Board Staff Interrogatory #196

Interrogatory

Reference:
Exhibit F2 / Tab 1 / Schedule 1 / pp. 16-17
Exhibit F2 / Tab 1 / Schedule 1 / Attachment 2 / p. 6
Exhibit F2 / Tab 1 / Schedule 1 / Attachment 3 / p. 10

Preamble:

OPG provided annual operational and financial targets for Pickering and Darlington in Charts 3 and 4 at Exhibit F2 / Tab 1 / Schedule 1 / pp. 16-17.

The ScottMadden Evaluation of 2019 OPG Nuclear Benchmarking states that OPG has informed ScottMadden that during the 2020 business planning cycle, OPG plans to use three-year rolling average targets and normalized three-year rolling average targets for value for money metrics. The change is intended to better align with the metrics themselves, which are calculated as three-year rolling averages, and to reduce year-to-year volatility associated with refurbishment operations. OPG will also continue to set one-year targets.

Question(s):

a) Please further explain the statement in Note 4 at Exhibit F2 / Tab 1 / Schedule 1 / pp. 16-17 that the value for money targets are indicative and will be updated for final cost allocations reflected in the application.

b) Please advise whether the 2020-2026 targets provided in Charts 3 and 4 at Exhibit F2 / Tab 1 / Schedule 1 / pp. 16-17 are three-year rolling average targets or annual targets.

c) Please provide the same information as provided in Charts 3 and 4 at Exhibit F2 / Tab 1 / Schedule 1 / pp. 16-17 for the period 2013-2020. Please include both the actuals and targets for each year of the 2013-2020 period. Please specify the basis of the information provided in response (i.e. annual actuals and annual targets or rolling average actuals and rolling average targets, or some other basis).

Response

a) Consistent with past practice, the 2020-2026 Value for Money targets in Chart 3 and Chart 4 at Ex. F2-1-1, pp. 16-17 are based on support cost allocations

determined as part of the previous year's business planning process. While the cost allocations based on the approved 2020-2026 Business Plan were subsequently finalized in accordance with OPG's cost allocation methodology (Ex. F3-1-4), the metrics included in the pre-filed evidence did not reflect this update, as noted. The update to the metrics was anticipated in OPG's 2020-2026 Business Plan document, which indicated that the Value for Money targets were "indicative and will be updated once cost allocations and assumptions are finalized" (Ex. A2-2-1, Attachment 1, p. 50, footnote 4). Chart 3 and Chart 4 in response to part c) below provide the updated 2021-2026 Value for Money targets, which do not materially differ from the initial metrics.

b) The 2020-2026 Value for Money targets provided in Charts 3 and 4 of Ex. F2-1-1, pp. 16-17 are annual targets. Prior to finalizing those targets, OPG considered setting the targets based on three-year rolling averages and communicated this to ScottMadden. OPG ultimately decided not to change the Value for Money targets to three-year rolling averages for business planning to maintain consistency with prior years' Value for Money targets and OPG's operational targets.

c) Chart 1 and Chart 2 below show 2013-2020 annual targets and annual actual results for Pickering and Darlington, respectively.

For completeness, OPG is also providing Chart 3 below, which shows 2021-2025 annual operational targets (Ex. F2-1-1, p. 16) and 2021-2025 annual financial targets for Pickering and Chart 4, which shows 2021-2026 annual operational targets (Ex. F2-1-1, p. 17) and 2021-2026 annual financial targets for Darlington. The financial targets in Chart 3 and Chart 4 below have been updated as described in OPG's response to part a) above.

The basis of the information provided in Charts 1 to 4 is annual with the exception of the Nuclear Performance Index ("NPI"), consistent with the NPI methodology that uses rolling averages.

Chart 1: Pickering Annual Actuals and Annual Targets 2013-2020

Benchmarking Indicators	Pickering Annual Actuals and Targets															
	2013		2014		2015		2016		2017		2018		2019		2020	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target
Safety																
Total Recordable Injury Frequency(#/200k hours worked) (1)	0.37	0.89	0.22	0.89	0.44	0.69	0.49	0.24	0.06	0.24	0.16	0.22	0.11	0.20	0.19	0.20
Industrial Safety Accident Rate (#/200k hours worked)	0.00	0.15	0.10	0.15	0.04	0.15	0.03	0.10	0.07	0.10	0.04	0.10	0.00	0.10	0.00	0.10
Collective Radiation Exposure (person-rem per unit)	69.93	101.95	94.55	100.95	100.90	124.40	93.56	111.50	74.37	126.90	88.94	110.30	51.70	92.3	107.41	121.7
Airborne Tritium Emissions (Curies) per Unit	1,915	2,350	2,390	1,900	2,409	2,410	3,067	2,333	3,103	2,917	2,772	2,666	2,517	2,500	2,918	2,333
Fuel Reliability (microcuries per gram)	0.000254	0.0005	0.001870	0.0005	0.000419	0.0005	0.000261	0.0005	0.000615	0.000500	0.000834	0.000500	0.000186	0.0005	0.000137	0.0005
Reactor Trip Rate (# per 7,000 hours)	0.63	0.5	0.36	0.50	0.19	0.50	0.44	0.50	0.22	0.50	0.60	0.50	0.00	0.50	0.00	0.5
Auxiliary Feedwater System Unavailability (#)	0.0167	0.02	0.023	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.014	0.02	0.0002	0.02	0.0118	0.02
Emergency AC Power Unavailability (#)	0.0000	0.025	0.000	0.025	0.009	0.025	0.0001	0.025	0.000	0.025	0.000	0.025	0.0008	0.025	0.000	0.025
High Pressure Safety Injection Unavailability (#)	0.0000	0.02	0.0000	0.02	0.0000	0.02	0.0000	0.02	0.0000	0.02	0.0000	0.02	0.00022	0.02	0.0000	0.02
Reliability																
Rolling Average WANO NPI (Index)(2)	67.5	66.0	64.3	72.0	68.5	66.5	76.3	72.3	76.7	69.7	74.9	75.5	82.5	74.3	82.5	77.6
Forced Loss Rate (%)	9.73	8.09	10.72	7.76	2.89	5.50	4.08	5.00	5.18	5.00	5.31	3.50	1.60	3.50	2.65	3.50
Unit Capability Factor (%)	73.70	79.20	75.28	79.90	79.35	79.85	75.24	77.63	80.00	71.50	79.09	74.60	87.55	80.56	76.25	76.0
Chemistry Performance Indicator (Index)	1.04	1.06	1.05	1.05	1.06	1.04	1.02	1.03	1.02	1.03	1.01	1.02	1.03	1.03	1.06	1.02
On-line Deficient Mtce Backlog (work orders/unit)	215	207	276	197	251	196	350	196	383	196	279	153	114	133	88	115
On-line Deficient Critical Mtce Backlog (work orders/unit)	--	--	--	--	--	--	--	--	41	71	9	15	5	9	1	7
On-Line Corrective Mtce Backlog (work orders/unit)	124	104	160	85	125	78	116	55	25	28	17	20	9	12	3	10
On-Line Corrective Critical Mtce Backlog (work orders/unit)	--	--	--	--	--	--	--	--	0	10	0	0	1	0	0	0
Value for Money																
Normalized Total Generating Cost per MWh ($/MWh)**(3)	--	--	--	--	46.81	--	52.72	--	48.47	--	46.83	--	39.78	--	47.94	50.37
Total Generating Cost per MWh ($/MWh)**	69.62	65.99	67.63	66.08	63.91	63.62	71.75	71.79	66.29	78.83	65.44	73.17	56.17	64.89	67.87	70.57
Normalized Total Generating Cost per Unit (M$ per Unit)**(3)	--	--	--	--	178.31	--	189.74	--	186.18	--	175.42	--	167.34	--	177.15	183.79
Total Generating Cost per Unit (M$ per Unit)**	227.93	--	226.35	--	226.02	--	238.68	--	236.56	250.47	227.29	243.03	220.97	232.93	232.32	238.30
Normalized Non-Fuel Operating Cost per MWh ($/MWh) **(3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Non-Fuel Operating Cost per MWh ($/MWh)**	58.54	55.83	57.18	55.71	53.95	53.58	60.45	60.10	56.49	68.04	56.96	64.75	48.70	56.67	59.97	63.02
Fuel Cost per MWh ($/MWh)	5.81	6.04	4.50	6.02	5.68	5.69	5.93	5.78	4.36	5.85	4.33	5.59	4.00	4.12	3.89	4.02
Normalized Capital Cost per MW DER (k$/MW) ***(3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capital Cost per MW DER (k$/MW) ***	33.53	28.05	38.62	29.98	29.39	29.98	34.65	39.70	37.65	30.40	27.88	26.22	26.46	28.55	26.59	23.10
Human Performance																
Human Performance Error Rate (# per 200k ISAR hours) (4)	0.21	0.10	0.18	0.08	0.11	0.12	0.06	0.06	0.12	0.06	0.14	0.06	0.02	0.08	0.02	0.06

** TGC/MWh and Non-Fuel Operating Cost per MWh exclude OPEB, Pension and Corporate Asset Service Fees to align with the industry standard.

*** Design Electrical Rating (DER)

Note 1: In 2018, Total Recordable Injury Frequency replaced All Injury Rate. Data prior to 2018 are All Injury Rate figures.
Note 2: Indicates a 2-Year Rolling Average for Pickering and a 3-Year Rolling Average for Darlington.
Note 3: Normalization methodologies are applied as described in Ex. F2-1-1 section 3.2.1
Note 4: In 2017, the 18-month Human Performance Error Rate transitioned from 10k to 200k hours. 2013-2016 figures have been restated from 10k to 200k ISAR and contractor hours.

Chart 2: Darlington Annual Actuals and Annual Targets 2013-2020

Benchmarking Indicators	Darlington – Annual Actuals and Targets															
	2013		2014		2015		2016		2017		2018		2019		2020	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target
Safety																
Total Recordable Injury Frequency(#/200k hours worked) (1)	0.21	0.89	0.31	0.89	0.22	0.69	0.23	0.24	0.40	0.24	0.32	0.22	0.00	0.20	0.25	0.20
Industrial Safety Accident Rate (#/200k hours worked)	0.08	0.15	0.05	0.15	0.09	0.15	0.04	0.10	0.04	0.10	0.08	0.10	0.00	0.10	0.00	0.10
Collective Radiation Exposure (person-rem per unit)	110.74	96.73	54.45	56	73.72	73.8	82.7	65	93.56	111.9	71.13	79.8	83.14	80	29.97	30.63
Airborne Tritium Emissions (Curies) per Unit	1,067	1,000	1,276	1,000	1,313	1,200	846	1,014	875	900	982	800	1,213	900	879	970
Fuel Reliability (microcuries per gram)	0.00225	0.0005	0.000156	0.0005	0.000109	0.0005	0.000147	0.00050	0.000146	0.00050	0.000139	0.00050	0.000216	0.0005	0.003504	0.0005
Reactor Trip Rate (# per 7,000 hours)	0	0.5	0	0.5	0.25	0.5	0.23	0.5	0.29	0.5	0	0.5	0	0.5	0	0.5
Auxiliary Feedwater System Unavailability (#)	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02
Emergency AC Power Unavailability (#)	0	0.025	0	0.025	0	0.025	0	0.025	0	0.025	0.0078	0.025	0	0.025	0	0.025
High Pressure Safety Injection Unavailability (#)	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02
Reliability																
Rolling Average WANO NPI (Index)(2)	90.8	97.7	92.1	97.9	83.7	88.8	87.8	87.3	82	83.1	90.7	91.3	88.9	92.1	93.6	93.7
Forced Loss Rate (%)	4.84	1.50	1.50	1.25	4.86	1.00	2.34	1.00	1.72	1.00	1.13	1.00	4.80	1.00	1.54	2.85
Unit Capability Factor (%)	82.92	88.80	92.09	93.50	76.87	82.35	89.49	91.10	85.17	85.10	88.57	86.00	87.44	89.00	93.05	91.06
Chemistry Performance Indicator (Index)	1.00	1.01	1.00	1.01	1.00	1.01	1.00	1.01	1.03	1.01	1.06	1.01	1.00	1.10	1.01	1.02
On-line Deficient Mtce Backlog (work orders/unit)	184	200	176	190	174	180	170	175	119	159	124	134	110	115	96	101
On-line Deficient Critical Mtce Backlog (work orders/unit)	--	--	--	--	--	--	--	--	15	40	9	29	3	6	1	2
On-Line Corrective Mtce Backlog (work orders/unit)	32	50	20	29	24	25	14	20	13	15	6	7	4	4	2	2
On-Line Corrective Critical Mtce Backlog (work orders/unit)	--	--	--	--	--	--	--	--	1	2	0	2	0	0	0	0
Value for Money																
Normalized Total Generating Cost per MWh ($/MWh)**(3)	--	--	--	--	40.21	--	35.06	--	39.01	49.75	39.60	51.66	37.90	53.61	32.23	39.05
Total Generating Cost per MWh ($/MWh)**	42.31	40.25	39.63	36.21	52.31	49.18	46.11	48.09	67.91	67.56	67.00	70.26	66.12	65.24	54.30	62.16
Normalized Total Generating Cost per Unit (M$ per Unit)**(3)	--	--	--	--	245.35	--	234.16	--	265.55	333.11	281.10	347.34	264.72	356.60	241.83	274.78
Total Generating Cost per Unit (M$ per Unit)**	264.99	--	277.31	--	304.81	--	295.34	--	437.53	429.32	451.16	451.54	437.74	433.95	389.17	416.40
Normalized Non-Fuel Operating Cost per MWh ($/MWh) **(3)	--	--	--	--	--	--	--	--	39.97	35.42	37.18	35.13	36.48	36.77	31.33	34.52
Non-Fuel Operating Cost per MWh ($/MWh)**	33.61	31.76	28.33	27.21	38.59	35.46	33.01	33.84	49.62	49.76	46.56	49.01	45.19	45.30	36.91	40.51
Fuel Cost per MWh ($/MWh)	5.21	5.39	5.05	5.36	5.31	5.22	5.60	5.41	4.52	5.84	4.43	5.92	4.20	4.51	4.22	4.74
Normalized Capital Cost per MW DER (k$/MW) ***(3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	71.91	N/A	100.00	N/A	97.42	N/A	82.96	109.68
Capital Cost per MW DER (k$/MW) ***	24.88	23.76	49.86	29.48	55.82	59.84	54.72	65.54	101.04	64.90	122.76	91.11	126.22	87.65	107.55	129.03
Human Performance																
Human Performance Error Rate (# per 200k ISAR hours) (4)	0.134	0.08	0.124	0.08	0.062	0.08	0.075	0.060	0.074	0.04	0.051	0.06	0.036	0.04	0.020	0.033

** TGC/MWh and Non-Fuel Operating Cost per MWh exclude OPEB, Pension and Corporate Asset Service Fees to align with the industry standard.

*** Design Electrical Rating (DER)

Note 1: In 2018, Total Recordable Injury Frequency replaced All Injury Rate. Data prior to 2018 are All Injury Rate figures.
Note 2: Indicates a 2-Year Rolling Average for Pickering and a 3-Year Rolling Average for Darlington.
Note 3: Normalization methodologies are applied as described in Ex. F2-1-1 section 3.2.1
Note 4: In 2017, the 18-month Human Performance Error Rate transitioned from 10k to 200k hours. 2013-2016 figures have been restated from 10k to 200k ISAR and contractor hours.

Chart 3: 2021-2025 Annual Operational Targets and Updated Annual Financial Targets for Pickering

Benchmarking Indicators	WANO Max NPI	Best Quartile	Median Quartile	Pickering Annual Targets				
				2021	2022	2023	2024	2025
Safety								
Total Recordable Injury Frequency(#/200k hours worked)		0.81	N/A	0.13	0.1	0.09	0.09	0.08
Industrial Safety Accident Rate (#/200k hours worked)	0.20	0.00	0.01	0.10	0.10	0.10	0.10	0.10
Collective Radiation Exposure (person-rem per unit)	80.00	38.54	70.32	94.5	101	99.5	72.7	19.5
Airborne Tritium Emissions (Curies) per Unit		982	2,772	2,250	2,200	2,200	2,070	2,000
Fuel Reliability (microcuries per gram)	0.000500	0.000001	0.000007	0.0005	0.0005	0.0005	0.0005	0.0005
Reactor Trip Rate (# per 7,000 hours)	0.50	0.00	0.00	0.5	0.5	0.5	0.5	0.5
Auxiliary Feedwater System Unavailability (#)	0.02	0.0000	0.0000	0.02	0.02	0.02	0.02	0.02
Emergency AC Power Unavailability (#)	0.025	0.0008	0.0016	0.025	0.025	0.025	0.025	0.025
High Pressure Safety Injection Unavailability (#)	0.02	0.00000	0.00000	0.02	0.02	0.02	0.02	0.02
Reliability								
Rolling Average WANO NPI (Index)(1)		92.7	87.6	74.7	76.9	75.7	80.3	85.6
Forced Loss Rate (%)	1.00	1.08	2.43	3.50	3.50	3.50	3.50	3.50
Unit Capability Factor (%)	92.0	87.06	86.14	80.0	74.1	79.4	83.3	93.2
Chemistry Performance Indicator (Index)	1.01	1.00	1.00	1.01	1.03	1.01	1.01	1.00
On-line Deficient Mtce Backlog (work orders/unit)		30	39	57	52	46	39	39
On-line Deficient Critical Mtce Backlog (work orders/unit)		0	0	0	0	0	0	0
On-Line Corrective Mtce Backlog (work orders/unit)		2	3	2	2	2	2	2
On-Line Corrective Critical Mtce Backlog (work orders/unit)		0	0	0	0	0	0	0
Value for Money								
Normalized Total Generating Cost per MWh ($/MWh)**(2)		30.83	36.12	45.31	47.49	42.12	37.62	23.48
Total Generating Cost per MWh ($/MWh)**		34.63	41.85	64.50	68.72	61.76	57.02	46.61
Normalized Total Generating Cost per Unit (M$ per Unit)**(2)		239.49	290.39	173.85	169.43	160.43	144.39	69.39
Total Generating Cost per Unit (M$ per Unit)**		275.21	310.29	229.93	226.44	218.38	203.31	129.29
Non-Fuel Operating Cost per MWh ($/MWh)**		20.84	24.65	57.18	62.09	55.77	51.06	40.96
Fuel Cost per MWh ($/MWh)		7.03	7.69	3.83	3.90	4.01	4.17	4.52
Capital Cost per MW DER (k$/MW) ***		38.82	53.64	24.10	17.45	13.54	12.33	6.07
Human Performance								
Human Performance Error Rate (# per 200k ISAR hours)		0.0000	0.0530	0.066	0.066	0.04	0.04	0.04

** TGC/MWh and Non-Fuel Operating Cost per MWh exclude OPEB, Pension and Corporate Asset Service Fees to align with the industry standard.

*** Design Electrical Rating (DER)

Note 1: Indicates a 2-Year Rolling Average for Pickering and a 3-Year Rolling Average for Darlington.
Note 2: Normalization methodologies are applied as described in Ex. F2-1-1 section 3.2.1

Chart 4: 2021-2026 Annual Operational Targets and Updated Annual Financial Targets for Darlington

Benchmarking Indicators	WANO Max NPI	Best Quartile	Median Quartile		Darlington – Annual Targets					
					2021	2022	2023	2024	2025	2026
Safety										
Total Recordable Injury Frequency(#/200k hours worked)		0.81	N/A		0.17	0.10	0.09	0.09	0.08	0.08
Industrial Safety Accident Rate (#/200k hours worked)	0.20	0.00	0.01		0.10	0.10	0.10	0.10	0.10	0.10
Collective Radiation Exposure (person-rem per unit)	80.00	38.54	70.32		126.2	21.1	73.9	40	78.2	31.8
Airborne Tritium Emissions (Curies) per Unit		982	2,772		970	970	970	970	970	970
Fuel Reliability (microcuries per gram)	0.000500	0.000001	0.000007		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Reactor Trip Rate (# per 7,000 hours)	0.50	0.00	0.00		0.5	0.5	0.5	0.5	0.5	0.5
Auxiliary Feedwater System Unavailability (#)	0.02	0.0000	0.0000		0.02	0.02	0.02	0.02	0.02	0.02
Emergency AC Power Unavailability (#)	0.025	0.0008	0.0016		0.025	0.025	0.025	0.025	0.025	0.025
High Pressure Safety Injection Unavailability (#)	0.02	0.00000	0.00000		0.02	0.02	0.02	0.02	0.02	0.02
Reliability										
Rolling Average WANO NPI (Index)(1)		92.7	87.6		84.3	93.1	77.54	86.9	84.75	85
Forced Loss Rate (%)	1.00	1.08	2.43		3.79	2.12	1.20	5.99	6.42	4.27
Unit Capability Factor (%)	92.0	87.06	86.14		76.0	85.8	78.1	81.8	68.2	89.4
Chemistry Performance Indicator (Index)	1.01	1.00	1.00		1.01	1.01	1.01	1.01	1.01	1.01
On-line Deficient Mtce Backlog (work orders/unit)		30	39		90	75	65	60	41	30
On-line Deficient Critical Mtce Backlog (work orders/unit)		0	0		0	0	0	0	0	0
On-Line Corrective Mtce Backlog (work orders/unit)		2	3		2	2	2	2	2	2
On-Line Corrective Critical Mtce Backlog (work orders/unit)		0	0		0	0	0	0	0	0
Value for Money										
Normalized Total Generating Cost per MWh ($/MWh)**(2)		30.83	36.12		58.15	45.83	60.24	42.92	59.81	40.75
Total Generating Cost per MWh ($/MWh)**		34.63	41.85		94.47	105.67	153.08	115.22	109.04	66.11
Normalized Total Generating Cost per Unit (M$ per Unit)**(2)		239.49	290.39		348.94	313.25	377.55	280.05	323.34	287.13
Total Generating Cost per Unit (M$ per Unit)**		275.21	310.29		532.35	667.78	861.14	688.64	545.31	443.25
Normalized Non-Fuel Operating Cost per MWh ($/MWh) **(2)		20.84	24.65		55.93	47.51	71.30	52.78	63.53	41.92
Non-Fuel Operating Cost per MWh ($/MWh)**		20.84	24.65		66.89	70.02	109.38	80.61	79.78	49.11
Fuel Cost per MWh ($/MWh)		7.03	7.69		4.08	4.10	4.35	5.16	5.11	4.89
Normalized Capital Cost per MW DER (k$/MW) ***(2)		38.82	53.64		119.86	139.75	140.56	170.48	102.52	77.14
Capital Cost per MW DER (k$/MW) ***		38.82	53.64		150.87	227.16	252.11	276.82	135.48	90.86
Human Performance										
Human Performance Error Rate (# per 200k ISAR hours)		0.0000	0.0530		0.039	0.039	0.019	0.019	0.019	0.019

** TGC/MWh and Non-Fuel Operating Cost per MWh exclude OPEB, Pension and Corporate Asset Service Fees to align with the industry standard.

*** Design Electrical Rating (DER)

Note 1: Indicates a 2-Year Rolling Average for Pickering and a 3-Year Rolling Average for Darlington.
Note 2: Normalization methodologies are applied as described in section 3.2.1 and summarized in Chart 1