

EB-2007-0905

Energy Probe Cross-examination

Document Brief

**OPG Panel #5: Nuclear Production Forecast and
Outage OM&A**

May 29, 2008

COMPARISON OF PRODUCTION FORECAST – NUCLEAR

1.0 PURPOSE

This evidence presents period-over-period comparisons of Nuclear production forecasts.

2.0 OVERVIEW

Nuclear's production data from 2005 budget to 2009 plan can be found in Ex. E2-T1-S2 Table 1.

OPG seeks through its extensive outage planning process to establish accurate and reliable production forecasts, while maintaining challenging targets. However, there are many unanticipated factors that can contribute to variances between actual and forecast production. In particular, *forced extensions of planned outages* can occur because inspections during an outage can lead to unanticipated requirements for additional work to be completed on *critical path* before the reactor can be restarted, either for safety, regulatory, or economic reasons.

The number of planned outage days per station reflects the work activity needed to enable completion of routine maintenance, inspections and project work, which can only be performed while the units are shut-down. The force loss rate ("FLR") reflects the forecast of the number of unplanned outage days per station, to accommodate any unforeseen events that result in unit shutdowns and forced derates. OPG's objective is to operate its nuclear generating stations in compliance with all applicable regulations and requisite licences and approvals in a safe, efficient, and cost effective manner. OPG will, in accordance with its Nuclear Safety Policy, conservatively implement unit shutdowns in all circumstances, when in OPG's assessment the safe operation of the station could be at risk.

OPG Nuclear's actual outage schedule (e.g., planned and forced) for 2005 and 2006 are set out in Appendix A and Appendix B, respectively. Appendix C sets out descriptions and related details of each outage in 2005, 2006 and 2007. Appendix C also includes a discussion of OPG's ongoing initiatives to minimize the reoccurrence of specific outage causal factors such as failures in the primary heat transport system and liquid zone controls. In addition, a discussion of the broad initiatives that have been undertaken by OPG (e.g., investment in plant material

Energy Probe Interrogatory #29

Ref: Ex. E2-T1-S1

Issue Number: 4.1

Issue: Is the methodology used by OPG to generate the proposed hydroelectric and nuclear business production forecasts appropriate?

Interrogatory

a) What has been the actual historic average annual rate of Forced Production Losses (FLR) for OPG's nuclear generating units, over the years?

(i) Please present the results both including and excluding reactors that are on long-term shutdown or prematurely shut down.

(ii) Please present the results disaggregated for each reactor, for each year of operation.

(iii) Please present the average for all units in their first year of operation, all units in their second year of operation, and so on, and please include all 20 OPG units.

b) Is it OPG's position that the historical record is significantly different than the forecast rate? If so, please explain.

c) Is it OPG's position that the historical record shows a significant trend with unit age? If so, does OPG's forecast reflect the continuation of that trend? Please explain.

Response

a) OPG declines to provide historical information prior to 2005 for the reasons given in L-12-6. Please refer to L-6-31 for actual FLR rates for OPG's nuclear generating units for 2005 - 2007.

b) With reference to actual versus budgeted FLR for 2005 – 2007, as set out at Ex. E2-T1-S2, Tables 2a and 2b, the FLR in 2005 and 2006 for OPG Nuclear was better or approximately on plan.

For 2007 the actual FLR was 11.7 percent versus a budget FLR of 5.4 percent. The two major one-time extraordinary events that have had significant generation impacts at Pickering but which are not expected to recur (Ex. E2-T1-S2, page 4) accounted for 7.2 percent of the FLR. Without these events, the FLR would have been 5.1 percent (i.e., under budget).

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1 c) OPG's FLR over the period 2005 - 2007 shows a positive trend at Pickering A and
2 Pickering B when the two major, non-recurring exceptions are excluded. See response
3 to L-1-32. These major non recurring events are not age related. While OPG recognizes
4 that aging plants will have more 'material degradation issues' which can lead to an
5 increase in the FLR, OPG is addressing that risk as part of its investments and work
6 programs aimed at improving the material condition of the units as set out in Ex. E2-T1-
7 S1, page 16.
8

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The following table provides Forced Loss Rate and Unit Capability Factor information for the period 2003 to 2007. Where available, data has been

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L-6-31
Attachment 1

	2005		2006		2007	
	Actual	Forecast	Actual	Forecast	Actual	Forecast
Unit Capability Factor						
Pickering 1	92.94	84.00	77.55	81.23	38.96	72.20
Pickering 2	-		-		-	
Pickering 3	-		-		-	
Pickering 4	66.67	69.22	66.51	75.90	43.71	92.00
Pickering 1-4	69.91	76.61	72.03	78.57	41.34	82.10
Pickering 5	53.73	54.83	90.09	93.00	58.06	78.50
Pickering 6	64.32	56.65	86.20	93.00	71.47	77.70
Pickering 7	97.95	91.00	59.25	75.02	82.42	93.80
Pickering 8	94.95	91.00	65.32	67.10	87.85	93.80
Pickering 5-8	77.74	73.37	75.21	82.02	74.95	85.96
Darlington 1	97.10	94.40	85.20	83.40	98.19	95.90
Darlington 2	79.78	79.90	99.42	95.90	83.38	77.80
Darlington 3	99.15	95.40	73.13	81.80	94.76	95.90
Darlington 4	86.50	88.14	97.11	95.90	81.48	78.90
Darlington 1-4	90.63	89.46	88.71	89.23	89.45	87.14
OPGN	84.39	82.48	81.94	85.31	77.49	86.22
Forced Loss Rate						
Pickering 1	7.06	16.00	19.09	12.00	50.77	8.00
Pickering 2	-		-		-	
Pickering 3	-		-		-	
Pickering 4	33.33	16.00	14.79	12.00	48.95	8.00
Pickering 1-4	30.09	16.00	17.16	12.00	49.82	8.00
Pickering 5	9.57	9.00	9.91	7.00	21.16	6.20
Pickering 6	3.07	9.00	4.22	7.00	8.13	6.20
Pickering 7	2.05	9.00	10.09	7.00	9.62	6.20
Pickering 8	5.05	9.00	3.05	7.00	12.15	6.20
Pickering 5-8	4.55	9.00	6.93	7.00	12.50	6.20
Darlington 1	2.90	4.60	1.82	4.10	1.71	4.10
Darlington 2	0.96	4.60	0.58	4.10	0.01	4.10
Darlington 3	0.83	4.60	8.52	4.10	0.02	4.10
Darlington 4	0.33	4.60	2.89	4.10	2.86	4.10
Darlington 1-4	1.31	4.60	3.24	4.10	1.14	4.10
OPGN	5.35	7.89	6.44	6.20	11.67	5.36

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Numbers may not add due to rounding.

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Exhibit E2
Tab 1
Schedule 2
Table 2b

Table 2b
Comparison of Production Forecast - Nuclear

Line No.	Prescribed Facility	2007 Budget	(c)-(a) Change	2007 Actual	(e)-(c) Change	2008 Plan	(g)-(e) Change	2009 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Darlington NGS							
1	TWh	26.8	0.4	27.2	1.4	28.6	(2.1)	26.6
2	PO Days	131.0	3.3	134.3	(59.2)	75.1	100.3	175.4
3	FEPO Days	0.0	2.7	2.7	(2.7)	0.0	0.0	0.0
4	FLR (%)	4.1	(3.0)	1.1	1.1	2.24	(0.2)	2.0
5	FLR Days Equivalent	54.5	(29.9)	24.6	6.5	31.1	(5.4)	25.7
	Pickering A NGS							
6	TWh	7.5	(3.9)	3.6	3.5	7.1	0.2	7.3
7	PO Days	66.2	(1.1)	65.1	1.9	67.0	3.0	70.0
8	FEPO Days	0.0	60.2	60.2	(60.2)	0.0	0.0	0.0
9	FLR (%)	8.0	41.8	49.8	(36.8)	13.0	(3.0)	10.0
10	FLR Days Equivalent	53.1	246.5	299.6	(213.2)	86.4	(20.4)	66.0
	Pickering B NGS							
11	TWh	15.6	(2.2)	13.4	2.3	15.7	0.3	16.0
12	PO Days	121.0	10.8	131.8	(19.8)	112.0	(14.0)	98.0
13	FEPO Days	0.0	68.3	68.3	(68.3)	0.0	0.0	0.0
14	FLR (%)	6.2	6.3	12.5	(6.3)	6.2	(1.2)	5.0
15	FLR Days Equivalent	83.0	76.9	159.9	(76.1)	83.8	(15.7)	68.1
	Totals							
16	PO Days	318.2	13.0	331.2	(77.1)	254.1	89.3	343.4
17	FEPO Days	0.0	131.2	131.2	(131.2)	0.0	0.0	0.0
18	FLR (%)	5.4	6.3	11.7	(6.6)	5.1	(0.9)	4.2
19	FLR Days Equivalent	190.6	293.5	484.1	(282.7)	201.4	(41.6)	159.8
20	Total TWh	49.9	(5.7)	44.2	7.2	51.4	(1.5)	49.9

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Energy Probe Interrogatory #32

Ref: Ex. E

Issue Number: 4.1

Issue: Is the methodology used by OPG to generate the proposed hydroelectric and nuclear business production forecasts appropriate?

Interrogatory

Based on information provided by OPG, an independent government-appointed task force predicted that the two refurbished reactors at Pickering-A would achieve Capacity Factors of 85%.

What was OPG's predicted probability of Pickering-A achieving actual Capacity Factors as low as those it has really attained since refurbishment? If that number is not available, please provide all available confidence data attached to those forecasts, including (but not limited to) 95% Confidence Intervals, Standard Deviations, etc.

Response

The average capacity factor ("ACF") range assumed for Pickering A Unit 1 in the OPG Review Committee report (2004) was 75 percent to 90 percent. At that time, OPG assumed that there was a 10 percent probability that ACF would be below 75 percent and a 5 percent probability that ACF would be above 90 percent.

The assumed ACF when the return to service decision was made back in 1999 on Pickering 4 was 85 percent. A range of 70 percent to 90 percent was also tested in sensitivity analyses.

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