

1 **COMPARISON OF PRODUCTION FORECASTS – NUCLEAR**

2 3 **PURPOSE**

4 This evidence presents year-over-year and budget to actual comparisons of nuclear
5 production forecasts in support of the approval of OPG's nuclear production forecast for the
6 test period.

7 8 **1.0 OVERVIEW**

9 Variances between actual and forecast production in any year or plan over plan are typically
10 the result of OPG experiencing more or fewer forced outages ("FO") or derates, forced
11 extensions to planned outages ("FEPO"), planned outage days (PO days) or unbudgeted
12 planned outages. Year over year or plan over plan variances may also arise due to station
13 consumption, grid losses and high lake water temperature.

14 15 **PERIOD-OVER-PERIOD CHANGES – TEST YEARS**

16 **2015 Plan versus 2014 Plan**

17 The nuclear production forecast for 2015 of 48.0 TWh is 1.7 TWh lower than the nuclear
18 production forecast for 2014 of 49.7 TWh.

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20 The lower production forecast for 2015 relative to 2014 is due to:

- 21 • 105.9 more PO days for the combined nuclear fleet (110.9 more PO days at
22 Darlington and 5.0 less PO days at Pickering). The additional outage days for
23 Darlington are due to a 4 unit Vacuum Building Outage in 2015.
- 24 • The lower production is partially offset by a forecast improvement in the combined
25 nuclear FLR of 1.0 per cent (44.4 fewer FO days). Pickering's FLR improves by 2.3
26 per cent and Darlington's FLR improves by 0.3 per cent. Pickering's forecast FLR
27 improvement reflects an expectation of improved equipment reliability.

28 29 **2014 Plan versus 2013 Budget**

30 The nuclear production forecast for 2014 of 49.7 TWh is 1.7 TWh higher than the 2013
31 Budget of 48.0 TWh.

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2 The higher production forecast for 2014 relative to 2013 is due to:

- 3 • 77.9 fewer PO days for the combined nuclear fleet (67.3 fewer PO days at Darlington
4 and 10.6 fewer PO days at Pickering). There is a single planned outage scheduled
5 at Darlington in 2014, compared to two in 2013, consistent with the 3 year outage
6 cycle at Darlington
- 7 • An improvement in the combined nuclear FLR of 0.3 per cent (10.5 fewer FO days).
8 Pickering's forecast FLR improves by 0.3 per cent and Darlington's FLR improves by
9 0.3 per cent. Pickering's forecast FLR improvement reflects an expectation of
10 improved equipment reliability due to initiative to improve reliability in an effort to
11 reduce the number of forced outages.

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13 **2.0 PERIOD-OVER-PERIOD CHANGES – BRIDGE YEAR**

14 **2013 Budget versus 2012 Actual**

15 The nuclear production forecast for 2013 of 48.0 TWh is 1.0 TWh lower than the 2012 Actual
16 of 49.0 TWh.

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18 The lower production forecast for 2013 relative to 2012 Actual is due to 31.9 additional PO
19 days for the combined nuclear fleet (80.7 additional PO days at Darlington offset by 48.8
20 fewer PO days at Pickering). There are two planned outages scheduled for Darlington in
21 2013 compared to a single outage scheduled in 2012, consistent with the 36-month outage
22 cycle at Darlington.

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24 The FLR forecast remains constant, as Darlington FLR improves from 2.3 per cent actual to
25 1.5 per cent forecast, offset by an increase in Pickering FLR from 7.0 per cent actual to 8.1
26 per cent forecast reflecting historical performance over multiple years.

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28 **3.0 PERIOD-OVER-PERIOD CHANGES – HISTORICAL YEARS**

29 **2012 Actual versus 2012 Board Approved**

1 Actual nuclear production of 49.0 TWh for 2012 is 2.5TWh lower than the 2012 Board
2 Approved forecast of 51.5 TWh. The lower actual production for 2012 relative to the Board
3 Approved 2012 forecast is primarily due to:

- 4 • The increase (103.5 days) in PO days for the combined nuclear fleet includes the
5 introduction of a 20-day Pickering Unit 1 mid-cycle outage aimed at improving plant
6 reliability through preventative maintenance to reduce the risk of future forced
7 outages and three unbudgeted planned outages that were not included in the
8 approved nuclear outage and generation plan partly offset by the early completion of
9 the Darlington Unit 3 planned outage.
- 10 • A 1.6 per cent increase (26.2 days) in the combined nuclear FLR (2.7 per cent
11 increase at Pickering, 0.8 per cent increase at Darlington).
- 12 • There were 26.2 FEPO days for Pickering of which 16.4 FEPO days were due to
13 maintenance required on the Unit 8 west fueling machine and on Unit 4 to complete
14 the pressurizing pump maintenance.

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16 **2012 Actual versus 2011 Actual**

17 The nuclear production for 2012 of 49.0 TWh was 0.4 TWh higher than the 2011 actual
18 nuclear production of 48.6 TWh.

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20 The higher actual production for 2012 relative to 2011 actual production is primarily due to:

- 21 • A 1.0 per cent decline (i.e. improvement) in the combined nuclear FLR in the 2012
22 (4.6 per cent improvement for Pickering, partially offset by a 1.7 per cent increase for
23 Darlington).
- 24 • There were 70.7 FEPO days for Pickering in 2011 (63.9 FEPO days due to the
25 Pickering Unit 5 planned outage being extended to addressing gadolinium oxalate
26 deposits in the calandria and 6.8 FEPO days due to fuelling machine maintenance on
27 Pickering Unit 4) versus only 26.2 FEPO days in 2012.

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29 Offsetting the above, there were 60.7 additional PO days for the combined nuclear fleet
30 in 2012 versus 2011 (3.4 PO days for Darlington and 57.3 PO days for Pickering). The
31 increase in PO days in 2012 reflects adjustments for historical duration of planned outage

1 performance at Pickering and Darlington as well as the Pickering Unit 1 mid-cycle outage
2 to focus on preventative maintenance and lessen the risk of future forced outages.

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4 **2011 Actual versus 2011 Board Approved**

5 The actual nuclear production for 2011 of 48.6 TWh is 1.8 TWh lower than the 2011 Board
6 Approved forecast of 50.4 TWh.

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8 The lower actual production for 2011 relative to the Board Approved 2011 forecast is due to:

- 9 • A 2.1 per cent increase (96.6 days) in the combined nuclear forced loss rate (“FLR”).
10 There was a 6.2 per cent increase in the Pickering FLR largely driven by equipment
11 reliability. The largest contributors to unplanned losses were at Pickering Units 1 and
12 4 which included a steam leak on the turbine system, high condenser vacuum
13 pressure on the heat transport system resulting in a reactor trip, moderator level
14 control valve and system pump seal failures. This was offset by a slight decrease of
15 0.9 per cent in Darlington’s FLR.
- 16 • There were 70.7 Forced Extension of Planned Outage (“FEPO”) days for Pickering in
17 2011 (63.9 days due to the Pickering Unit 5 planned outage being extended to
18 addressing gadolinium oxalate deposits in the calandria, and 6.8 days due to fuelling
19 machine maintenance on Pickering Unit 4).

20
21 Offsetting the above, there were 17.0 fewer planned outage (“PO”) days for the combined
22 nuclear fleet (8.0 fewer actual PO days for Darlington and 9.0 fewer actual PO days for
23 Pickering).

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25 **2011 Actual versus 2010 Actual**

26 The actual nuclear production for 2011 of 48.6 TWh is 2.9 TWh higher than the 2010 actual
27 nuclear production of 45.7 TWh.

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29 The higher production for 2011 relative to 2010 is primarily due to:

- 1 • A 0.6 per cent decrease (i.e. improvement) in the combined nuclear FLR (2.6 per
2 cent decrease in FLR for Darlington partially offset by a 2.3 per cent increase in FLR
3 for Pickering).
- 4 • 62.7 fewer PO days at Darlington in 2011. There was a single planned outage 2011,
5 compared to two planned outages in 2010.
- 6 • 13.9 fewer FEPO days at Darlington in 2011 compared to 2010 (2010 FEPO days
7 were due to fuel machine issues).
- 8 • 124.3 fewer PO days at Pickering in 2011. In 2010 additional PO days were required
9 for the Pickering Vacuum Building Outage (VBO), partially offset by 49.2 additional
10 FEPO days for Pickering in 2011 due to gadolinium oxalate and fuelling machine
11 issues.

12 13 **2010 Actual versus 2010 Budget**

14 The actual nuclear production for 2010 of 45.8 TWh is 0.4 TWh lower than the 2010 Budget
15 of 46.2 TWh.

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17 The lower actual production for 2010 relative to the 2010 Budget forecast was due primarily
18 to:

- 19 • An increase in the combined nuclear FLR of 2.4 per cent from 3.5 per cent forecast to
20 5.9 per cent actual. There was a 3.3 per cent increase in Pickering FLR primarily due
21 to a 19.7 per cent FLR for Pickering Units 1 & 4 due to issues regarding Turbines &
22 Auxiliary and Liquid Zone Control systems, and 4.3 per cent FLR for Pickering Units
23 5-8. There was a 1.5 per cent increase in FLR for Darlington primarily due to Fuel
24 Handling issues. The 2010 Budget forecast of 46.2 TWh included a 2.0 TWh
25 reduction for major unforeseen events.
- 26 • There were 35.4 FEPO days in 2010 (13.9 for Darlington Unit 4 defueling delay, and
27 21.5 for Pickering primarily due to issues during Pickering Unit 1 start-up activities.