ONTARIO ENERGY BOARD

EB-2016-0152

IN THE MATTER OF the *Ontario Energy Board Act*, 1998, S. O. 1998, c. 15, Schedule B;

AND IN THE MATTER OF an application by Ontario Power Generation (OPG) pursuant to section 78.1 of the *Ontario Energy Board Act*, 1998 for payment amounts for the period from January 1, 2017 to December 31, 2021.

ENVIRONMENTAL DEFENCE COMPENDIUM FOR PANEL 1

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Lawyers for Environmental Defence

Filed: 2016-10-26 EB-2016-0152 Exhibit L Tab 4.5 Schedule 7 ED-006 Page 1 of 1

ED Interrogatory #6

3 Issue Number: 4.5

- 4 **Issue:** Are the proposed test period in-service additions for the Darlington
- 5 Refurbishment Program appropriate?
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8 Interrogatory

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10 **Reference:**

Reference: "For the purpose of OPG's request for approval of in-service additions,
\$4,800.2M is forecast to come into service in 2020 for the Unit 2 refurbishment." Ex. D2, Tab
2, Schedule 1, Page 5

14

Please provide OPG's forecast of its cumulative capital expenditures and interest costs with respect to the Unit 2 refurbishment, at the end of each quarter, starting with the first quarter in 2017 and ending with the 4th quarter in 2020. Please include contingency amounts. Please base the quarterly estimates based on the \$4,800.2M high confidence budget. Presumably the cumulative capital expenditures for the 4th quarter of 2020 will equal approximately \$4,800.2 million, but if that is not the case please explain why not.

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<u>Response</u>

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The cumulative Unit 2 capital expenditures including contingency and interest costs based on the RQE high confidence schedule are shown below. The total adds up to \$4,800.2M, noted in Ex. D2-2-1, p. 5, at the end of 2020.

	LTD		20	17	2018	2019	2020	
M\$	2016 FCST	Q1	Q2	Q3	Q4	Annual	Annual	Annual
Capital including								
contingency	2,065	193	188	205	191	782	328	70
Interest	215	29	31	34	37	178	214	40
Total Capital Costs	2,280	221	220	239	228	959	542	110
Cumulative Total								
Capital Costs	2,280	2,502	2,722	2,961	3,189	4,148	4,690	4,800

28 29

29 Note: numbers may not add due to rounding.

30

As part of the RQE development, annual flows are available for the estimates from 2018 onwards.

Filed: 2016-11-21 EB-2016-0152 JT1.17 Attachment C Page 1 of 1

UNDERTAKING JT1.17 ATTACHMENT C

Undertaking

6 ED INTERROGATORY #6

This interrogatory requested the quarterly cumulative capital expenditures for 2017-2020. OPG provided the information for 2017 but not for 2018 to 2020. Please provide a complete response to this interrogatory including the quarterly figures for all years from 2017 to 2020. Please provide this as a revised and updated response so that all the information is clearly laid out in one place.

13 **Response**

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This Undertaking requests OPG to provide quarterly cost flows for 2018, 2019 and 2020 for the Unit 2 in-service amount of \$4.8B. OPG had provided quarterly cost flows for 2017 only and had noted in its response to Ex. L-4.3-7 ED-6 that only annual cost flows were produced at the time of the Release Quality Estimate (RQE) for 2018 onwards. OPG has approximated the quarterly flows for 2018, 2019 and 2020. Please note that these flows will be re-forecast on an ongoing basis as the Unit 2 refurbishment project progresses.

	LTD		20	17		2018					
\$M	2016 F/Cast at RQE	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Capital inc. Contingency	2,065	193	188	205	191	205	198	189	189		
Interest	215	29	31	34	37	40	43	46	49		
Total Capital Cost	2,280	221	220	239	228	245	241	235	238		
Cumulative Total Capital Cost	2,280	2,502	2,722	2,961	3,189	3,434	3,675	3,910	4,148		

23

¢М		2020				
ΦINI		Q1	Q2	Q3	Q4	Q1
Capital inc. Contingency		94	90	74	70	70
Interest		51	53	54	56	40
Total Capital Cost		145	143	128	126	110
Cumulative Total Capital Cost		4,293	4,436	4,564	4,690	4,800

24

25 <u>Notes to the Table:</u>

26 1. OPG has used the LTD 2016 forecast at RQE to match the RQE flows. The actual

27 expenditures to date in 2016 have been lower compared to the forecast at the time of RQE.

Filed: 2016-10-26 EB-2016-0152 Exhibit L Tab 4.3 Schedule 7 ED-009 Page 1 of 1

ED Interrogatory #9

3 Issue Number: 4.3

Issue: Are the proposed nuclear capital expenditures and/or financial commitments for the Darlington Refurbishment Program reasonable?

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8 Interrogatory

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10 Reference:

Reference: "OPG plans to issue status reports to the public for the duration of the Program."
Ex. D2, Tab 2, Schedule 1, Page 5

13

Is OPG planning to report its actual cumulative capital expenditures and interest costs with respect to the Unit 2 refurbishment in its quarterly financial reports? If "no", please explain why not.

- 17
- 18

19 **Response**

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OPG will continue to report the year-to-date and life-to-date total actual capital expenditures for the Darlington Refurbishment Program ("DRP"), inclusive of interest costs, in its publicly available quarterly and annual Management's Discussion and Analysis ("MD&A") documents. OPG will also be reporting in the MD&A its progress towards the planned in-service addition of \$4.8 billion associated with the scheduled return to service of refurbished Unit 2 in February 2020.



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VOLUME:	Technical Conference	

DATE: November 14, 2016

expenditures and interest costs with respect to unit 2
 refurbishment on a quarterly basis?

3 MR. ROSE: Yes, we will.

4 MR. ELSON: And that will be in the MD&A document?
5 MR. ROSE: Yes, it will be.

6 MR. ELSON: Thank you. <u>If we could turn to IR number</u> 7 6, in this interrogatory we asked for the budget for unit 2 8 broken down on a quarterly basis. And so will we be able 9 to compare the numbers in this chart with the quarterly

10 cumulative capital expenditure reporting that we just

11 discussed?

MR. SAAGI: The answer to that question is yes. MR. ELSON: Thank you. And the quarterly reporting, I take it that will happen a month or two after the end of the quarter in question?

16 MR. ROSE: It will happen in alignment with -- as I 17 said earlier this morning, in alignment with our financial 18 statements. So our financial statements for year-end December 31st are issued in March; our financial statements 19 20 for June 30th are issued in August, and it will be within 21 days after -- obviously the MD&A will go the same date as the financial statements, and our report will go shortly 2.2 23 after that, our public report with the additional information that's provided beyond what's in the MD&A. 24 25 MR. ELSON: And that is roughly around the one to two 26 month period.

27 MR. ROSE: That's correct, so June to August, correct.
28 MR. SAAGI: Sorry, I will have to correct something I

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1 had said. With reference to reporting the financial -- the 2 numbers in the quarterly financial statements, OPG's, with 3 the chart and the response under ED 6, they will not be 4 comparable. 5 These costs here are just for unit 2, including the definition phase. It does not include the early in-service б 7 projects, and those numbers that we would carry in the 8 financial statements would be all inclusive across all 9 units as well. I apologize. 10 MR. ELSON: No, thank you for that clarification and 11 that was just the kind of thing I was trying to get at. So let me unpack that a little bit. 12 13 The numbers in ED 6 do not include, which? They don't 14 include? 15 MR. SAAGI: So these numbers will be just unit 2 inservice amounts. So it does not include any of the 16 17 subsequent units, and it doesn't include any of the early 18 in-service projects such as the FNIP and the SIO. 19 MR. ELSON: So I think what I am trying to say is will 20 you provide something that -- just provide quarterly 21 figures just relating to unit 2? Yes, we will. 2.2 MR. SAAGI: MR. ELSON: And will that be part of what document? 23 24 MR. SAAGI: The vision currently is to include those 25 numbers as part of the semi-annual project status update. 26 MR. ELSON: So that wouldn't be quarterly; that would 27 be twice a year? I believe the reporting is every 28 MR. SAAGI: Correct.

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it's something that you don't have a full position on, I
 would appreciate a position on monthly and quarterly
 reporting of those figures.

MR. REINER: We will give it consideration. As I said, we hadn't thought about quarterly reporting. The public reporting is coordinated through our shareholder, and the current arrangement that we operate under is semiannual reporting, and it actually works through our shareholder.

10 So we would need to make a change to that process, and 11 it's not something I could commit to here.

MR. MILLAR: So I am hearing there is an undertaking,and it's JT1.18.

14 UNDERTAKING NO. JT1.18: TO PROVIDE THE OPG POSITION
 15 ON MONTHLY AND QUARTERLY REPORTING OF THOSE FIGURES
 16 MR. ELSON: That was JT1-point...

17 MR. MILLAR: 18.

18 MR. ELSON: Thank you. For the CPI and cost variance, 19 how is contingency treated?

20 MR. ROSE: When contingency is drawn down it is 21 allocated to the work package for which the cost basis CPI 2.2 is calculated on. So CPI -- normally speaking, CPI is 23 based on the work package, the original work package, plus 24 the cost of any changes. Cost variance is done different 25 levels, but we will ultimately be doing a cost variance on 26 the overall cost of the project, including contingency and 27 non-contingent items.

28

MR. ELSON: So the CPI would be one if you spend all

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1 of your contingency, no more, no less.

2	MR. ROSE: Depends on the basis for how we change
3	we process our changes. So if the change this is
4	getting a little bit technical, but try and hear me out for
5	a moment. If the change is due to a vendor not executing
6	per its approved plan with no change in scope or direction,
7	generally speaking we will not we will draw down
8	contingency but not change the original base line for which
9	we measure CPI.
10	So their CPI will be degraded at the work package
11	level because it costs them more money to do the work that
12	was originally planned. If we are making a strategic
13	change where we are directing the vendor to take on new
14	components or we are moving them on a schedule and it's an
15	agreed-to change, in certain cases we would adjust the base
16	line for which we are measuring CPI, so we are not
17	penalizing the vendor, so to speak, in CPI space for cases
18	like that.
19	MR. ELSON: Okay. Well, I guess there is an overall
20	CPI for the DRP; is that fair to say?
21	MR. ROSE: CPI is rolled up based it's measured at
22	the work-package level, at quite a detailed level, and we
23	roll it up to the multiple levels.
24	
27	MR. ELSON: Will you be providing reporting in your
25	MR. ELSON: Will you be providing reporting in your semi-annual reports at the work-package level for the CPI?
25 26	MR. ELSON: Will you be providing reporting in your semi-annual reports at the work-package level for the CPI? MR. ROSE: No. Only at the rolled-up level.
24 25 26 27	MR. ELSON: Will you be providing reporting in your semi-annual reports at the work-package level for the CPI? MR. ROSE: No. Only at the rolled-up level. MR. ELSON: Is there any reason you couldn't do that?

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that we would be providing data on. We would not provide
 it at that low level of detail.

3 MR. ELSON: Oh, I just mean for each work package.
4 MR. ROSE: Sorry, at the work-package level, bundle
5 level?

6 MR. ELSON: Yes, let's say -- I think the bundle level 7 is -- makes more sense.

8 MR. ROSE: So balance the plan R&FR --

9 MR. ELSON: Precisely.

10 [Witness panel confers.]

11 MR. ROSE: I am just looking for what we had said in 12 our IRs. I think right now we are not advocating to 13 provide it at the bundle level. We are advocating to 14 provide it at the all-in unit-2 level.

MR. ELSON: And I am just wondering if you know of any impediment to providing it at the work-bundle level.

MR. ROSE: There is no impediment. Obviously we are doing it internally. It gets back to the same conversation we recently had with the -- whether we would go monthly or -- you know, this is obviously more detail than we had planned to provide.

22 MR. ELSON: Your forecast at completion and variance 23 at completion, is that something you also report on 24 internally monthly?

25 MR. ROSE: Yes.

26 MR. ELSON: Perhaps you could add to the previous 27 undertaking to provide your position on also providing 28 those metrics on a monthly or quarterly basis and including

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UNDERTAKING JT1.18

<u>Undertaking</u>

5 TO PROVIDE THE OPG POSITION ON MONTHLY AND QUARTERLY REPORTING OF 6 THOSE FIGURES

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8 <u>Response</u> 9

10 The context for this undertaking is shown in the Technical Conference transcript of 11 November 14, 2016, p. 96, line 23 through to p. 100, line 13 and with reference to OPG's 12 responses to Ex. L-4.3-7 ED-006 and Ex. L-4.3-7 ED-009 with respect to Unit 2 costs and 13 public reporting on the Darlington Refurbishment Program (DRP) respectively.

14

15 OPG has considered the request and will issue public reporting on the status of the DRP and 16 specifically on Unit 2 safety, quality, cost performance and schedule performance on a 17 quarterly basis shortly after the issuance of its quarterly Management Discussion and 18 Analysis (MD&A) and external financial reports.

19

20 OPG will also issue frequent updates on the status of the project on OPG's website, with the 21 current plan being monthly.

22

In addition, as discussed in Ex. L-10.4-1 Staff-223, OPG proposes to report annually to the
 OEB on the DRP performance measures set out in Ex. D2-2-9, pp. 9-10, in conjunction with
 the reporting on the hydroelectric and nuclear performance measures set out in Ex. A1-3-2,

26 pp. 41-42.

Filed: 2016-10-11-01 EB-2016-0152 Exhibit L Tab 4.3 Schedule 7 ED-004 Page 1 of 3

ED Interrogatory #4

3 Issue Number: 4.3

Issue: Are the proposed nuclear capital expenditures and/or financial commitments for the Darlington Refurbishment Program reasonable?

- 5 the Darlington Refurbishment Program reasonable?
- 6 7

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8 <u>Interrogatory</u> 9

10 **Reference**:

11 Reference: Exhibit D2, tab 2, schedule 3, p. 14

13 Please provide the total cost of the DRP based on cost overrun scenarios of: a) 25%; b) 14 50%; c) d) 100%; e) 150%; f) 200%, and g) 250%. Please assume that the cost overrun percentages are applied equally to each of the program components (e.g. a 25% increase of 15 each work bundle cost, 25% increase of the safety improvement costs, 25% increase of the 16 17 facility & infrastructure project costs, and so on). Please apply the cost overruns both to the contractor costs (i.e. the work bundles) and the cost of the work to be undertaking by OPG 18 19 itself. Please assume that the cost overruns are in addition to the amounts set aside for 20 contingency (seeing as "contingency refers to amounts that are expected to be expended" 21 per Ex. D2, Tab 2, Schedule 7, p. 1)). Please also calculate and include the consequential 22 increases to interest and escalation.

23

Please provide a breakdown of each scenario in a chart similar to chart 4 on page 14 of Ex. D2-2-3 (pasted below). This will require adding rows for the other work bundles, the subcomponents of the other work bundles, the remainder of the work components, interest and escalation, and contingency to the chart. The chart will help confirm that all costs are included and how the overrun scenarios have been applied.

29

Chart 4 - Illustrative Scenarios of RFR Target Pricing (Contractor 10% Cost Overrun)

		% Contractor Cost Overrun = 10%							
#	Category (\$ Million)	Contract Costs (from table 3)	Contractor Cost	Cost Variance	Impact to Contractor	Impact to OPG	OPG Payment to Contractor		
1	Definition Phase Target Cost (Incl RWPB)	185	204	19	0	19	204		
2	Definition Phase Fixed Fee	74	81	7	7	0	74		
3	Definition Phase Fixed Fee Incentive/ Disincentive	0			0	0	0		
4	Execution Phase Target Cost	1,667	1,834	167	0	167	1,834		
5	Execution Phase Fixed Fee	492	541	49	49	0	492		
6	Execution Phase Fixed Fee Incentive/ Disincentive	0	0	0	18	(18)	(18)		
7	Mock-up Fixed Price	38	42	4	4	0	38		
8	Non-target Reimbursable Costs	6	7	1	0	1	7		
9	Tooling Fixed Price	375	413	38	38	0	375		
10	OSM with Fee(estimate)	579	637	58	0	58	637		
11	Goods with Fee(estimate)	48	53	5	0	5	53		
12	Total	3,464	3,810	346	116	230	3,694		

Witness Panel: Darlington Refurbishment Program

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1 <u>Response</u> 2

OPG has provided the results of pro-rating OPG's RQE estimate by: a) 25%; and, d) 100%.

- a) For the 25% cost overrun scenario, the total cost of the DRP mathematically evaluates to \$15.5B.
- 7 8

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b) For the 100% cost overrun scenario, the total cost of the DRP mathematically evaluates to \$23.5B.

9

10 The detailed cost breakdowns for the above two scenarios, in a similar format to Chart 4 in 11 Ex. D2-2-3 p. 14 are provided in Attachment 1. The additional scenarios cannot be provided 12 with reasonable effort given the modeling work required to develop the responses. 13 Development of these scenarios requires detailed assessment of the incentive mechanisms 14 in the contracts in order to assess costs borne by OPG versus costs which would be borne 15 by each contractor. Simplifying assumptions needed to be made to provide the two scenarios 16 in this response.

17

18 While OPG has responded to this interrogatory as requested, OPG does not believe that the 19 information provides a reasonable basis to assess the potential future costs that may be 20 expended by OPG in executing the Darlington Refurbishment Program (DRP).

21

OPG has learned significantly from the experiences of past large complex projects and has executed a robust planning process. Please see Ex. D2-2-4 regarding OPG's planning process, including the application of lessons learned. The Release Quality Estimate (RQE) produced in 2015 is a high confidence estimate with a high degree of certainty for each of the contractors' estimates, and with adequate contingency based on the class of estimate.

27

28 There will be risks associated with the execution of the project. OPG is the general contractor 29 and will play an active role in monitoring the work and ensuring that all risks are actively 30 managed. OPG would intervene and take appropriate actions to mitigate the costs and 31 schedule impacts long before the circumstances contemplated in this interrogatory 32 manifested. The contractors are responsible and have incentives to mitigate and recover 33 delays and cost overruns. There are also off-ramps in the contracts that allow OPG to 34 terminate contracts in situations where performance is not meeting expectation. OPG has full 35 transparency on the status of the overall DRP, in terms of safety, quality, schedule, and cost 36 performance, and would take corrective actions very early in the process, if required.

37

The target price contracts are structured in a way to incent OPG's contract partners to achieve (and beat) the target price and schedule, and contain disincentives for failure to meet these targets. If the contractor exceeds the target price, OPG will pay the direct costs, i.e. actual costs for trades and project management labour; however, the contractors would be unable to recover profit or overheads on the cost overruns, and receive a contract disincentive which would reduce their recovery of overheads.

44

In order to respond to this undertaking, OPG has adhered to the assumptions requested, butwhich OPG does not view as reasonable. Specifically:

Witness Panel: Darlington Refurbishment Program

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1		
2	i.	OPG was asked to assume all contingency is spent before applying the cost overrun
3		percentages. OPG does not believe that is appropriate. Contingency would be used
4		to offset risks and cost growth in executing the DRP and should first be reduced to
5		zero before the cost overrun percentages are applied;
6	ii.	OPG has artificially pro-rated all of its functional costs, including project management
7		associated with each major work bundle by the cost overrun percentage. OPG does
8		not believe that this is reasonable as the functional costs would be unlikely to grow at
9		the same proportion as the costs in a major work bundle; and
10	iii.	OPG has applied the cost overrun scenario to all costs, including costs that are
11		already expended, some of which has already been placed in service.
12		
13	OPG h	has not pro-rated contingency, as there is no basis for assuming that, should there be a
14	cost ov	verrun, there would also be a need to increase contingency in the estimate.
15		
16	To re-i	terate, OPG has provided the information as requested; however in OPG's view, none

16 To re-iterate, OPG has provided the information as requested; however in OPG's vie 17 of the scenarios are a reasonable representation of any likely outcome of the DRP.

Attachment to L-04.3-7 ED-004 (includes summary calculations for L-04.3-7 ED-003) Cost Overrun Scenarios

				ED-004					ED-003	ED-004				ED-003	
2015\$M (except for Inter	est an	d Escalation line item)		1.25			25% Cost Growt	1		2		<u> </u>	100% Cost Growt	h	
Major Category		Category/ Contract Type	RQE Base Case	Base cost + % Increase	Cost Variance	Impact to Contractor	Impact to OPG	Actual Cost to OPG	Proportion of Increase paid by OPG	Base cost + % Increase	Cost Variance	Impact to Contractor	Impact to OPG	Actual Cos to OPG	Proportion of Increase paid by OPG
	OPG	Project Management & Oversight Costs	167	209	42		42	209		334	167		167	334	$\overline{)}$
		Definition Phase Target Price (Incl RWPB)	185	231	46	0	46	231		370	185	0	185	370	
		Definition Phase Fixed Fee	74	92	18	18	0	74		147	74	74	0	74	
	ts	Definition Phase Fixed Fee Incentive/ Disincentive				9	(9)	(9)				35	(35)	(35)	
	Sos	Execution Phase Target Price	1,667	2,084	417	0	417	2,084		3,334	1,667	0	1,667	3,334	
Retube Feeder	- O	Execution Phase Fixed Fee	492	615	123	123	0	492		984	492	492	0	492	
Replacement	cto	Execution Phase Fixed Fee Incentive/ Disincentive				68	(68)	(68)				236	(236)	(236)	
	Jtra	Mock-up Fixed Price	38	48	10	10	0	38		76	38	38	0	38	
	õ	Non-target Reimbursable Costs	0	8	2	0	2	275		12	0	0	6	12	
	-	OSM with Eco(ostimato)	570	409	94	94	145	3/5		1 159	570	3/5	570	3/3	
		Goods with Fee(estimate)	48	60	143	0	143	60		1,130	48	0	48	1,130	
	OPG	Project Management & Oversight Costs	40	61	12	0	12	61		98	40	•	40	98	
		Defueling - Eng Services (Fixed/Firm Price)	16	20	4	4	0	16		32	16	16		16	
Fuel Handling/ Defueling	ont	Defueling - Eng Services (Misc Reimbursable)	7	9	2	0	2	9		14	7	0	7	14	
	ΰŭ	Fuel Handling (ESMSA - see assumptions)	126	157	31					252	126				
	OPG	Project Management & Oversight Costs	13	16	3		3	16		26	13		13	26	
			-												
Steam Generators	Contractor Costs								67%						68%
	OPG	Project Management & Oversight Costs	41	51	10		10	51		82	41		41	82	
		ESES - Fixed/ Firm Cost - Equipment Supply	257	321	64	64	0	257		513	257	257	0	257	
		ESES - Larget Cost Installation & Static Commissioning	38	48	10	0	10	48		//	38	0	38	(10)	
		ESES - Target Cost - Incentive/ Disincentive	14	17	2	5	(5)	(5)			14	19	(19)	(19)	
		ESES - Target Cost - Dynamic Commissioning	14	17	3	2	(2)	(2)		20	14	7	(7)	(7)	
	sts	ESES - Reimbursable (no markup)	28	35	7	0	(2)	35		56	28	0	28	56	1
	ပိ	EPC - Definition Phase Target Cost	21	27	5	0	5	27		43	21	0	21	43	
Turbine Generator	tor	EPC - Definition Phase Fixed Fee	13	16	3	3	0	13		26	13	13	0	13	
	rac	EPC - Definition Phase Fixed Fee Incentive/ Disincentive	-			1	(1)	(1)			-	4	(4)	(4)	
	ont	EPC - Execution Phase Target Cost	161	202	40	0	40	202		323	161	0	161	323	1
	Õ	EPC - Execution Phase Fixed Fee	53	66	13	13	0	53		106	53	53	0	53]
		EPC - Execution Phase Fixed Fee Incentive/ Disincentive				7	(7)	(7)				25	(25)	(25)	
		EPC - Dynamic Commissioning Work (Trades)	2	3	1	0	1	3		5	2	0	2	5	
		EPC - Goods	5	6	1	0	1	6		10	5	0	5	10	
		EPC - Reimbursable Costs with no-markup	11	14	3	0	3	14		23	11	0	11	23	
Balance of Plant	OPG	Froject Management & Oversight Costs	183	229	46		46	229		366	183		183	366	
	Contr	actor Costs (mainly ESMSA)	784	980	196					1,507	764				
F&IP & SIO Projects	Facili	ty and Infrastructure Projects (mainly ESMSA)	640	800	160					1,280	640				
	Droio	et Execution	203	402	80		80	402		643	203		300	643	
	Contr	act Management	52	402	13		13	402		104	52		52	104	
	Engin	neering	283	353	71		71	353		565	283		283	565	
	Mana	aged Systems Oversight	41	51	10		10	51		82	41		41	82	
	Plann	ning & Controls	136	170	34		34	170		272	136		136	272	1
Functions	Nucle	ear Safety	83	104	21		21	104	100%	166	83		83	166	1000/
Functions	Progr	ram Fees & Other Support	341	426	85		85	426	100%	682	341		341	682	100%
	Supp	ly Chain	86	107	21		21	107		171	86		86	171	
	Work	Control	80	99	20		20	99		159	80		80	159	
	Opera	ations and Maintenance	805	1,006	201		201	1,006		1,610	805		805	1,610	
	Early	Release 3	102	127	25		25	127		203	102		102	203	
Contingonov	⊏ariy	NEIEd3E 4	1 700	4 700	2		2	4 700	N1/A	15	/		/	15	N1/A
Sub Total			10 420	1,706	2 191	ACE	1 716	1,706	IN/A	1,706	9 724	1 920	6 004	1,706	IN/A
Interest & Escalation (CM)			2 271	2,011	2,101	400	1,710	2 966	100%	13,134	1 092	1,020	1 092	17,320	100%
Total			12 800	15 477	2 677	465	2 212	15.004	82%	23 507	10 707	1 820	8 887	21 674	92%
			12,000	10,477	2,017		2,212	10,004		20,001	10,101	1,020	0,001	21,074	00//

Notes and assumptions:

1. Based on OPG's Release Quality Estimate (RQE). All numbers except interest and escalation are in 2015\$.

2. These are illustrative examples; assumption is that all contractor incentives/disincentives and performance fee mechanisms are applicable.

3. Cost overrun factors are also applied to life-to-date actual costs (costs with no risk of overruns).

4. Cost overrun factors are applied to all costs excluding contingency.

5. RFR contract costs are as per Ex. D2-2-3, pp. 10 and 11.

6. De-fuelling contract is mainly fixed/ firm price. Reimbursable fixed fees are capped for certain costs; however, this was not incorporated into the calculations due to lack of materiality.

8. For work bundles that are mainly under ESMSA contracts (e.g. BOP, FH, FIP, SIO), it was assumed, for simplicity, that the increase is caused by the contractor; therefore, the cost to OPG is of the cost overrun (performance fee of withheld).

9. For simplicity, for all of the target cost contracts, a 20% cost disincentive was applied above any neutral band specified in the contracts. The actual percentage is calculated using a graded approach.

10. For simplicity, interest and escalation were pro-rated.

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UNDERTAKING JT1.20

<u>Undertaking</u>

TO RECALCULATE IR 3 AND 4 BASED ONLY ON FUTURE COSTS, OR WHY OPG WILL NOT ANSWER.

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<u>Response</u>

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Please note that OPG's response to this undertaking should be read in conjunction with the responses to interrogatory L-4.3-7 ED-003 and interrogatory L-4.3-7 ED-004 with particular emphasis on the qualifications OPG has noted in preparing these scenario assessments.

15 This response is an update to interrogatories L-04.3-7 ED-003 and L-04.3-7 ED-004 to apply 16 the cost overruns scenarios to only the future costs. These calculations assume all costs to 17 date are on plan with respect to the cost incentive and disincentive calculations.

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As in interrogatories L-04.3-7 ED-003 and L-04.3-7 ED-004, OPG has provided the results of
 pro-rating OPG's RQE estimate on costs remaining to be spent by: a) 25%; and, d) 100%.

22 Update to Interrogatory L-04.3-7 ED-003 23

The calculated percentage of these cost overruns that would be passed on to OPG when the cost overrun percentages are applied only to the future costs are: a) 85% of the 25% cost overrun; d) 86% of the 100% cost overrun.

- 28 <u>Update to Interrogatory L-04.3-7 ED-004</u> 29
- 30 When the cost overrun percentages are applied only to the future costs: 31
- a) For the 25% cost overrun scenario, the total cost of the DRP mathematically evaluates to
 \$14.7B
- b) For the 100% cost overrun scenario, the total cost of the DRP mathematically evaluates
 to \$20.6B.
- The detailed cost breakdowns for the above two scenarios, in a similar format to Chart 4 in
 Ex. D2-2-3 p. 14 are provided in Attachment 1 (Attachment 1 contains confidential
 information).

Attachment to L-04.3-7 ED-004 (includes summary calculations for L-04.3-7 ED-003) - Amended for JT1.20 **Cost Overrun Scenarios**

					ED-004/ JT-1.20 ED-003					ED-004/ JT-1.20					ED-003
2015\$M (except for Interest and Escalation line item)				1.25	1.25 25% Cost Growth				2	2 100% Cost Growth					
Major Category		Category/ Contract Type	RQE Base Costs (1)	Base cost + % Increase on Remaining Costs	Cost Variance on Remaining Costs	Impact to Contractor	Impact to OPG	Actual Cost to OPG	Proportion of Increase paid by OPG	Base cost + % Increase on Remaining Costs	Cost Variance on Remaining Costs	Impact to Contractor	Impact to OPG	Actual Cos to OPG	Proportion of Increase paid by OPG
	OPG	Project Management & Oversight Costs	167	191	24		24	191		265	98		98	265	
		Definition Phase Target Price (Incl RWPB)	185	186	1	0	1	186		190	5	0	5	190	
		Definition Phase Fixed Fee	74	76	2	2	0	74		83	10	10	0	74	
	sts	Execution Phase Target Price	1 667	2 076	409	0	409	2 076		3 301	1 634	0	(0.400)	3 301	
Retube Feeder	ő	Execution Phase Fixed Fee	492	613	121	121		492		974	482	482	0	492	
Replacement	ctor	Execution Phase Fixed Fee Incentive/ Disincentive		0		67	(67)	(67)		0		236	(236)	(236)	
	itra	Mock-up Fixed Price	38	38	0	0	0	38		38	0	0	0	38	
	Š	Non-target Reimbursable Costs	6	8	2	0	2	8		12	6	0	6	12	
	_	OSM with Fee(estimate)	579	704	2 125	2	125	704		1 078	o 499	<u> </u>	499	1 078	
		Goods with Fee(estimate)	48	60	12	0	120	60		96	48	0	48	96	
	OPG	Project Management & Oversight Costs	49	58	9		9	58		85	36		36	85	
Fuel Handling/ Defueling	nt. Sts	Defueling - Eng Services (Fixed/Firm Price)	16	16	0	0	0	16		16	0	0	0	16	
,	S S	Defueling - Eng Services (Misc Reimbursable)	7	7	0	0	0	7		7	0	0	0	7	
	OPG	Project Management & Oversight Costs	120	155	29		2	15		242	9		q	22	
Steam Generators	Contractor Costs								73%						74%
	OPG	Project Management & Oversight Costs	41	48	7	40	7	48		69	28	474	28	69	
		ESES - FIXed/ FITM Cost - Equipment Supply	257	299	43	43	10	<u> </u>		428	38	171	38	257	
		ESES - Target Cost - Incentive/ Disincentive		0	10	5	(5)	(5)		0	00	19	(19)	(19)	
		ESES - Target Cost - Dynamic Commissioning	14	17	3	0	3	17	1	28	14	0	14	28	
	Costs	ESES - Target Cost - Incentive/ Disincentive		0		2	(2)	(2)		0		7	(7)	(7)	
		ESES - Reimbursable (no markup)	28	33	5	0	5	33		47	19	0	19	47	
Turbine Generator	or (EPC - Definition Phase Fixed Fee	21	13	0	0	0	13		23	2 1	0	2	23	
	ract	EPC - Definition Phase Fixed Fee Incentive/ Disincentive	10	0	Ŭ	0	0	0		0		0	(0)	(0)	
	ont	EPC - Execution Phase Target Cost	161	201	39	0	39	201		318	157	0	157	318	
	O	EPC - Execution Phase Fixed Fee	53	66	13	13	0	53		104	52	52	0	53	
		EPC - Execution Phase Fixed Fee Incentive/ Disincentive	2	0	1	/	(7)	(/)		0	2	25	(25)	(25)	
		EPC - Goods	5	6	1	0	1	6		10	5	0	5	10	1
		EPC - Reimbursable Costs with no-markup	11	14	3	0	3	14		23	11	0	11	23	
Balance of Plant	OPG	Project Management & Oversight Costs	183	213	30		30	213		304	122		122	304	
	Contr	actor Costs (mainly ESMSA)	784	933	149					1,382	598				
F&IP & SIO Projects	Facili	y and Intrastructure Projects (mainly ESMSA)	640 205	239	15					239	59 34				
	Proie	ct Execution	322	395	73		73	395		614	293		293	614	
	Contr	act Management	52	62	10		10	62		92	40		40	92	
	Engin	eering	283	330	47		47	330		471	188		188	471	
	Mana	ged Systems Oversight			66	25		25	66						
	Nucle	ar Safety	83	94	14		14	94		191	54 44		54 44	191	
Functions	Progr	am Fees & Other Support	341	413	72		72	413	100%	630	290		290	630	100%
	Supp	ly Chain	86	103	17		17	103		155	69		69	155	
	Work	Control	80	96	16		16	96		144	65		65	144	
	Operations and Maintenance Early Release 3 Early Release 4		805	984	1/9		1/9	984		1,523	/18		/18	1,523	
			7	7	0		0	7		7	0		0	7	
Contingency			1,706	1,706	0		0	1,706	N/A	1,706	0		0	1,706	N/A
Sub Total			10,429	11,987	1,557	288	1,269	11,699		16,556	6,127	1,114	5,013	15,442	
Interest & Escalation (\$M)			2,371	2,799	429		429	2,799	100%	4,057	1,686		1,686	4,057	100%
Total			12,800	14,786	1,986	288	1,698	14,49	85%	20,613	7,813	1,114	6,699	19,490	86%

Notes and assumptions:

1. Based on OPG's Release Quality Estimate (RQE). All numbers except interest and escalation are in 2015\$.

2. These are illustrative examples; assumption is that all contractor incentives/disincentives and performance fee mechanisms are applicable.

3. Cost overrun factors are modelled based on remaining to go costs only.

4. Cost overrun factors are not applied to contingency.

5. RFR contract costs are as per Ex. D2-2-3, pp. 10 and 11.

5. RFR contract costs are as per Ex. D2-23, pp. 10 and 11. 6. De-fuelling contract is mainly fixed/ firm price. Reimbursable fixed fees are capped for certain costs; however, this was not incorporated into the calculations due to lack of materiality. 7. Steam Generator contract includes 8. For work bundles that are mainly under ESMSA contracts (e.g. BOP, FH, FIP, SIO), it was assumed, for simplicity, that the increase is caused by the contractor; therefore, the cost to OPG is for the cost overrun (performance fee of withheld). 9. For simplicity, for all of the larger target cost contracts, a 20% cost disincentive was applied above any neutral band specified in the contracts. The actual percentage is calculated using a graded approach.

10. For simplicity, interest and escalation were pro-rated.

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CONTINGENCY

3 **1.0 OVERVIEW**

4 Risk management is a systematic approach for proactively identifying, analyzing, managing 5 and responding to project risks. OPG has implemented a comprehensive and robust risk 6 management system for the Darlington Refurbishment Program "(DRP"), a key product of 7 which is the contingency that is included in the Release Quality Estimate ("RQE"). 8 Contingency is an important tool for managing uncertainty and risk throughout the life of a 9 project. The process that OPG has used to develop the DRP contingency is set out in this 10 Ex. D2-2-7. The process that OPG will use to manage contingency during the Execution 11 Phase is described in Ex. D2-2-9.

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13 2.0 CONTINGENCY

14 Determining the amount of contingency for a particular project or program is integral to the 15 estimating, scheduling and risk management processes.

16

Importantly, <u>contingency refers to amounts that are *expected* to be expended because there are risk items and uncertainties that will occur and cannot be entirely mitigated or avoided. Contingency is included as a component of a project estimate just like any other component of a project. It is not an extra amount that will not be spent if the project goes as planned, nor is it a tool to compensate for an underdeveloped project plan. It is a necessary, legitimate and thoughtfully developed part of the estimated project cost based on residual (postmitigated) risk and uncertainty.</u>

24

Association for the Advancement of Cost Engineering ("AACE"), a leading authority in the area of cost engineering, management and estimation, defines "contingency" as an amount that is added to an estimate to allow for items, conditions or events, for which the state, occurrence or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs. In addition, the AACE definition states that "contingency is generally