M)¹

Line No.		2014 Forecast	2014 Actual	2015 Forecast	2015 Actual
		(a)	(b)	(c)	(d)
1	Darlington Energy Complex	92.0	77.8	89.6	75.1
2	Water and Sewer Project	20.8	31.6	26.4	41.8
3	Heavy Water Storage & Drum Handling Facility	0.0	7.3	20.3	14.3
4	Electric Power Distribution System	2.2	2.6	7.3	10.1
5	Powerhouse Steam Venting System	0.0	0.0	5.0	2.6
6	Third Emergency Power Generator Project	0.0	0.0	16.0	4.8
7	Retube Feeder Replacement Island Support Annex	0.0	0.0	0.0	0.9
8	Refurbishment Project Office	0.0	0.0	0.0	28.8
9	Emergency Service Water Buried Piping	0.0	0.0	0.0	6.6
10	Other Miscellaneous Projects	1.0	2.1	7.5	7.7
11	<b>Net Plant Rate Base Amounts without Reclassified Projects</b>	<b>116.0</b>	<b>121.2</b>	<b>172.1</b>	<b>192.6</b>
12	Darlington Operations Support Building Refurbishment	0.0	0.0	14.6	9.1
13	Darlington Auxiliary Heating System	0.0	0.0	17.9	0.0
14	Emergency Service Water Pipe and Component Replacement	0.0	0.0	0.0	2.4
15	<b>Net Plant Rate Base Amount with Reclassified Projects</b>	<b>116.0</b>	<b>121.2</b>	<b>204.6</b>	<b>204.2</b>

Notes:

- 1 DRP forecasts approved in EB-2013-0321 included reclassified projects, as the reclassification did not take place until after EB-2013-0321. Actual DRP amounts are reported excluding the reclassified projects.

Numbers may not add due to rounding

Filed: 2016-10-26  
EB-2016-0152  
Exhibit L  
Tab 9.1  
Schedule 1 Staff-210  
Attachment 1  
Table 2

Table 2  
Darlington Refurbishment Program - EB-2013-0321 Forecast Rate Base (\$M)

Line No		Notes	2013 Forecast (a)	2014 Forecast <sup>1</sup> (b)	2015 Forecast <sup>1</sup> (c)
1	Gross Plant In-service - opening balance		5.0	109.2	127.9
2	Gross Plant In-service Additions	2	104.2	18.7	209.4
3	Gross Plant In-service - closing balance (line 1 + line 2)		109.2	127.9	337.2
4	Accumulated Depreciation - opening balance		-	1.0	4.0
5	Depreciation Expense	3	1.0	3.0	6.1
6	Accumulated Depreciation - closing balance (line 4 + line 5)		1.0	4.0	10.0
7	Net Plant In-service - opening balance (line 1 - line 4)		5.0	108.2	123.9
8	Net Plant In-service - closing balance (line 3 - line 6)		108.1	123.9	327.2
9	Net Plant Rate Base		56.6	116.0	204.6

Notes:

- 1 As shown in EB-2013-0321 Ex. L-4.9-1 Staff-048, Chart 1 and does not reflect the subsequent reclassification of certain projects to Nuclear Operations.
- 2 As shown in EB-2013-0321 Ex. D2-2-1, Table 6, line 14.
- 3 As shown in EB-2013-0321 Ex. F4-1-1, Table 2, Note 1.

Numbers may not add due to rounding

Filed: 2016-10-26  
EB-2016-0152  
Exhibit L  
Tab 9.1  
Schedule 1 Staff-210  
Attachment 1  
Table 3

Table 3  
Darlington Refurbishment Program - Actual Rate Base (\$M)

Line No.		Notes	2013 Actual <sup>1</sup>	2014 Actual	2015 Actual
			(a)	(b)	(c)
1	Gross Plant In-service - opening balance		5.0	104.2	147.6
2	Gross Plant In-service Additions	2	99.2	43.5	147.1
3	Gross Plant In-service - closing balance (line 1 + line 2)		104.2	147.6	294.8
4	Accumulated Depreciation - opening balance		0.0	2.3	7.0
5	Depreciation Expense	3	2.3	4.7	7.0
6	Accumulated Depreciation - closing balance (line 4 + line 5)		2.3	7.0	14.0
7	Net Plant In-service - opening balance (line 1 - line 4)		5.0	101.9	140.6
8	Net Plant In-service - closing balance (line 3 - line 6)		101.9	140.6	280.8
9	Net Plant Rate Base	4	60.2	121.2	192.6

Notes:

- 2013 Actual as reported in Ex. B3-3-1, Table 1, line 2; Ex. B3-4-1, Table 1, line 2; and Ex. B3-1-1, Table 1, line 2.
- 2014 Actual and 2015 Actual per Ex. B3-3-1, Table 1, lines 9 and 16; and Ex. D2-2-10 Table 5, line 6. Also detailed in Ex. L-2.21 Staff-008.
- 2014 Actual and 2015 Actual as shown in Ex. B3-4-1, Table 1, lines 9 and 16.
- As shown in Ex. B3-1-1 Table 1, line 2, cols (c), (f) and (i); and reflects reclassification of certain projects to Nuclear Operations. 2013 Actual also shown in EB-2013-0321 Ex. L-9.1-17, SEC-132 Att. 1, Table 12a, Note 1. 2014 Actual also shown in EB-2014-0370 Ex. H1-1-2, Table 12, line 19. 2015 Actual also as shown in H1-1-1, Table 11, line 19.



**Board Staff Interrogatory #9**

**Issue Number: 2.2**

**Issue:** Are the amounts proposed for nuclear rate base for the Darlington Refurbishment Program appropriate?

**Interrogatory**

**Reference:**

**2.2-Staff-9**

Ref: Exh D2-2-10, Table 5 Ref: Exh D2-2-4, Figure 1

The first reference above shows in-service capital additions for the DRP. In EB-2013- 0321, Exhibit L, Tab 4.9, Schedule 1, Staff-048, OPG provided the following Chart:

DRP projects wholly or partially in service in the test period (\$millions)	Final In service year	Partial in-service years	Projected Total Capital Expenditure	Amount in 2014 Rate Base	Amount in 2015 Rate Base	Dep'n in 2014 Rev Req <sup>1</sup>	Dep'n in 2015 Rev Req <sup>1</sup>	Amount recorded in Capacity Refurb
Darlington Energy Complex	2013		105.	92.0	89.6	2.4	2.4	6.8
Water and Sewer Project	2014	2012,	36.0	20.8	26.4	0.4	0.6	1.5
Heavy Water Storage & Drum Handling Facility	2015		108.	-	20.3	-	1.1	-
Darlington Operations Support Building Refurb	2015		46.8	-	14.6	-	0.4	-
Auxiliary Heating System	2015		45.6	-	17.9	-	0.5	-
Electrical Power Distribution System	2015	2014	17.8	2.2	7.3	0.1	0.2	0.1
Powerhouse Steam Venting System	2015		10.2	-	5.0	-	0.1	-
Third Emergency Power Generator Project	2015		32.5	-	16.0	-	0.4	-
Container Venting System Project			-	-	-	-	-	-
Other Miscellaneous Projects		2014,	13.2	1.0	7.5	0.0	0.2	-
<b>TOTAL</b>			<b>415.</b>	<b>116.</b>	<b>204.</b>	<b>3.0</b>	<b>6.1</b>	<b>8.4</b>

\* Note: Account records variances between actual capital and non capital and firm capital commitment incurred for the DRP and the corresponding forecasts reflected in the revenue requirement approved by the OEB

<sup>1</sup> Total depreciation as shown in Ex. F4-1-1, Table 2, Note 1.

<sup>2</sup> Includes income tax impacts related to cost of capital and depreciation account additions. Does not reflect CCA variances, as CCA is claimed for all eligible DRP expenditures pursuant to an election under the *Income Tax Act (Canada)* noted in Ex. D2-2-1, p. 29, note 2. Interest on the outstanding account balance is also excluded.

Witness Panel: Finance, D&V Accounts, Nuclear Liabilities, Cost of Capital

1 Please provide a similar chart, updated to include the actual amounts included in rate base  
2 for DRP from 2012 to 2015 and the proposed amounts from 2016 to 2021

3

4

5 **Response**

6

7 The updated chart requested is presented in Attachment 1.

Final in service year	Partial In-Service Years	Total Project Cost	Actual Amount in Rate Base <sup>1</sup>					Planned Amount in Rate Base <sup>1</sup>					Actual Depreciation <sup>2</sup>					Planned Depreciation in Revenue Requirement <sup>2</sup>					Amount Recorded in CRVA in 2015 <sup>3</sup>
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
DRP projects wholly or partially in service in the test period (millions)	2013	105.4	-	46.1	77.8	75.1	71.9	68.7	65.0	61.3	57.6	53.9	-	2.0	3.6	3.7	3.7	3.7	3.7	3.7	3.7	0.3	
	2015	57.7	2.5	12.7	41.6	45.1	42.1	40.4	38.7	37.0	35.3	0.0	0.2	0.6	1.6	1.7	1.7	1.7	1.7	1.7	2.9		
	2017	39.1	-	7.3	14.3	13.9	25.4	36.7	35.8	34.6	1	-	-	0.1	0.4	0.4	6.8	10.7	10.7	10.7	0.1		
	2018	20.8	-	1.3	2.6	10.1	18.7	18.6	18.2	18.8	18.1	-	-	0.0	0.1	0.3	0.4	0.4	0.4	0.4	0.7		
	2019	15.6	-	-	2.8	5.4	10.5	15.3	15.1	15.0	4.8	-	-	-	0.0	0.2	0.2	0.2	0.2	0.2	0.2		
	2016	3.5	-	-	3.5	11.4	10.6	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5		
	2018	80.3	-	-	-	20.6	71.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4		
	2016	40.7	-	-	0.9	21.4	40.5	39.4	38.3	37.1	36.0	-	-	-	0.0	0.6	1.1	1.2	1.2	1.2	1.2		
	2015	99.9	-	-	28.8	96.1	97.2	94.4	91.7	88.9	86.2	-	-	-	0.6	2.7	2.8	2.8	2.8	2.8	3.2		
	2016	87.0	-	-	-	53.7	84.4	82.0	79.6	77.3	74.9	-	-	-	-	1.5	2.4	2.4	2.4	2.4	2.4		
	2017	13.5	-	-	20.7	13.1	12.7	12.4	12.4	12.4	12.4	-	-	-	-	0.1	0.3	0.4	0.4	0.4	-		
	2015	14.6	-	-	-	6.6	13.7	13.9	13.5	13.1	12.7	12.4	-	-	-	0.1	0.4	0.4	0.4	0.4	0.7		
	2020	4,800.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Various	45.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Various	5,672.8	2.3	80.2	121.2	192.6	419.1	852.3	955.2	929.7	5,037.4	5,176.2	0.0	2.3	4.7	7.0	14.1	25.8	29.9	30.0	159.1	177.6		

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding.

DRP projects wholly or partially in service in the test period (millions)

Amount recorded in CRVA at end of 2015.

Amount recorded in CRVA at end of 2015.

Numbers may not add due to rounding

## IN-SERVICE AMOUNTS

### 1.0 OVERVIEW

Capital expenditures for the Darlington Refurbishment Program ("DRP") for the years 2013 to 2021 are provided in Ex. D2-2-10 Table 1. The capital in-service amounts are presented in Ex. D2-2-10 Tables 2 to 5. Capital in-service amounts are presented in four categories: (1) Unit Refurbishment – Unit 2 In-service; (2) Unit Refurbishment - Early In-service Projects; (3) Safety Improvement Opportunities ("SIO"); and (4) Facility and Infrastructure Projects ("F&IP").

### 2.0 CAPITAL IN-SERVICE AMOUNTS

#### 2.1 Unit Refurbishment - Unit 2 In-service Amount

The Unit Refurbishment - Unit 2 in-service amount includes costs incurred to complete the refurbishment scope and return to service of Unit 2. It does not include any early in-service amounts that are used or useful to the Darlington station in advance of Unit 2 return to service. The in-service amounts in the test period for Unit 2 are \$4,799.8M in 2020 and \$0.4M in 2021.

The 2020 in-service amount includes \$4,777.7M that will be placed in-service in February 2020 and an additional \$22.1M capital costs for close-out activities that are forecast to be incurred and placed in-service by the end of August 2020. As discussed in section 3.1.2 of Ex. B1-1-1, the nuclear rate base values for 2020 reflect the \$4,777.7M in-service amount subject to a weighting of 10.5/12 in order to recognize that it is expected to be placed in-service in February. This is shown in Ex. B3-3-1, Table 2, line 23.

Capital costs included in the Unit 2 in-service were incurred commencing in 2010 with the preliminary planning portion of the Definition Phase. Definition Phase costs are included in the Unit 2 in-service amounts as these costs would be required for a single unit refurbishment. OPG has discussed the accounting treatment with its external auditor, who concurs that this treatment is in accordance with US GAAP.

structure, consistent with the OEB's filing guidelines, has been used to present the F&IP that have budgeted expenditures or in-service amounts during the bridge year or test period.

#### 2.4.2 F&IP >\$20M

The following F&IP greater than \$20M will be completed and placed in service in the bridge year or test period (Ex. D2-2-10, Table 2):

- *Heavy Water Storage and Drum Handling Facility*: Discussed below in section 2.4.5.1.
- *Retube and Feeder Replacement Island Support Annex ("RFRISA")*: RFRISA will be used by DRP staff to execute the Program, and also in support of Darlington online and outage maintenance activities. It became used and useful when it was partially placed in service in November 2015.
- *Refurbishment Project Office ("RPO")*: The Refurbishment Project Office is a multi-purpose facility that initially will be used by DRP staff for secure access into the Darlington protected area, contractor change room and shower facilities, contractor lunchroom, offices of DRP support staff, and parking for all DRP contractor and project staff. Similar to the Darlington Energy Complex discussed below, the RPO will be used to consolidate OPG nuclear staff at Darlington and would otherwise be expected to benefit current operations if the DRP were to be discontinued. The RPO became used and useful when it was placed in service in November 2015.
- *Electrical Power Distribution System*: Discussed below in section 2.4.5.3.

The following F&IP greater than \$20M were placed in service in the historical years and have minor in-service amounts associated with project close-out in the bridge year:

- *Water and Sewer Project*: Discussed below in section 2.4.5.2.
- *Darlington Energy Complex*: The Darlington Energy Complex became used and useful when it was placed in service in 2013 in providing space for training reactor mock-up, warehouse space for tooling and materials, and office space. Following the completion of the DRP, the Darlington Energy Complex will also allow the consolidation of leases and co-location of support staff, including Inspection and Maintenance, closer to Darlington.

Business Case Summaries for F&IP of \$20M or greater are included in Attachment 1. Variance explanations for F&IP that varied by more than 10 per cent from the initial full release, are provided in section 2.4.5.

#### 2.4.3 F&IP Between \$5M and \$20M

The following F&IP between \$5M and \$20M will be completed and placed in service in the bridge year or test period (Ex. D2-2-1, Table 3):

- GM Facility Interim Office Leasehold Improvements<sup>2</sup>
- Vehicle Screening Facility

#### 2.4.4 Reconciliation of F&IP List to EB-2013-0321

In support of RQE, OPG reviewed the cost classification of DRP projects to ensure clarity between costs characterized as refurbishment versus costs needed for the operation of Darlington in general. This review resulted in the reclassification of certain projects, including the Operations Support Building Refurbishment and the Auxiliary Heating System projects, from DRP to the Nuclear Operations Portfolio, and certain OM&A costs to Nuclear Operations. OPG concluded that the reclassified projects were not required for refurbishment, but rather are necessary for first life operations and outage requirements. Evidence supporting projects reclassified to the Nuclear Operations Portfolio is provided in Ex. D2-1-3.

Chart 1 below reconciles the capital projects greater than \$5M in DRP and the Nuclear Operations Portfolio to the F&IP capital projects in DRP in EB-2013-0321.

---

<sup>2</sup> Although classified as F&IP for internal tracking purposes, this project is treated in the same manner as other Definition Phase costs necessary for the refurbishment of a single unit and is expected to be placed in service in conjunction with Unit 2.

1 Current status

2 The Heavy Water Facility is forecast to be ready to receive the heavy water from Unit 2 in  
3 support of the refurbishment outage schedule. All 28 heavy water storage tanks have been  
4 installed in the Heavy Water Facility. Pipe and structural steel installation and preparation for  
5 erection of the building superstructure is in progress. The current in-service date for the  
6 Heavy Water Facility coincides with the current need date for the Unit 2 refurbishment<sup>3</sup>. Risk  
7 mitigation assessments are underway to mitigate any risk of delays and/or advancements of  
8 the need date for the Unit 2 refurbishment.

9  
10 2.4.5.2 Water and Sewer Project

11 Overview

12 The Water and Sewer Project was initiated to address gaps between the current condition of  
13 the water and sewer systems and future incremental requirements identified in preparation  
14 for the DRP and continued operation of Darlington. The project involves replacing the  
15 existing on-site water and sewer system by installing a separate domestic water system and  
16 a separate fire water system, redirecting the station sanitary sewage system from the on-site  
17 sewage treatment plant to the Region of Durham's sanitary sewage system, and  
18 decommissioning the existing Sewage Treatment Plant and Domestic Water Pumphouse.

19  
20 Planning and execution of the Water and Sewer Project was organized into three phases:

- 21 • Phase 1 - Holt Road Domestic and Fire Water Supply System;
- 22 • Phase 2 - Solina Road Domestic and Fire Water Supply System and Darlington  
23 Sanitary Sewer System; and
- 24 • Phase 3 - Decommissioning and Removal of Existing Darlington Domestic Water  
25 Pumphouse and Sewage Treatment Plant.

26  
27 Variance

28 The project was fully released in May 2013 based on a BCS that included a total estimated  
29 project cost of \$40.6M. The forecast in-service amount for the project is \$47.5M.

---

<sup>3</sup> The facility will be available to receive heavy water aligned with the Unit 2 need date, however final in-service is planned for May 2017 when the facility will benefit current operations.

1 The variance was driven by three technical issues:

2 (i) *Additional costs and schedule delays related to a change in railway crossing*  
3 *construction methodology.* The original construction methodology for the railway  
4 crossing used a single boring unit. Existing soil conditions discovered during  
5 tunneling operations were found to present an unacceptable risk for loss of  
6 ground and impact on the railway tracks using this methodology. Micro-tunnelling  
7 was selected as the methodology to complete the railway crossing.

8 (ii) *Additional costs for a revised excavation protocol.* The contractor's initial  
9 excavation protocol resulted in unintentional contact with buried services.  
10 Following two separate incidents, OPG required the contractor to follow a revised  
11 protocol that was at a higher standard and aligned with OPG's excavation  
12 protocol. As a result of the revised protocol, several potential incidents were  
13 avoided where there were mismatches between drawings and field configuration.  
14 The revised protocol resulted in additional costs for exploratory investigations and  
15 standby costs.

16 (iii) *Additional costs and schedule delays resulting from revised routing of the sewage*  
17 *and firewater line.* The Water and Sewer project design was developed based on  
18 conceptual drawings of the RPO, which is another F&IP. During detailed design of  
19 the RPO, its location was changed to avoid costs and station impacts associated  
20 with interference with the station bulk hydrogen supply trailer. The location  
21 change of the RPO required changes to the original routing of the sewage and  
22 firewater line and changes to the depth of the west pumping station.

23

24 All phases of the project were completed, with \$43.7M placed into service from 2012 to 2014,  
25 and \$3.7M in close out costs in 2016.

26

#### 27 2.4.5.3 Electrical Power Distribution Project

##### 28 Overview

29 In preparation for the DRP and continued operations at the Darlington site, OPG determined  
30 that the existing site electrical grid, fed from the local distribution utility's transformer station,  
31 did not have sufficient capacity to supply the new facilities that would be constructed at the



1 The actual 2014 in-service amounts of \$43.5M increased from the OEB-approved amount of  
2 \$18.7M. The key drivers of the variance in the in-service amounts were:

- 3 • advanced in-service date for the Heavy Water Facility relocated service tanks and  
4 pipes, tie-ins and contaminated soil laydown pad (\$14.6M);
- 5 • deferred in-service amounts from 2013 for the Water and Sewer project, as a result of  
6 construction delays (\$10.7M);
- 7 • delayed in-service date to 2015 for the Electrical Power Distribution System project (-  
8 \$4.4M);
- 9 • the in-service amount for a new Vehicle Screening Facility project that started being  
10 used in 2014, and that was not included in EB-2013-0321 (\$4.1M); and
- 11 • cancellation of a core program minor Early In-Service project (-\$2.1M).

### 12 13 **3.3 2015 Actual versus 2015 OEB Approved**

14 The actual 2015 in-service amounts of \$147.1M were slightly higher than the OEB-approved  
15 amount of \$143.4M. The key drivers of the variance in the in-service amounts were:

- 16 • advanced in-service dates for the RPO and RFRISA (\$96M);
- 17 • deferred in-service amount from 2014 for the Electrical Power Distribution System  
18 project (\$9.3M);
- 19 • delayed in-service dates to 2017 for the Heavy Water Facility due to project  
20 engineering and construction delays (-\$83.5M);
- 21 • delayed in-service dates to 2016 for the Emergency Power Generator, and  
22 Containment Filtered Venting System, and Islanding D2O Management System  
23 Modifications (-\$36M); and
- 24 • the inclusion of the new Powerhouse Steam Venting System, and Emergency Service  
25 Water Buried Services SIO projects (\$18M).

26

**BUSINESS CASE SUMMARIES FOR FACILITY AND  
 INFRASTRUCTURE PROJECTS OF \$20M OR GREATER**

<b>Tab No.</b>	<b>Project Number</b>	<b>Business Case Summary (BCS) Title</b>	<b>BCS Approval Date</b>	<b>Project Phase</b>	<b>Status of BCS</b>	<b>Status of BCS in EB-2013-0321</b>
1	16-31555	Heavy Water Storage and Drum Handling Facility	Mar-15	Execution	Superseding	Partial release - Execution
2	10-73810	Retube and Feeder Replacement Island Support Annex	Feb-14	Execution	Full release	Full release - Definition
3	10-73815	Refurbishment Project Office	Feb-14	Execution	Full release	Full release - Definition
4	10-73821	Darlington Site Electrical Distribution System Upgrades	Oct-15	Execution	Superseding	Partial release - Definition
5	10-73802	Darlington Water & Sewer Project	May-14	Execution	Superseding	Partial release - Execution
6	10-73803	Darlington Energy Complex	Dec-10	Execution	Full release	Full release - Execution

## Type 3 Business Case Summary

Final Security Classification of the BCS: **Internal Use Only**

To be used for investments/projects meeting Type 3 criteria in OPG-STD-0076.

### Executive Summary and Recommendations

Project Information			
<b>Project #:</b>	10-73802	<b>Document #:</b>	NK38-BCS-72700-10002
<b>Title:</b>	Darlington Water and Sewer Project		
<b>Class:</b>	Capital	<b>Investment Type:</b>	Sustaining
<b>Phase:</b>	Execution	<b>Release:</b>	Superseding
<b>Facility:</b>	Darlington	<b>Target In-Service or Completion Date:</b>	2016-01-18

**Project Overview**

**We recommend the release of \$12,008 k, including \$3,014 k of contingency.**  
**The estimated total project cost is \$57,711 k, including \$3,014 k of contingency.**

We recommend a superseding release of \$12,008k (including \$3,014k contingency) to complete the following scope of work:

- Phase II - Solina Road Domestic and Fire Water Supply System, and Darlington Sanitary Sewer System
  - Installation and commissioning of Domestic / Fire Water System (**In Progress**)
  - Installation and commissioning of Water and Sewer Systems for Refurbishment Project Office (**In Progress**)
  - Design Closeout
- Phase III – Decommissioning and removal of existing Domestic Water Pumphouse (DWP) and Sewage Treatment Plant (STP)
  - Detailed Design (**In Progress**)
  - Procurement and Construction to decommission and demolish the STP and DWP
  - Design Closeout
  - Project Closeout

The business objectives of the Darlington Water and Sewer project is to:

- Install new domestic and fire water supply lines from Oshawa and Bowmanville municipalities to ensure adequate supply for the continued operation of the Darlington Nuclear Generating Station (DNGS) post refurbishment.
- Re-route the station sewer system to the Courtoise Water Pollution Control Plant to support the continued operation of the Darlington Nuclear Generating Station (DNGS) post refurbishment.
- Decommission and remove the existing DWP, water storage bladders and associated chlorination systems, and STP
- Provide sewage and water connections for future Darlington Refurbishment facilities

**Problem Statement/Business Need:**

In preparation for the continued operation of the Darlington Nuclear Generating Station (DNGS), the Darlington Water and Sewer Project was initiated based on the finding of gaps between the current domestic/fire water and sewage system condition and future incremental requirements.

The project entails replacing the existing on-site water and sewer system by installing a separate domestic water system and a separate fire water system; redirecting the station sanitary sewage system from the Sewage Treatment Plant (STP) to the Region of Durham's sanitary sewage system; and decommissioning of the existing STP and Domestic Water Pumphouse (DWP).

The planning and execution of the Darlington Water and Sewer Project is broken up into 3 phases:

- Phase I - Holt Road Domestic and Fire Water Supply System (Complete)
- Phase II - Solina Road Domestic and Fire Water Supply System, and Darlington Sanitary Sewer System (In Progress)
- Phase III – Decommissioning and removal of existing DWP and Sewage Treatment Plant STP (In Progress)

**History of BCS releases and project cost estimates:**

The total project cost is now estimated at \$57,711k (including contingency), compared to \$45,704k (including contingency) in the previous Over Variance Approval.

\*Associated with OPG-STD-0076, Developing and Documenting Business Cases

## Type 3 Business Case Summary

Project #: 10-73802

Document #: NK38-BCS-72700-10002

Title: Darlington Water and Sewer Project

The project was fully released in May 2013 with an estimated cost of \$40,607k (with contingency). An Over Variance Approval was required in August 2013 (\$45,704k including \$3,525k contingency) due to significant cost increases which were attributed to the following:

- Cost and schedule delays related to the change in railway crossing construction methodology due to existing soil conditions discovered during tunnelling operations, and the subsequent risk for loss of ground and impact on the railway tracks.
- Additional costs for exploratory investigations and standby costs associated with the Revised Excavation Protocol. The enhanced protocol exceeds industry requirements and was put forth to ensure no unintentional contact with buried services.
- Additional costs and schedule delays resulting from the design and location change of the Refurbishment Project Office.
- Additional costs and schedule delays due to construction methodology changes for high voltage crossings.
- Additional contingency to address an updated evaluation of remaining risks.

Through the Over Variance Approval, the project requested additional funding to cover approved and anticipated change requests for Phase II execution. These change requests have since been realized and are significantly higher than anticipated which was not properly quantified in the risk assessment. Furthermore, additional change requests are forthcoming which were not identified at the time of preparing the Over Variance Approval Form. Phase III costs and schedule were assumed to be in line with the previous BCS and therefore no additional funding or schedule changes were requested through the Over Variance Approval. The proposal submissions for the Engineering, Procurement, Construction (EPC) contract were higher than the allocated budget and requested schedule milestones could not be achieved. This was identified as a risk in the previous Full-Execution BCS.

Increased cost and schedule variances related to the outstanding work remaining under the August 2013 Over Variance Approval requires a superseding BCS. The requirement for the additional funds are attributed to the following:

- Underestimating the value of change requests identified in the Over Variance Approval
- Additional change requests not identified or anticipated at the time of the Over Variance Approval
- Increased Contractor indirect costs (Project Management) due to schedule delays
- Underestimating the Engineering, Procurement, Construction (EPC) budget for Phase III

The cumulative effect of the issues identified above has delayed the Phase II final Available for Service (AFS) date to 30-Nov-2015, and the Phase III AFS date to 18-Jan-2016. The table below demonstrates the schedule variances between the previous Full-Execution BCS and the proposed dates:

Milestone Name/Deliverable Name	Previous BCS Approved Date	Proposed Date
Phase III Detailed Design Complete	23-Jun-2014	30-Jan-2015
Phase III Start of Decommissioning (T-0)	11-Dec-2014	27-Jul-2015
Phase II - RPO Water and Sewer System Available for Service	N/A	30-Nov-2015*
Phase III Available for Service	05-Jun-2015	18-Jan-2016
Project Closeout	24-Feb-2016	1-Sep-2016

*\*\*AFS cannot be completed until after completion of the RPO building AFS. TCD for the commissioning of the RPO Water and Sewer systems is 28-Nov-14.*

### History of scope and schedule changes:

The scope of work for the project has not changed. Several challenges have occurred during field execution which has led to significant cost increases and schedule delays. A summary of the major items is as follows:

#### Phase II – Solina Road Water and Sewer

- Standby labour and equipment costs, and schedule delays resulting from contact with undocumented and undetectable buried services.
- Additional labour and equipment costs due to the Revised Excavation Protocol, which was put forth to ensure no unintentional contact with buried services.
- Significant cost increase and schedule delays resulting from the design and location change for the Refurbishment Project Office (RPO), as specified by OPG.
- Additional labour and equipment costs for change in construction methodology for five (5) existing electrical transmission lines not properly identified on Contract Drawings.

\*Associated with OPG-STD-0076, Developing and Documenting Business Cases

# Type 3 Business Case Summary

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

- Additional costs for geotechnical analysis and construction methodology changes to mitigate adverse soil conditions
- Additional costs for construction strategy changes from Owner Only to Owner Constructor for tie-in and decommissioning work.
- Additional costs for scope not submitted within the Contractor's original bid.

## Phase III -- Decommissioning and Removal of STP and DWP

- Proposals received were higher than allocated budget for EPC contract.
- Schedule timelines for EPC could not be achieved.

The revised estimate to completion includes approximately 16% contingency allowance on the remaining scope of work for Phase II and III. Significant work amounting to roughly 80% (life to date) of the Phase II scope has been completed since the Full-Execution BCS and Over Variance Approval which has led to a number of risks being retired. The completion of the railway crossing eliminated the risk for damage to property outside of the Contractor's work limits, availability of materials, and equipment failure. Discovery work and underground utilities risk has been substantially reduced due to the amount of completed scope and implementation of the Revised Excavation Protocol.

All submissions from the Contractor have been challenged for validity and pricing resulting in some submissions being rejected and others being reduced through negotiations. Third party estimates are also utilized to challenged and validate the accuracy of the estimates provided.

## Key Assumptions and Risks:

Funding totalling \$4,875K has been allocated in the Base Project Cost due to the high certainty of realizing the following risks; Payment of all repair work related to sedimentation in pipeline, Fire Main pressure test failure and the Fire Main leak. Distribution of these funds will be released through the Purchase Order following the Contract Management Process if these risks are realized.




Project Cash Flows, NPV, and OAR Approval Amount									
k\$	LTD	2014	2015	2016	2017	2018	2019	Future	Total
Currently Released	35,822	5,508	3,629	744					45,703
Requested Now	-	10,029	1,348	631					12,008
Future Required	-								
<b>Total Project Cost</b>	<b>35,822</b>	<b>15,537</b>	<b>4,977</b>	<b>1,375</b>					<b>57,711</b>
Ongoing Costs	-			221	225	230	235	1,509	2,420
<b>Grand Total</b>	<b>35,822</b>	<b>15,537</b>	<b>4,977</b>	<b>1,596</b>	<b>225</b>	<b>230</b>	<b>235</b>	<b>1,509</b>	<b>60,131</b>
<b>Estimate Class:</b>	Class 3			<b>Estimate at Completion:</b>			\$54,697 k		
<b>NPV:</b>	\$(20,855) k			<b>OAR Approval Amount:</b>			\$60,131 k		
<b>Additional Information on Project Cash Flows (optional):</b>									
The incremental ongoing cost for the treatment of Darlington water and sewage and additional water supply is estimated at \$221K per year, for 10 years, with an escalation factor of 2% after 2016.									
The Cost estimate for the completion of Phase 2 is based on the existing ES MSA contract, plus approved, pending and anticipated change orders.									
The cost estimate provided for Phase III Decommissioning of the DWP and STP is based on the existing ES MSA contract.									
Decommissioning and removal cost (Phase III) has been estimated at \$4.7M.									
Estimate at Completion is based on our projected cost without contingency.									
Contingency: \$3,014k									

## Type 3 Business Case Summary

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

Approvals			
Project #:	10-73802	Document #:	NK38-BCS-72700-10002
Title:	Darlington Water and Sewer Project		
Phase:	Execution	Release:	Superseding
	Signature	Comments	Date
The recommended alternative, including the identified ongoing costs, if any, represents the best option to meet the validated business need.			
<b>Recommended by:</b> Bill Robinson Senior Vice President, Nuclear Projects Project Sponsor			2014.05.01
I concur with the business decision as documented in this BCS.			
<b>Finance Approval:</b> Robin Heard Senior Vice President & Chief Financial Officer (Acting)			2014-05-05
I confirm that this project, including the identified ongoing costs, if any, will address the business need, is of sufficient priority to proceed, and provides value for money.			
<b>Approved by:</b> Tom Mitchell President & CEO, per OAR 1.1			2014-05-06

## Type 3 Business Case Summary

Project #: 10-73802

Document #: NK38-BCS-72700-10002

Title: Darlington Water and Sewer Project

Final Security Classification of the BCS: Internal Use Only

### Business Case Summary

#### **Part A: Business Need**

In preparation for the continued operation of the Darlington Nuclear Generating Station (DNGS) post refurbishment, the Darlington Water and Sewer project was initiated based on the finding of gaps between the current domestic & fire water and sewage system condition and future incremental requirements.

##### Domestic & Fire Water Supply

The site domestic water system was installed during the construction of the station and was not intended to remain in service following construction. The design included a diesel booster pump located in the Domestic Water Pumphouse (DWP) and two 250,000 gallon water storage bladders to provide water supply for the booster pump. The pump is triggered by falling domestic water pressure, which while operating, increases the domestic water pressure to provide the additional water that is needed due to the operation of a fire sprinkler in the service buildings outside of the protected area.

A series of reported events (recorded in Station Condition Records (SCR) #s D-1998-00944, D-1998-0143, D-2001-06602, D-2003-08451, and D-2005-06206 resulting from the continued use of the DWP, temporary water storage bladders and diesel booster pump raised concerns about the site domestic water system. On several occasions, the fire pump has started unexpectedly due to mechanical problems or pressure transients which results in the water from the bags entering the active part of the domestic water system. Our station procedures require that the domestic water system be quarantined and flushed following operation of the diesel pump, which represents a significant disruption to normal station operation and a considerable cost to the corporation.

##### Sanitary Sewer Upgrades

###### **Sewage Treatment Capacity:**

The existing sewage system average flow rate and treatment capacity is not adequate to accommodate the future demand during Refurbishment and the continued operation of the station post refurbishment. New campus plan and refurbishment facilities being constructed during the next decade would also require additional sewage system capacity.

###### **Environmental Concerns:**

The STP was erected during the construction of the station as a municipal waste line did not exist in the vicinity.

The existing Sewage Treatment Plant (STP) exposes OPG to Ministry of Environment (MOE) violations and potential negative public perception due to MOE non-compliances. In 2007 alone, there were four MOE reportable events due to unmonitored release which were a result of equipment failures and lack of operator monitoring. Design changes to eliminate the possibility of unmonitored discharges have been considered, but are considered too complex and too expensive to implement.

Once the Sanitary Sewer Systems are re-directed to the municipality, the existing STP will be de-commissioned and removed. This will eliminate the above stated environmental concerns, as well as eliminate asset maintenance and operating costs.

#### **Part B: Preferred Alternative**

**Description of Preferred Alternative: Install new domestic and fire water mains and redirect the sanitary sewage system to the Municipality**

##### Domestic & Fire Water Supply

Installation of domestic water and fire water lines from the municipality of Oshawa at Osborne Road and a new fire water line from the municipality of Bowmanville on Holt Road just south of Highway 401. Install tie-in points in strategic locations for supply of water to various station facilities.

Bypass the domestic water supply to the existing pump house equipment to allow the existing bladders, fire pump and chlorination equipment to be removed from the water system which will reduce maintenance and operating costs, simplify the functionality of the system and improve the water quality, thus eliminating employee concerns.

Installation of water distribution lines and tie-in points to proposed Refurbishment and Campus Plan facilities.

##### Sanitary Sewer Upgrades

Installation of a sanitary sewer line from the station to the Courtyce Water Pollution Control Plant along with the construction of two new pumping stations. This would allow OPG to send sewage directly to the municipality and de-commission the existing

\*Associated with OPG-STD-0076, Developing and Documenting Business Cases

## Type 3 Business Case Summary

Project #: 10-73802

Document #: NK38-BCS-72700-10002

Title: Darlington Water and Sewer Project

deteriorating Sewage Treatment Plant.

Installation of sewer distribution lines and tie-in points to proposed Refurbishment and Campus Plan facilities.

The project boundaries for the domestic/fire water supply will be from the municipality tie-ins points to the station inlet flange in the existing Domestic Water Pumphouse. The project boundaries for the sanitary sewer system discharge will be from a new Lift Station at the west of the existing Project Office to the municipality tie-ins point. The systems conditions and the documentation outside these boundaries are not included in the scope of this project.

Deliverables:	Associated Milestones (if any):	Target Date:
Phase III - Detailed Design Complete	Design Complete	30-Jan-2015
Phase III - Completion of Work Plans		21-Apr-2015
Phase III - Start of Decommissioning	Start of Installation	27-Jul-2015
Phase II - RPO Water and Sewer System	Available for Service Completed	30-Nov-2015
Phase III - Decommissioning and Removal Complete	Available for Service Completed	18-Jan-2016
Phase II - Design Closeout	Design Closeout Completed	30-May-2016
Phase III - Design Closeout	Design Closeout Completed	18-Jul-2016
Project Closeout	Project Closeout Completed	01-Sep-2016

### Part C: Other Alternatives

Summarize all reasonable alternatives considered, including pros and cons, and associated risks. Other alternatives may include different means to meet the same business need, and a reduced or increased scope of work, etc.

#### Base Case: Do Nothing More

To do nothing more is not recommended because this alternative will not allow DNGS to meet the domestic/fire water and sewage treatment demand for refurbishment work and continued station operation post refurbishment. This alternative has not been estimated and is used as a basis to evaluate the incremental cost of other alternatives.

#### Alternative 2: Delay Work – Delay the decommissioning of DWP and STP

To delay the decommissioning of the DWP and STP is not recommended as the removal of these facilities will provide additional real estate for future Campus Plan facilities, eliminate the need for asset maintenance and operating costs and eliminate environmental concerns.

#### Alternative 3: Do Less - Remove the decommissioning of DWP and STP from scope

Similarly to Alternative 2, to remove the decommissioning of the DWP and STP from scope is not recommended as the removal of these facilities will provide additional real estate for future Campus Plan facilities, eliminate the need for asset maintenance and operating costs and eliminate environmental concerns.

### Part D: Project Cash Flows, NPV, and OAR Approval Amount

k\$	LTD	2014	2015	2016	2017	2018	2019	Future	Total
Currently Released	35,822	5,508	3,629	744					45,703
Requested Now	-	10,029	1,348	631					12,008
Future Required	-								
<b>Total Project Cost</b>	<b>35,822</b>	<b>15,537</b>	<b>4,977</b>	<b>1,375</b>					<b>57,711</b>
Ongoing Costs	-			221	225	230	235	1,509	2,420
<b>Grand Total</b>	<b>35,822</b>	<b>15,537</b>	<b>4,977</b>	<b>1,596</b>	<b>225</b>	<b>230</b>	<b>235</b>	<b>1,509</b>	<b>60,131</b>
<b>Estimate Class:</b>	Class 3			<b>Estimate at Completion:</b>			\$54,697 k		
<b>NPV:</b>	\$(20,855) k			<b>OAR Approval Amount:</b>			\$60,131 k		

#### Additional Information on Project Cash Flows (optional):

The incremental ongoing cost for the treatment of Darlington water and sewage and additional water supply is estimated at \$221K per year, for 10 years, with an escalation factor of 2% after 2016.

\*Associated with OPG-STD-0076, Developing and Documenting Business Cases



# Type 3 Business Case Summary

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

The Cost estimate for the completion of Phase 2 is based on the existing ES MSA contract, plus approved, pending and anticipated change orders.

The cost estimate provided for Phase III Decommissioning of the DWP and STP is based on the existing ES MSA contract. Decommissioning and removal cost (Phase III) has been estimated at \$4.7M.

Estimate at Completion is based on our projected cost without contingency.

Contingency: \$3,014k

## Part E: Financial Evaluation

k\$	Preferred Alternative	Base Case	Alternative 2	Alternative 3	Alternative 4
<b>Project Cost</b>	(57,711)	N/A			
<b>NPV</b>	(20,855)	N/A			
<b>Other (e.g., IRR)</b>					

### Summary of Financial Model Key Assumptions or Key Findings:

The Darlington Water and Sewer project is not a value enhancing project and therefore has a negative NPV. The financial model considers the following:

- Capital and OM&A Costs
- Operating/Ongoing costs associated with Municipal water and sewage treatment and additional water supply
- Cost savings from abandoning the operation of the DWP and STP, including material/consumables, rentals, and maintenance and operation cost.

Ongoing and savings costs were calculated until 2061 (Assumed end of Darlington Station life including safe storage activities).

## Part F: Qualitative Factors

The qualitative factors resulting from this project are:

- Eliminate employee concerns regarding the appeal of domestic water for staff consumption.
- Provide redundancy in supply of domestic and fire water to the station from the municipality.
- Reduce risk of MOE violations and non-compliances with continuing operation of the Sewage Treatment Plant.

## Part G: Risk Assessment

Risk Class	Description of Risk	Risk Management Strategy	Post-Mitigation	
			Probability	Impact
Cost	There is a risk that the Contractor comes into contact with underground utilities and services while performing excavation activities. Such incidents can lead to safety infractions and stand downs. Additional engineering may be required to address the situation and determine path forward. This would lead to additional engineering and execution costs as well as delays to the execution schedule	An excavation protocol is in place to determine the location of any existing underground utilities inside the limits of construction. OPEX indicates that even with the excavation protocol, the detection of some types of services may be difficult.	Medium	Medium
Scope	There is a risk that the excavation required for the West Pumping Station will undermine the future footings for the RPO building due to the size of the excavation footprint and the close proximity to the RPO footprint. The impact will be additional costs for engineering, geotechnical analysis and construction scope as well as potential schedule	Work with RPO project to determine the best alternative construction method if it is determined that the excavation footprint impacts the RPO footings	Low	Medium

\*Associated with OPG-STD-0076, Developing and Documenting Business Cases

## Type 3 Business Case Summary

Project #: 10-73802

Document #: NK38-BCS-72700-10002

Title: Darlington Water and Sewer Project

	delays for installation.			
Schedule	There is a risk that foreign material enters the pipelines if proper preventative measures are not made during installation, or foreign material entering due to joint/pipe failure. The cause of this would be related to human performance and workmanship issues. The impact can lead to significant delays to the execution schedule for flushing and sampling the lines for potability.	Contractor to apply proper FME covers to all pipes which are staged for installation.  Field oversight to ensure that the appropriate measures are taken to prevent foreign material from entering the system.	Low	Medium
Quality/ Performance	There is a risk that the pressure testing is not successful during the commissioning on the RPO domestic and fire water lines. The impact would be a delay in schedule and potential costs to rectify the problem in order to achieve a passing result.	OPG to provide Oversight during installation to ensure construction meets the design specifications and workmanship.  Quality control to be performed by the Contractor to ensure construction meets the design specifications and workmanship.	Low	Medium
Technical	There is a risk that designated substances such as asbestos, lead paint etc are discovered to be present in the facilities which are to be demolished. The impact will be additional costs required for the remediation of discovered substances.	Contractor to perform required sampling as per SOW.	Low	Medium
<b>Additional Risk Analysis:</b>				
Funding totalling \$4,875K has been allocated in the Base Project Cost due to the high certainty of realizing the following risks; Payment of all repair work related to sedimentation in pipeline, Fire Main pressure test failure and the Fire Main leak. Distribution of these funds will be released through the Purchase Order following the Contract Management Process if these risks are realized.				
Please refer to the Water and Sewer Risk Register – "Contingency Evaluation Template for Gate 2+ Submission" for additional risks.				

Part H: Post Implementation Review (PIR) Plan				
<input type="checkbox"/> It is determined appropriate that only a Project Closure Report (PCR) is needed as the PIR for this project due to its straight forward deliverables, which do not require any measures other than confirmation of completion or delivery.				
Type of PIR Report		Target In-Service or Completion Date		Target PIR Completion Date
Simplified PIR Report		2016-01-18		2016-12-15
Measurable Parameter	Current Baseline	Target Result	How will it be measured?	Who will measure it? (person/group)
Domestic Water Pressure	450kPa - 460kPa at the Domestic Water Pumphouse	Maintain adequate domestic water pressure: 450kPa - 460kPa at the new Pressure Reducing Valves located south of the existing Domestic Water Pumphouse	Pressure Reducing Valves set to 460kPa.	Station Engineering

## Type 3 Business Case Summary

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

Measurable Parameter	Current Baseline	Target Result	How will it be measured?	Who will measure it? (person/group)
Fire Water	Fire water supplied by Water Bladders and Diesel Fire Pump	Fire water supplied from the Municipality of Oshawa and Municipality of Bowmanville	New Lines in service/project AFS	Station Engineering
Sewage Treatment Plant	Sewage treated at on-site Sewage Treatment Plant	Sewage redirected and treated by the Municipality. Reduce risk of MOE violations due to operation of STP	Flow of Sanitary Sewer to the Municipality/Project AFS	Station Engineering
Sewage Treatment Plant	Operating	Decommissioned and removed	Flow of Sanitary Sewer to the Municipality/Project AFS	Station Engineering
Domestic Water Pumphouse	Operating	Decommissioned and removed	Pumphouse by-passed decommissioned and removed. Project AFS	Station Engineering
Water Bladders	Operating	Decommissioned and removed. Eliminate employee concerns regarding water quality	Bladders by-passed decommissioned and removed. Project AFS	Station Engineering

### Part I: Definitions and Acronyms

### Type 3 Business Case Summary

Project #: 10-73802

Document #: NK38-BCS-72700-10002

Title: Darlington Water and Sewer Project

#### Appendix A: Summary of Estimate (Numbers may not add up due to rounding.)

<b>Project Number:</b>	10-73802									
<b>Title:</b>	Darlington Water and Sewer Project									
k\$	LTD 2013	2014	2015	2016	2017	2018	2019	Future	Total	%
OPG Project Management	2,095	712	580	376					3,764	7
OPG Engineering (including Design)	214	198	146	129					688	1
OPG Procured Materials										
OPG Other	1,241	583	349	125					2,298	4
Design Contract(s)	1,343	250	7	33					1,633	3
Construction Contract(s)	29,907	9,938	92						39,937	73
EPC Contract(s)		1,282	2,902	523					4,707	9
Consultants										
Other Contracts/Costs										
Interest	1,022	433	216						1,671	3
<b>Subtotal</b>	<b>35,822</b>	<b>13,397</b>	<b>4,292</b>	<b>1,186</b>					<b>54,697</b>	
Contingency		2,139	685	189					3,014	6
<b>Total</b>	<b>35,822</b>	<b>15,537</b>	<b>4,977</b>	<b>1,375</b>					<b>57,711</b>	<b>100</b>

#### Notes

<b>Project Start Date</b>	2010-06-24	<b>Definition Cost Included</b> (includes contingency only if spent)	\$3,005 k
<b>Target In-Service (or AFS) Date</b>	2015-11-30	<b>Contingency Included in this Release</b>	\$3,014 k
<b>Target Completion Date</b>	2016-09-01	<b>Total-to-Date Contingency</b>	\$5,233 k
<b>Escalation Rate</b>	2%	<b>Total-to-Date Released</b> (excluding contingency)	\$42,179 k
<b>Interest Rate</b>	5%	<b>Total-to-Date Released</b> (including contingency)	\$45,704 k
<b>Removal Costs</b>	\$4,707 k included in EPC Contract for Phase III	<b>Estimate at Completion</b> (includes contingency only if spent)	\$54,697 k

<b>Prepared by:</b>	<b>Approved by:</b>
 Kyle Money Sr. Technical Engineer/Officer Darlington Projects Date: 25-Apr-2014	 Mike Nairne Section Manager Darlington Projects Date: 25-Apr-2014

**Type 3 Business Case Summary**

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

**Appendix B: Comparison of Total Project Estimates**

Phase	Release	Date	Total Project Estimate in k\$ or M\$ (by year including contingency)						Future	Total Project Estimate
			2010	2011	2012	2013	2014	2015		
Definition	Developmental	2010-07-22	265	3,590	11,542	9,980	8,380	6,243		40,000
Execution	Partial	2011-08-08	180	1,908	8,964	16,897	7,486	565		36,000
Execution	Full	2013-05-23	164	1,733	11,051	21,164	2,578	3,896	20	40,607
Execution	Over Variance	2013-08-08	164	1,733	11,051	26,261	2,578	3,896	20	45,703
Execution	Superseding	May 2014	164	1,733	11,051	22,873	15,537	4,977	1,375	57,711

**Project Variance Analysis**

k\$ or M\$	LTD	Total Project		Variance	Comments
		Last BCS	This BCS		
OPG Project Management	2,095	2,882	3,764	882	See Note 1 below
OPG Engineering (including Design)	214	674	688	14	See Note 2 below
OPG Procured Materials					
OPG Other	1,241	1,369	2,298	929	See Note 3 below
Design Contract(s)	1,343	1,510	1,633	123	See Note 4 below
Construction Contract(s)	29,907	32,077	39,937	7,860	See Note 5 below
EPC Contract(s)		2,700	4,707	2,007	See Note 6 below
Consultants					
Other Contracts/Costs					
Interest	1,022	967	1,671	704	See Note 7 below
<b>Subtotal</b>	<b>35,822</b>	<b>42,179</b>	<b>54,697</b>	<b>12,518</b>	
Contingency		3,524	3,014	(510)	
<b>Total</b>	<b>35,822</b>	<b>45,703</b>	<b>57,711</b>	<b>12,008</b>	

**Note 1: OPG Project Management**

The Available for Service milestone date for the Domestic Water / Fire Water system has been delayed by approximately 6 months, the Water and Sanitary Service installation for the RPO facility has been delayed over one (1) year, and Phase III Engineering is expected 6 months later than the previous BCS commitment. Due to the schedule extension for both Phase II and Phase III, OPG Project Management Team costs have increased for the period of 2014 to 2016.

Description:	RC	Cost Increase
Design Projects	1811	\$382k
Project Controls	2894	\$107k
Supply Chain	6469	\$11k
Core Team	N/A	\$95k
		<b>\$595k</b>

The burn rate for Project Management personnel was higher than anticipated resulting in a 2013 budget overspending of \$287k.

## Type 3 Business Case Summary

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

### Note 2: OPG Engineering

The burn rate for OPG Engineering has been lower than anticipated and therefore the project does not require a significant increase to account for the cumulative delay of 1 year on Phase II and 6 months for Phase III.

### Note 3: OPG Other

Due to the schedule extension for both Phase II and Phase III, estimated costs have increased for the period of 2014 to 2016.

Description:	RC	Cost Increase
Operations Manager	1610	\$53k
Operations	1619	\$67k
Drawing Office	2417	\$112k
Contract Mgmt Office	2898	<u>\$437k</u>
		<b>\$668k</b>

The burn rate for project oversight and support personnel such as CMO, FE, DO, and OPS was higher than anticipated resulting in a 2013 budget overspend of \$138k

### Note 4: Design Contracts

The delay of 1 year on Phase II scope has increased the costs required for Design Agency support during Installation and Commissioning. Furthermore, because the AFS for the RPO water and sewer service cannot be completed until the RPO AFS, the Design Agency support contract will also be extended to support the closeout of the design packages. The additional services provided on this project represent the ongoing support for the Water and Sanitary Project beyond the original scope and time frame which assumed that the bulk of the services to be provided to Sept 2013. The cost increase over and above the approved budget is as follows:

Description:	Cost Increase
Sept 2013 to May 2015	\$142k

### Note 5: Construction Contract(s)

The increases in construction costs related to the outstanding work remaining under the August 2013 Over Variance Approval are related to:

- Underestimating the value of change requests identified in the Over Variance Approval
- Additional change requests not identified or anticipated at the time of the Over Variance Approval
- Increased Contractor indirect costs (Project Management) due to schedule delays

These change requests and cost impacts are summarized below:

Category	Title	Description	Cost
Approved Contract Changes – Not Invoiced	Refurb Project Office (RPO) Design & Location Change Impact	Cost increase and schedule delays for the Refurbishment Water and Sanitary Services due to the changes in design and location of the RPO, as specified by OPG.	\$1,450k
Anticipated Contract Changes	Repair Work	Additional costs for repair work which was carried out by the Contractor to rectify issues with sediment in fire main and failed pressure testing of fire main. Standby labour and equipment costs are included.	\$4,875k
	Additional PMT	Additional costs for Contractor Project Management Team due to the delays in the schedule	\$925k
	Additional Paving	Additional costs over and above the original scope for paving Park Rd North and along Lakefront Rd. Increased scope was required due to the extent of damage caused to the existing roads during pipeline installation.	\$406k
	Various Others	Costs for attempted advancement of Water Main Installation Manhole Modifications Grade Drainage Issues at East Pumping Station Meter House Roof Frame	\$207k

**Type 3 Business Case Summary**

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

		Additional Costs for Decommissioning Existing Lift Station	
<i>Invoiced Changes</i>	Execution of Revised Excavation Protocol between Mar 13, 2013 to Oct 2, 2013	Additional labour and equipment costs due to the Revised Excavation Protocol which increased the requirements for excavation preparatory work including drawing reviews, scanning, hydro vac operations, walk downs and secondary verifications.	\$781k
	Construction Methodology Change for KV Crossings	Additional labour and equipment costs for change in construction methodology due to five (5) existing high voltage electrical transmission line crossings which were not properly identified on contract drawings. Directional drilling was required as an outage could not be accommodated due to the fact these lines supply the Main Security Building, Boiler House, and Information Center.	\$611k
	Standby Costs	Standby labour and equipment costs for an incident where an undocumented and undetectable buried service was contacted by excavation equipment and another where inadvertent ground movement occurred during excavation resulting in damage to a buried service conduit. An enhanced excavation protocol exceeding industry requirements was required to prevent future occurrences.	\$598k
	Waterfront Trail Sub-excavation	Additional costs for geotechnical analysis and construction methodology changes to mitigate adverse soil conditions identified as unstable and inadequate for supporting proposed pipelines along the Waterfront Trail.	\$101k
<b>Total Cost of Changes (Not Including Invoiced Changes)</b>			<b>\$7,862k</b>

**Note 6: EPC Contracts**

The Request for Proposal and subsequent proposal submissions for Phase III were not issued to the proponents prior to the August 2013 Over Variance request. At the time of preparing the Over Variance request, Phase III costs and schedule were assumed to be in line with the previous BCS and therefore no additional funding or schedule changes were requested. The increase in the Phase III EPC cost is due to the proposal submissions for the Engineering, Procurement and Construction (EPC) contract being higher than the allocated budget and requested schedule milestones could not be achieved. This was identified as a risk in the previous Full-Execution BCS.

**Note 7: Interest**

Schedule delays have pushed phase II scope into 2014 and 2015 resulting in an increase in capital cost and a \$700k increase in interest cost. This was not included in the August 2013 Over Variance Approval as it was anticipated that the completion of phase II was on track.

## Type 3 Business Case Summary

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

### Appendix C: Financial Evaluation Assumptions

Key assumptions used in the financial model of the Project are (complete relevant assumptions only):

#### Project Cost:

1. The project costs for the completion of Phase II are based on the existing ES MSA Procurement and Construction contract, including all approved, pending, and anticipated change requests.
2. The project costs for the completion of Phase III are based on the ES MSA Engineering, Procurement, and Construction contract.

#### Financial:

1. The ongoing cost for the treatment of Darlington water and sewage is estimated at \$221k per year until 2062 (assumed end of Darlington station life including safe storage activities).
2. Cost savings from abandoning the operation of the DWP and STP, including material/consumables, rentals, and maintenance and operation cost.

#### Project Life:

1. The life cycle analysis for this project forecasts costs until 2062. This assumes the need for water and sewer services until the end of Darlington station life including safe storage of the nuclear units.

#### Energy Production:

1. This project does not have any impact on the energy production of the Darlington units.

#### Operating Cost:

1. The operating and maintenance costs associated with the DWP and STP will no longer be applicable once Phase II and III are complete. This has been reflected in the NPV calculations.<sup>3</sup>



## Type 3 Business Case Summary

Document #: NK38-BCS-72700-10002

Project #: 10-73802

Title: Darlington Water and Sewer Project

### Appendix D: References

Project Charter D-PCH-72700-10002-R001 – Domestic Fire Water Replacement Project 38308  
Conceptual Design Report NK38-REP-72700-10021-R000 – Darlington Water and Sewer Project  
Developmental Release BCS, NK38-BCS-72700-10007-R000 – Darlington Water and Sewer Project  
Execution-Partial Release BCS, NK38-BCS-72700-10008-R000 – Darlington Water and Sewer Project  
Execution-Full Release BCS, NK38-BCS-72700-10010 – Darlington Water and Sewer Project

1 Current status

2 The Heavy Water Facility is forecast to be ready to receive the heavy water from Unit 2 in  
3 support of the refurbishment outage schedule. All 28 heavy water storage tanks have been  
4 installed in the Heavy Water Facility. Pipe and structural steel installation and preparation for  
5 erection of the building superstructure is in progress. The current in-service date for the  
6 Heavy Water Facility coincides with the current need date for the Unit 2 refurbishment<sup>3</sup>. Risk  
7 mitigation assessments are underway to mitigate any risk of delays and/or advancements of  
8 the need date for the Unit 2 refurbishment.

9  
10 2.4.5.2 Water and Sewer Project

11 Overview

12 The Water and Sewer Project was initiated to address gaps between the current condition of  
13 the water and sewer systems and future incremental requirements identified in preparation  
14 for the DRP and continued operation of Darlington. The project involves replacing the  
15 existing on-site water and sewer system by installing a separate domestic water system and  
16 a separate fire water system, redirecting the station sanitary sewage system from the on-site  
17 sewage treatment plant to the Region of Durham's sanitary sewage system, and  
18 decommissioning the existing Sewage Treatment Plant and Domestic Water Pumphouse.

19  
20 Planning and execution of the Water and Sewer Project was organized into three phases:

- 21 • Phase 1 - Holt Road Domestic and Fire Water Supply System;
- 22 • Phase 2 - Solina Road Domestic and Fire Water Supply System and Darlington  
23 Sanitary Sewer System; and
- 24 • Phase 3 - Decommissioning and Removal of Existing Darlington Domestic Water  
25 Pumphouse and Sewage Treatment Plant.

26  
27 Variance

28 The project was fully released in May 2013 based on a BCS that included a total estimated  
29 project cost of \$40.6M. The forecast in-service amount for the project is \$47.5M.

---

<sup>3</sup> The facility will be available to receive heavy water aligned with the Unit 2 need date, however final in-service is planned for May 2017 when the facility will benefit current operations.

1 If OPG and Nordion proceed with this opportunity, production of Cobalt-60 at Darlington  
2 would not begin until after the current test period. As a result of the incremental risks OPG  
3 faces in introducing Cobalt 60 production at Darlington, OPG will, at its next payment  
4 amounts application, propose a revenue sharing of the net revenues it earns from any  
5 Cobalt-60 produced at Darlington.

### 6 7 **3.1.2 Tritium Sales**

8 Tritium is a by-product of electricity generation using CANDU (Canadian Deuterium Uranium)  
9 technology. It is produced by the irradiation of heavy water. In order to stay within the  
10 specified limits, and to lower radiation exposure to workers and the environment, tritium is  
11 removed from the heavy water via the Darlington Tritium Removal Facility ("TRF").

12  
13 OPG has entered into short-term contracts to sell the tritium to government-approved and  
14 licensed organizations. Commercial use of tritium includes safety and security products like  
15 land-mine markers and emergency exit signs, tritium labeled chemicals for medical research  
16 and research into future power sources.

17  
18 Tritium sales have been relatively stable over time, with some variation due to competition,  
19 fluctuating demand and variations in the value of the Canadian dollar. Planned total revenues  
20 from isotope sales over the test period are shown in Ex. G2-1-1 Table 1. The direct costs and  
21 other support costs are described in Section 4 below.

## 22 23 **3.2. Heavy Water Sales and Processing**

24 Heavy water is a manufactured product required for CANDU reactor operations. Heavy water  
25 is required as a moderator for sustaining a nuclear reaction and as a heat transport medium  
26 in a CANDU nuclear reactor.

### 27 28 **3.2.1 Heavy Water Sales**

29 OPG seeks opportunities to sell surplus quantities of heavy water from its heavy water  
30 inventory. Surplus quantities are defined as those quantities of heavy water not required to  
31 meet OPG's current and future needs. OPG expects to have surplus heavy water available

for sale up to 2017 when OPG's inventory will be depleted. As determined by the OEB in EB-2010-0008, revenues (less costs) from heavy water sales are to be shared on a 50-50 basis between OPG and ratepayers. OPG proposes that this treatment continue unchanged during the test period.

### 3.2.2 Heavy Water Processing

Heavy water processing is primarily comprised of tritium removal (detritiation) at the TRF. The bulk of the heavy water processing revenue is earned from the provision of detritiation services to Bruce Power. Opportunities for providing detritiation services to others are limited because of storage and capacity restrictions at the TRF.

Provision of detritiation services is affected by a station's ability to ship water to the TRF and the availability of the TRF, which fluctuates according to its maintenance cycle. TRF outages follow a three year cycle, with the first year requiring a long outage (six months), the second year requiring a shorter one (three months) and the third year requiring no outage at all. As a result, revenues fluctuate from year to year.

On occasion, OPG is able to lease/loan small quantities of heavy water to third parties; revenues from these transactions are also recorded under "heavy water services". Planned total revenues for heavy water sales and processing over the test period are summarized in Ex. G2-1-1 Table 1. Cost of goods sold and other support costs are described in section 4 below.

### **3.3 Helium-3**

In EB-2013-0321, OPG included a forecast for \$4M of revenue in 2015 from the sale of Helium-3. A change in customer requirements resulted in no sales of Helium-3. OPG's test period forecast does not include revenue for sales of Helium-3.

### **3.4 Ancillary Services**

OPG's nuclear assets are able to supply the IESO with reactive support and voltage control. Reactive support service allows the IESO to maintain the reactive power levels required by

Numbers may not add due to rounding.

Filed: 2016-05-27  
 EB-2016-0152  
 Exhibit G2  
 Tab 1  
 Schedule 1  
 Table 1

Table 1  
 Other Revenues - Nuclear (\$M)

Line No.	Revenue Source	2013 Actual	2014 Actual	2015 Actual	2016 Budget	2017 Plan	2018 Plan	2019 Plan	2020 Plan	2021 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
	<b>NGD-Related Revenues:</b>									
1	Heavy Water Sales & Processing	28.2	21.5	24.9	18.0	25.4				
2	Isotope Sales (Cobalt 60 + Tritium)	7.0	12.7	13.5	12.6	12.6				
3	Inspection & Maintenance Services	0.0	0.4	0.0	0.0	0.0				
4	Helium-3 Sales	0.0	0.0	0.0	0.0	0.0				
5	<b>Total NGD-Related Revenues (lines 1 through 4)</b>	35.2	34.6	38.4	30.6	38.0	28.7	28.7	28.7	28.7
6	<b>NGD-Related Direct Costs</b>	5.9	5.9	6.7	8.3	8.1	8.6	7.9	8.5	7.8
7	<b>NGD-Related Contribution Margin (line 5 - line 6)</b>	29.3	28.7	31.6	22.3	29.9	20.1	20.8	20.2	21.0
8	<b>Ancillary Services</b>	1.7	2.4	1.5	1.8	1.8	1.8	1.9	1.9	2.0
9	<b>Other</b>	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	<b>Total (line 7 + line 8 + line 9)</b>	31.0	31.2	33.2	24.1	31.7	22.0	22.7	22.2	22.9

