

10 June 2014

Ontario Energy Board
2300 Yonge St., 27th Floor
Toronto, ON
M4P 1E4

Attn: Ms Kirsten Walli
Board Secretary

By electronic filing and e-mail

Dear Ms Walli:

Re: EB-2013-0321 – OPG Payments 2014-15 – GEC materials for cross examination

Attached please find a copy of the OPA Freedom of Information response referred to in our earlier correspondence. We will be referring to excerpts from this material during our cross examinations. For the convenience of the Board and the parties we will endeavour to provide a separate cross exhibit limited to specific excerpts prior to that time.

Sincerely,

A handwritten signature in black ink, appearing to read 'David Poch', with a stylized flourish at the end.

David Poch

Freedom Of Information and Protection of Privacy Act Request 2013-054
Received October 23, 2013
Ontario Power Authority

Index of Records and Decision regarding release of Records

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
1.	Report on the Integrated Power System Planning Impacts of Pickering NGS Continued Operation	April 16, 2012	Yes			1
2.	Email to and from OPA staff with spreadsheets attached	Jan 12, 2012 @12:02 PM	Yes			31
3.	Email to and from OPA staff with spreadsheets attached	Feb 14, 2012 @9:20 AM	Yes			37
4.	Email to and from OPA staff with power point presentation attached	Mar 19, 2012 @11:21 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	44
5.	Email to and from OPA staff	Mar 19, 2012 @5:14 PM	Yes			60
6.	Email to and from OPA staff	Mar 20, 2012 @9:45 AM	Partial		Responsive in part	62
7.	Email to and from OPA staff with OPG spreadsheet attached	Mar 21, 2012 @8:34 AM	Partial	s. 17	Confidential third party information has been redacted	64
8.	Email to and from OPA staff	Mar 28, 2012 @1:06 PM	Yes			74

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
9.	Email to and from OPA staff	Mar 28, 2012 @4:31 PM	Yes			75
10.	Email to and from OPA staff	Mar 28, 2012 @4:42 PM	Partial	s. 17	Confidential third party information has been redacted	77
11.	Email to and from OPA staff	Mar 29, 2012 @9:52 AM	Partial	s. 17	Confidential third party information has been redacted	80
12.	Email to and from OPA staff with power point presentation attached	Mar 29, 2012 @10:05 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	83
13.	Email to and from OPA staff with OPG spreadsheet attached	Mar 29, 2012 @5:00 PM	Partial	s. 17	Confidential third party information has been redacted	106
14.	Email to and from OPA staff with power point presentation attached	Apr 9, 2012 @9:22 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	118
15.	Email to and from OPA staff	Apr 11, 2012 @12:18 PM	Partial	s. 18	Confidential draft OPA information has been redacted	134
16.	Email to and from OPA staff	Apr 13, 2012 @4:40 PM	Yes			136
17.	Email to and from OPA staff	Apr 24, 2012 @4:51 PM	Partial	s. 18	Confidential draft OPA information has been redacted	137

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
18.	Email to and from OPA staff with letter attached	July 31, 2012 @3:39 PM	Partial		Responsive in part	139
19.	Email to and from OPA staff	Aug 3, 2012 @2:46 PM	Partial		Responsive in part	147
20.	Email to and from OPA staff with letter attached	Aug 13, 2012 @4:47 PM	Partial		Responsive in part	150
21.	Email to and from OPA staff with letters attached	Aug 16, 2012 @1:27 PM	Partial		Responsive in part	157
22.	Email to and from OPA staff with letter attached	Aug 16, 2012 @1:33 PM	Partial		Responsive in part	174
23.	Email to and from OPA staff with letter attached	Aug 16, 2012 @5:50 PM	Partial		Responsive in part	181
24.	Email to and from OPA staff with letter attached	Aug 23, 2012 @9:15 AM	Partial		Responsive in part	197
25.	Email to and from OPA staff	Aug 23, 2012 @10:50 AM	Yes			204
26.	Email to and from OPA staff	Aug 23, 2012 @11:20 AM	Partial		Responsive in part	205
27.	Email to and from OPA staff	Aug 23, 2012 @11:23 AM	Partial		Responsive in part	206

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
28.	Email to and from OPA staff with letter attached	Aug 23, 2012 @11:32 AM	Partial		Responsive in part	207
29.	Email to and from OPA staff with letter attached	Aug 23, 2012 @12:45 PM	Partial		Responsive in part	214
30.	Email to and from OPA staff with final letter attached	Aug 23, 2012 @2:38 PM	Yes			221
31.	Email to and from OPA staff with final letter attached	Aug 23, 2012 @2:38 PM	Yes			228
32.	Email to and from OPA staff with final letter attached	Aug 23, 2012 @2:41 PM	Yes			235
33.	Email to and from OPA staff with final letter attached	Aug 24, 2012 @10:07 PM	Yes			242
34.	Email to and from OPA staff with final letter attached	Aug 24, 2012 @3:02 PM	Yes			249
35.	Email to and from OPA staff with letter attached	Sept 6, 2012 @1:44 PM	Yes			256
36.	Email to and from OPA staff with various attachments	Sept 14, 2012 @11:17 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	263

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
37.	Email to OPA staff from OPG	Sept 17, 2012 @2:43 PM	Yes			280
38.	Email to and from OPA staff	Sept 17, 2012 @5:18 PM	Partial		Responsive in part	282
39.	Email to and from OPA staff	Sept 17, 2012 @5:37 PM	Partial		Responsive in part	286
40.	Email to and from OPA staff	Sept 17, 2012 @5:43 PM	Partial		Responsive in part	290
41.	Email to and from OPA staff with final letter attached	Sept 18, 2012 @2:07 PM	Yes			295
42.	Email to Hydro One from OPA staff	Sept 21, 2012 @2:07 PM	Yes			302
43.	Email to and from OPA staff	Sept 21, 2012 @3:35 PM	Yes			304
44.	Email to and from OPA staff	Sept 21, 2012 @3:50 PM	Partial		Responsive in part	306
45.	Email to OPA staff and Hydro One from OPG	Sept 25, 2012 @3:39 PM	Yes			308
46.	Email to OPA staff from OPG	Sept 25, 2012 @4:37 PM	Yes			310

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
47.	Email to OPA staff from OPG	Sept 26, 2012 @8:24 AM	Yes			313
48.	Email to and from OPA staff with spreadsheet attached	May 3, 2012 @4:34 PM	Partial	s. 17	Confidential third party information has been redacted	316
49.	Email to OPA staff from OPG	Jan 15, 2010 @4:49 PM	Partial	s. 17	Confidential third party information has been redacted	323
50.	Email to OPA staff from OPG with email and spreadsheet attached	Jun 29, 2011 @2:48 PM	Partial	s. 17	Confidential third party information has been redacted	329
51.	Email to and from OPA staff with spreadsheet attached	Jun 29, 2011 @5:08 PM	Partial		Responsive in part	339
52.	Capacity Gap Charts	Undated	Yes			348
53.	System Impact of Pickering Continued Operations	Undated	Yes			350
54.	2012 Pickering Continued Operations Study Scope/Summary	Dec 8, 2011	Yes			352
55.	Email to OPA staff from OPG with spreadsheet attached	Dec 20, 2011 @4:06 PM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	354

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
56.	Email to and from OPA staff with spreadsheet attached	Jan 3, 2012 @11:13 AM	Yes			366
57.	Email to OPG from OPA staff with spreadsheet attached	Jan 3, 2012 @12:09 PM	Partial	s. 17	Confidential third party information has been redacted	374
58.	Pickering Historical ACF and Sensitivity Cases for Pickering Study	Undated	Yes			390
59.	Email to OPA staff from OPG	Jan 5, 2012 @10:43 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	397
60.	Pickering Continued Operation Study for OPG 2013/2014 Rate Application	Undated	Yes			403
61.	Email to and from OPA staff	Jan 10, 2012 @10:32 AM	Yes			404
62.	Email to OPG from OPA staff	Jan 11, 2012 @10:57 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	405
63.	Email to OPA staff from OPG	Jan 11, 2012 @10:59 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	410
64.	Email to and from OPA staff	Jan 11, 2012 @4:55 PM	Yes			415

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
65.	Email to and from OPA staff	Jan 11, 2012 @4:55 PM	Yes			416
66.	Email to and from OPA staff	Jan 12, 2012 @8:02 AM	Yes			417
67.	Email to and from OPA staff	Jan 12, 2012 @11:47 AM	Yes			419
68.	Email to and from OPA staff	Jan 12, 2012 @11:50 AM	Yes			420
69.	Email to and from OPA staff	Jan 12, 2012 @11:58 AM	Yes			421
70.	Email to and from OPA staff	Jan 12, 2012 @3:22 PM	Yes			423
71.	2011 Pickering Continued Operations Study- Case Summary	Undated	Yes			425
72.	Email to and from OPA staff	Jan 12, 2012 @3:49 PM	Yes			432
73.	Email to and from OPA staff	Jan 18, 2012 @5:14 PM	Yes			434
74.	Email to and from OPA staff	Jan 18, 2012 @5:21 PM	Partial	s. 17	Confidential third party information has been redacted	435

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
75.	Email to and from OPA staff	Jan 18, 2012 @5:24 PM	Partial	s. 17	Confidential third party information has been redacted	436
76.	Email to and from OPA staff	Jan 18, 2012 @5:26 PM	Partial	s. 17	Confidential third party information has been redacted	437
77.	Email to and from OPA staff with OPG spreadsheet attached	Jan 20, 2012 @4:16 PM	Partial	s. 17	Confidential third party information has been redacted	439
78.	Email to and from OPA staff with spreadsheet attached	Jan 23, 2012 @3:01 PM	Partial		Responsive in part	455
79.	Simplified Pickering Continued Operations Study Model	Undated	Yes			478
80.	Email to and from OPA staff with spreadsheet attached	Jan 23, 2012 @3:04 PM	Yes			480
81.	Simplified Pickering Continued Operations Study Model	Undated	Yes			483
82.	Email to and from OPA staff	Jan 24, 2012 @9:47 AM	Yes			487
83.	Email to and from OPA staff	Jan 24, 2012 @9:57 AM	Yes			488
84.	Email to and from OPA staff	Jan 24, 2012 @10:24 AM	Yes			489

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
85.	Email to and from OPA staff	Jan 24, 2012 @11:36 AM	Yes			490
86.	Email to and from OPA staff	Jan 24, 2012 @11:38 AM	Yes			492
87.	Email to OPA staff from OPG	Feb 1, 2012 @11:27 AM	Partial	s. 15 s. 17	Confidential information shared between the OPA and OPG has been redacted Confidential third party information has been redacted	494
88.	Email to OPA staff from OPG	Feb 1, 2012 @11:51 AM	Partial	s. 15 s. 17	Confidential information shared between the OPA and OPG has been redacted Confidential third party information has been redacted	496
89.	Email to and from OPA staff	Feb 1, 2012 @11:53 AM	Partial	s. 15 s. 17	Confidential information shared between the OPA and OPG has been redacted Confidential third party information has been redacted	498
90.	Email to OPG from OPA staff	Feb 1, 2012 @4:10 PM	Partial	s. 15 s. 17	Confidential information shared between the OPA and OPG has been redacted Confidential third party information has been redacted	501

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
91.	Email to and from OPA staff	Feb 6, 2012 @11:30 AM	Yes			504
92.	Email to and from OPA staff	Feb 8, 2012 @11:09 AM	Yes			506
93.	Email to and from OPA staff	Feb 8, 2012 @2:26 PM	Yes			509
94.	Email to and from OPA staff	Feb 8, 2012 @2:29 PM	Yes			512
95.	Email to and from OPA staff with OPG spreadsheet attached	Feb 24, 2012 @8:34 AM	Partial	s. 17	Confidential third party information has been redacted	515
96.	Email to and from OPA staff with OPG spreadsheet attached	Feb 24 ,2012 @8:35 AM	Partial	s. 17	Confidential third party information has been redacted	525
97.	Email to and from OPA staff with OPG spreadsheet attached	Feb 24, 2012 @8:53 AM	Partial	s. 17	Confidential third party information has been redacted	535
98.	Email to and from OPA staff	Feb 24, 2012 @11:12 AM	Partial		Responsive in part	545
99.	Email to and from OPA staff	Feb 24, 2012 @11:12 AM	Partial		Responsive in part	548
100.	Email to and from OPA staff with spreadsheet attached	Feb 24, 2012 @1:57 PM	Yes			551

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
101.	Email to and from OPA staff	Feb 24, 2012 @4:19 PM	Partial		Responsive in part	557
102.	Email to and from OPA staff	Feb 27, 2012 @11:08 AM	Yes			560
103.	Email to and from OPA staff	Feb 27, 2012 @12:04 PM	Yes			562
104.	Email to OPG from OPA staff with spreadsheet attached	Feb 27, 2012 @1:52 PM	Partial	s. 17	Confidential third party information has been redacted	564
105.	Email to OPG from OPA staff with spreadsheet attached	Feb 27, 2012 @1:52 PM	Partial	s. 17	Confidential third party information has been redacted	575
106.	Email to OPA staff from OPG with spreadsheet attached	Feb 27, 2012 @2:23 PM	Partial	s. 17	Confidential third party information has been redacted	586
107.	Email to OPG from OPA staff with spreadsheet attached	Feb 27, 2012 @2:54 PM	Partial	s. 17	Confidential third party information has been redacted	597
108.	Email to OPA staff from OPG with spreadsheet attached	Feb 28, 2012 @11:58 AM	Partial	s. 17	Confidential third party information has been redacted	609
109.	Email to and from OPA staff with spreadsheet attached	Feb 28, 2012 @12:06 PM	Partial	s. 17	Confidential third party information has been redacted	620
110.	Email to and from OPA staff	Feb 28, 2012 @3:34 PM	Yes			632

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
111.	Email to and from OPA staff	Feb 28, 2012 @3:34 PM	Yes			633
112.	Email to and from OPA staff with power point presentation attached	Feb 29, 2012 @4:00 PM	Partial		Responsive in part	634
113.	Email to and from OPA staff	Mar 13, 2012 @11:25 AM	Partial	s. 17	Confidential third party information has been redacted	680
114.	Email to OPA staff from OPG	Mar 15, 2012 @10:26 AM	Partial		Responsive in part	696
115.	Email to OPG from OPA staff	Mar 15, 2012 @11:19 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	697
116.	Email to OPG from OPA staff	Mar 15, 2012 @11:32 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	698
117.	Email to and from OPA staff with power point presentation attached	Mar 16, 2012 @4:11 PM	Partial	s.17	Responsive in part Confidential third party information has been redacted	700
118.	Email to and from OPA staff	Mar 20, 2012 @4:27 PM	Yes			716
119.	Email to and from OPA staff	Mar 21, 2012 @3:33 PM	Partial	s. 17	Confidential third party information has been redacted	718

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
120.	Email to and from OPA staff	Mar 21, 2012 @3:59 PM	Partial	s. 17	Confidential third party information has been redacted	720
121.	Email to and from OPA staff	Mar 23, 2012 @5:35 PM	Partial	s. 17 s. 18	Confidential third party information has been redacted Confidential OPA commercial information has been redacted	722
122.	Email to and from OPA staff	Mar 27, 2012 @10:20 AM	Yes			724
123.	Email to and from OPA staff	Mar 27, 2012 @11:00 AM	Yes			726
124.	Email to and from OPA staff	Apr 20, 2012 @4:25 PM	Yes			727
125.	Email to and from OPA staff	Apr 24, 2012 @4:51 PM	Partial	s. 18	Confidential OPA commercial information has been redacted	729
126.	Email to and from OPA staff with spreadsheet attached	May 3, 2012 @4:34 PM	Partial	s. 17	Confidential third party information has been redacted	731
127.	Nuclear Available Capacity (MW)	Undatred	Partial	s. 17	Responsive in part Confidential third party information has been redacted	738

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
128.	Email to and from OPA staff with spreadsheet attached	May 10, 2012 @ 1:32 PM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	746
129.	Email to OPA staff from OPG	July 11, 2012 @ 10:39 AM	Yes			755
130.	Letter to OPG	August 1, 2011	Partial		Responsive in part	757
131.	Email to and from OPA staff with letter attached	July 31, 2012 @ 3:39 PM	Partial		Responsive in part	764
132.	Email to and from OPA staff	Aug 2, 2012 @ 2:51 PM	Yes			772
133.	Email to and from OPA staff	Aug 3, 2012 @ 2:29 PM	Partial		Responsive in part	773
134.	Email to and from OPA staff	Aug 3, 2012 @ 2:46 PM	Partial		Responsive in part	776
135.	Email to OPA staff from OPG with spreadsheet attached	Aug 9, 2012 @ 2:19 PM	Partial		Responsive in part	779
136.	Email to and from OPA staff with draft letter attached	Aug 16, 2012 @ 2:01 PM	Partial		Responsive in part	783

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
137.	Email to and from OPA staff with draft letter attached	Aug 23, 2012 @12:46 PM	Partial		Responsive in part	790
138.	Email to and from OPA staff with letter attached	Sept 6, 2012 @1:44 PM	Partial		Responsive in part	797
139.	Email to and from OPA staff with power point presentation attached	Sept 13, 2012 @10:34 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	804
140.	Email to and from OPA staff with attachments	Sept 14, 2012 @11:17 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	816
141.	Email to and from OPA staff with power point slides attached	Sept 14, 2012 @1:58 PM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	833
142.	Email to and from OPA staff with power point slides attached	Sept 14, 2012 @2:01 PM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	839
143.	Email to and from OPA staff	Sept 18, 2012 @8:41 AM	Partial		Responsive in part	845
144.	Email to and from OPA staff	Sept 18, 2012 @2:39 PM	Yes			850

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
145.	Email to and from OPA staff	Sept 18, 2012 @2:39 PM	Yes			851
146.	Email to and from OPA staff	Sept 19, 2012 @4:46 PM	Yes			852
147.	Email to and from OPA staff	Sept 19, 2012 @4:47 PM	Yes			854
148.	Email to and from OPA staff	Sept 19, 2012 @4:52 PM	Yes			856
149.	Email to and from OPA staff	Sept 19, 2012 @4:53 PM	Yes			858
150.	Email to and from OPA staff	Sept 19, 2012 @4:53 PM	Yes			860
151.	Email to and from OPA staff	Jan 6, 2012 @11:51 AM	Partial		Responsive in part	862
152.	Email to and from OPA staff with spreadsheet attached	Jan 10, 2012 @10:06 AM	Yes			864
153.	Email to OPG from OPA staff	Jan 11, 2012 @10:57 AM	Partial	s. 17	Confidential third party information has been redacted	866
154.	Email to and from OPA staff	Jan 12, 2012 @11:58 AM	Yes			871

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
155.	Email to and from OPA staff with spreadsheet attached	Jan 23, 2012 @4:03 PM	Yes			873
156.	Email to and from OPA staff	Jan 24, 2012 @11:09 AM	Yes			878
157.	Email to and from OPA staff with background paragraph attached	Feb 16, 2012 @2:26 PM	Partial		Responsive in part	879
158.	Email to OPA staff from OPG with spreadsheet attached	Feb 23, 2012 @5:13 PM	Partial	s. 17	Confidential third party information has been redacted	882
159.	Email to and from OPA staff with OPG spreadsheet attached	Feb 24, 2012 @8:53 AM	Partial	s. 17	Confidential third party information has been redacted	892
160.	Email to OPG from OPA staff	Feb 24, 2012 @10:57 AM	Partial		Responsive in part	902
161.	Email to and from OPA staff with OPG spreadsheet attached	Feb 28, 2012 @12:06 PM	Partial	s. 17	Confidential third party information has been redacted	905
162.	Email to and from OPA staff with attachments	Mar 26, 2012 @9:41 PM	Partial		Responsive in part	917
163.	Email to and from OPA staff	Mar 27, 2012 @11:10 AM	Yes			934
164.	Email to and from OPA staff	Mar 27, 2012 @1:08 PM	Yes			936

Record No.	Description	Date	Release yes/no/partial	Exemption(s) Applied	Comments	Page No.
165.	Email to and from OPA staff with letter attached	Aug 24, 2012 @3:02 PM	Partial		Responsive in part	938
166.	Email to and from OPA staff with power point presentation attached	Sept 13, 2012 @10:34 AM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	945
167.	Email to and from OPA staff with power point presentation attached	Dec 11, 2012 @4:42 PM	Partial	s. 17	Responsive in part Confidential third party information has been redacted	957

CONFIDENTIAL

**PRELIMINARY DRAFT PREPARED IN
CONTEMPLATION OF LITIGATION**

Report on the Integrated Power System Planning Impacts of Pickering NGS Continued Operation

April 16, 2012



ONTARIO
POWER AUTHORITY

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DRAFT

REPORT ON THE INTEGRATED POWER SYSTEM PLANNING IMPACTS OF PICKERING NGS CONTINUED OPERATION

EXECUTIVE SUMMARY

This report provides an assessment of the integrated power system planning impacts of Ontario Power Generation's (OPG) proposal for continued operation of the Pickering Nuclear Generation Station ("Pickering NGS") between approximately 2015 and 2020.

The Ontario Power Authority's (OPA) assessment indicates that the net system benefit of Pickering NGS continued operation is expected to be \$182 million, but could range from -\$0.76 billion to \$1.33 billion depending on a number of factors. These include higher or lower than forecast natural gas prices; implementation of carbon prices; a shorter continued operation period; higher or lower capital and fixed operating costs; and/or higher or lower production at Pickering NGS during the continued operation period.

There are several potential benefits to Pickering NGS continued operation. These include:

- A reduction in the need for replacement capacity and energy during the nuclear refurbishment period (2016 to 2024) and associated acquisition costs;
- A hedge against factors including increased demand, delay in achieving conservation targets, higher natural gas or carbon prices, nuclear refurbishment delays, or delays in the in-service of directed resources;
- Compliance with the Ontario government Supply Mix policy direction of 50% nuclear energy;
- A reduction in Ontario CO₂ emissions; and
- Deferral of transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS.

The OPA therefore considers it prudent, on balance, to spend funds in 2013 and 2014 for Pickering NGS continued operation should it prove to be technically feasible.

The technical feasibility of continued operation is expected to be known in 2012. A study is currently being conducted under the auspices of the CANDU Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020. In the absence of continued operation, the six generating units that are currently in operation at Pickering NGS are expected to cease operation by approximately 2015.

From 2013 to 2014, it will be necessary for OPG to incur \$190 million in additional capital and operating related costs associated with Pickering NGS. Of this, \$85 million is associated with preserving the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this

work. The remaining \$105 million is associated with the operation of Pickering NGS during the 2013 to 2014 period.

The OPA has evaluated the effect of Pickering NGS continued operation on various factors including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission impacts. The OPA's assessment assumes that resources directed by the Ontario government will proceed as planned.

Figure 1: Net System Benefit–Cost of Pickering Continued Operation for a Range of System Conditions 2013 – 2020



Source: OPA

TABLE OF CONTENTS

1.0 INTRODUCTION	6
2.0 PLANNING CONSIDERATIONS	6
2.1 Integrated Power System Impacts	7
2.2 Opportunities and Risks	7
2.3 Supply Mix Policy Direction	8
2.4 Ontario CO ₂ Emissions Impact	9
2.5 Transmission Requirements	9
3.0 METHODOLOGY AND APPROACH	9
4.0 ASSUMPTIONS	10
4.1 Reference Scenario Assumptions Regarding Pickering NGS	11
4.2 Reference Scenario Assumptions Regarding Supply and Demand	11
4.2.1 Demand Forecast and Conservation	11
4.2.2 Supply Resources	13
4.2.3 Demand-Supply Balance	15
4.2.4 Transmission Requirements	16
4.2.5 Forecast Natural Gas Prices	16
4.2.6 Price of CO ₂ Emissions	17
4.2.7 Economic Analysis Assumptions	18
4.3 Sensitivity Scenarios	18
5.0 RESULTS OF ASSESSMENT	20
5.1 Integrated Power System Impacts	20
5.1.1 Capacity Investments	20
5.1.2 Energy Production from Available Resources	21
5.1.3 Electricity Imports and Exports	22
5.1.4 Potential Surplus Energy	22
5.1.5 System Operating and Capital Costs	23
5.2 Sensitivity of System Benefit for a Range of System Conditions	26
5.3 Supply Mix Policy Direction	28
5.4 Ontario CO ₂ Emissions	28
5.5 Transmission Requirements	29
6.0 CONCLUSIONS	29
7.0 RECOMMENDATIONS	30

REPORT ON THE INTEGRATED POWER SYSTEM PLANNING IMPACTS OF PICKERING NGS CONTINUED OPERATION

1.0 INTRODUCTION

In the absence of continued operation, the six generating units that are currently in operation at the Pickering Nuclear Generating Station ("Pickering NGS") are expected to cease operation beginning in approximately 2015. A study is currently being performed under the auspices of the CANDU Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

The technical feasibility of continued operation is expected to be known in 2012. If feasible, it will be necessary for Ontario Power Generation (OPG) to incur \$190 million in additional capital and operating related costs from 2013 to 2014 with respect to Pickering NGS. Of this, \$85 million is associated with preserving the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work. The remaining \$105 million is associated with the operation of Pickering NGS during the 2013 to 2014 period.

In April 2010, the Ontario Power Authority (OPA) supported a decision by OPG to proceed with an initial expenditure of funds in the period 2010 to 2012 to assess the feasibility of continued operation of Pickering NGS and to maintain the option for continued operation should it prove to be feasible. The OPA stated system benefits should be re-assessed before committing additional funds required beyond 2012.

The purpose of this report is to provide an assessment of the integrated power system planning impacts of OPG's proposal for the continued operation of Pickering NGS between approximately 2015 and 2020. The assessment provided herein is an independent study performed by the OPA based on information provided by OPG and on OPA's assessment of system impacts. Updated Pickering NGS capital and operating related cost and production information provided by OPG is accepted as given. The information covers the period from 2013 to 2020.

2.0 PLANNING CONSIDERATIONS

A number of planning considerations are used to evaluate Pickering NGS continued operation, consistent with the OPA's integrated planning criteria. These include:

- Integrated power system impacts;
- Opportunities and risks;
- Supply mix policy direction;
- Ontario CO₂ emissions; and
- Transmission requirements.

Each is described further below.

2.1 Integrated Power System Impacts

The availability of Pickering NGS between approximately 2015 and 2020 affects various aspects of Ontario's electricity system. These include:

- Need and timing of capacity and associated transmission investments;
- Production from available generation resources;
- Electricity imports and exports;
- Amount of potential surplus energy; and
- System capital and operating costs.

A capacity shortfall may arise in the mid-term period (2016 to 2024) driven primarily by the refurbishment of nuclear units at Darlington NGS and Bruce NGS. A capacity shortfall arises if the total system capacity at the time of peak demand is less than the resource requirement at that time. During this period the availability of Pickering NGS could reduce or avoid short-term capacity purchases and associated transmission enhancements to meet system requirements.

If continued operation is determined to be technically feasible, it will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the period prior to 2015 to perform the necessary incremental inspection and maintenance work. These outages could result in additional system costs, as the energy which would otherwise have been produced during these hours by Pickering NGS is replaced by energy from more expensive supply resources or electricity imports in some hours. In other hours, where there is surplus energy, some of the generation from Pickering NGS would be replaced by renewable resources that would have otherwise been curtailed.

During the continued operation period beginning in approximately 2015, lower cost energy production from Pickering NGS could displace more expensive supply resources including imports, resulting in lower overall system costs during this period. During this period, generating units at Darlington NGS and at Bruce B NGS are expected to be out of service for refurbishment and gas-fired generation will therefore be on the margin for many hours. Generation from Pickering NGS will replace generation from gas-fired resources or similarly-priced imports, resulting in lower overall system costs. During some hours, however, generation from Pickering NGS could be surplus to Ontario's need, resulting in the curtailment of other baseload resources, primarily renewables, and increased exports. This would reduce the benefit of Pickering NGS operation in those hours.

2.2 Opportunities and Risks

Pickering NGS continued operation has a number of system impacts. Under certain conditions, these impacts could result in net system benefits or net system costs. Potential system impacts can be influenced by:

- Changes in demand for electricity and conservation;
- Impact of Ontario's supply mix;
- Performance of generators, including Pickering NGS; and
- Cost of Pickering NGS continued operation relative to other supply or conservation sources.

For example, lower demand for electricity would reduce the potential of Pickering NGS to offset more expensive production from other resources (such as natural gas-fired resources); whereas higher demand would increase this potential. Increased electricity demand could come about through, for example, increased economic activity, electrification of transportation, or delays in achieving conservation targets. Likewise, greater amounts of relatively low operating cost or self-scheduling resources within Ontario's supply mix would limit incremental opportunities to offset more expensive production, while lesser amounts would have the opposite effect.

The following factors would reduce the extent of potential benefits to continued operation at Pickering NGS: Less than expected performance of Pickering NGS units during the continued operation period, higher costs associated with achieving continued operation, lower fuel costs of competing resources, or lower carbon emission penalties on competing resources.

2.3 Supply Mix Policy Direction

The Ontario government has outlined its supply mix policy through the Supply Mix Directive¹ and the Long Term Energy Plan (LTEP)². This includes:

- The refurbishment of 10,000 MW of nuclear generating capacity at Darlington NGS and Bruce NGS;
- Phasing-out of coal-fired generation by 2014;
- The conversion of Atikokan GS to biomass by 2013 and of Thunder Bay GS to natural gas by 2014;
- Installed hydroelectric capacity to reach 9,000 MW by 2018; and
- Installed non-hydroelectric renewable capacity of 10,700 MW by 2018.

The OPA's assessment of Pickering NGS continued operation assumes that resources directed by the Ontario government proceed as planned. Delays in achieving directive requirements could increase the amount of capacity and energy needed to meet system supply requirements. Pickering NGS continued operation could mitigate potential impacts if these delays were to materialize.

¹ Supply Mix Directive. February 17, 2011.

http://www.powerauthority.on.ca/sites/default/files/new_files/IPSP%20directive%2020110217.pdf

² Ontario's Long-Term Energy Plan. November 23, 2010.

http://www.energy.gov.on.ca/docs/en/MEI_LTEP_en.pdf

2.4 Ontario CO₂ Emissions Impact

The Ontario government has firm targets for reducing Ontario's greenhouse gas emissions including a 15% (27 megatonne) reduction below 1990 levels by 2020.³ In the absence of Pickering NGS continued operation, emissions would be expected to increase as a result of increased energy production from gas-fired facilities. Availability of Pickering NGS during the continued operation period could reduce emissions from gas-fired generation.

2.5 Transmission Requirements

As described in the 2007 Integrated Power System Plan (IPSP), Pickering NGS provides approximately 3,100 MW of supply in the east GTA.⁴ Pickering NGS is connected to the Cherrywood Transformer Station ("Cherrywood TS") and its output reduces loading on the 500/230 kV transformers at Cherrywood TS by providing supply to local loads at the 230 kV voltage level. When the Pickering NGS units cease to operate, additional transformation capacity will be needed to maintain reliable load supply to customers in the GTA. These facilities must be timed to precede the absence of Pickering NGS generation and in the absence of continued operation, the timing is advanced.

3.0 METHODOLOGY AND APPROACH

The evaluation of Pickering NGS continued operation was performed using a reference scenario and a number of sensitivity scenarios that considered potential benefits of continued operation against factors that could either support or erode those benefits. The economic performance of continued operation against these conditions helped inform the OPA's conclusions on the economic merits of Pickering NGS continued operation.

Each scenario studied includes the evaluation of two cases: (1) a resource portfolio "without" Pickering NGS continued operation and (2) a resource portfolio "with" Pickering NGS continued operation. Each portfolio is derived and assessed using the following steps:

1. Identify the amount and timing of existing, committed, or directed resources⁵;
2. Determine the contribution of resources during peak periods;
3. Determine the amount of resources needed for adequacy;
4. Determine the extent to which existing, committed, and directed resources meet the resource requirement and identify the capacity gap;
5. Determine the transmission enhancements that are required to connect committed and directed resources;
6. Identify resource options to fill any remaining capacity gap; and

³ Ontario's Climate Change Action Plan, Annual Report 2008-2009 (December 2009).
http://www.ene.gov.on.ca/environment/en/resources/STD01_076569.html

⁴ Integrated Power System Plan (IPSP). EB-2007-0707.
<http://www.powerauthority.on.ca/integrated-power-system-plan>

⁵ Existing resources are those generation resources in current operation. Committed resources are those generation resources currently under construction or development. Directed resources are those generation resources that have been directed or have been committed to by government.

7. Perform simulations to give insight into the operation of the proposed resource mix using the OPA's energy production simulation software. Simulations consider intra- and inter-jurisdictional electricity transactions for each hour of each year between 2013 and 2020.

Each case is based on reference scenario conditions as described in Section 4.0 and modified as required for each sensitivity scenario as described in Section 4.3. Economic advantages or disadvantages of continued operation of Pickering NGS were identified by comparing the net present value of costs of the "with continued operation" case for the period 2013 to 2020 to the net present value of costs of the "without continued operation" case for the same period. The net present value of costs consisted of the following cost components:

- Generation operating costs;
- Capital investments in electricity resources; and
- Import costs and export revenues.

In practice, there could be opportunity for deferring or avoiding other supply investments that would otherwise have been made in absence of continued operation. It is assumed the capacity and energy supplied by Pickering NGS during the continued operation period would be replaced by alternative sources of supply *as needed to meet system requirements*.

A number of options were considered to meet additional short-term capacity and energy needs that may arise in the absence of Pickering NGS continued operation:

- Gas-fired Generation – May consist of new simple-cycle gas turbines or equivalent coal units converted to gas for capacity and existing combined-cycle gas turbines for energy. The lead time required is shorter than other alternatives and capital costs are lower. Operating costs are higher and CO₂ emissions are increased as compared to a case with continued operations.
- Additional Conservation and Demand Response – This alternative would require a large amount of energy savings to offset the reduction in energy production from Pickering NGS. The additional effort to achieve this, beyond the current aggressive conservation targets, was considered to be an unrealistic planning assumption.
- Firm Imports – An option that would require a significant amount of firm inter-tie capacity to be purchased and is expected to be priced similar to gas-fired generation capacity.

Based on the above considerations, gas-fired generation ("unspecified gas-fired generation") was assumed to be a feasible alternative for meeting additional short-term capacity and energy needs.

4.0 ASSUMPTIONS

In formulating each case, it is necessary to make assumptions with respect to the continued operation of Pickering NGS and with respect to future system demand and supply. The study period is from 2013 to 2020, as preparation for continued operation occurs during the

period from 2013 to 2014 and continued operation itself would occur during the period from approximately 2015 to 2020.

4.1 Reference Scenario Assumptions Regarding Pickering NGS

Assumptions with respect to the continued operation of Pickering NGS were based on information provided by OPG and are summarized in Table 1. These include the cost of continued operation, the length of the continued operation period, and the capability of the Pickering NGS units during the continued operation period.

Table 1: OPG's Pickering NGS Operating Costs and Production Related Assumptions

OPG Pickering NGS Assumptions	No Continued Operation	With Continued Operation
Unit Availability		
Operating Period	2013-2016	2013-2020
Capacity	3,094 MW (all 6 units operating)	3,094 MW (all 6 units operating)
Capital and Fixed Operating Costs		
Total (NPV \$ 2012)	\$2.5 billion	\$6 billion
Average Per Unit Energy (\$ 2012)	~45/MWh	
Fuel and Fuel Related Costs		
Total (NPV \$ 2012)	\$290 million	\$780 million
Average Per Unit Energy (\$ 2012)	~6/MWh	
Production Related Data (Including P7 Life Management)		
Average Forced Loss Rate	Pickering A: 13.2%	Pickering A: 10.8%
	Pickering B: 4.4%	Pickering B: 5.0%
Average Capability Factor	Pickering A: 78%	Pickering A: 80%
	Pickering B: 80%	Pickering B: 82%
Total Planned Outage Unit Days	Pickering A: 277 Unit Days	Pickering A: 603 Unit Days
	Pickering B: 658 Unit Days	Pickering B: 1,435 Unit Days
Total Energy Production	56 TWh	166 TWh

Source: OPG

4.2 Reference Scenario Assumptions Regarding Supply and Demand

The demand and supply assumptions used in this report are based on information contained in the Supply Mix Directive and the Ontario government's LTTP. These were updated to reflect current information on Darlington NGS and Pickering NGS availability as provided by OPG. Key demand and supply assumptions for the period 2013 to 2020 are related to:

- The forecast demand net of conservation;
- The resource mix—the amount of existing and future nuclear, renewables, coal and gas-fired generation;
- The price of natural gas; and,
- The price of CO₂ emissions.

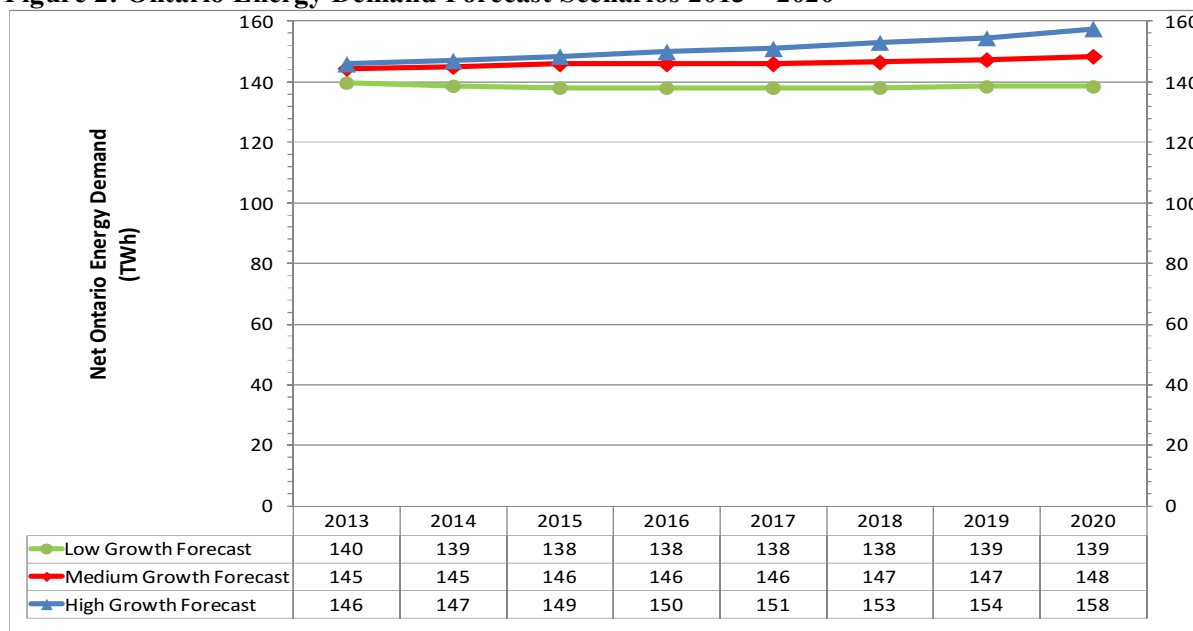
These are further described in Sections 4.2.1 to 4.2.7.

4.2.1 Demand Forecast and Conservation

The study relied on the low-, medium-, and high-growth electricity demand forecast (net of conservation and excluding dispatchable demand response resources) illustrated in Figure 2

1 and Figure 3. The reference scenario assumes the medium demand growth forecast
2 consistent with the Supply Mix Directive.

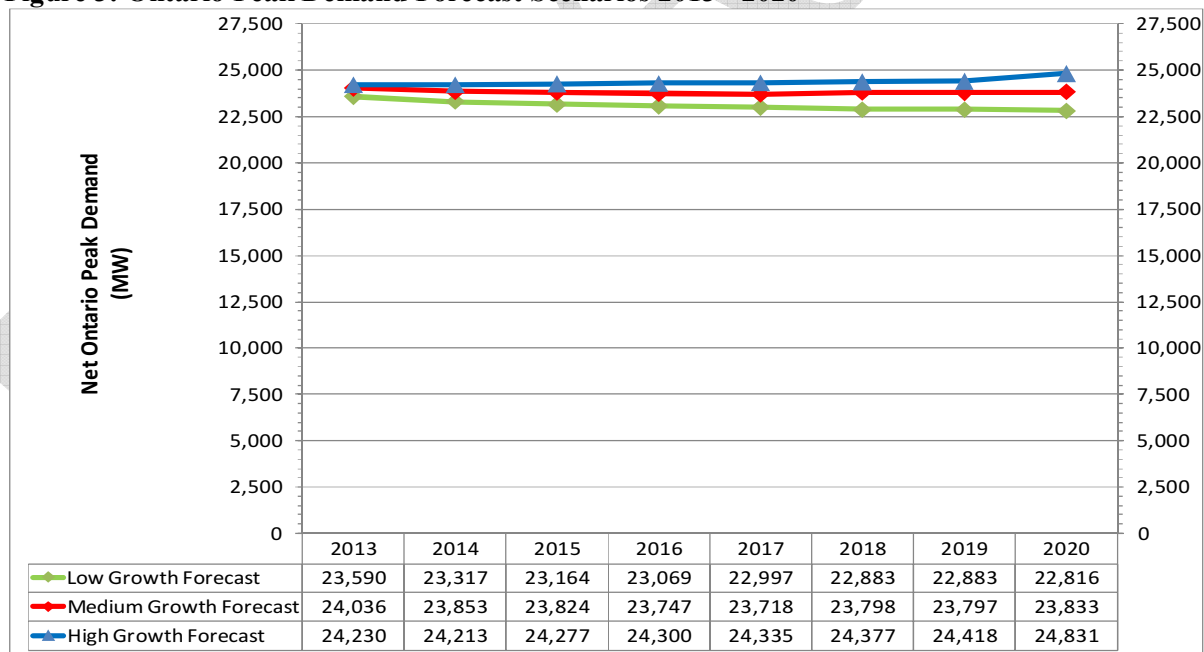
Figure 2: Ontario Energy Demand Forecast Scenarios 2013 – 2020



Source: OPA

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Figure 3: Ontario Peak Demand Forecast Scenarios 2013 - 2020



Source: OPA

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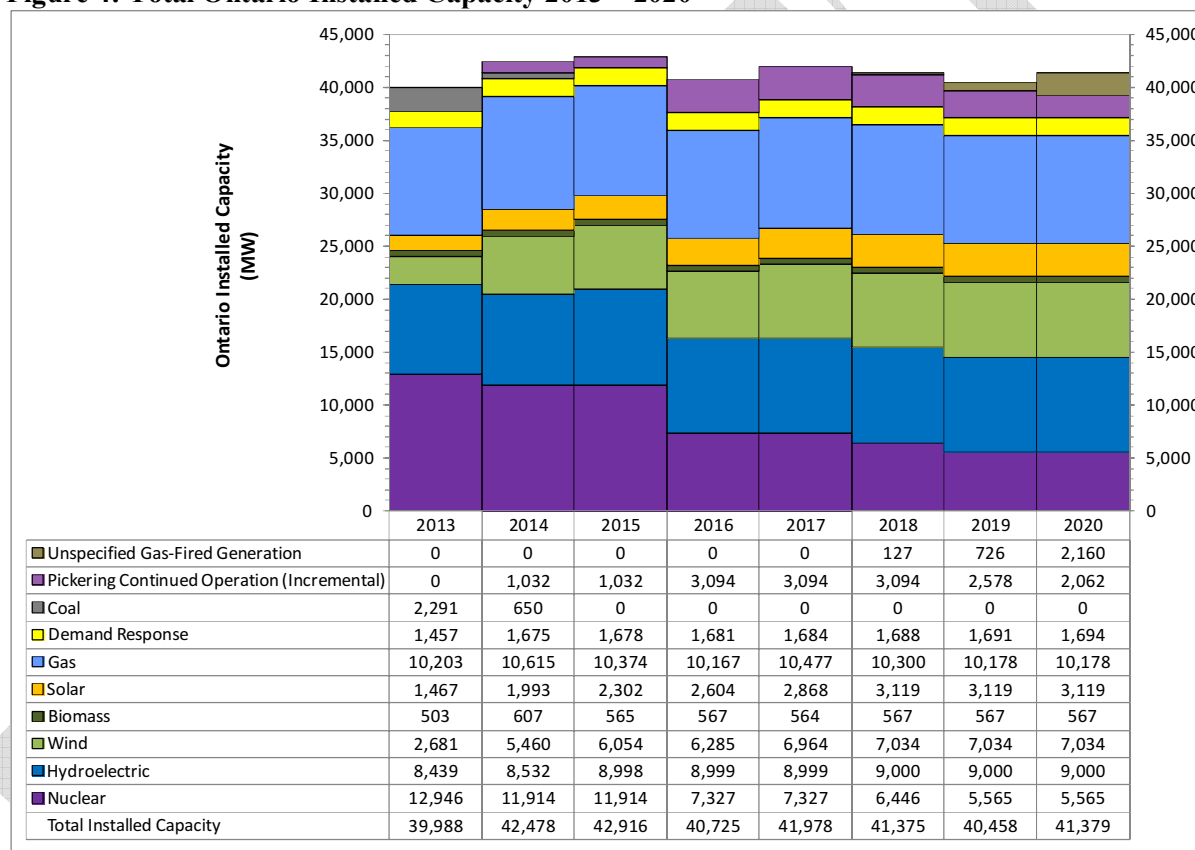
5 Under the reference scenario, the energy demand forecast grows by 3 TWh from 145 TWh in
6 2013 to 148 TWh in 2020. During this period, peak demand is forecast to decrease by about
7 200 MW from about 24,000 MW in 2013 to about 23,800 MW in 2020. These scenarios are
8 further described in the LTEP.

The conservation assumptions used in this forecast reflect recent experience and the expectation of accelerated conservation levels consistent with the Supply Mix Directive (4,550 MW and 13 TWh by the end of 2015; 5,840 MW and 21 TWh by the end of 2020). These more aggressive conservation forecasts offset the economic growth impacts in the forecast period.

4.2.2 Supply Resources

Figure 4 illustrates total Ontario installed capacity by fuel type. The supply mix includes contribution from demand response and reflects the resources described in section 2.3.

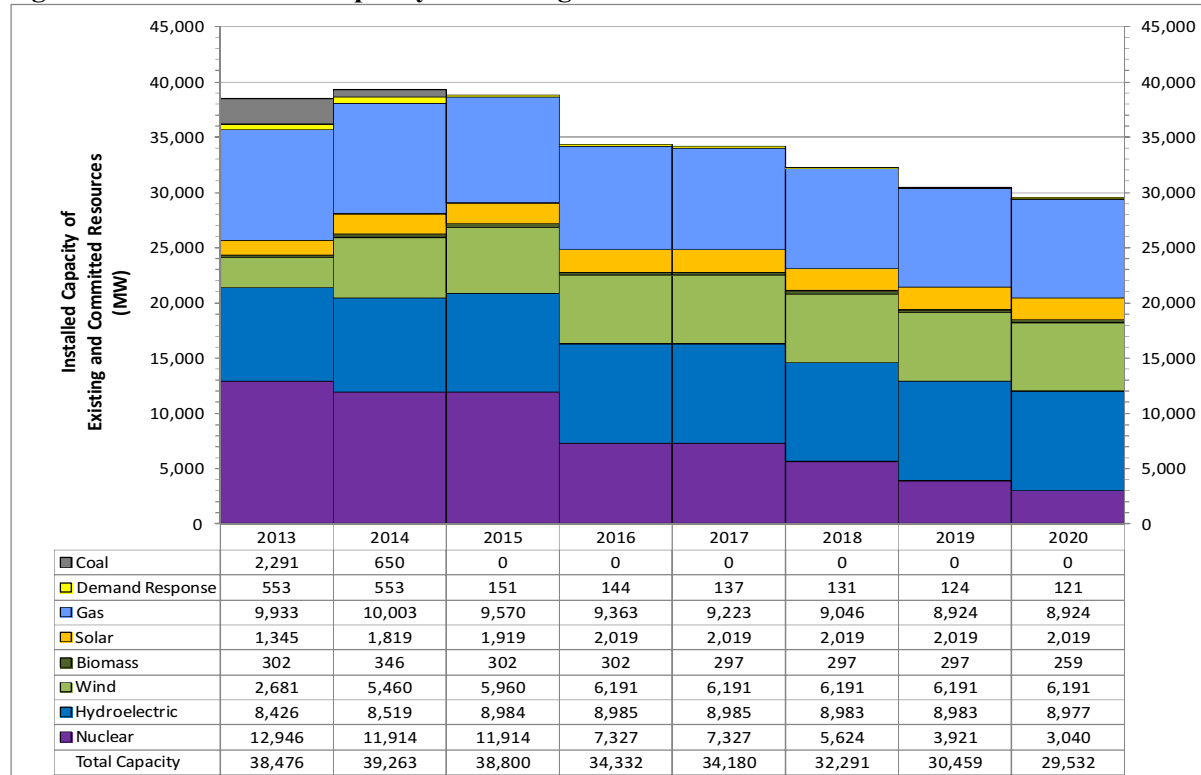
Figure 4: Total Ontario Installed Capacity 2013 – 2020



Source: OPA

The total installed capacity of Ontario resources is about 41,000 MW. By 2020, existing and committed resources represent about 71% or 29,500 MW as shown in Figure 5. About 11,800 MW of installed capacity, as shown in Figure 6, are subject to meeting directive requirements or are options to be determined.

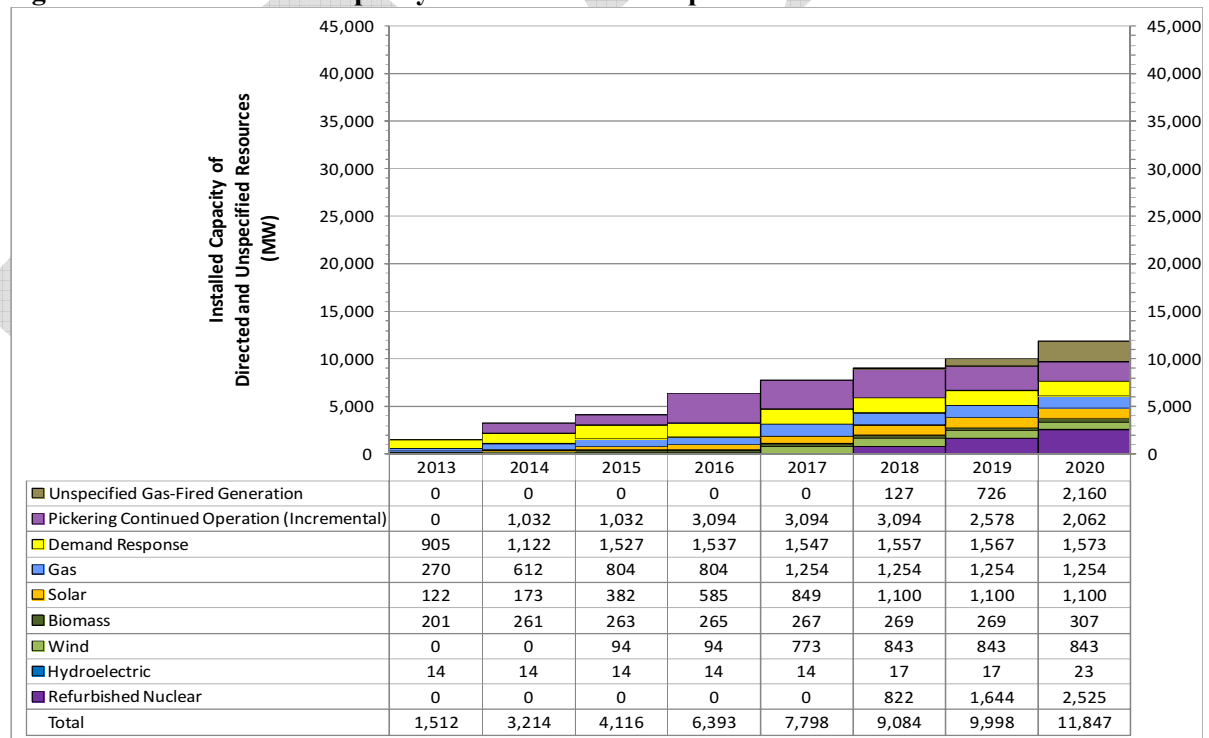
Figure 5: Total Installed Capacity of Existing and Committed Resources 2013 – 2020



Source: OPA

1

Figure 6: Total Installed Capacity of Directed and Unspecified Resources 2013 – 2020



Source: OPA

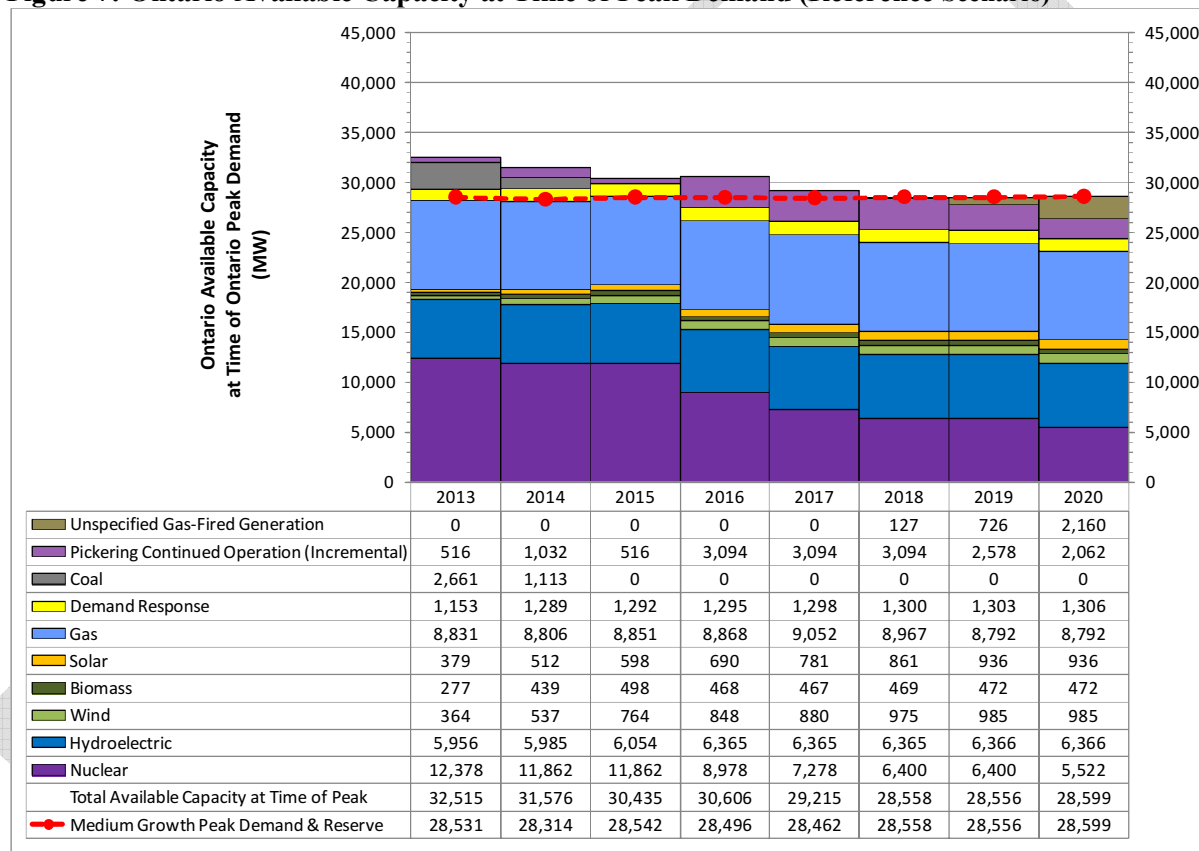
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As described in Section 3.0, unspecified gas fired-generation is assumed to meet the incremental need for capacity identified. Options for meeting this need could include the conversion of Lambton GS and Nanticoke GS, extension of non-utility generation (“NUG”) contracts, or firm imports.

4.2.3 Demand-Supply Balance

The contribution during peak periods of the resources described in Section 4.2.2 is less than the installed capacity. This is due to the intermittent and energy-limited nature of renewable resources, as well as the decline in the output of thermal generating units during high summer ambient temperatures. Figure 7 shows the supply mix contribution at time of peak to meet peak demands plus NPCC reserve requirements.⁶

Figure 7: Ontario Available Capacity at Time of Peak Demand (Reference Scenario)



Source: OPA

Where a capacity gap exists, it is assumed to be met by unspecified gas-fired resources as described in Section 3.0.

⁶ The amount of resources needed in a given year is equal to the forecast annual peak demand plus planning reserve requirements. Planning reserve requirements are determined through the use of a model that takes into consideration load forecast uncertainty, the unreliability of generating units, and the variability of renewable resources. The reserve margins are in accordance with the Northeast Power Coordinating Council (NPCC) resource adequacy criterion and are consistent with North American Electric Reliability Corporation (NERC) policies and standards.

4.2.4 Transmission Requirements

The transmission plan for east GTA involves constructing a new 500/230 kV transformer station in the Oshawa area as illustrated in Figure 7. This facility is estimated to cost \$270 million (or \$240 net present value in 2012 dollars) and would address the loss of supply capacity resulting from the retirement of Pickering NGS. Work is currently underway with Hydro One to develop a staged east GTA transmission plan that provides sufficient flexibility to meet the possible earliest need date of approximately 2015 while minimizing ratepayer costs should a decision be made in 2012 to extend the life of Pickering NGS to the year 2020.

Figure 8: Map of Transmission Facilities Supplying the GTA



Source: OPA

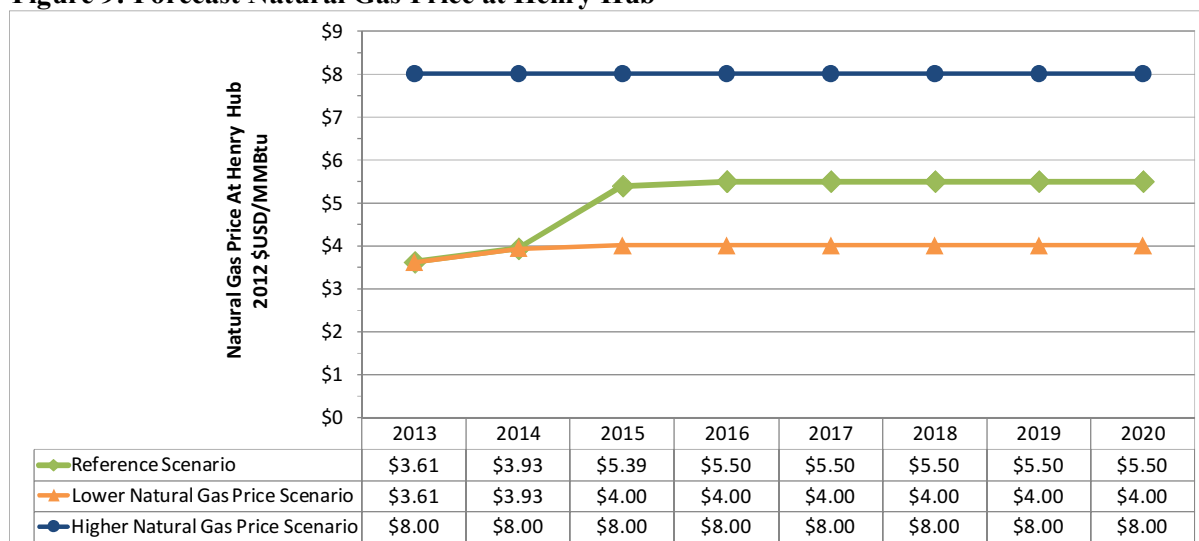
4.2.5 Forecast Natural Gas Prices

Natural gas prices used in the reference scenario are based on the January 31, 2012 forecast produced by Sproule Associates Limited⁷ as shown in Figure 9. Sensitivity scenarios described in Section 4.3 examine the impact of natural gas prices that are higher or lower than the reference scenario prices.

⁷ Sproule Associates Limited. www.sproule.com/files/January_31_2012.xls

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Figure 9: Forecast Natural Gas Price at Henry Hub



Source: Sproule, OPA

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4.2.6 Price of CO₂ Emissions

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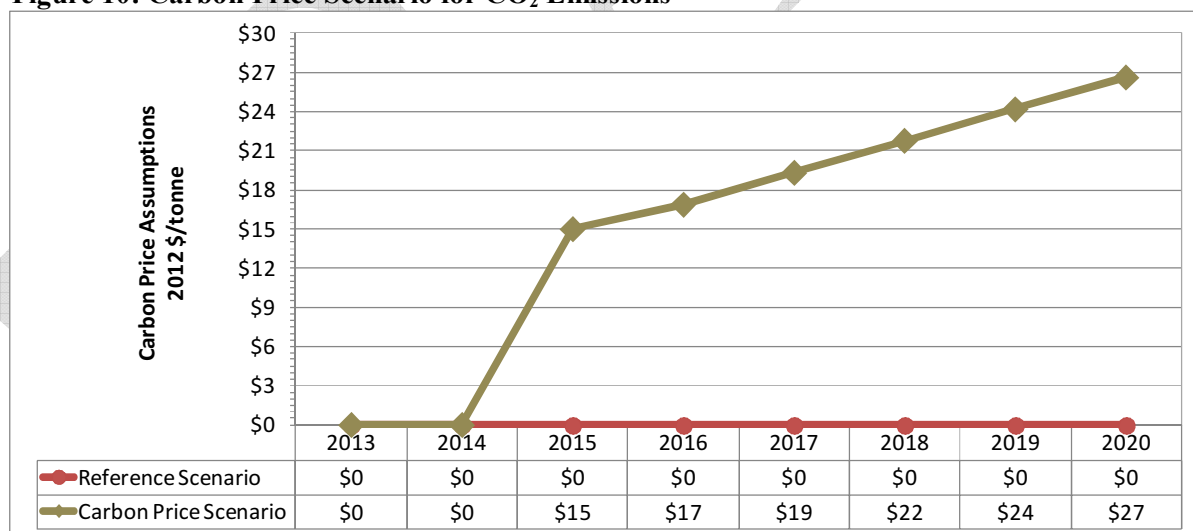
Projections of future carbon prices vary widely.⁸ Figure 10 shows the carbon price scenario assumed in the reference scenario and sensitivity scenario. The reference scenario assumes a carbon price of \$0/tonne between 2013 and 2020 which is consistent with the LTEP.

5

6

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Figure 10: Carbon Price Scenario for CO₂ Emissions



Source: OPA

⁸ For example, see “Canada’s Energy Future Reference Case and Scenarios to 2030” (NEB, 2007); “Design Recommendations for the WCI Regional Cap-and-Trade Program” (WCI, 2008); “Pricing Carbon: Saving Green” A Carbon Price to Lower Emissions, Taxes and Barriers to Green Technology” (David Suzuki Foundation, 2008); “Achieving 2050: A Carbon Pricing Policy for Canada” (NRTEE, 2009); “Climate Leadership, Economic Prosperity: Final Report on an Economic Study of Greenhouse Gas Targets and Policies for Canada” (Pembina Institute and David Suzuki Foundation, 2009).

4.2.7 Economic Analysis Assumptions

Economic analysis was performed on a societal basis without consideration of taxes, market financing, or other commercial impacts. Future costs were net present valued to 2012 dollars using a 4% real discount rate.

As described in Section 3.0, gas-fired generation was assumed to meet additional short-term capacity needs. The cost of gas-fired capacity is assumed to be \$108/kW-year which is the average per unit levelized fixed cost of a simple-cycle gas turbine.

The impacts on economic development, jobs, and community acceptance have not been studied but positive benefits are likely with the continued operation of Pickering NGS.

4.3 Sensitivity Scenarios

The sensitivity of the net benefits or costs to changes in key assumptions is considered to test the robustness of results across a broader range of system conditions. Ten sensitivity conditions were assessed in total and include:

- Lower or higher than forecast demand;
- Lower or higher than forecast natural gas prices;
- Higher than assumed cost of CO₂ emissions;
- Less than or better than expected performance of the Pickering NGS units during the continued operation period;
- Shorter than expected duration of the continued operation period; and
- Lower or higher than forecast capital and operating costs of continued operation.

The first sensitivity illustrates the effect of further demand reduction or demand growth on the value of additional supply from Pickering NGS. The second and third sensitivities illustrate factors that would influence the relative cost competitiveness of energy from Pickering NGS to that of other Ontario-based and external fossil-fuelled sources. The last three sensitivities illustrate implications of better or worse performance from Pickering NGS. These illustrate a range of factors and conditions that could influence the system impact of continued operation and the extent to which the potential benefits of continued operation could be achieved.

Each sensitivity scenario is further described below.

1. Reference Scenario

This scenario assumes the reference scenario conditions described in Sections 4.1 and 4.2.

2. Lower electricity demand in Ontario:

In this sensitivity scenario, annual demand in Ontario during the 2013 to 2020 period was assumed to be approximately 10 TWh lower by 2020 (62 TWh over the study period) as shown in Figure 2 and Figure 3. The effect of this sensitivity was to reduce opportunities for

electricity produced by Pickering NGS under continued operation to offset production from other, more expensive resources.

3. Higher electricity demand in Ontario:

In this sensitivity scenario, annual demand in Ontario during the 2013 to 2020 period was assumed to be approximately 10 TWh higher by 2020 (38 TWh over the study period) as shown in Figure 2 and Figure 3. The effect of this sensitivity was to increase opportunities for electricity produced by Pickering NGS under continued operation to offset production from other, more expensive resources.

4. Lower natural gas prices:

In this sensitivity scenario, natural gas prices were assumed to be \$4/MMBtu or approximately 40% lower than under the reference scenario. The effect of this assumption was to improve the cost competitiveness of production from natural gas-fired resources relative to production from Pickering NGS during the continued operation period.

5. Higher natural gas prices:

In this sensitivity scenario, natural gas prices were assumed to be \$8/MMBtu or approximately 40% higher than under the reference scenario. The effect of this assumption was to decrease the cost competitiveness of production from natural gas-fired resources relative to production from Pickering NGS between during the continued operation period.

6. Higher carbon prices:

In this sensitivity scenario, carbon penalties on electricity production from fossil sources were assumed to be as shown in Figure 10. This sensitivity represents a possibility of some form of carbon pricing being applied in accordance with government policy during the continued operations period. The effect of this assumption was to decrease the cost competitiveness of production from fossil fuel sources relative to production from Pickering NGS between approximately 2015 and 2020.

7. Lower annual production from Pickering NGS during continued operations:

In this sensitivity scenario, Pickering NGS was assumed to have an average annual capacity factor of approximately 64% during the continued operation period. This is based on the worst five-year average in the plant's history. The effect of this assumption was lower annual energy production (34 TWh less) from Pickering NGS during the continued operation period.

8. Higher annual production from Pickering NGS during continued operations:

In this sensitivity scenario, Pickering NGS was assumed to have an average annual capacity factor of approximately 85% during the continued operation period. This is based on the best five-year average in the plant's history. The effect of this assumption was higher annual energy production (8 TWh more) from Pickering NGS during the continued operation period.

9. Shorter than planned duration of the continued operation period:

In this sensitivity scenario, the duration of the continued operation period was assumed to be 50% of the planned duration. Accordingly, less total energy was produced (57 TWh less) from Pickering NGS during the continued operation period.

10. Lower capital and fixed operating costs related to Pickering NGS:

In this sensitivity scenario, capital and fixed operating costs related to Pickering NGS between 2013 and 2020 were assumed to be 10% lower than the planned expenditures in the reference scenario.

11. Higher capital and fixed operating costs related to Pickering NGS:

In this sensitivity scenario, capital and fixed operating costs related to Pickering NGS between 2013 and 2020 were assumed to be 20% higher than the planned expenditures in the reference scenario.

5.0 RESULTS OF ASSESSMENT

The results of this assessment are further described in Sections 5.1 through 5.5 below.

5.1 Integrated Power System Impacts

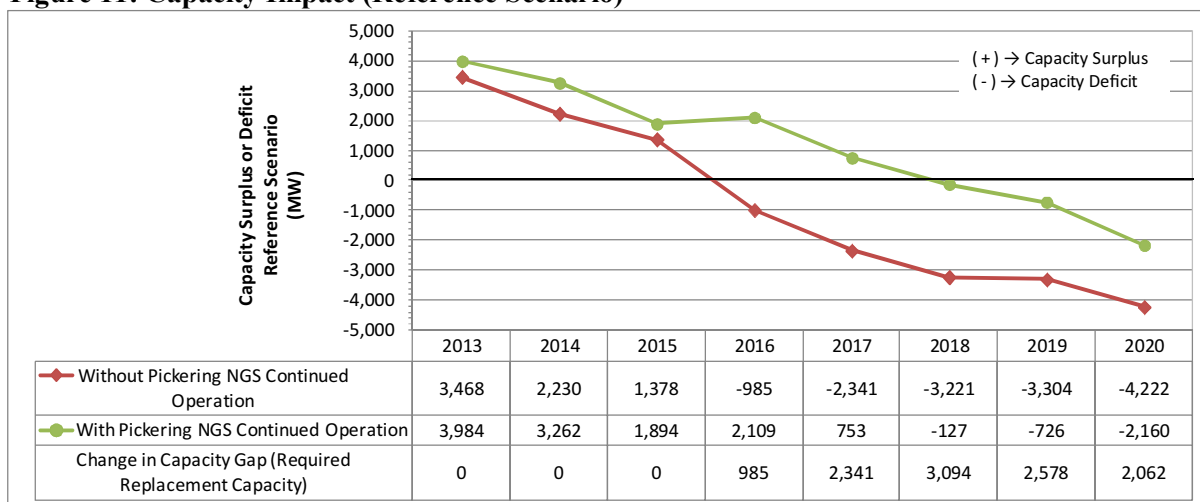
5.1.1 Capacity Investments

To meet NPCC reliability criteria, sufficient capacity must exist to meet peak demand and system reserve requirements. Between 2016 and 2020, in the absence of Pickering NGS continued operation and assuming that directed resources proceed as planned, between approximately 980 MW and 3,100 MW of capacity would have to be replaced in the reference scenario as shown in Figure 11.

In 2016 and 2017, only a portion of the capacity forgone by Pickering NGS would need to be replaced due to surplus capacity that could be available in these years. Between 2018 and 2020, all of the capacity otherwise provided by Pickering NGS would likely have to be replaced. As described in Section 3.0, gas-fired generation is assumed to provide the replacement capacity.

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Figure 11: Capacity Impact (Reference Scenario)



Source: OPA

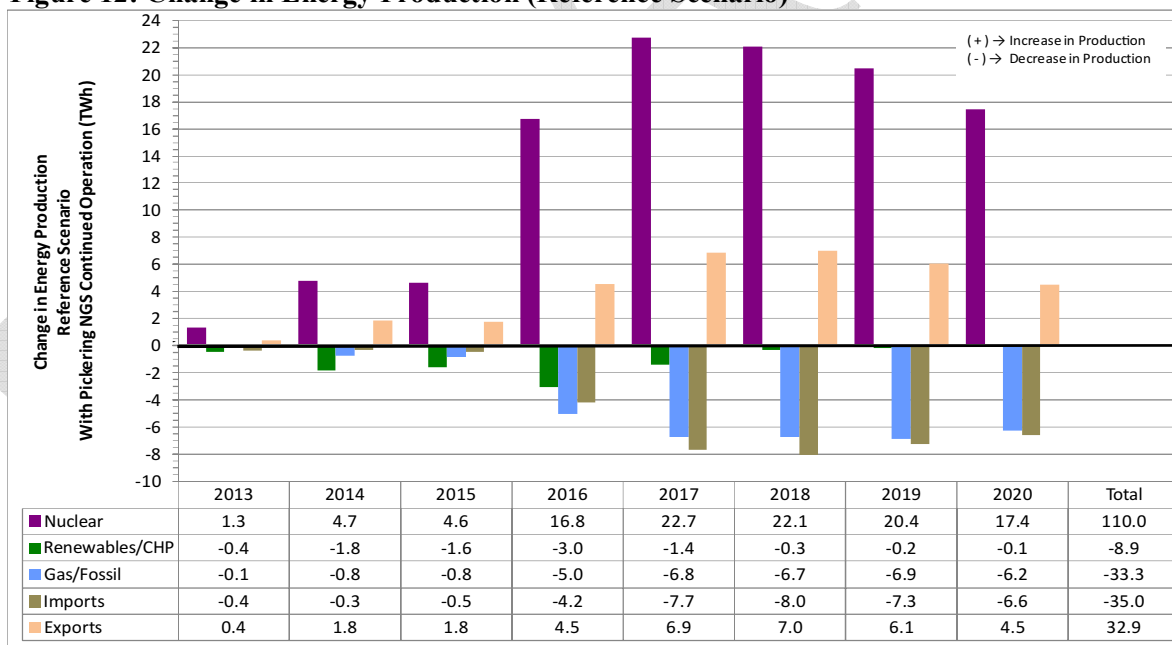
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3 5.1.2 Energy Production from Available Resources

4 In the reference scenario, nuclear energy production increases by 110 TWh between 2013
5 and 2020 with Pickering NGS continued operation as illustrated in Figure 12.

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Figure 12: Change in Energy Production (Reference Scenario)



Source: OPA

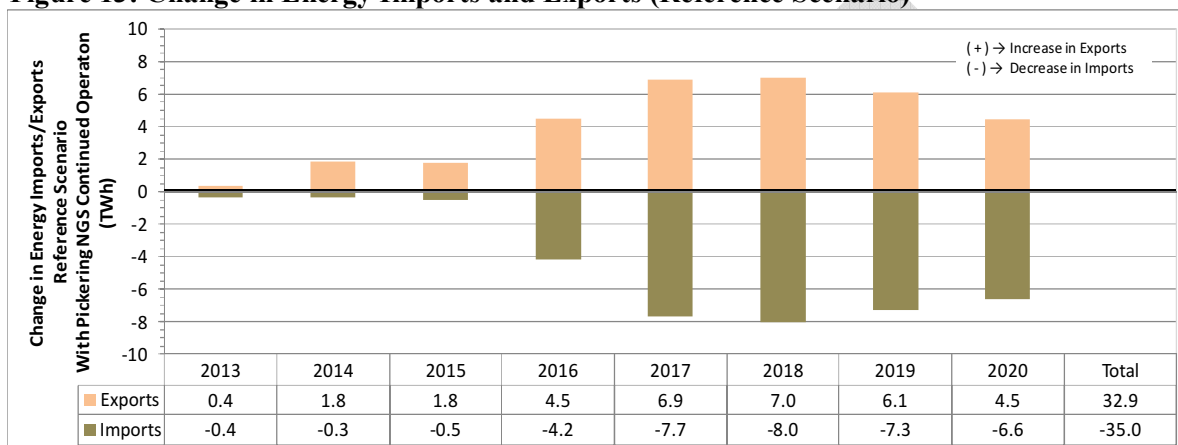
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8 The increase in energy production from Pickering NGS results in the displacement of
9 approximately 9 TWh of energy production from renewable and CHP resources and the
10 displacement of approximately 68 TWh of energy production from gas-fired generation and
11 imports. During this period, energy exports increase by approximately 33 TWh.

5.1.3 Electricity Imports and Exports

Between 2013 and 2020, Pickering NGS continued operation increases electricity exports by about 33 TWh under the reference scenario as a result of the increase in nuclear energy production from Pickering NGS (see Figure 13). This is equivalent to 30% of the increase in nuclear energy production during this period. During the same period, electricity imports decrease by about 35 TWh.

Figure 13: Change in Energy Imports and Exports (Reference Scenario)



Source: OPA

5.1.4 Potential Surplus Energy

Potential surplus energy (“PSE”) is a condition that occurs when electricity production from facilities that are self-scheduling or have limited dispatch capability (i.e. baseload resources) is greater than the Ontario demand. Generation resources that are self-scheduling or have limited dispatch capability include facilities such as wind, non-utility generation, and nuclear.

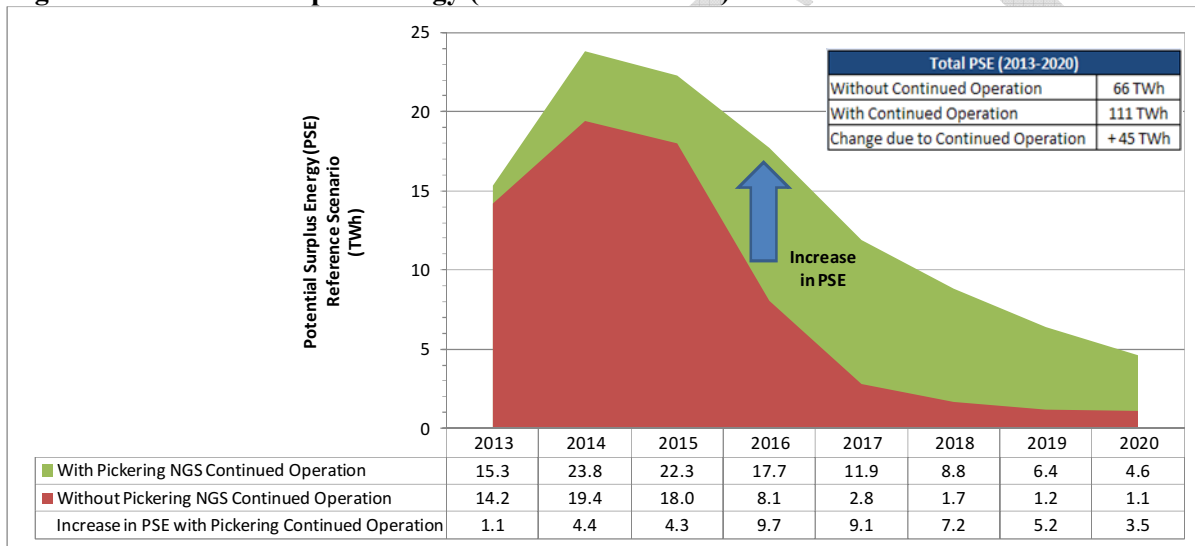
The potential for these periods of surplus to occur has, and is expected to, increase in the near-term in frequency, duration, and volume as overall electricity demand declines and new non-dispatchable and intermittent resources are added. Then, in the mid-term, the potential for surplus energy is expected to decline as nuclear units are refurbished. When these units return to service, PSE is expected to rise again but at somewhat lower levels as the load grows. As the amount of baseload resources increase, so does the frequency for periods with surplus energy.

Figure 14 illustrates the amount of generation produced from self-scheduling and baseload resources that are in excess to Ontario demand and prior to exercising actions to manage and mitigate the surplus energy. In practice, surplus energy does not exist in real time operation of the power system as electricity production matches demand for electricity. The mechanisms the system has to mitigate potential surplus energy include exporting the surplus energy, strategically scheduling outages, spilling hydro, and curtailing generation including wind and solar in order to balance the system. In real time, the amount of potential surplus energy that could be experienced may be quite different from the planned or expected

amounts due to even minor changes in actual production by specific generators like hydroelectric or nuclear facilities or due to changes in demand (due to, for example, weather).

Between 2013 and 2020, PSE exists in all years but is observed to increase by 45 TWh due to Pickering NGS continued operation. The increase in PSE is equivalent to 40% of the increase in Pickering NGS energy production during the period 2013 through 2020 (Table 2). This means that in the absence of Pickering NGS continued operation, 60% of the energy that would have been produced by Pickering NGS throughout the continued operation period would be replaced by renewable resources that would have otherwise been curtailed and by additional gas-fired generation (as seen in Figure 12). The remaining 40% would have been surplus to Ontario.

Figure 14: Potential Surplus Energy (Reference Scenario)



Source: OPA

Table 2: Potential Surplus Energy (PSE) Production from Pickering

	2013	2014	2015	2016	2017	2018	2019	2020	Total
Change in PSE Relative to the Increase in Nuclear Energy Production Due to Pickering NGS Continued Operations	87%	93%	94%	58%	40%	32%	25%	20%	40%

Source: OPA

5.1.5 System Operating and Capital Costs

The availability of Pickering NGS affects the operating cost of Ontario's electricity system and associated capital investments.

In the reference scenario, the net system operating cost ("system variable costs"), which include variable operating costs and fuel costs, decrease by \$2.51 billion (net present value) between 2013 and 2020 with Pickering NGS continued operation (Figure 15).

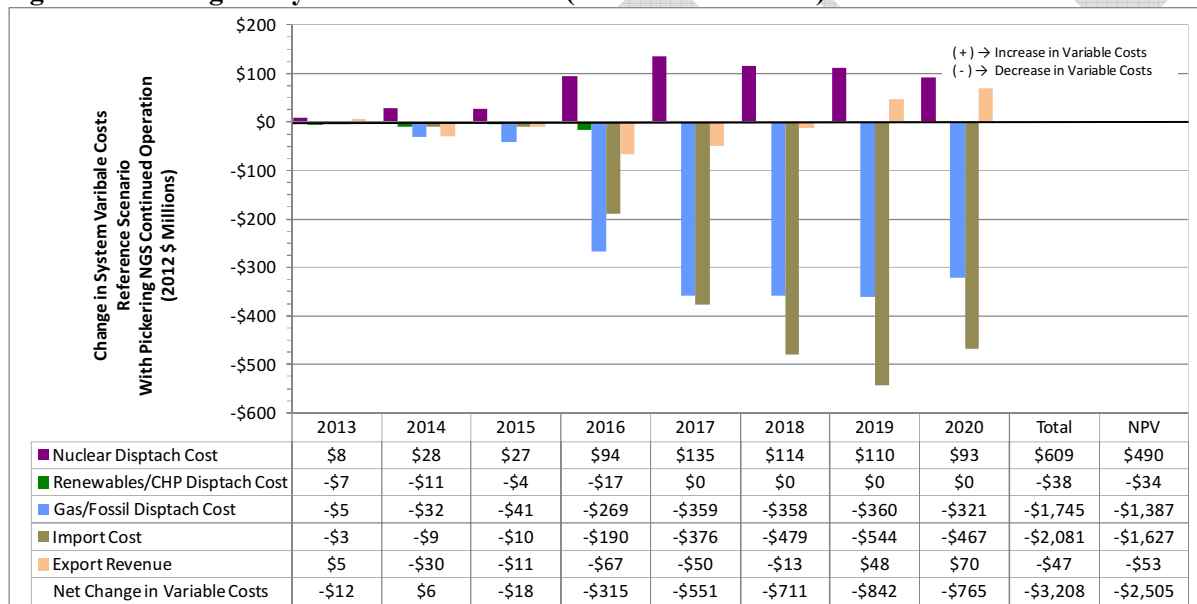
The savings in system variable costs consist of approximately \$1.42 billion in reduced dispatch costs from Ontario resources (as production from Pickering NGS offsets production

from higher cost gas-fired resources in Ontario) and \$1.63 billion in reduced import costs. Some of these savings are offset by ongoing nuclear variable costs during this period amounting to \$0.49 billion namely due to the increased fuel and fuel related costs associated with Pickering NGS continuing to operate for additional years.

Hourly exports occur due to economic opportunities that exist between Ontario and external electricity markets. The revenues associated with these transactions are based on the Hourly Ontario Electricity Price (HOEP). Export revenues decrease by \$0.05 billion over the period as the average value of HOEP decreases due to the lower cost of supply resulting from Pickering NGS continued operation.

Almost 47% of the savings in system variable costs were seen to come from reduced amounts of more expensive supply in Ontario. About 53% of the savings were a result of lower import requirements.

Figure 15: Change in System Variable Costs (Reference Scenario)



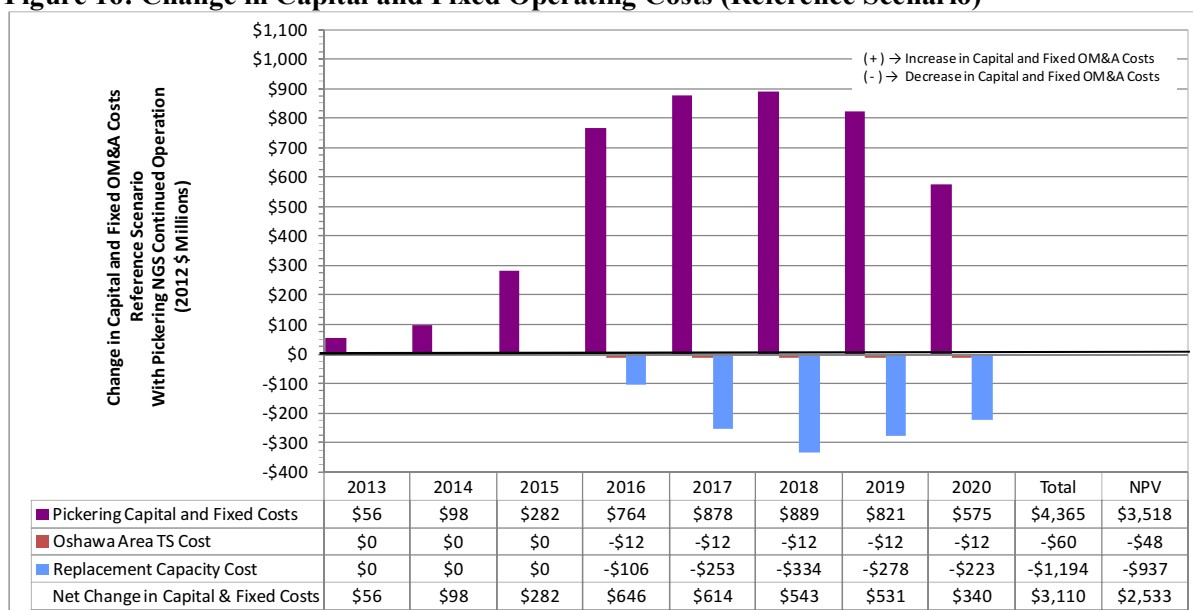
Source: OPA

The net savings in system variable costs are offset by a net increase in system capital and fixed operating costs in the reference scenario. Net system capital and fixed operating costs increase by \$2.53 billion (net present value) between 2013 and 2020 with Pickering NGS continued operation (Figure 16).

The net increase in system capital and fixed operating costs is primarily due to the cost of operating units at Pickering NGS for additional years, amounting to \$3.52 billion (net present value). However, Pickering NGS continued operation does reduce or avoid the need for capacity investments in some years. In addition to providing capacity, Pickering NGS continued operation would defer the need for transmission investments for the GTA. Together, the savings from these is estimated to be \$985 million consisting of \$937 million from reduced capacity costs and \$48 million from the deferral of Oshawa Area TS.

1 In addition, OPG estimates \$120 million (net present value) in savings in deferring
2 decommissioning of the Pickering NGS units until at least 2020 and \$90 million savings in
3 severance related costs.

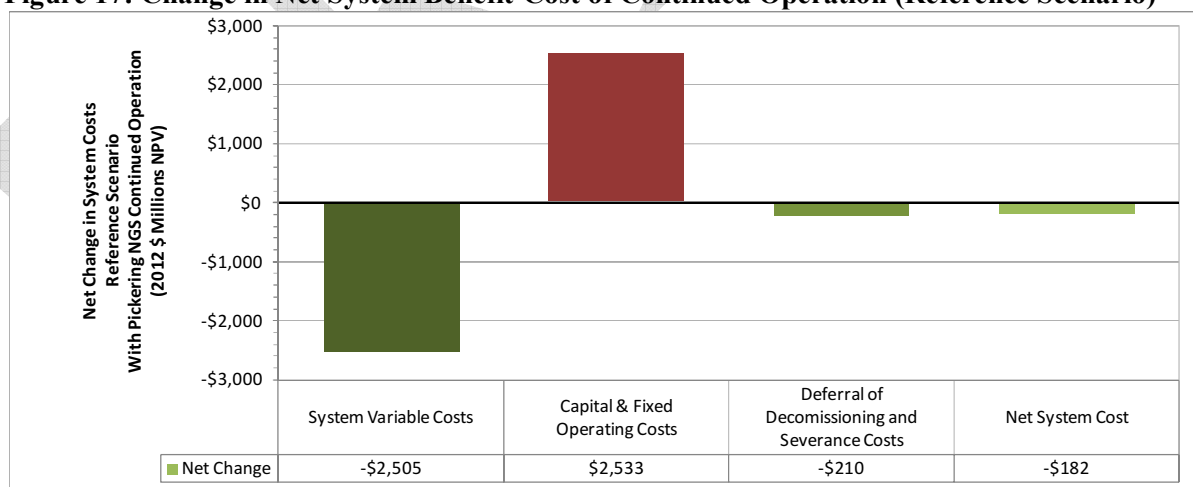
Figure 16: Change in Capital and Fixed Operating Costs (Reference Scenario)



Source: OPA

4 Thus over the study period and under the reference scenario, the \$2.51 billion decrease in
5 system variable costs, \$2.53 billion increase in system capital and fixed operating costs, and
6 \$210 million savings in deferring decommissioning and severance results in a net system
7 benefit of \$0.18 billion as a result of Pickering NGS continued operation (Figure 17).
8
9

Figure 17: Change in Net System Benefit-Cost of Continued Operation (Reference Scenario)



Source: OPA

10 Expenditures in support of continued operation and additional fuel and fixed operating costs
11 associated with operating Pickering NGS over the continued operation period, net of
12

1 decommissioning and severance related savings, total approximately \$3.80 billion. This is
2 exceeded by system savings of approximately \$3.98 billion from avoiding generation from
3 more expensive sources, reducing capacity purchases during the continued operation period,
4 and deferring transmission investments.

5
6 The timing and amount of replacement capacity in the absence Pickering NGS continued
7 operation was assumed to exactly match system requirements (NPV cost of \$937 million).
8 This likely underestimates the benefit of avoiding replacement capacity related investments
9 as in reality, replacement capacity would likely be procured in advance of the timing of need
10 and, depending on the nature of the procurement, may remain in service beyond the period of
11 need. In addition, building new facilities to replace Pickering NGS is also not a practical
12 option as the capacity gap is temporary (primarily during the nuclear refurbishment period
13 from 2016 through 2024) and new facilities would tend to operate for at least 20 years. There
14 would be a cost associated with continuing to operate a new facility beyond the period of
15 need.

16 17 **5.2 Sensitivity of System Benefit for a Range of System Conditions**

18 Figure 18 provides a summary of the net system benefit-cost of Pickering NGS continued
19 operation for a range of system conditions. Of the ten sensitivity scenarios examined,
20 Pickering NGS continued operation increases system costs in five of the scenarios whereas
21 system costs are decreased in the other five. The net system benefit ranges from -\$0.76
22 billion to \$1.33 billion for the range of system conditions evaluated.

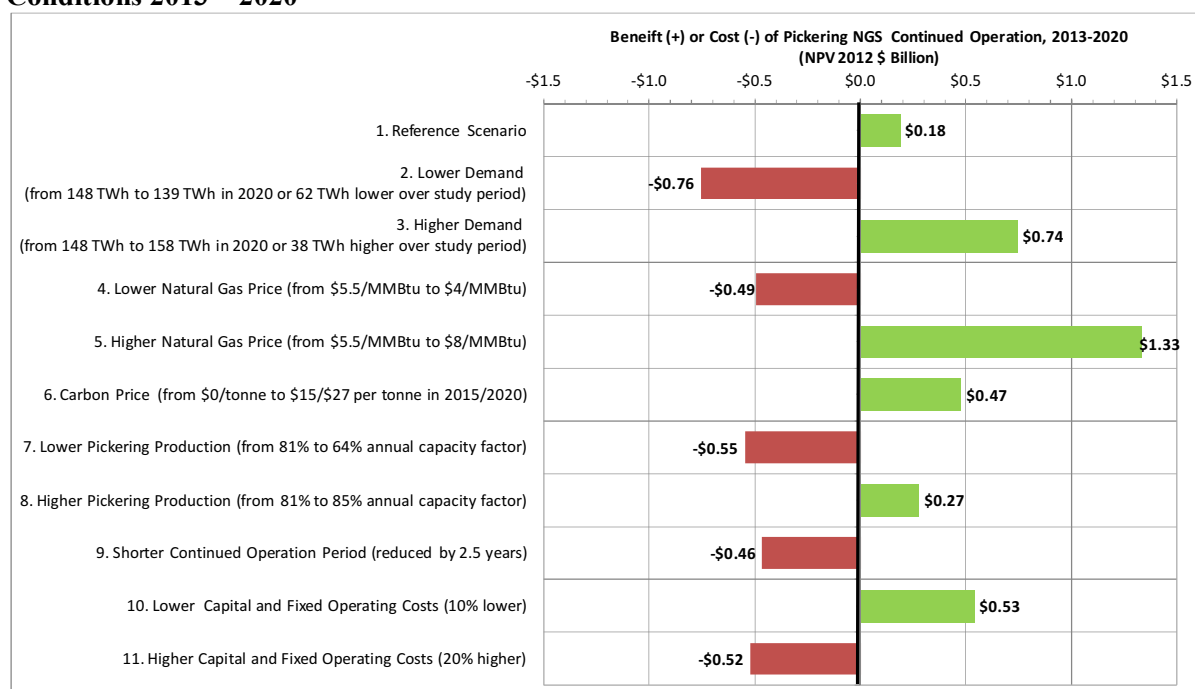
23
24 The first five sensitivity scenarios illustrate the impact of changes in system conditions
25 independent to the operation of Pickering NGS. Three factors were explored in this regard:
26 changes to demand, natural gas prices, and carbon prices.

27
28 A reduction in demand growth of 10 TWh by 2020 (62 TWh over the study period) had the
29 affect of increasing net system cost to \$0.76 billion. This is due to reduced benefits derived
30 from displacing gas-fired generation and imports and increases in surplus energy. If demand
31 were to increase 10 TWh by 2020 (38 TWh over the study period), the net system benefit
32 increases to \$0.74 billion.

33
34 Reducing the natural gas price to \$4/MMBtu increased the net system cost to about \$0.49
35 billion. However, increasing the natural gas price to \$8/MMBtu increased the net system
36 benefit to \$1.33 billion. The analysis shows that for Pickering NGS continued operation to
37 be a net system benefit, forecast natural gas prices would have to be above \$5/MMBtu (all
38 else being equal).

39
40 The sensitivity scenario illustrating higher carbon prices (and therefore affecting the cost
41 competitiveness of natural gas and coal-fired sources (in the case of imports)) resulted in a
42 net system benefit of \$0.47 billion. More aggressive carbon pricing systems than that
43 assumed in this study during the continued operation period would further increase the
44 system benefit of Pickering NGS continued operations.

Figure 18: Net Benefit–Cost of Pickering Continued Operation for a Range of System Conditions 2013 – 2020



Source: OPA

The last 5 sensitivity scenarios relate to the performance of Pickering NGS. Three factors were explored in this regard: annual energy output of Pickering NGS under continued operation, duration of the continued operation period, and the capital and fixed operating costs associated with continued operation.

Reducing the annual capacity factor (a measure of plant energy production) to 64% increased the net system cost to \$0.55 billion. This is due to reduced opportunities for gas displacement while fixed costs of operating Pickering NGS remain unchanged. An increase in the annual energy production from Pickering NGS to an 85% annual capacity factor resulted in a \$0.27 billion net system benefit.

Reducing the duration of continued operation by 50% increased the net system cost to \$0.46 billion. This is as a result of most of the additional energy production from Pickering NGS occurring during periods of significant surplus energy, thereby reducing opportunities to displace gas-fired generation.

A 10% decrease in capital and fixed operating costs translated to a \$0.53 billion increase in net system benefit whereas a 20% increase in capital and fixed operating costs resulted in a \$0.52 billion increase in net system costs.

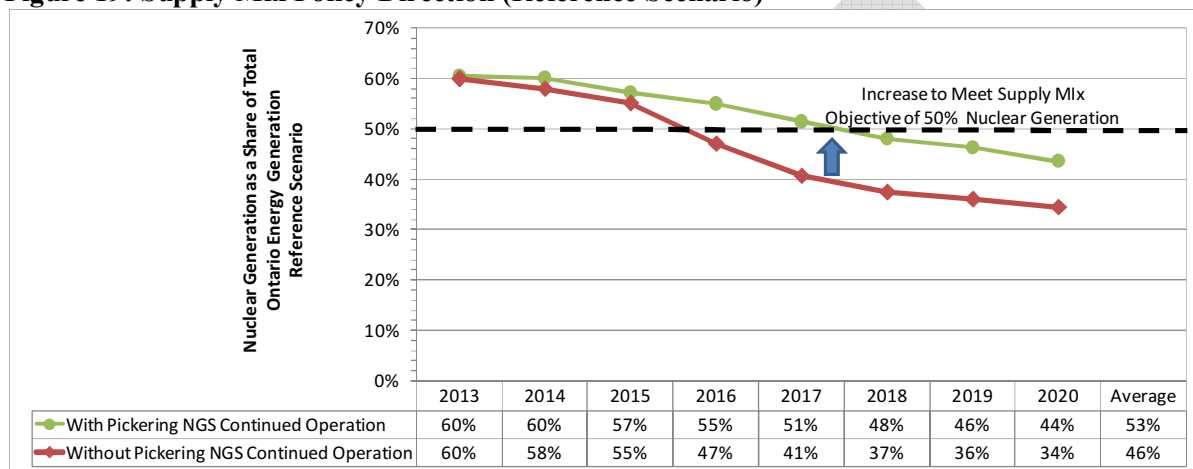
Drivers of costs and benefits of continued operation under sensitivity conditions considered were found to have similar relative impact as under the reference scenario. For example, cost savings associated with reduced natural gas-fired production and imports in Ontario

under scenarios of continued operation were typically seen to represent the largest share of total continued operation benefits.

5.3 Supply Mix Policy Direction

Between 2013 and 2020, average Ontario nuclear energy production with Pickering NGS continued operation represents 53% of the energy supply mix as compared to 46% without (Figure 19).

Figure 19: Supply Mix Policy Direction (Reference Scenario)



Source: OPA

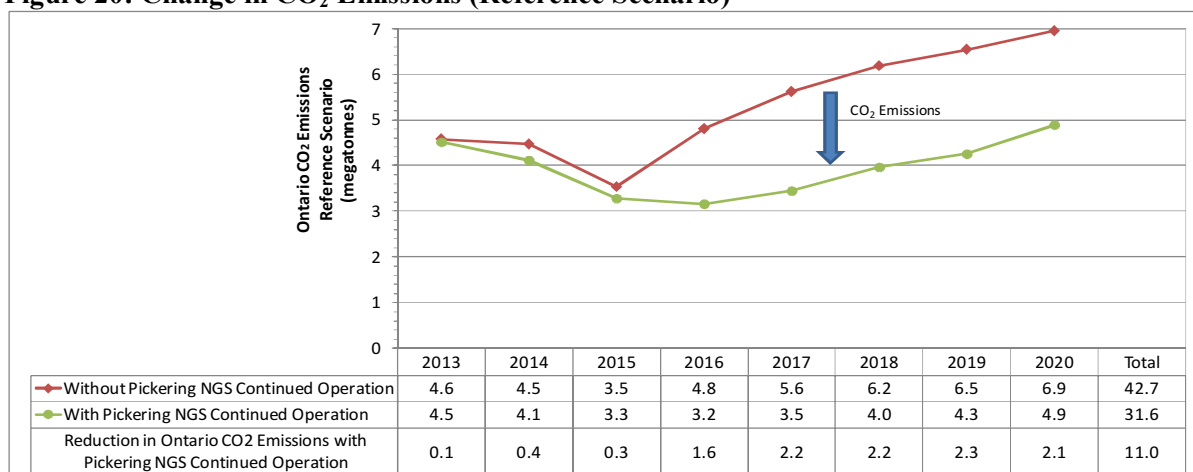
Pickering NGS continued operation is consistent with the 2011 Supply Mix Directive for 50% of Ontario generation to be supplied from nuclear generation. This policy is consistent with the OPA Supply Mix Advice provided to the Ontario government in December 2005, the Integrated Power System Plan submitted to the OEB in 2007, and in subsequent OPA planning.

5.4 Ontario CO₂ Emissions

Pickering NGS continued operation could avoid 11 megatonnes of total Ontario CO₂ emissions by 2020. The replacement energy provided by gas-fired generation is a source of increased CO₂ emissions which is not consistent with government policy to reduce greenhouse gas emissions as described in Section 2.4. Pickering NGS continued operation produces virtually no CO₂ emissions in operation.

Pickering NGS continued operation also reduces imports. Most of the imports are likely to come from coal-fired generation in NYISO and PJM. Emissions reductions in jurisdictions outside Ontario due to reduced imports were not considered in this analysis although would further increase the benefit.

Figure 20: Change in CO₂ Emissions (Reference Scenario)



Source: OPA

5.5 Transmission Requirements

As described in Section 2.5 and 4.2.4, when Pickering NGS retires, additional transformer capacity will be needed to maintain reliable load supply to customers in the GTA. These facilities must be timed to precede the retirement of Pickering NGS. In the absence of Pickering NGS continued operation, the timing of the need for “Oshawa Area TS” is accelerated from an in-service date of approximately 2020 to approximately 2015. The estimated capital investment for Oshawa Area TS is \$270 million (or \$240 net present value in 2012 dollars). Deferral of Oshawa Area TS as a result of Pickering NGS continued operation would result in cash flow savings of \$12 million for each year deferred. Deferring the in-service date from approximately 2015 to 2020 would result in a net present value savings of approximately \$50 million over this period.

6.0 CONCLUSIONS

1. The net system benefit of Pickering NGS continued operation is expected to be \$182 million, but could range from -\$0.76 billion to \$1.33 billion, based on the system conditions studied.
2. Conditions under which system economic benefits could be higher than those studied include higher than forecast natural gas prices or a combination of higher than forecast demands and carbon prices. These would tend to increase the value of displacing Ontario gas-fired generation as well as increase the potential value of net exports. A combination of lower capital and fixed operating costs and/or higher production during the continued operation period could also lead to higher system economic benefits.
3. There are several potential benefits to Pickering NGS continued operation. These include:
 - A reduction in the need for replacement capacity and energy during the nuclear refurbishment period and associated acquisition costs;

- A hedge against factors including increased demand, delay in achieving conservation targets, higher natural gas or carbon prices, nuclear refurbishment delays, or delays in the in-service of directed resources;
- Compliance with the Supply Mix policy direction of 50% nuclear energy;
- A reduction in Ontario CO₂ emissions; and
- Deferral of transmission enhancements to maintain reliable load supply to customers in the east GTA (“Oshawa Area TS”) upon retirement of Pickering NGS.

7.0 RECOMMENDATIONS

Based on the potential benefits that have been identified, the OPA considers it prudent, on balance, to proceed with an expenditure of funds in 2013 and 2014 for Pickering NGS continued operation should it prove technically feasible.

From: Simon Zhang
Sent: January-12-12 12:02 PM
To: Nicole Hynum; Julia McNally; Jodi Amy
Cc: Andrew Pietrewicz
Subject: RE: Bathtub chart (demand vs supply)
Attachments: Load & Supply bathtub chart 2012-01-10.xlsx

Hi Nicole,

The attached is the requested file. There is no same graph for energy as energy output from each type of generation can vary as per system conditions.

Regards,

Simon

From: Nicole Hynum
Sent: Thursday, January 12, 2012 11:49 AM
To: Simon Zhang; Julia McNally; Jodi Amy
Cc: Andrew Pietrewicz
Subject: RE: Bathtub chart (demand vs supply)

Thank you Simon:

Would you be able to send the source file for the below graph?
Also, could you provide the same graph for energy (and its source file)?

Please let me know if you have any questions and if you are able to complete this today. We need this as soon as possible.

Thanks again for all your help.

Nicole L. Hynum

Strategy Manager
Strategy and Reporting - Conservation

Ontario Power Authority
120 Adelaide Street West
Suite 1600
Toronto, ON M5H 1T1

416.969.6240 (T)
416.967.1947 (F)

<http://www.powerauthority.on.ca>

From: Simon Zhang
Sent: Tuesday, January 10, 2012 1:21 PM
To: Julia McNally; Jodi Amy
Cc: Andrew Pietrewicz; Nicole Hynum
Subject: Bathtub chart (demand vs supply)

Hi Julia and Jodi,

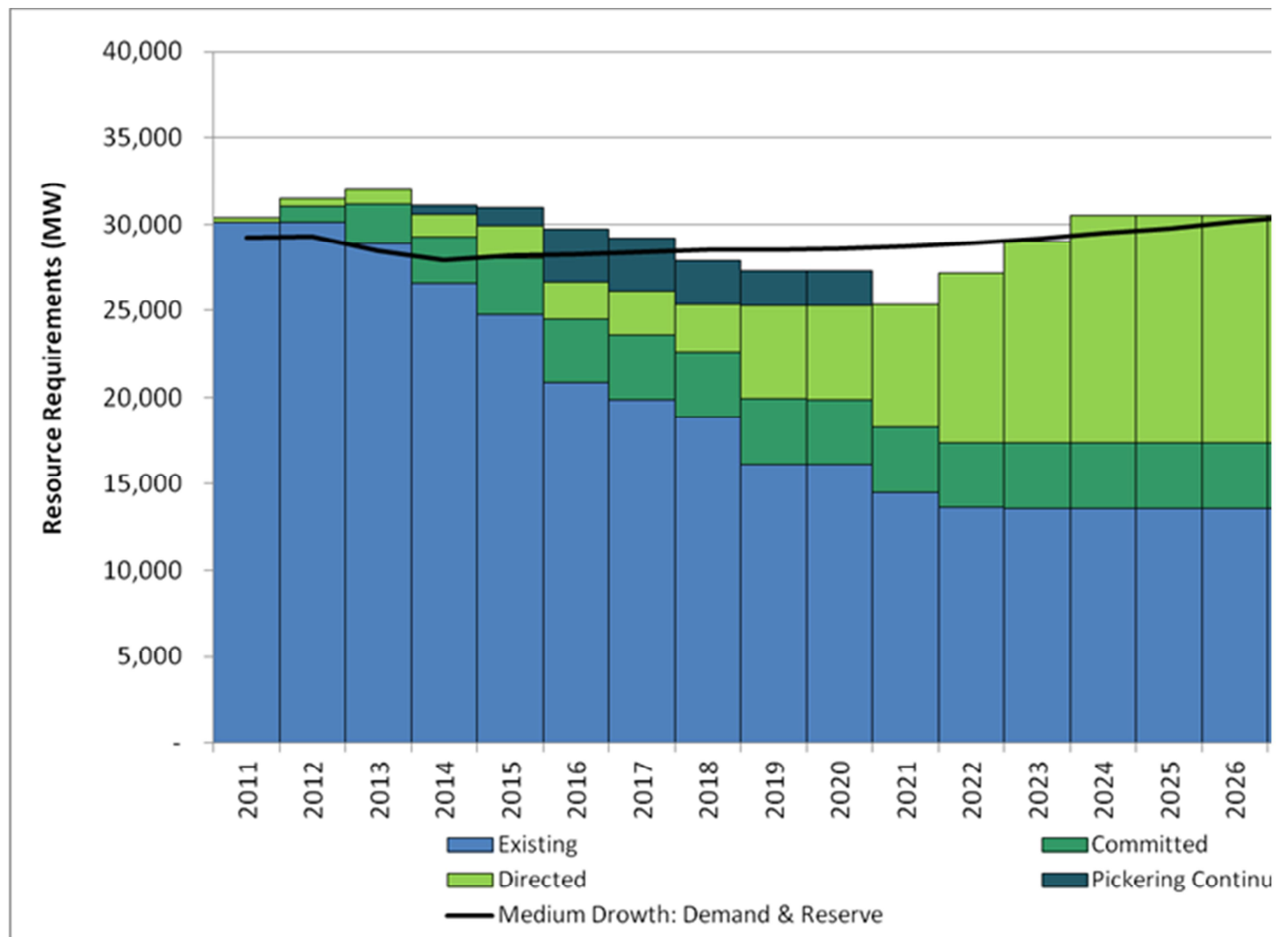
As discussed, here is the bathtub chart showing the demand and resources.

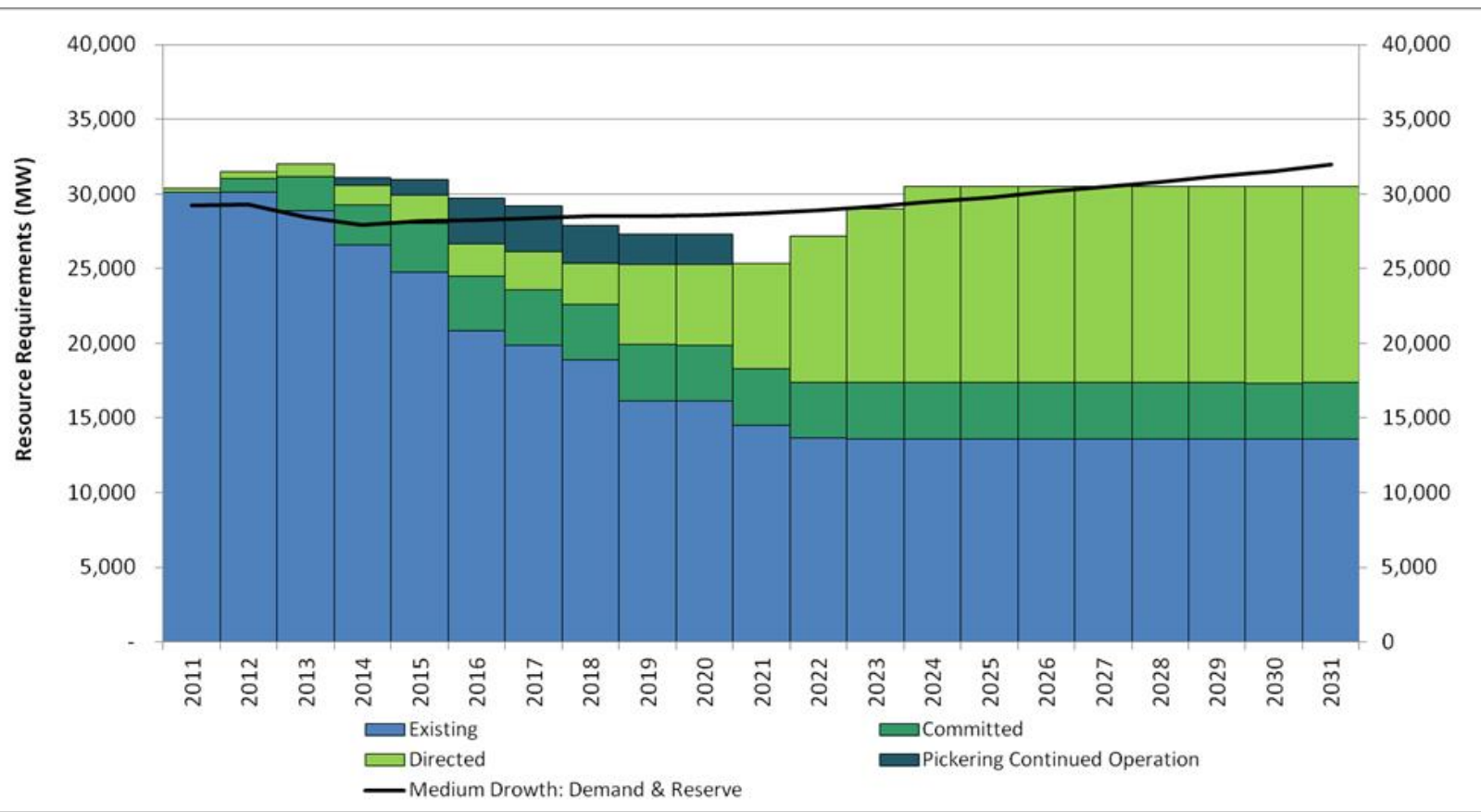
Demand: medium case net + reserve
Supply: breakdown of effective MW at peak

Let me know if you have any questions. Thanks.

Regards,

Simon

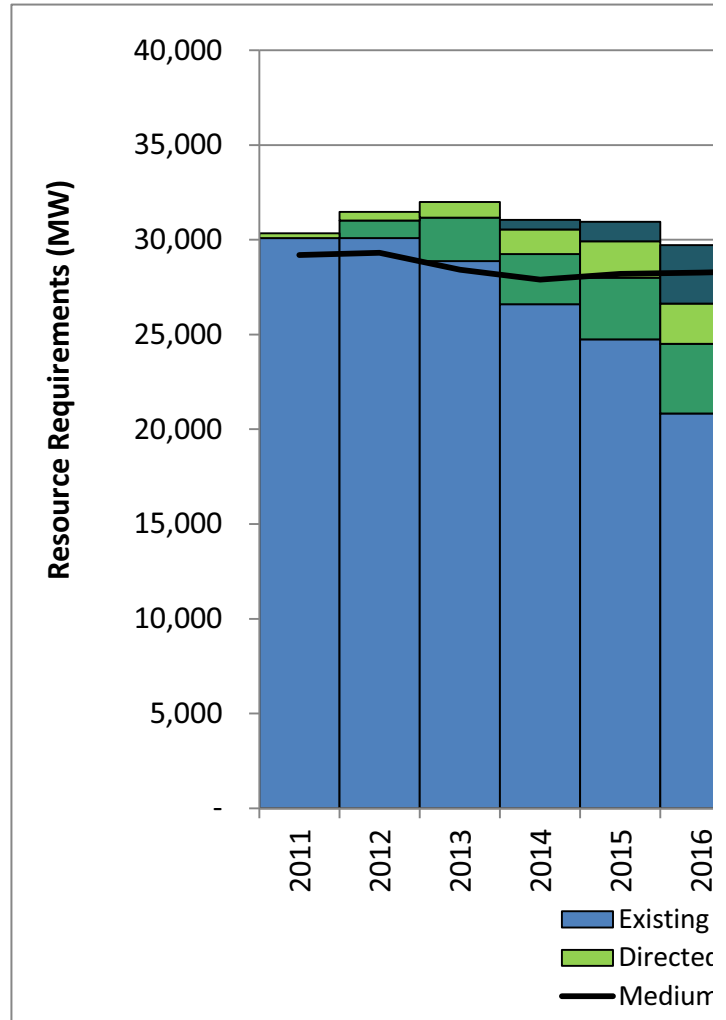




Contribution at Time of Peak

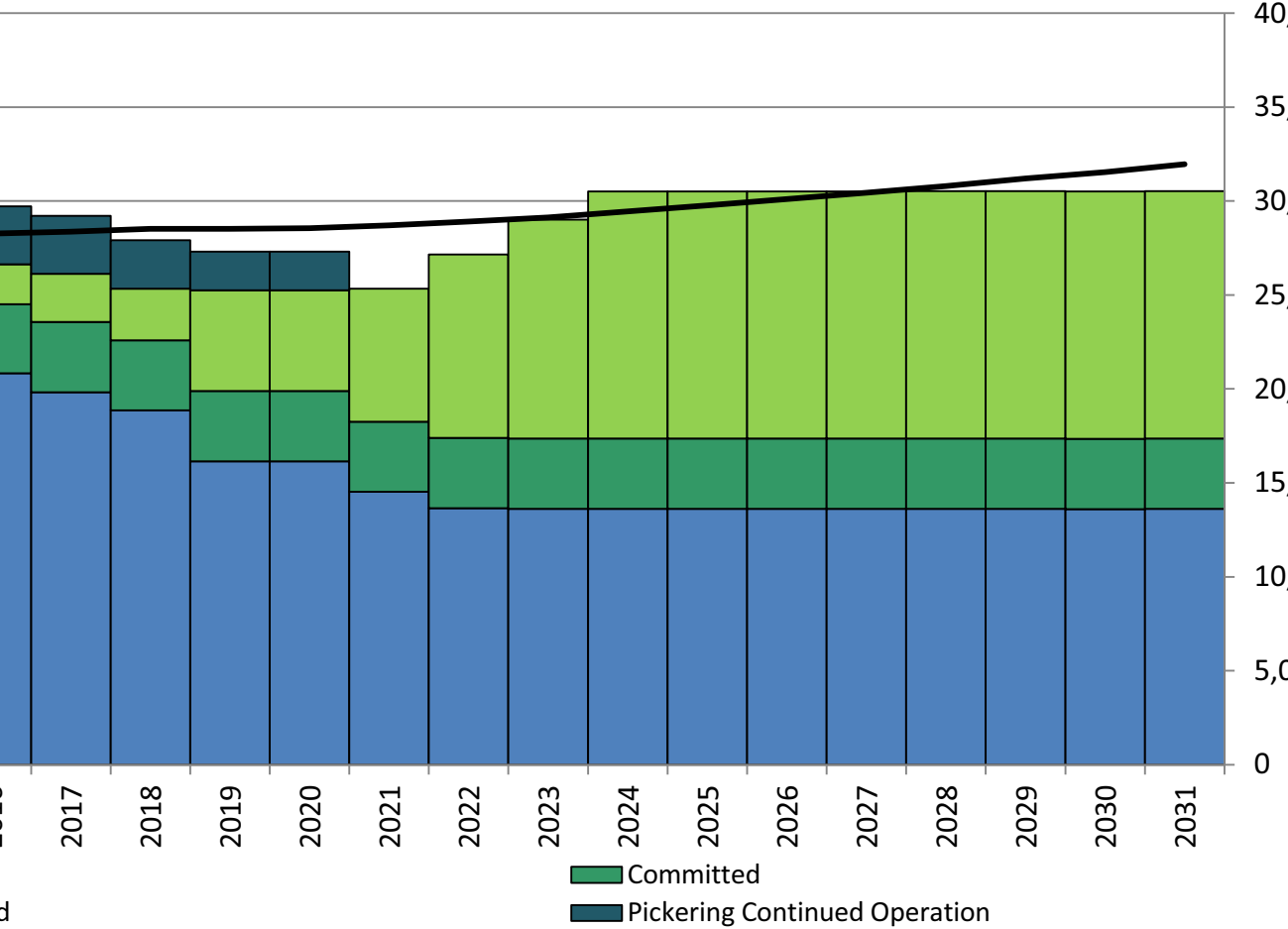
Effective MW	2011	2012	2013	2014	2015	2016	2017
Existing	30,084	30,088	28,874	26,605	24,744	20,838	19,827
Committed	8	930	2,303	2,639	3,263	3,673	3,736
Directed	252	463	823	1,300	1,912	2,122	2,558
Pickering Continued Operation	-	-	-	516	1,032	3,094	3,094
Total	30,344	31,482	31,999	31,060	30,951	29,728	29,215

Medium Growth: Demand & Reserv 29205 29320 28424 27891 28199 28277 28369



2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
18,858	16,153	16,151	14,523	13,655	13,619	13,619	13,619	13,619	13,619	13,619
3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736
2,743	5,364	5,369	7,072	9,775	11,655	13,158	13,161	13,164	13,167	13,169
2,578	2,062	2,062	-	-	-	-	-	-	-	-
27,915	27,315	27,317	25,330	27,165	29,010	30,513	30,515	30,518	30,521	30,524

28524	28522	28553	28702	28906	29133	29456	29764	30108	30452	30797
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1 Growth: Demand & Reserve

2029	2030	2031
13,619	13,606	13,619
3,736	3,736	3,734
13,172	13,175	13,178
-	-	-
30,527	30,517	30,531

31198	31542	31960
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From: Simon Zhang
Sent: February-14-12 9:20 AM
To: Andrew Pietrewicz
Subject: FW: Bathtub chart (demand vs supply)
Attachments: Load & Supply bathtub chart 2012-01-10.xlsx

Hi Andrew,

FYI. This is what was requested and provided a month ago.

Regards,

Simon

From: Simon Zhang
Sent: Thursday, January 12, 2012 12:02 PM
To: Nicole Hynum; Julia McNally; Jodi Amy
Cc: Andrew Pietrewicz
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Hi Nicole,

The attached is the requested file. There is no same graph for energy as energy output from each type of generation can vary as per system conditions.

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Sent: Thursday, January 12, 2012 11:49 AM
To: Simon Zhang; Julia McNally; Jodi Amy
Cc: Andrew Pietrewicz
Subject: RE: Bathtub chart (demand vs supply)

Thank you Simon:

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Thanks again for all your help.

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Strategy Manager
Strategy and Reporting - Conservation

Ontario Power Authority

120 Adelaide Street West
Suite 1600
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416.969.6240 (T)

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<http://www.powerauthority.on.ca>

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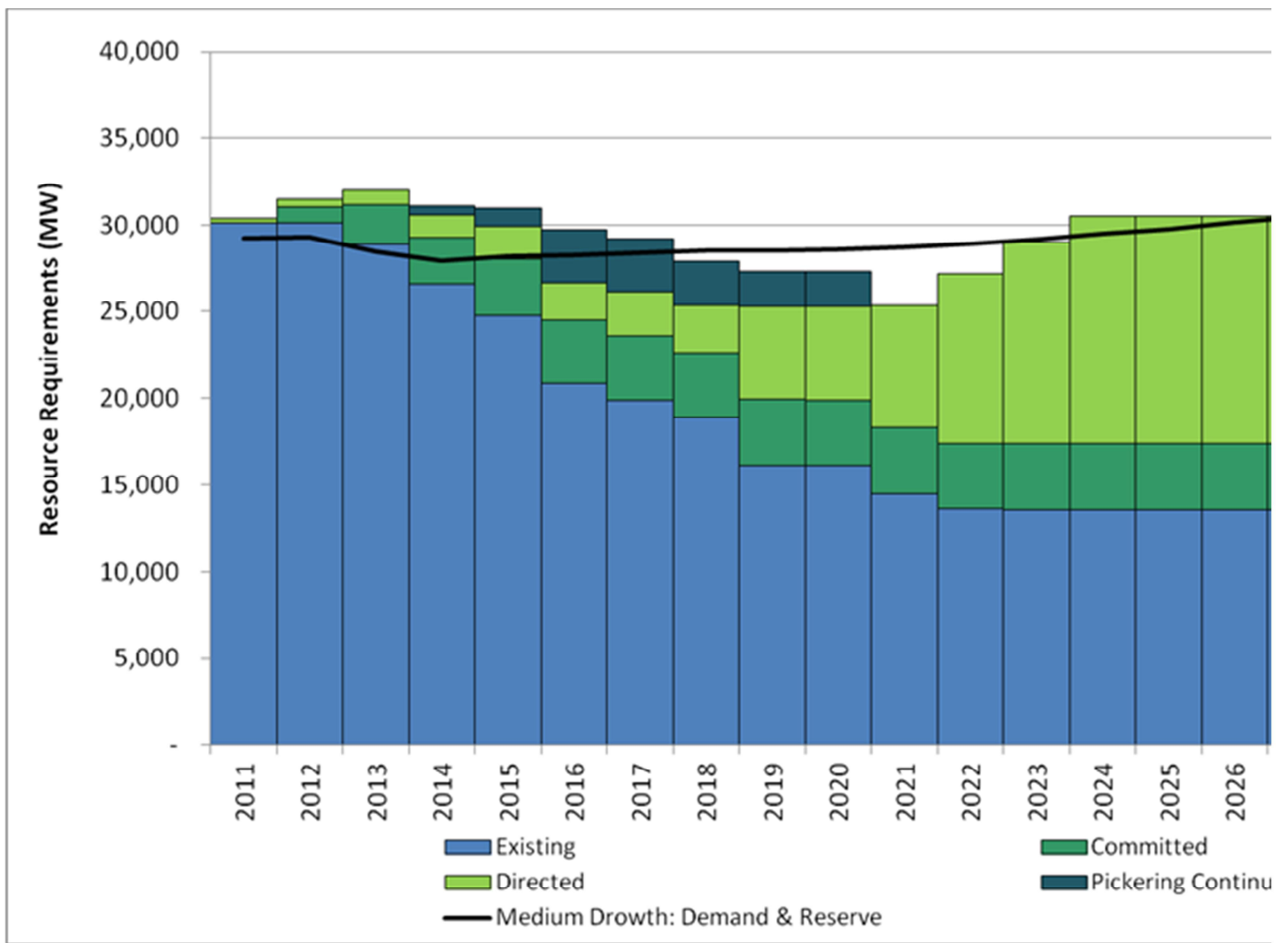
Demand: medium case net + reserve

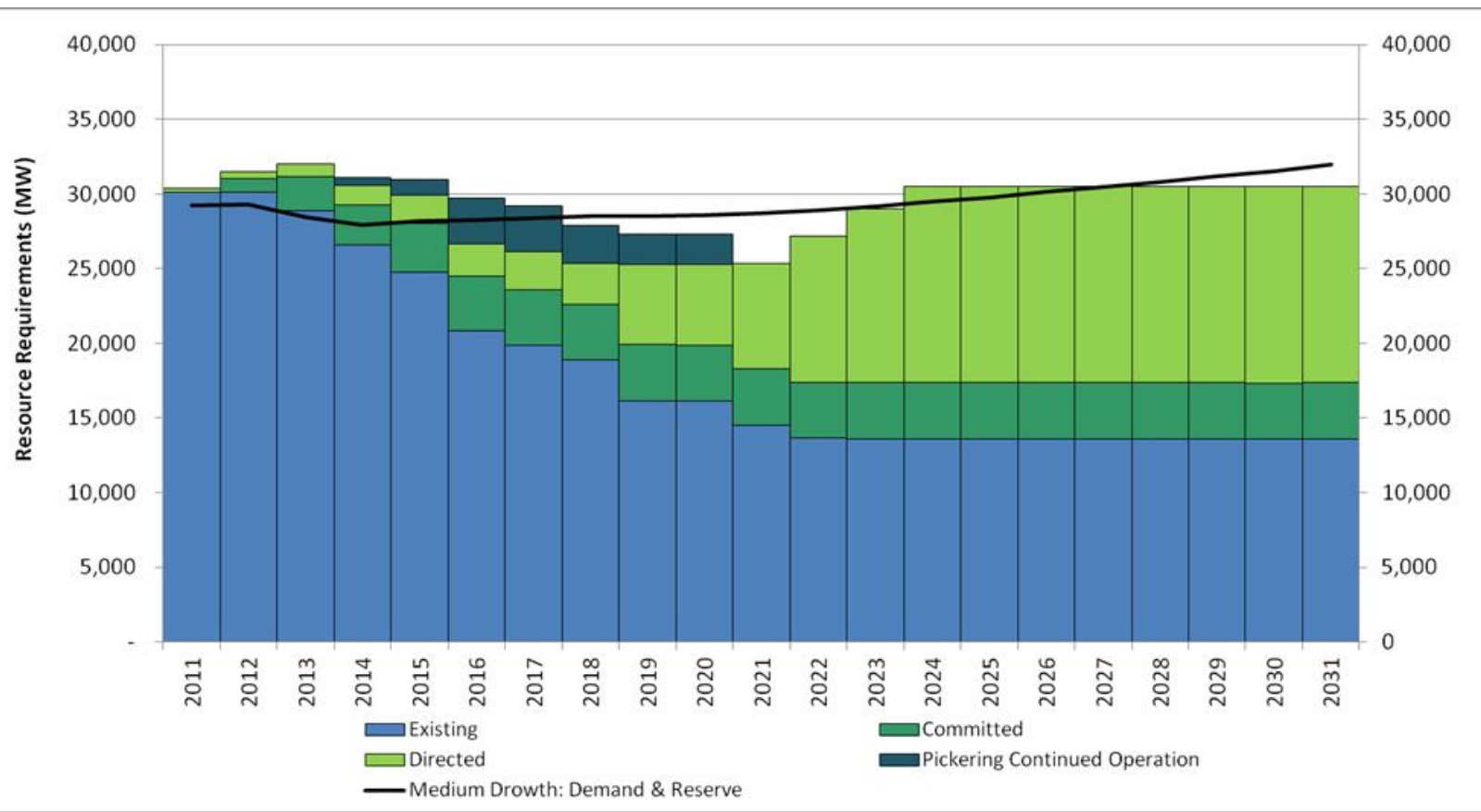
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Regards,

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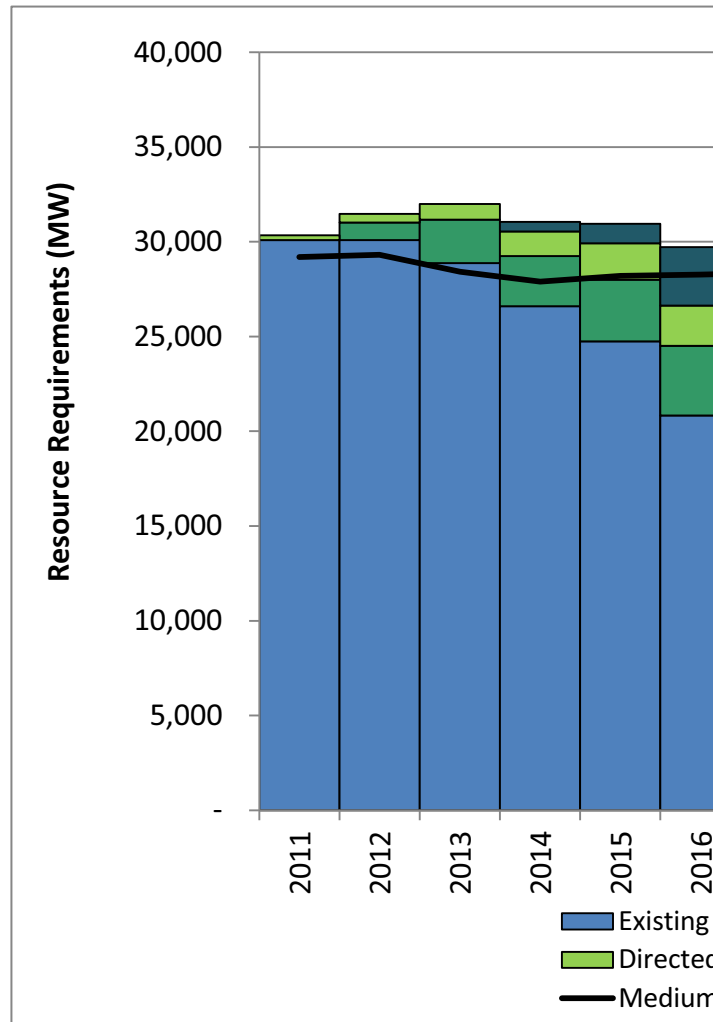




Contribution at Time of Peak

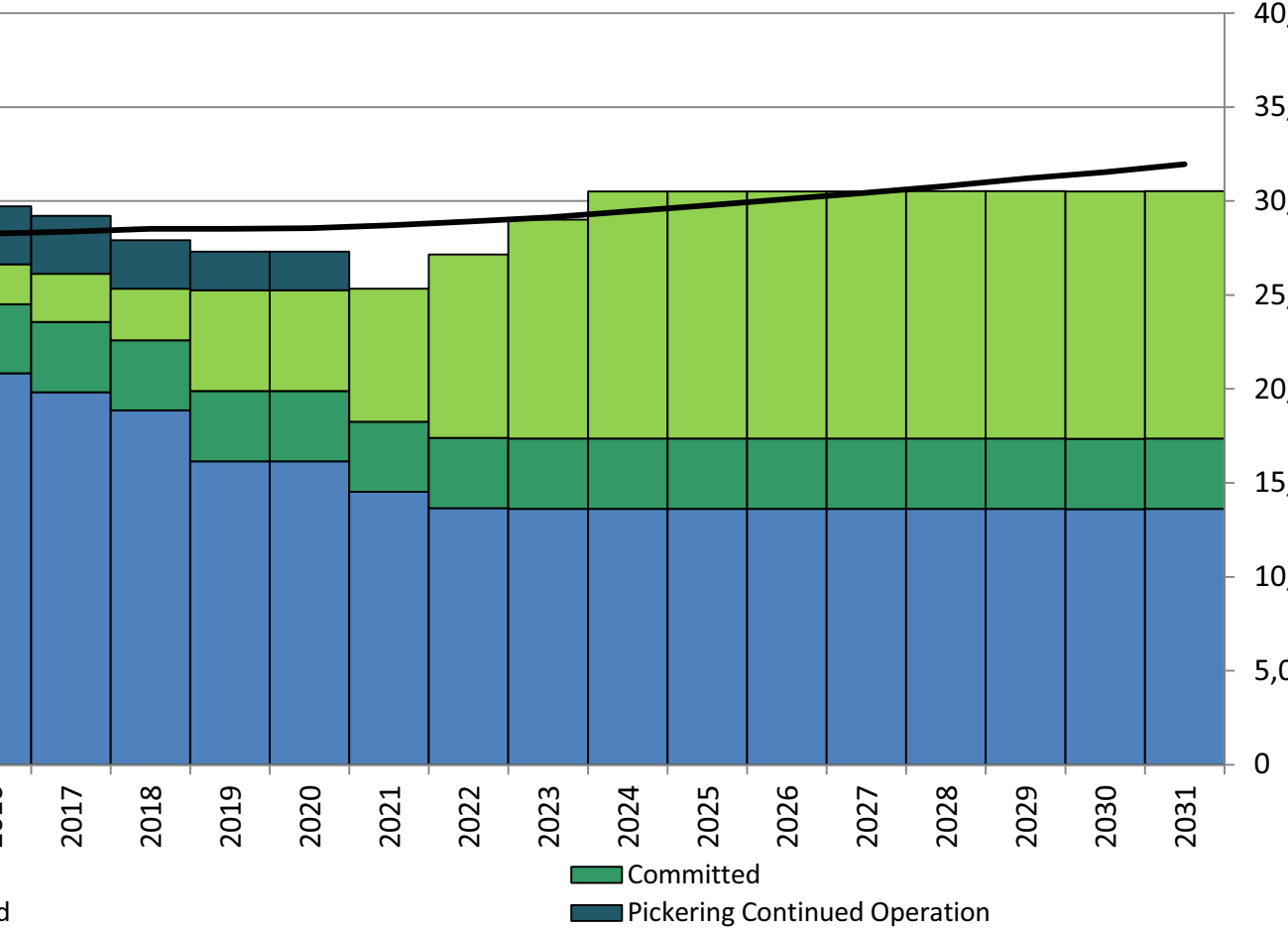
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30,527	30,517	30,531

31198	31542	31960
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From: Bashir Bhana
Sent: March-19-12 11:21 AM
To: Amir Shalaby; Bob Gibbons; Andrew Pietrewicz
Subject: Nuclear Presentation for PSP Team Mtg
Attachments: PSPTeamMeeting_Nuclear_03-14-2012 (BB) v4.ppt

Attached is the nuclear presentation from today's team meeting.

Amir/Andrew - I'm happy to discuss further.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca



Integration of Nuclear Resources in Power System Planning

Bashir Bhana, Planner, Power System Planning Division


Prepared for PSP Team Meeting

March 19, 2012

Not Responsive

Not Responsive

3 Nuclear Power Plants in Operation...

Station	Not Responsive	Pickering NGS
Site		
Installed Capacity		3,100 MW
Annual Energy		20 TWh
Transmission Connection		230 kV
In-Service		1970s - 1980s
End of Service Life		As early as 2015
Cost Recovery		OEB Regulated Rates

Planning Activities Regarding Nuclear Integration

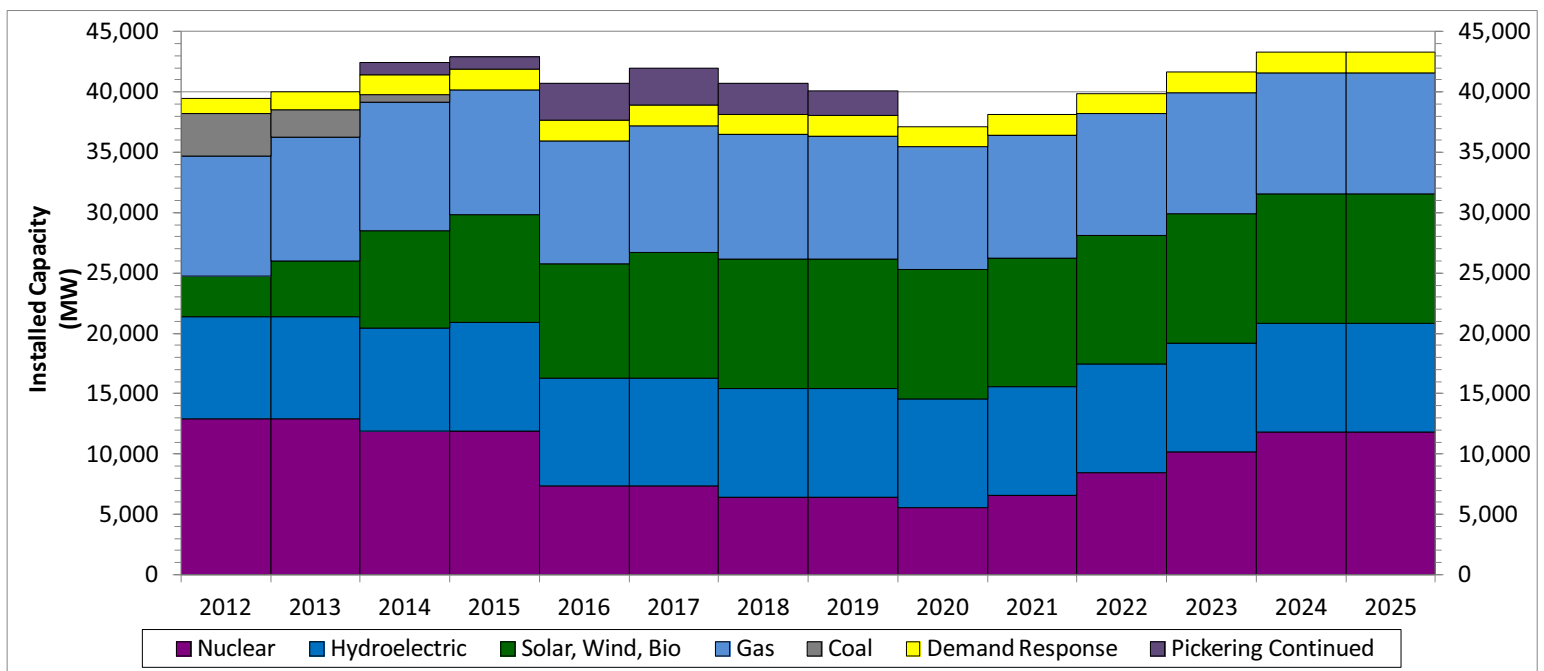
Not Responsive

- Pickering Continued Operation *Not Responsive*

Not Responsive

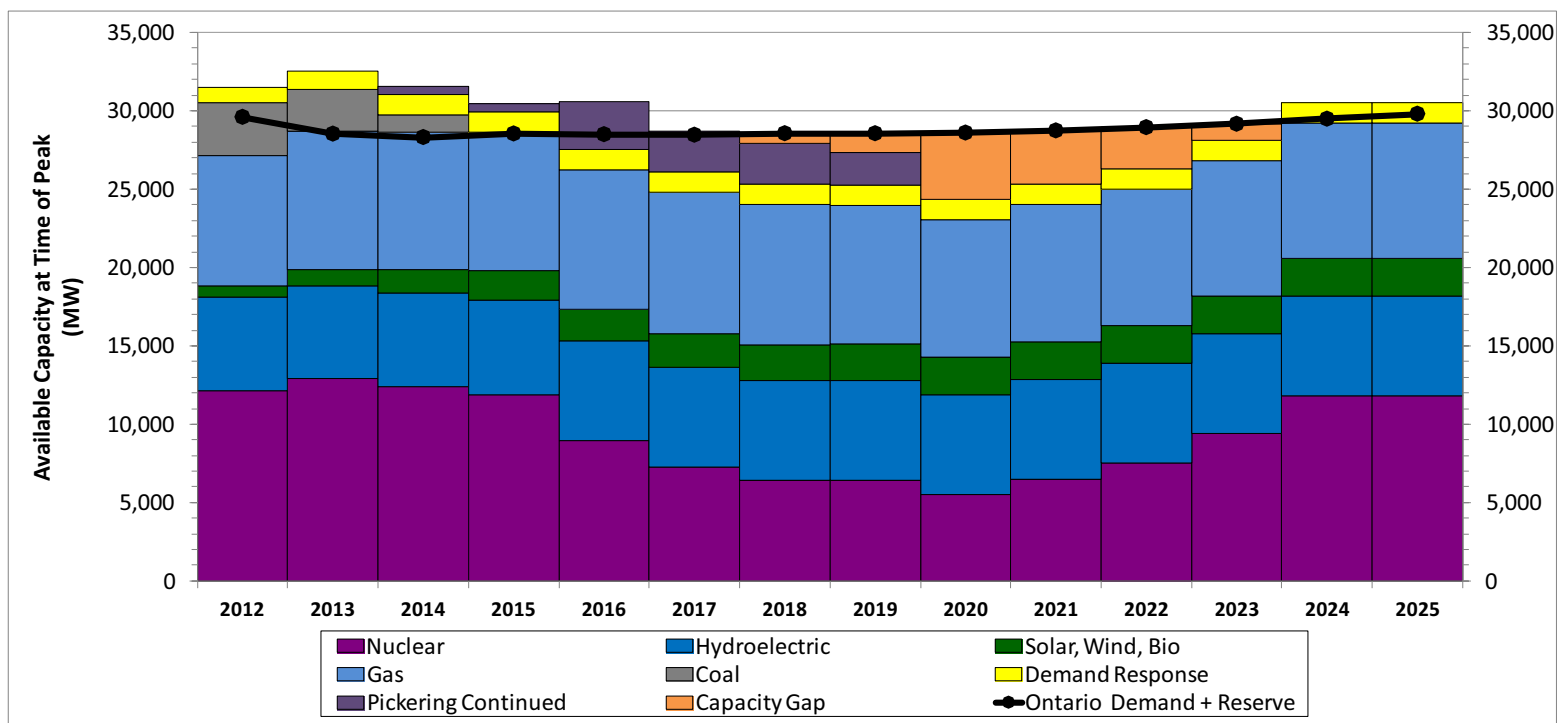
Resource Planning Outlook to 2025

- About 41,000 MW installed capacity over planning period



Need & Timing of Capacity Investments

- Driven primarily by nuclear availability, short duration



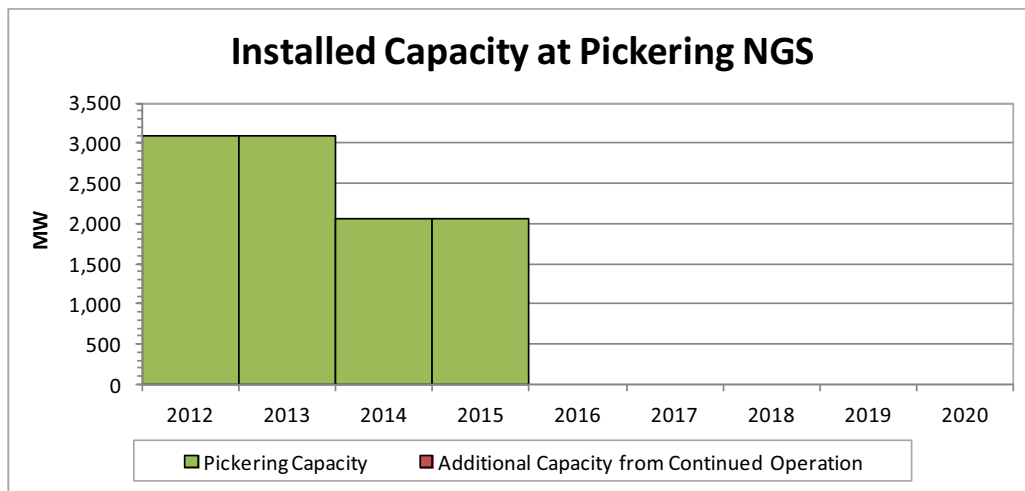
Section 17

Not Responsive

Not Responsive

Pickering NGS Continued Operation

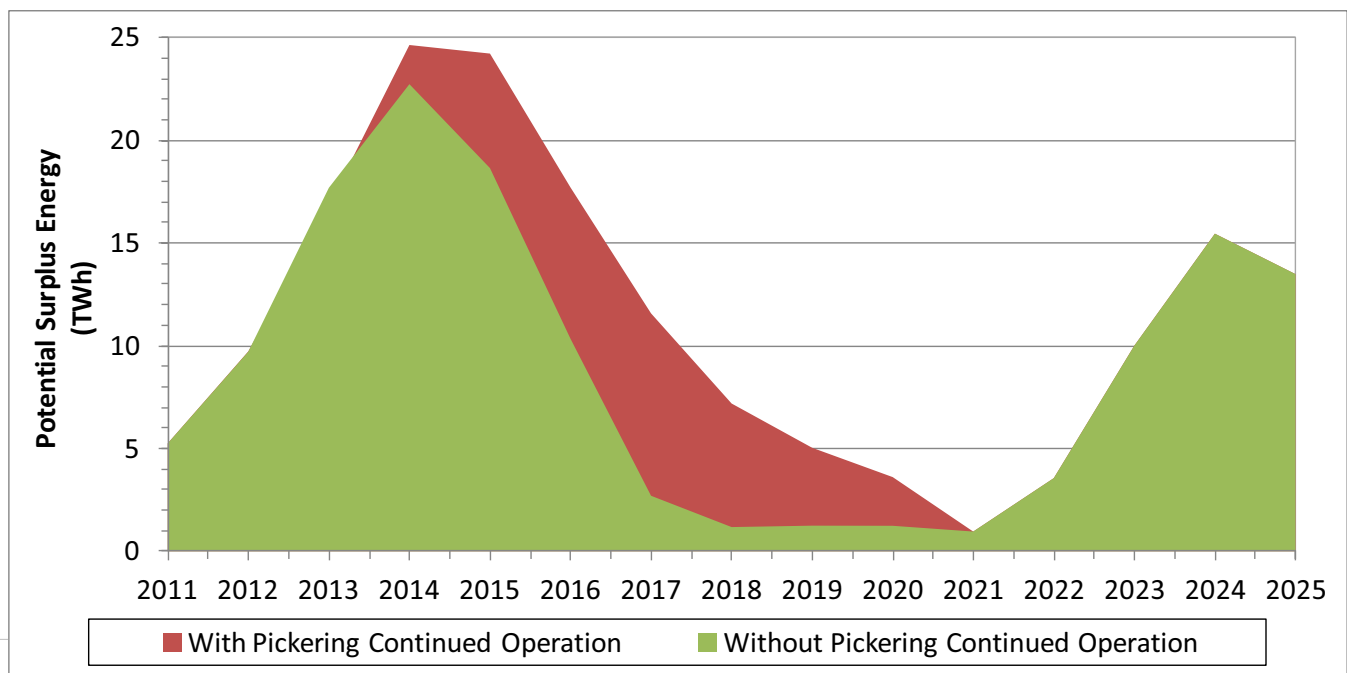
- Pickering NGS end of service life as early as 2015
- OPG is studying the technical feasibility of extending life to 2020



- Evaluating option for OPG's 2013/2014 rate application and working with Hydro One on transmission needs

Potential Surplus Energy

- Significant potential surplus energy forecast in the near term
- Some maneuverability of existing nuclear fleet



Not Responsive

Not Responsive

Not Responsive

Thank You...

From: Bob Gibbons
Sent: March-19-12 5:14 PM
To: Amir Shalaby; Andrew Pietrewicz; Nancy Marconi; Joe Toneguzzo
Cc: Kristin Jenkins
Subject: Re: Pickering Nuclear Generating Station

This is consistent with our current understanding. If P7 is not agreed to, and 247,000 EFPH is not confirmed Pickering could be shutdown as early as 2015. However the risk seems to be smaller - but still finite.

Bob G

----- Original Message -----

From: Amir Shalaby
Sent: Monday, March 19, 2012 04:39 PM
To: Bob Gibbons; Andrew Pietrewicz; Nancy Marconi; Joe Toneguzzo
Cc: Kristin Jenkins
Subject: FW: Pickering Nuclear Generating Station

Letter saying end of life is at least 2016 (provided P7 is agreed to), and more likely 2020. Let us read and decide what next.
amir

-----Original Message-----

From: O'NEILL Sheila -REGAFFCRPSTY [<mailto:sheila.oneill@opg.com>]
Sent: Monday, March 19, 2012 4:30 PM
To: Amir Shalaby
Cc: BARRETT Andrew P -REGAFFCRPSTY; PASQUET Paul -NUCLEAR; BURKE Paul J -PLANNG&ANALY
Subject: Pickering Nuclear Generating Station

Dear Mr. Shalaby,

Please see attached letter re: Pickering Nuclear generating Station update on the expected end-of-life date. The original letter will follow by courier.

Regards

Sheila O'Neill
Business Support Supervisor for
Andrew Barrett, VP
Regulatory Affairs and Corporate Strategy Ontario Power Generation
* 700 University Ave., H18-F1, Toronto, ON M5G 1X6
*Tel: (416) 592-5121 *Fax: (416) 592-8519 [*sheila.oneill@opg.com](mailto:sheila.oneill@opg.com)

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From: Nancy Marconi
Sent: March-20-12 9:45 AM
To: Bob Gibbons; Amir Shalaby; Andrew Pietrewicz; Joe Toneguzzo
Cc: Kristin Jenkins
Subject: RE: Pickering Nuclear Generating Station

Not Responsive

Thanks,
Nancy

-----Original Message-----

From: Bob Gibbons
Sent: Monday, March 19, 2012 5:14 PM
To: Amir Shalaby; Andrew Pietrewicz; Nancy Marconi; Joe Toneguzzo
Cc: Kristin Jenkins
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amir

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Sent: Monday, March 19, 2012 4:30 PM
To: Amir Shalaby
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Sheila O'Neill
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Andrew Barrett, VP
Regulatory Affairs and Corporate Strategy Ontario Power Generation
* 700 University Ave., H18-F1, Toronto, ON M5G 1X6
*Tel: (416) 592-5121 *Fax: (416) 592-8519 [*sheila.oneill@opg.com](mailto:sheila.oneill@opg.com)

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not the intended recipient, you are hereby notified that any review, retransmission, dissemination, distribution,
copying, conversion to hard copy or other use of this communication is strictly prohibited. If you are not the intended
recipient and have received this message in error, please notify me by return e-mail and delete this message from your
system. Ontario Power Generation Inc.

From: Bob Gibbons
Sent: March-21-12 8:34 AM
To: Andrew Pietrewicz
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 23 2012_Final Draft.xlsx

Andrew - here is the data underlying the Pickering study. I expect it will be relevant in this morning's meeting.

Bob G

-----Original Message-----

From: Bashir Bhana
Sent: February 24, 2012 8:53 AM
To: Victor Stein; Steve Chui; Bonnie Chan
Cc: Bob Gibbons
Subject: FW: Response to OPA/OPG meeting on OEB Support

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

THIS MESSAGE IS ONLY INTENDED FOR THE USE OF THE INTENDED RECIPIENT(S) AND MAY CONTAIN INFORMATION THAT IS PRIVILEGED, PROPRIETARY AND/OR CONFIDENTIAL. If you are not the intended recipient, you are hereby notified that any review, retransmission, dissemination, distribution, copying, conversion to hard copy or other use of this communication is strictly prohibited. If you are not the intended recipient and have received this message in error, please notify me by return e-mail and delete this message from your system. Ontario Power Generation Inc.

February 23, 2012

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
------------------	------------

PB Outage	PA Outage	Off the Grid
-----------	-----------	--------------

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

February 23, 2012

N80s Continued Operations with Pickering Units 3-8 Operating to 24/6 EPPH to Year End 2020 and Later P7 Life Management																																					February 23, 20
Year 2012													2013													2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	
P1	<div>Section 17</div>																																				
P4																																					
P5																																					
P6																																					
P7																																					
P8																																					

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	<i>Section 17</i>																																			
P7																																				
P8																																				

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Section 17

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates

	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

	2018				2019				2020			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
------------------	------------	--	--	--	--	--	--	--	--	--	--	--

PB Outage	PA Outage	Off the Grid
-----------	-----------	--------------

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

Section 17 - Operating Costs (m2012\$)								
	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4								
P5 - P8								
	Planned Outage & Life Management Days							
P1								
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1								
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1								
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P								
P5 - P8								
	Planned Outage & Life Management Days							
P1								
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1								
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1								
P4								
P5								
P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

23-Feb-12

TIGATION

TIGATION

From: Bob Gibbons
Sent: March-28-12 1:06 PM
To: Bashir Bhana
Cc: Andrew Pietrewicz
Subject: RE: Pickering Report Edits

Bashir – looks good to me. Please send a clean copy to LARA.

Thanks,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

From: Bashir Bhana
Sent: March 28, 2012 10:33 AM
To: Bob Gibbons
Cc: Andrew Pietrewicz
Subject: Pickering Report Edits

Bob – I've made the edits discussed this morning.

I have updated the range of benefits to reflect a \$8/MMBtu gas price.

I also added a sentence on page 8 (highlighted in yellow) to close off the point being made.

Please review and advise if appropriate to send off to legal.

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: March-28-12 4:31 PM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Jim – \$240M in 2012 dollars is correct. I'll revise the \$240M to \$270M in the next round of edits per your first comment.

On your second comment, we've assumed Oshawa TS to be in-service prior to the out of service of the last two Pickering units. This assumes at least 2 Pickering units need to be available for Oshawa TS to be deferred. Pickering is retired either in March 2016 or Dec 2020. The \$48M represents deferral between this period.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: March 28, 2012 3:37 PM
To: Bashir Bhana
Cc: George Pessione; Mike Zajmalowski; Joe Toneguzzo
Subject: RE: Pickering CO Draft for OPG Review

Hi Bashir,

I would recommend the following changes to the Section 5.5 Transmission Requirements on page 9. Starting on line7, it shows:

"The estimated capital investment for Oshawa Area TS is \$240M (net present value in 2012 dollars). Deferral of Oshawa Area TS as a result of Pickering continued operation would result in cash flow savings of \$12 million for each year deferred. Deferring the in-service date from 2015 to 2020 would result in a time value savings of \$50 million over this period."

- 1) I expect the \$240M (net present value in 2012 dollars) to be correct, but could we show the same numbers shown in the H1 Tx rate submission which is \$270 M (for 2015 in-service)? This is just to avoid unnecessary questions.
- 2) The deferral should be from 2015 to 2019 in-service which is four year deferral. The station needs to be in-service before Pickering is retired in 2020. I assume the \$48M represents four year deferral.

Thank you
Jim

From: Bashir Bhana
Sent: Wednesday, March 28, 2012 1:27 PM
To: George Pessione; Mike Zajmalowski; Joe Toneguzzo; Jim Lee
Subject: FW: Pickering CO Draft for OPG Review

Fyi...Pickering continued ops draft report sent for OPG review attached.

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: March 28, 2012 1:14 PM
To: Nancy Marconi; Wajiha Shoaib
Cc: Andrew Pietrewicz; Bob Gibbons; Steve Chui; Victor Stein; Bonnie Chan
Subject: Pickering CO Draft for OPG Review

Please find attached a draft of the Pickering CO report which can be forward to OPG.

Thanks,
Bashir

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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: March-28-12 4:42 PM
To: Bashir Bhana
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Section 17

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Sent: Wednesday, March 28, 2012 4:31 PM
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Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: March-29-12 9:52 AM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Section 17

From: Bashir Bhana
Sent: Wednesday, March 28, 2012 4:31 PM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

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Thanks,
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Planner, Resource Integration

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Bashir

Bashir Bhana
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Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: March-29-12 10:05 AM
To: Andrew Pietrewicz
Subject: RE: Schematic.ppt
Attachments: Nuclear Refurb Cases - Briefing for Bob G 05-02-2011 (BB).ppt

Looks good – just layer Pickering uncertainty and the number of cases start to explode!

Reminds me of a similar exercise for IPSP2 (attached).

Bashir

From: Andrew Pietrewicz
Sent: March 29, 2012 8:28 AM
To: Bashir Bhana
Subject: Schematic.ppt

Fyi, old slide I found while cleaning out files. Schematic which summarizes a bunch of cases into ranges...



IPSP Nuclear Refurbishment Cases

Briefing for Bob G.

May 2, 2011

Overview

1. Information requested from OPG an Not Responsive
2. Considerations for uncertainty analysis
3. Analysis of cases
4. Next steps

Not Responsive

Response from OPG

- OPG provided a response on January 31, 2011

Not Responsive

Section 17

- The limiting component is pressure tubes
 - Hydrogen ingress
 - Pressure tube/calandria tube contact due to spacer movement and material integrity
 - Feeder thinning is not limiting
- Updated schedule not provided for the above cases

4

Not Responsive

Not Responsive

Nuclear Uncertainty for Consideration

- Pickering
 - Early (2014-2016) vs late retirement (2018-2020)

Not Responsive

Approach to Case Analysis

1. For Pickering, two cases will be studied for each “scenario” that is developed in the IPSP
 - Late Retirement vs Early Retirement of Pickering
2. In each case, new nuclear will be assumed to be in service 2022/2023

Not Responsive

- Each of the above will be treated independently
 - i.e. Pickering continued operation and decision on new nuclear does not affect Bruce/Darlington uncertainties

Not Responsive

Not Responsive

Not Responsive

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From: Bashir Bhana
Sent: March-29-12 5:00 PM
To: Andrew Pietrewicz
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 27 2012_Draft.xlsx

Data from opg attached and described in emails below.

Also - this is where all the Pickering CO work is kept...feel free to browse:
S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 28, 2012 11:58 AM
To: Bashir Bhana
Cc: Bob Gibbons; Steve Chui; Bonnie Chan
Subject: RE: Response to OPA/OPG meeting on OEB Support

Bashir,

Thanks for reviewing the file in detail. The minor discrepancies that you have detected have been corrected in the updated file attached, dated Feb 27. These changes are as follows:

1. Tab 1 (210k EFPH case): [REDACTED] *Section 17*

2. Tab 2a (247k case): [REDACTED] *Section 17*

Please note that the schematics in Tabs 1 and 2 are cannot be used to mimic the exact timing of the planned outages, as the resolution is only to the nearest one-half of a month. This is why we have provided the corresponding outage start and end dates in Tabs 1a and 2a for your use. The schematics are intended as a visual aid to see how all of the outages align.

Also, to expedite the analysis, if there are minor any further discrepancies between the schematics, the outage dates and the data provided in Tabs 3 and 4 in the attached file, please consider the data in Tabs 3 & 4 as over-riding any other data.

Please call if there are further questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

From: Bashir Bhana [mailto:Bashir.Bhana@powerauthority.on.ca]
Sent: Monday, February 27, 2012 2:54 PM
To: ROGERS Stephen -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen - I just left a message on your machine. Just spotted a similar issue with the LM dates between tab 1 and 1a (the 210K case). Could you please confirm. Thanks.

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 27, 2012 2:23 PM
To: Bashir Bhana
Cc: Bob Gibbons; Steve Chui; Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support

Bashir,

Thanks for catching the typo in Tab 2a. The schematic in Tab 2 was correct for the 2016 P7 LM outage. The dates in Tab 2a were typed in incorrectly and have been corrected in this version (cells G25, H25) and shaded in orange. I apologize for the inconvenience.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning

Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

From: Bashir Bhana [mailto:Bashir.Bhana@powerauthority.on.ca]
Sent: Monday, February 27, 2012 1:52 PM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Bonnie Chan; Steve Chui
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Could you please confirm the P7 LM outage dates for the 247K case? There appears to be inconsistencies between the schedules presented in Tabs 2 and 2a.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment

of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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If you have received this message in error, or are not the named recipient(s), please notify the sender immediately and delete this e-mail message.

PNGS No Continued Operations with Early P7 Life Management

February 27, 2012

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

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PNGS No Continued Operations with Early P7 Life Management

Scenario Dates

	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
------------------	------------

PB Outage	PA Outage	Off the Grid
-----------	-----------	--------------

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Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	
Pickering A	
Pickering A +B Total	

Section 17

Pickering B	Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.
Pickering A	Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)
Pickering A + B Total	Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	

Section 17

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From: Bashir Bhana
Sent: April-09-12 9:22 AM
To: Andrew Pietrewicz
Subject: FW: Nuclear Presentation for PSP Team Mtg
Attachments: PSPTeamMeeting_Nuclear_03-14-2012 (BB) v4.ppt

Here you go Sir.

Bashir

-----Original Message-----

From: Bashir Bhana
Sent: March 19, 2012 11:21 AM
To: Amir Shalaby; Bob Gibbons; Andrew Pietrewicz
Subject: Nuclear Presentation for PSP Team Mtg

Attached is the nuclear presentation from today's team meeting.

Amir/Andrew - I'm happy to discuss further.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
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E: Bashir.Bhana@powerauthority.on.ca



Integration of Nuclear Resources in Power System Planning

Bashir Bhana, Planner, Power System Planning Division

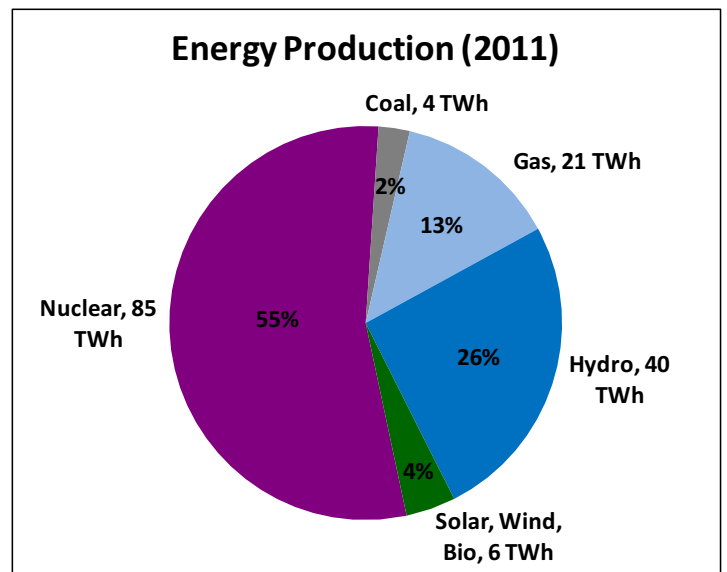
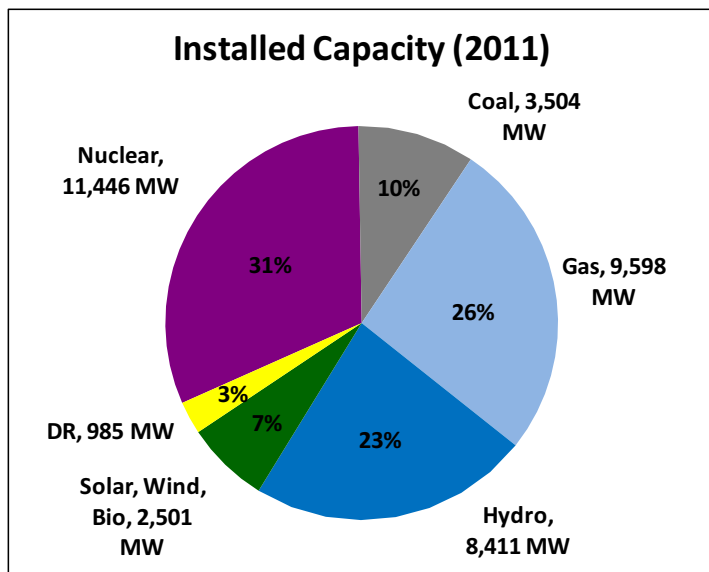
Prepared for PSP Team Meeting

March 19, 2012

Not Responsive

Snapshot of Ontario's Nuclear Fleet

- 30% of total installed generation capacity
- 55% of total energy production



3 Nuclear Power Plants in Operation...

Station	Not Responsive	Pickering NGS
Site		
Installed Capacity		3,100 MW
Annual Energy		20 TWh
Transmission Connection		230 kV
In-Service		1970s - 1980s
End of Service Life		As early as 2015
Cost Recovery		OEB Regulated Rates

Planning Activities Regarding Nuclear Integration

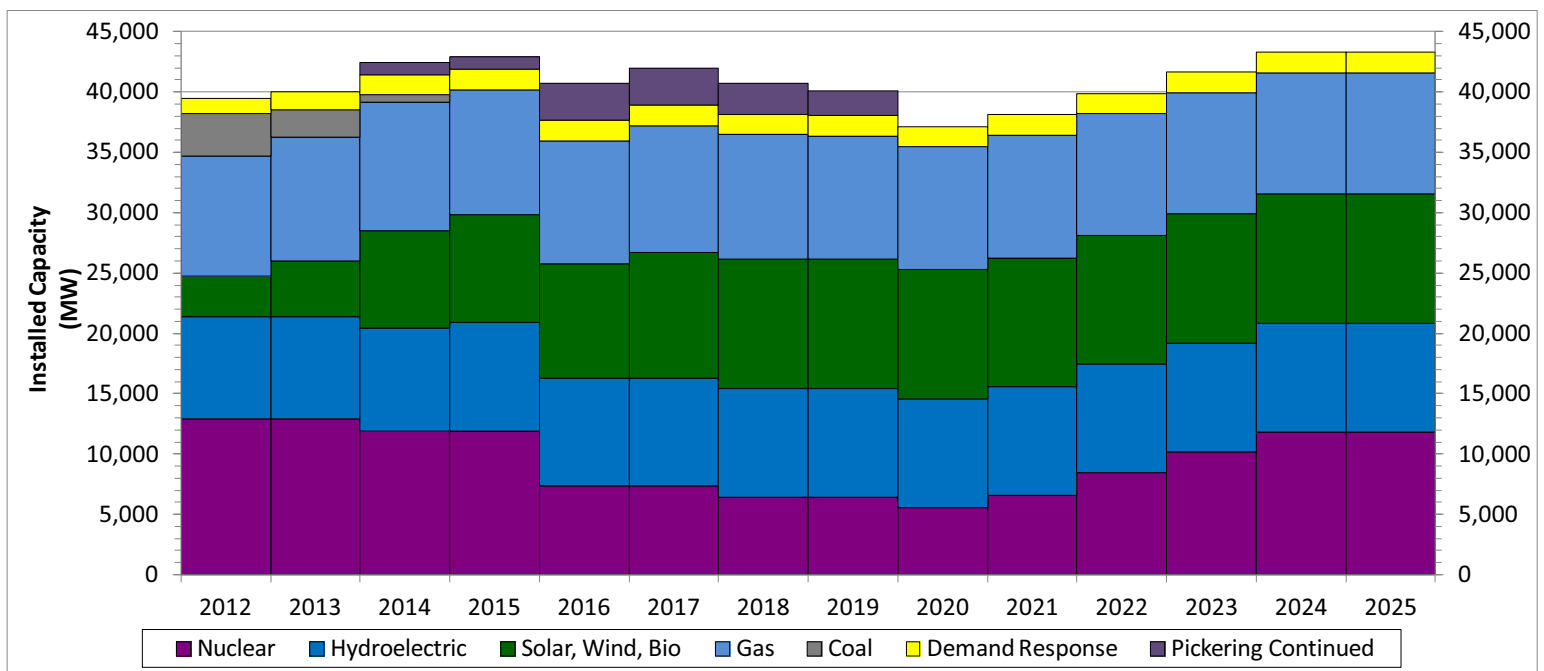
Not Responsive

- Pickering Continued Operation/ *Not Responsive*

Not Responsive

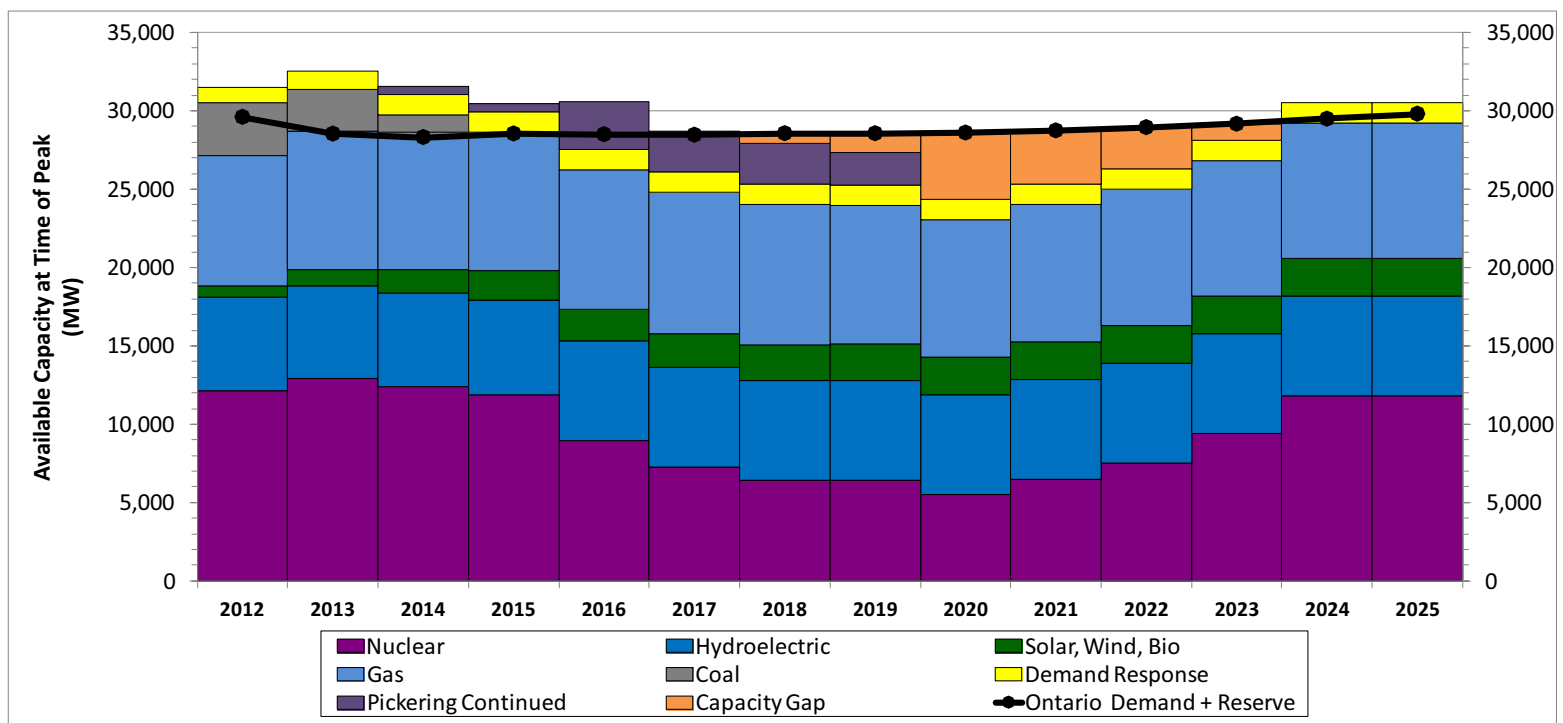
Resource Planning Outlook to 2025

- About 41,000 MW installed capacity over planning period



Need & Timing of Capacity Investments

- Driven primarily by nuclear availability, short duration



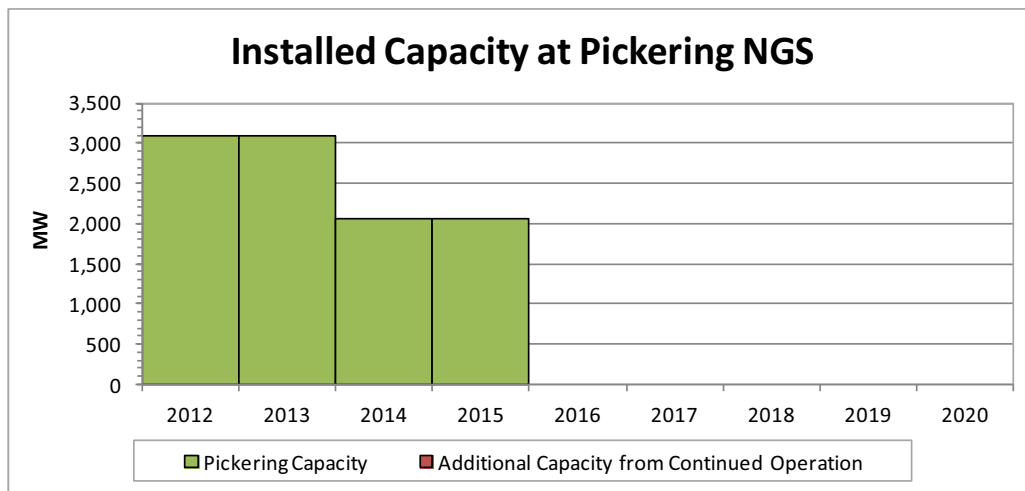
Section 17

Not Responsive

Not Responsive

Pickering NGS Continued Operation

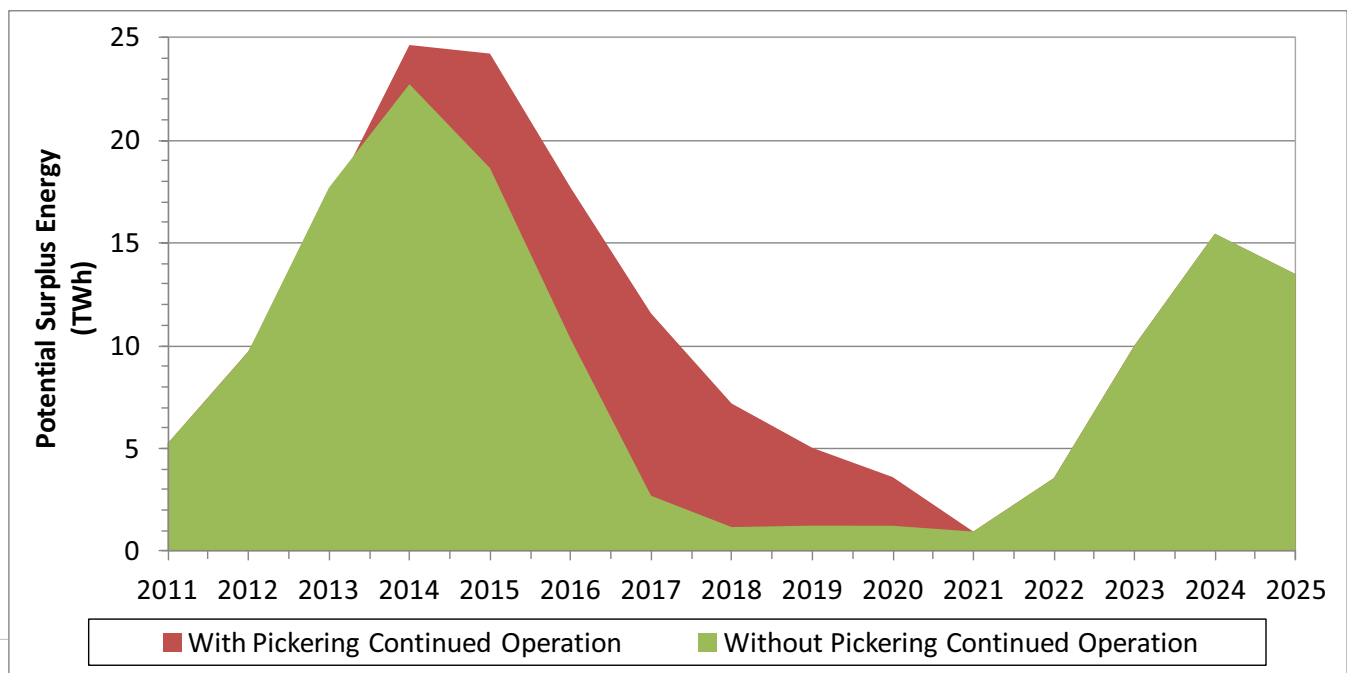
- Pickering NGS end of service life as early as 2015
- OPG is studying the technical feasibility of extending life to 2020



- Evaluating option for OPG's 2013/2014 rate application and working with Hydro One on transmission needs

Potential Surplus Energy

- Significant potential surplus energy forecast in the near term
- Some maneuverability of existing nuclear fleet



Not Responsive

Not Responsive

Not Responsive

From: Bashir Bhana
Sent: April-11-12 12:18 PM
To: Bob Gibbons; Andrew Pietrewicz
Cc: Victor Stein
Subject: Pickering CO Updated Economics

Bob/Andrew,

I've updated the Pickering CO economic analysis to reflect additional revenues from the ETS tariff. Please see the figure below.



Section 18

This added (\$2/MWh) x (net change in exports) to the previous results.

For the reference case, exports increase by 33 TWh with Pickering CO. At \$2/MWh ETS, export revenues would increase by \$2/MWh x 33 TWh = \$66M or \$53M NPV (\$ 2012).

So the net benefit for the reference case would increase from \$129M to \$182M (or from \$0.13B to \$0.18B).

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263

E: Bashir.Bhana@powerauthority.on.ca

From: Andrew Pietrewicz
Sent: April-13-12 4:40 PM
To: Bashir Bhana
Subject: Re: Revised Pickering CO Draft Report

Thank you, Bashir. The late 1990s/early 2000s were a rough time for me as well. ap

From: Bashir Bhana
Sent: Friday, April 13, 2012 04:38 PM
To: Bob Gibbons; Andrew Pietrewicz
Cc: Victor Stein; Bonnie Chan; Steve Chui
Subject: Revised Pickering CO Draft Report

Bob/Andrew,

Revised Pickering report attached for your review. Also [here](#).

Revisions to costs include:

1. Inclusion of ETS Tariff (net benefit now \$182M in reference case)
2. Model results of high gas price case included (model says net benefit of \$1.33B vs \$1.30 predicted at \$8/MMBtu gas)

fyi, the worst 5-year average ACF corresponds to 2001. Generally, late 1990s through early 2000s not so great.

Bashir

Bashir Bhana
Planner, Resource Integration
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E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: April-24-12 4:51 PM
To: Andrew Pietrewicz
Cc: Bob Gibbons
Subject: Updated Demand/Pickering

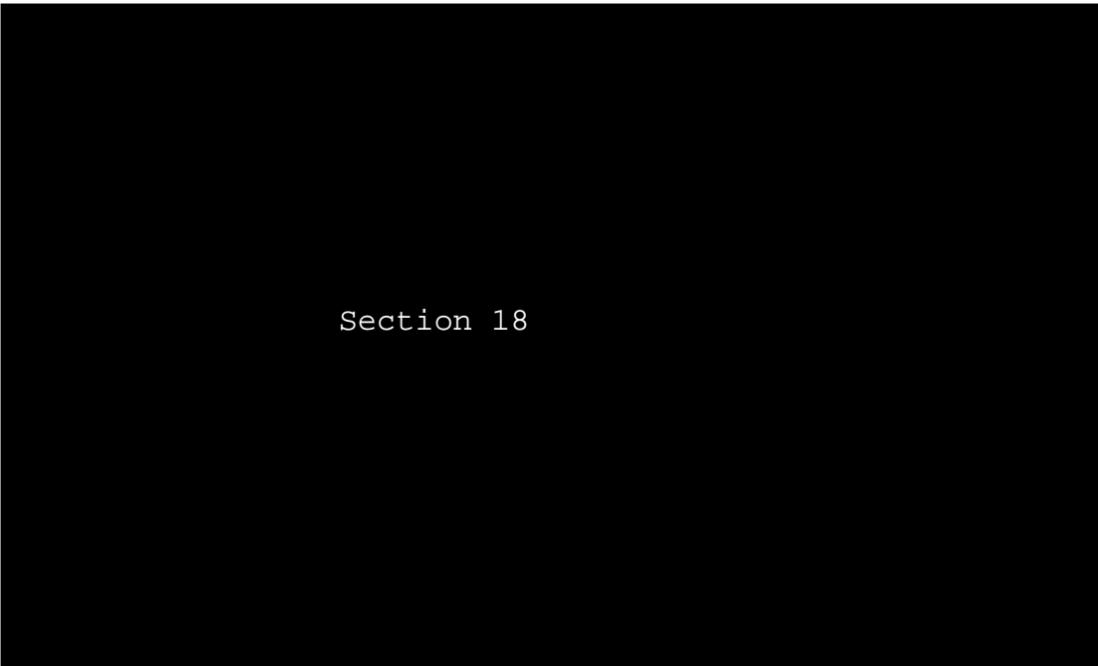
Andrew – here is a quick comparison of the new demand forecast relative to the LTEP forecasts (used in the Pickering study).

The updated peak demand forecast is about the same as in the LTEP low growth forecast up to 2018 (~23,000 MW). Between 2019-2020, the updated peak demand forecast falls between the LTEP low and LTEP medium forecasts (23,400 MW).

The updated energy demand forecast is lower than the LTEP low growth forecast by an average 3 TWh per year beginning in 2015. The average updated energy demand forecast between 2013-2020 is 136 TWh/year. In comparison, the LTEP low and medium forecasts average 138 TWh/year and 146 TWh/year, respectively between 2013-2020.

Regarding the Pickering study, I would expect the new demand forecast to produce a net benefit similar to that in the low demand sensitivity case (net cost of \$760M).

Section 18



Section 18

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
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120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: July-31-12 3:39 PM
To: Andrew Pietrewicz
Subject: OPG Nuclear Support Letter
Attachments: OPA Evidence Support for Pickering and Darlington - DRAFT - July 31, 2012 (BB).doc

Andrew – draft attached for discussion. If able to discuss tomorrow, I'll set something up.

Also available here:

S:\Resource Integration\Projects\Pickering\2012 OPG Support Letter for Pickering_Darlington

Bashir

Bashir Bhana
Planner, Resource Integration
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Ontario Power Authority
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Toronto, Ontario, M5H 1T1
T: 416-969-6263
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T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August X, 2011

Mr. Andrew Barrett
Vice President, Regulatory Affairs and Corporate Strategy
Ontario Power Generation
700 University Avenue,
Toronto Ontario
M5G 1X6

Dear Andrew,

Re: Pickering NGS Continued Operation and *Not Responsive*

Summary

The purpose of this letter is to convey the Ontario Power Authority's perspective on Ontario Power Generation's proposal for the continued operation of Pickering NGS and the *Not Responsive*.

The assessment provided herein is an independent study performed by the Ontario Power Authority ("OPA") based on the information provided by OPG (attached) and on OPA's assessment of system impacts. Updated Pickering NGS and *Not Responsive* capital and operating related cost and production information provided by OPG is accepted as given.

Given the information currently available and the potential for significant benefits arising from Pickering NGS continued operation and *Not Responsive*, the OPA believes it is prudent for OPG to continue to develop implementation plans and initiate work necessary to enable these options. Specifically, the OPA believes it is prudent, on balance, to spend funds in 2013 and 2014 to enable the option of Pickering NGS continued operation should it prove to be technically feasible and

Not Responsive

Rationale

Pickering NGS Continued Operation

In the absence of continued operation, the six generating units (3,094 MW) that are currently in operation at the Pickering Nuclear Generating Station ("Pickering NGS") are expected to cease operation beginning in approximately 2015. The technical feasibility of continued operation is expected to be known in 2012. A study is currently being conducted under the auspices of the CANDU

Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur \$190 million in additional capital and operating related costs associated with Pickering NGS. Of this, \$85 million is associated with preserving the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work. The remaining \$105 million is associated with the operation of Pickering NGS during the 2013 to 2014 period.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS between approximately 2015 and 2020 (Appendix 1).

The OPA has evaluated the effect of Pickering NGS continued operation on various factors related to the integrated power system including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications. The OPA's assessment assumes that resources directed by the Ontario government will proceed as planned. Delays in achieving directive requirements could increase the amount of capacity and energy needed to meet system supply requirements. Pickering NGS continued operation could mitigate potential impacts if these delays were to materialize.

There are several potential benefits to Pickering NGS continued operation. These include:

- To meet NPCC/NERC reliability criteria, sufficient capacity must exist to meet peak demand and system reserve requirements. Between 2016 and 2020, in the absence of Pickering NGS continued operation and assuming that directed resources proceed as planned, between approximately 980 MW and 3,100 MW of capacity would have to be replaced. Pickering NGS continued operation would allow for a reduction in the need for replacement capacity and energy and associated acquisition costs during the front end of the nuclear refurbishment period (2016 to 2024);
- A hedge against factors including increased demand, delay in achieving conservation targets, higher natural gas or carbon prices, nuclear refurbishment delays, or delays in the in-service of directed resources;
- Compliance with the Ontario government Supply Mix policy direction of 50% nuclear energy. This policy is consistent with the OPA Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the OEB in 2007 and in subsequent OPA planning;
- A reduction in Ontario CO₂ emissions of 11 megatonnes by 2020. The replacement energy provided by gas-fired generation is a source of increased CO₂ emissions which is not consistent with government policy to reduce greenhouse gas emissions. Pickering NGS continued operation produces virtually no CO₂ emissions in operation;

- Reduced reliance on imports, particularly during the nuclear refurbishment period. Further, imports are likely to come from thermal generation in NYISO and PJM. Emissions reductions in jurisdictions outside Ontario due to reduced imports were not considered in this analysis although would further increase the benefit; and
- Deferral of transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS.

The OPA's assessment of system cost impacts indicate that there is a net system benefit associated with Pickering NGS continued operation but could range from -\$0.76 billion to \$1.33 billion. Savings are the result of reduced gas-fired generation dispatch and associated reduction in replacement capacity and energy costs. These benefits could be greater or reduced or become negative depending on a number of factors. These factors include higher or lower than forecast demand or natural gas prices; implementation of carbon prices; a shorter continued operation period; higher or lower capital and fixed operating costs; and/or higher or lower production at Pickering NGS during the continued operation period.

Not Responsive

Not Responsive

Conclusion

Given the information currently available with respect to Pickering NGS continued operation and *Not Responsive* and the OPA's assessment of the benefits, the OPA concludes that:

- 1) Based on the potential benefits that have been identified, it is prudent, on balance, to proceed with an expenditure of funds in 2013 and 2014 to enable Pickering NGS continued operation should it prove technically feasible.

4.

Not Responsive

The OPA recognizes that as Ontario's supply and demand outlook evolves, additional information will become available and the anticipated benefits of OPG's proposals may change. The OPA is prepared to provide updated and detailed evidence in support of the integrated power system impacts of Pickering NGS continued operation and [REDACTED] [REDACTED]

Please feel free to contact us should you require any clarification or additional information.

Yours truly,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Andrew Pietrewicz
Sent: August-03-12 2:46 PM
To: Bonnie Chan; Alan Leung
Subject: FW: [REDACTED] *Not Responsive* here's a rough draft of what i've put together for Pickering, building on Bashir's first draft. Will continue to work on it and get a good version for your review early next week...

fyi

From: Andrew Pietrewicz
Sent: August 3, 2012 2:29 PM
To: Bashir Bhana
Cc: Victor Stein
Subject: [REDACTED] *Not Responsive* here's a rough draft of what i've put together for Pickering, building on Bashir's first draft. Will continue to work on it and get a good version for your review early next week...

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

Summary

The purpose of this letter is to convey to you the Ontario Power Authority's perspective on Ontario Power Generation's proposals for continued operation at Pickering NGS and [REDACTED] *Not Responsive*.

The Ontario Power Authority ("OPA") has independently evaluated these proposals and will continue to evaluate them in the course of its ongoing planning activities. At this time, the OPA considers that it would be prudent for Ontario Power Generation ("OPG") to continue to develop implementation plans and initiate work necessary in 2013 and 2014 to enable the option of Pickering NGS continued operation, should it prove to be technically feasible. [REDACTED] *Not Responsive*

Discussion

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning in approximately 2015. The technical feasibility of continued operation is expected to be known in 2012. A study is currently being conducted under the auspices of the CANDU Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur \$190 million in additional capital and operating related costs associated with Pickering NGS. Of this, \$85 million is associated with preserving the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work. The remaining \$105 million is associated with the operation of Pickering NGS during the 2013 to 2014 period.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS between approximately 2015 and 2020 (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all directed resources proceeded as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.
- A hedge against mid-term uncertainties and potential risks, including nuclear refurbishment delays, other generator implementation delays or failures, delays in achieving conservation targets, increased demand and higher natural gas or carbon prices.
- An approximately 11 megatonne cumulative reduction in Ontario CO₂ emissions by 2020.
- Deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).

The OPA's assessment of system cost impacts suggests a relatively modest, but positive economic advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements.

The OPA expects that continued availability of Pickering NGS between 2015 and approximately 2020 would increase opportunities for electricity exports. While the OPA's economic assessment accounts for electricity export contributions to the Ontario Export Transmission Tariff (and hence to a partial defrayal of transmission service costs for Ontario customers), it does not reflect any benefits of export-related profits that might accrue to OPG or to other Ontario exporters. The OPA realizes that this distinction tends to understate the benefits of electricity exports in general and, in this particular context, of the potential contribution of continued operation at Pickering toward increased export revenues for Ontario. The economic benefit of reduced carbon emissions was also not considered, nor was the potential for cost minimization through coordination of other nuclear plans with plans for continued operations at Pickering. The OPA expects to explore this latter consideration over the coming year.

The OPA's assessments illustrate that economic implications of Pickering continued operation could vary depending on a wide range of circumstances. Key factors in this regard include total level of electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

Based on evaluation conducted thus far, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These represent illustrative bookends and explore combinations of factors that together would tend to increase the economic value of Pickering continued operation and factors that would tend to reduce the economic value. Some of the factors outlined are clearly out of OPG's control, while others, such as station operational performance and cost are within OPG's control. In view of the absolute magnitude of capital and non-fuel OM&A costs involved in operating Pickering NGS, these represent particularly important areas for cost management focus.

A key consideration for the OPA that was not quantitatively reflected in its economic assessment of Pickering continued operation, but which informs its perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties and potential risks. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario, features multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances), stands to host a non-negligible degree of potential gas-fired generator retirements, relies on sizeable contributions from conservation interventions over and above already significant levels of anticipated natural efficiency gains in the Ontario economy, poses a number of possibilities around the future pace and trajectory of economic recovery in the province and relies on successful and timely implementation of a substantial number of supply resources that are presently contractually committed or directed. In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present a certain degree of planning risk. Continued operation at Pickering is seen by the OPA as a potentially helpful source of insurance within this dynamic context.

From: Andrew Pietrewicz
Sent: August-13-12 4:47 PM
To: Amir Shalaby
Subject: For your review. Next draft of letter to OPG re: Pickering & **Not Responsive**
Attachments: OPA Support for Pickering and **Not Responsive** - DRAFT - August 13 2012.docx

Attached is the next version of the letter for your review. Comments from last week's round have been incorporated to the best of my handwriting analysis ability.

Seems to me it is shaping up. Meeting scheduled for later this week (I think it's Thursday) to review with OPA regulatory affairs and Colin. Ideally, we'd get it to them at least by Wednesday morning or so to help them better prepare.

ap



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www.powerauthority.on.ca

August X, 2011

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and Not Responsive

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and Not Responsive

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements.

Based on evaluation to date, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would tend to either increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are clearly out of OPG's control, while others, such as station operational performance and cost, are within OPG's control.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances); a number of potential gas-fired generator retirements; sizeable contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy; a number of possibilities around the pace and trajectory of economic recovery in the province; and relies on successful and timely implementation of a substantial number of supply resources that are presently contractually committed or directed. In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk of resource shortage. Continued operation at Pickering is seen by the OPA as a potentially helpful source of insurance within this dynamic context.

Not Responsive

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] Not Responsive [REDACTED]. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require clarification or additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Andrew Pietrewicz
Sent: August-16-12 1:27 PM
To: Amir Shalaby
Cc: Clare Hudson; George Pessione
Subject: RE: Deadline - CEO Weekend Reading
Attachments: OPA Support for Pickering and *Not Responsive* - DRAFT - August 15 2012.docx; *Not Responsive*

Two items for weekend reading attached:

- 1) Draft letter from OPA to OPG supporting OPG's proposed spending in 2013/2014 to maintain the options of Pickering continued operation and *Not Responsive*
- 2) *Not Responsive*

ap.

Not Responsive

From: Amir Shalaby
Sent: August 16, 2012 12:29 PM
To: Andrew Pietrewicz; George Pessione
Cc: Clare Hudson
Subject: Fw: Deadline - CEO Weekend Reading

Let us get the OPG support letter and the deck on *Not Responsive* into Colin's reading bag. Send me a single email with both attachments that I can forward with context of my discussions with him
Friday am is good

From: Irene Mauricette
Sent: Thursday, August 16, 2012 12:16 PM
To: OPA Executive; Susan Kennedy; Ruth Covich; Julia McNally
Cc: Cathy Schell; Clare Hudson; Irene Mauricette; Kathleen Wilson; Manuela Moellenkamp; Nimi Visram; Suzana Sathiyar; Beverly Nollert
Subject: Deadline - CEO Weekend Reading

11:00 AM ... Friday, August 17th, please.

Thanks.

Bridget on behalf of

Irene Mauricette
Executive Assistant to
The Chief Executive Officer

Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto ON M5H 1T1

Direct: 416 969 6010
FAX: 416 969 6380
Email: irene.mauricette@powerauthority.on.ca
Web: www.powerauthority.on.ca

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive



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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED].
Not Responsive

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

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Not Responsive

From: Andrew Pietrewicz
Sent: August-16-12 1:33 PM
To: Wajiha Shoaib
Subject: Draft letter
Attachments: OPA Support for Pickering and Not Responsive - DRAFT - August 15 2012.docx

Amir will be giving it to Colin for weekend reading tomorrow morning. ap



120 Adelaide Street West
Suite 1600
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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

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Not Responsive

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Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Amir Shalaby
Sent: August-16-12 5:50 PM
To: Colin Andersen
Cc: George Pessione; Andrew Pietrewicz; Clare Hudson; Irene Mauricette; Michael Lyle
Subject: two items for your weekend reading : Nuclear at OPG, and [Redacted] *Not Responsive*
Attachments: OPA Support for Pickering and [Redacted] *Not Responsive* - DRAFT - August 15 2012.docx; [Redacted] *Not Responsive*

If we get a bit of a breather from the time urgent matters, these two items are important but not pressing yet.

Not Responsive

Second ,regulatory (OEB) support for keeping options to extend operations at two thirds of the nuclear fleet management. Important destiny issue.

This is OPG's regulatory case coming up later this year. They wanted our support in writing (customary by now-IPSP in parts as you say).

We are fully supportive of spending money in 2013-2014.

We wrote the letter to be expansive enough about strategic reasons for our support, and less reliant on detail assessments (as these will drag in the rest of the resource details)

Andrew P is our lead on this file. Regulatory (Lyle, Marconi, Shoib) are leading the regulatory process work.

Cheers
amir

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive



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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED].
Not Responsive

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
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- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
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Not Responsive

From: Andrew Pietrewicz
Sent: August-23-12 9:15 AM
To: Amir Shalaby
Subject: Response requested: this is the letetr version proposed to send to OPG
Attachments: OPA Support for Pickering and Not Responsive - August 15 2012.docx

With your o.k., I will send it over to OPA regulatory affairs (who would then send it to OPG for review). The version is identical to the one sent to Colin late last week, but with one update per his instruction from Monday re: noting coordination/integration prospects (see my insertion in bold green below). Please advise whether this is acceptable. Thank you,
ap

[...] On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. **Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.**

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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED].
Not Responsive

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Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
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Not Responsive

From: Amir Shalaby
Sent: August-23-12 10:50 AM
To: Andrew Pietrewicz
Subject: Re: Response requested: this is the letetr version proposed to send to OPG

Thanks. I will read and get back before noon

From: Andrew Pietrewicz
Sent: Thursday, August 23, 2012 09:15 AM
To: Amir Shalaby
Subject: Response requested: this is the letetr version proposed to send to OPG

With your o.k., I will send it over to OPA regulatory affairs (who would then send it to OPG for review). The version is identical to the one sent to Colin late last week, but with one update per his instruction from Monday re: noting coordination/integration prospects (see my insertion in bold green below). Please advise whether this is acceptable. Thank you,
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To: Andrew Pietrewicz
Subject: Re: Response requested: this is the letetr version proposed to send to OPG

Not Responsive

Cheers

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From: Andrew Pietrewicz
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To: Amir Shalaby
Subject: RE: Response requested: this is the letetr version proposed to send to OPG

Will do. Thank you,
ap

From: Amir Shalaby
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From: Andrew Pietrewicz
Sent: August-23-12 11:32 AM
To: Wajiha Shoaib
Subject: Letter for OPG
Attachments: OPA Support for Pickering and Not Responsive - August 15 2012.docx

Ready to go to OPG. ap

Andrew Pietrewicz
Director, Resource Integration
Power System Planning
Ontario Power Authority

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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

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Not Responsive

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- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Andrew Pietrewicz
Sent: August-23-12 12:45 PM
To: Bob Chow; Chuck Farmer; George Pessione; Joe Toneguzzo
Subject: FYI, letter for OPG
Attachments: OPA Support for Pickering and Not Responsive - August 15 2012.docx

In support of work in 2013 - 2014 to preserve the options of Pickering continued operation and
Not Responsive Signed pdf will follow. ap



120 Adelaide Street West
Suite 1600
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www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED]
Not Responsive

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
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An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

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Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
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(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

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Year	2013	2014	2015	2016	2017	2018	2019	2020
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Not Responsive

From: Andrew Pietrewicz
Sent: August-23-12 2:38 PM
To: Andrew Pietrewicz
Subject: OPA Support for Pickering and [REDACTED] - August 15_signed 2012
Attachments: OPA Support for Pickering and [REDACTED] *Not Responsive* - August 15_signed 2012.pdf



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Suite 1600
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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and Darlington NGS Refurbishment

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS.

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

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On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.

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- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
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- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Darlington NGS Refurbishment

The four-units at Darlington NGS (3,512 MW) entered service between 1990 and 1993. The Darlington design includes the need for major refurbishment at mid-life. Without refurbishment, Darlington NGS would cease production in 2020. With refurbishment, Darlington NGS would continue production until 2054 (Appendix 2).

OPG has been active on Darlington NGS refurbishment planning and development work since 2007. Total investment in capital and OM&A is expected to total approximately \$370 M by the end of 2012. To date, there has been significant refinement in scope and OPG has expressed high confidence in project costs and project execution. The Darlington Refurbishment Project is now in the Definition Phase and OPG has proceeded with contracting and procurement of labour and materials.

The OPA's support for expenditures in 2013-2014 to preserve the option of Darlington refurbishment is based on strategic considerations supported by cost comparisons. Strategic considerations prevail given the long time-period under consideration (to 2054) and correspondingly high degree of uncertainty. The cost comparisons developed by the OPA are to be taken in the context of uncertainty, including with respect to the long-term supply and price of natural gas, value of carbon and cost of new nuclear - all three come with a wide range of uncertainty.

On balance, the preservation of approximately 3,500 MW and 28 TWh of nuclear supply on an existing site with access to services and transmission is seen to have merit in terms of shorter lead-time, community acceptance, impacts on the environment and cost. In consideration of the longer-term uncertainties, the OPA's probabilistic analysis suggests a high likelihood that refurbishing Darlington NGS would be less costly than other sources of supply, including new nuclear or new gas-fired facilities, for a wide range of potential future conditions.

In addition to the above considerations, the OPA estimates that the option would not add significantly to carbon emissions in the province. In comparison, an equivalent natural gas-fired alternative would increase CO₂ emissions by an average of 10 megatonnes annually between 2024 and 2054. This would approximately triple the annual volume of CO₂ emissions for Ontario that is otherwise projected for the long-term.

Further, the OPA views Darlington refurbishment as supportive of the diversity and performance of Ontario's long-term electricity supply mix. The rationale for a diverse supply mix relates to considerations of uncertainty, risk mitigation and security of supply. Recognition of nuclear energy in these and other regards is found in the OPA's Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the Ontario Energy Board in 2007 (EB-2007-0707), the Ontario Government's Long-Term Energy Plan issued in 2010 and, subsequently, in the 2011 Supply Mix Directive. Each of these identifies an important role for nuclear energy in Ontario's long-term supply mix. Refurbishment of Darlington, in addition to the merits outlined above, is consistent with this direction.

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

A handwritten signature in black ink, appearing to read 'A. Shalaby', written in a cursive style.

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
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Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
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Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Attachment 2 - Information Received from OPG Regarding Darlington NGS Refurbishment

Darlington NGS Refurbishment Schedule						
Unit	Unit Shutdown Date	Idle Time (months)	Refurbishment Start Date	Refurbishment End Date	Shutdown Date Post-Refurbishment	Refurb. Duration (months)
1	Same as Refurbishment Start	0	Oct - 2016	Dec - 2019	Dec - 2049	39
2	Same as Refurbishment Start	0	May - 2018	May - 2021	May - 2051	37
3	Same as Refurbishment Start	0	Dec - 2019	Oct - 2022	Oct - 2052	35
4	Jul - 2020	10	May - 2021	Jan - 2024	Jan - 2054	33

From: Andrew Pietrewicz
Sent: August-23-12 2:38 PM
To: Andrew Pietrewicz
Subject: OPA Support for Pickering and Not Responsive - August 15_signed 2012
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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and Darlington NGS Refurbishment

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The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

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Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
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Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
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Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Attachment 2 - Information Received from OPG Regarding Darlington NGS Refurbishment

Darlington NGS Refurbishment Schedule						
Unit	Unit Shutdown Date	Idle Time (months)	Refurbishment Start Date	Refurbishment End Date	Shutdown Date Post-Refurbishment	Refurb. Duration (months)
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4	Jul - 2020	10	May - 2021	Jan - 2024	Jan - 2054	33

From: Andrew Pietrewicz
Sent: August-23-12 2:41 PM
To: Nancy Marconi; Wajiha Shoaib
Subject: two follow-up items
Attachments: OPA Support for Pickering and Not Responsive - August 15_signed 2012.pdf

- a. Amir not in office next week
- b. Tried using copy and paste signature: see attached experiment – I think it works reasonably enough

Once we have the CC list, will alert Amir before using his signature and sending out to OPG. ap

From: Andrew Pietrewicz
Sent: August 23, 2012 2:38 PM
To: Andrew Pietrewicz
Subject: OPA Support for Pickering and Not Responsive - August 15_signed 2012



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and Darlington NGS Refurbishment

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS.

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Darlington NGS Refurbishment

The four-units at Darlington NGS (3,512 MW) entered service between 1990 and 1993. The Darlington design includes the need for major refurbishment at mid-life. Without refurbishment, Darlington NGS would cease production in 2020. With refurbishment, Darlington NGS would continue production until 2054 (Appendix 2).

OPG has been active on Darlington NGS refurbishment planning and development work since 2007. Total investment in capital and OM&A is expected to total approximately \$370 M by the end of 2012. To date, there has been significant refinement in scope and OPG has expressed high confidence in project costs and project execution. The Darlington Refurbishment Project is now in the Definition Phase and OPG has proceeded with contracting and procurement of labour and materials.

The OPA's support for expenditures in 2013-2014 to preserve the option of Darlington refurbishment is based on strategic considerations supported by cost comparisons. Strategic considerations prevail given the long time-period under consideration (to 2054) and correspondingly high degree of uncertainty. The cost comparisons developed by the OPA are to be taken in the context of uncertainty, including with respect to the long-term supply and price of natural gas, value of carbon and cost of new nuclear - all three come with a wide range of uncertainty.

On balance, the preservation of approximately 3,500 MW and 28 TWh of nuclear supply on an existing site with access to services and transmission is seen to have merit in terms of shorter lead-time, community acceptance, impacts on the environment and cost. In consideration of the longer-term uncertainties, the OPA's probabilistic analysis suggests a high likelihood that refurbishing Darlington NGS would be less costly than other sources of supply, including new nuclear or new gas-fired facilities, for a wide range of potential future conditions.

In addition to the above considerations, the OPA estimates that the option would not add significantly to carbon emissions in the province. In comparison, an equivalent natural gas-fired alternative would increase CO₂ emissions by an average of 10 megatonnes annually between 2024 and 2054. This would approximately triple the annual volume of CO₂ emissions for Ontario that is otherwise projected for the long-term.

Further, the OPA views Darlington refurbishment as supportive of the diversity and performance of Ontario's long-term electricity supply mix. The rationale for a diverse supply mix relates to considerations of uncertainty, risk mitigation and security of supply. Recognition of nuclear energy in these and other regards is found in the OPA's Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the Ontario Energy Board in 2007 (EB-2007-0707), the Ontario Government's Long-Term Energy Plan issued in 2010 and, subsequently, in the 2011 Supply Mix Directive. Each of these identifies an important role for nuclear energy in Ontario's long-term supply mix. Refurbishment of Darlington, in addition to the merits outlined above, is consistent with this direction.

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

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Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
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Year	2013	2014	2015	2016	2017	2018	2019	2020
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From: Andrew Pietrewicz
Sent: August-24-12 10:07 AM
To: Wajiha Shoaib
Cc: Nancy Marconi
Subject: Letter ready for delivery
Attachments: OPA Support for Pickering and *Not Responsive*_August 15 2012__Signed.docx.pdf

...CCs added, e-signature added, confirmation received from Amir that it's ok to bring this to OPG. Thank you,

ap

p.s. Please confirm once you've delivered it.



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
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700 University Avenue
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Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
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From: Andrew Pietrewicz
Sent: August-24-12 3:02 PM
To: Bashir Bhana; Victor Stein
Subject: Signed letter for your records.
Attachments: OPA Support for Pickering and *Not Responsive* August 15 2012__Signed.docx.pdf



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
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700 University Avenue
Toronto, Ontario M5G 1X6

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Further, the OPA views Darlington refurbishment as supportive of the diversity and performance of Ontario's long-term electricity supply mix. The rationale for a diverse supply mix relates to considerations of uncertainty, risk mitigation and security of supply. Recognition of nuclear energy in these and other regards is found in the OPA's Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the Ontario Energy Board in 2007 (EB-2007-0707), the Ontario Government's Long-Term Energy Plan issued in 2010 and, subsequently, in the 2011 Supply Mix Directive. Each of these identifies an important role for nuclear energy in Ontario's long-term supply mix. Refurbishment of Darlington, in addition to the merits outlined above, is consistent with this direction.

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

A handwritten signature in black ink, appearing to read 'A. Shalaby', written in a cursive style.

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Attachment 2 - Information Received from OPG Regarding Darlington NGS Refurbishment

Darlington NGS Refurbishment Schedule						
Unit	Unit Shutdown Date	Idle Time (months)	Refurbishment Start Date	Refurbishment End Date	Shutdown Date Post-Refurbishment	Refurb. Duration (months)
1	Same as Refurbishment Start	0	Oct - 2016	Dec - 2019	Dec - 2049	39
2	Same as Refurbishment Start	0	May - 2018	May - 2021	May - 2051	37
3	Same as Refurbishment Start	0	Dec - 2019	Oct - 2022	Oct - 2052	35
4	Jul - 2020	10	May - 2021	Jan - 2024	Jan - 2054	33

From: Andrew Pietrewicz
Sent: September-06-12 1:44 PM
To: Bashir Bhana
Subject: FW: Letter ready for delivery
Attachments: OPA Support for Pickering and Not Responsive_August 15 2012__Signed.docx.pdf

From: Andrew Pietrewicz
Sent: August 24, 2012 10:07 AM
To: Wajiha Shoaib
Cc: Nancy Marconi
Subject: Letter ready for delivery

...CCs added, e-signature added, confirmation received from Amir that it's ok to bring this to OPG. Thank you,

ap

p.s. Please confirm once you've delivered it.



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and Darlington NGS Refurbishment

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS.

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Darlington NGS Refurbishment

The four-units at Darlington NGS (3,512 MW) entered service between 1990 and 1993. The Darlington design includes the need for major refurbishment at mid-life. Without refurbishment, Darlington NGS would cease production in 2020. With refurbishment, Darlington NGS would continue production until 2054 (Appendix 2).

OPG has been active on Darlington NGS refurbishment planning and development work since 2007. Total investment in capital and OM&A is expected to total approximately \$370 M by the end of 2012. To date, there has been significant refinement in scope and OPG has expressed high confidence in project costs and project execution. The Darlington Refurbishment Project is now in the Definition Phase and OPG has proceeded with contracting and procurement of labour and materials.

The OPA's support for expenditures in 2013-2014 to preserve the option of Darlington refurbishment is based on strategic considerations supported by cost comparisons. Strategic considerations prevail given the long time-period under consideration (to 2054) and correspondingly high degree of uncertainty. The cost comparisons developed by the OPA are to be taken in the context of uncertainty, including with respect to the long-term supply and price of natural gas, value of carbon and cost of new nuclear - all three come with a wide range of uncertainty.

On balance, the preservation of approximately 3,500 MW and 28 TWh of nuclear supply on an existing site with access to services and transmission is seen to have merit in terms of shorter lead-time, community acceptance, impacts on the environment and cost. In consideration of the longer-term uncertainties, the OPA's probabilistic analysis suggests a high likelihood that refurbishing Darlington NGS would be less costly than other sources of supply, including new nuclear or new gas-fired facilities, for a wide range of potential future conditions.

In addition to the above considerations, the OPA estimates that the option would not add significantly to carbon emissions in the province. In comparison, an equivalent natural gas-fired alternative would increase CO₂ emissions by an average of 10 megatonnes annually between 2024 and 2054. This would approximately triple the annual volume of CO₂ emissions for Ontario that is otherwise projected for the long-term.

Further, the OPA views Darlington refurbishment as supportive of the diversity and performance of Ontario's long-term electricity supply mix. The rationale for a diverse supply mix relates to considerations of uncertainty, risk mitigation and security of supply. Recognition of nuclear energy in these and other regards is found in the OPA's Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the Ontario Energy Board in 2007 (EB-2007-0707), the Ontario Government's Long-Term Energy Plan issued in 2010 and, subsequently, in the 2011 Supply Mix Directive. Each of these identifies an important role for nuclear energy in Ontario's long-term supply mix. Refurbishment of Darlington, in addition to the merits outlined above, is consistent with this direction.

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Regards,

A handwritten signature in black ink, appearing to read 'A. Shalaby', written in a cursive style.

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
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[TBD]

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From: Bashir Bhana
Sent: September-14-12 11:17 AM
To: Andrew Pietrewicz
Subject: Nuclear Deck - Capacity/Energy/Emissions Slides
Attachments: Prototype - Illustrative Case Summary 09-13-2012 (BB).ppt; Ontario Greenhouse Gas Emissions Targets A Technical Brief June 2007.pdf

Andrew – sample slides attached.

Not Responsive

Please advise on which version is preferred and I will update the remaining case slides accordingly.

Bashir Bhana, P.Eng.
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

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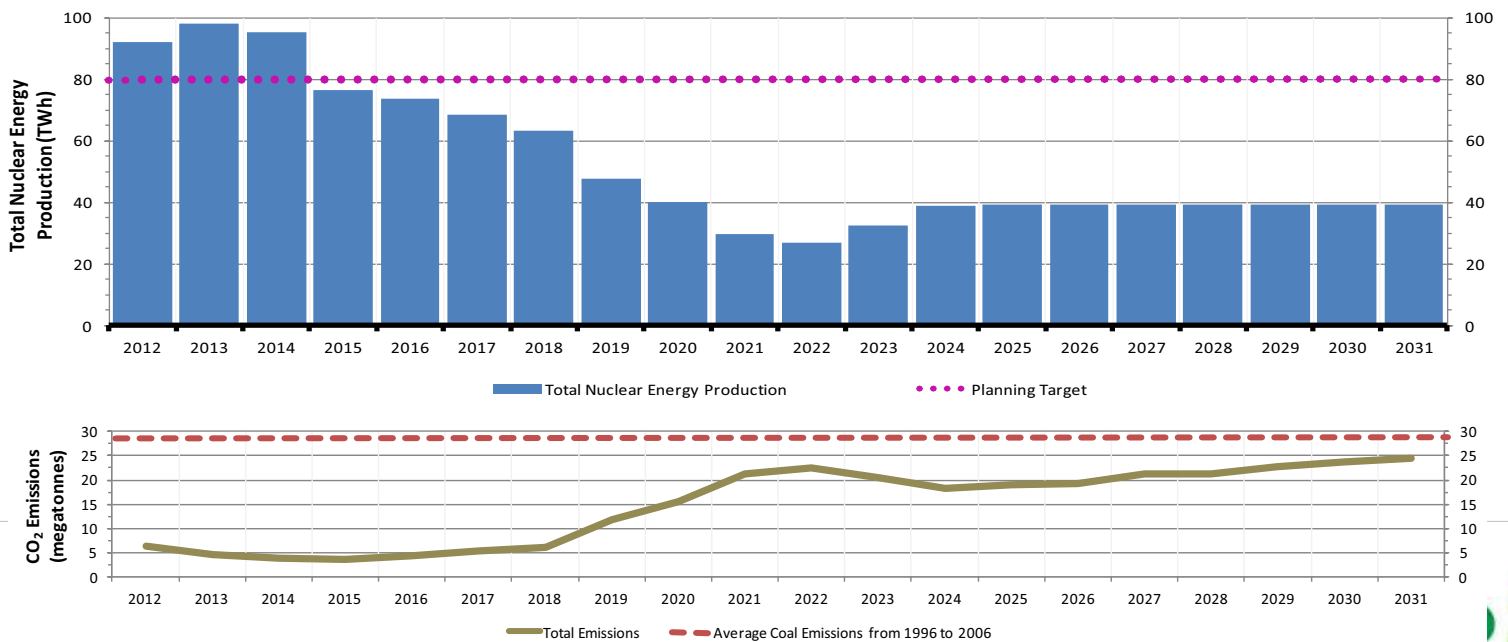
Not Responsive

SAMPLE VERSION 1

Shortages will emerge soon without continued operations at Pickering and

NR

Section 17

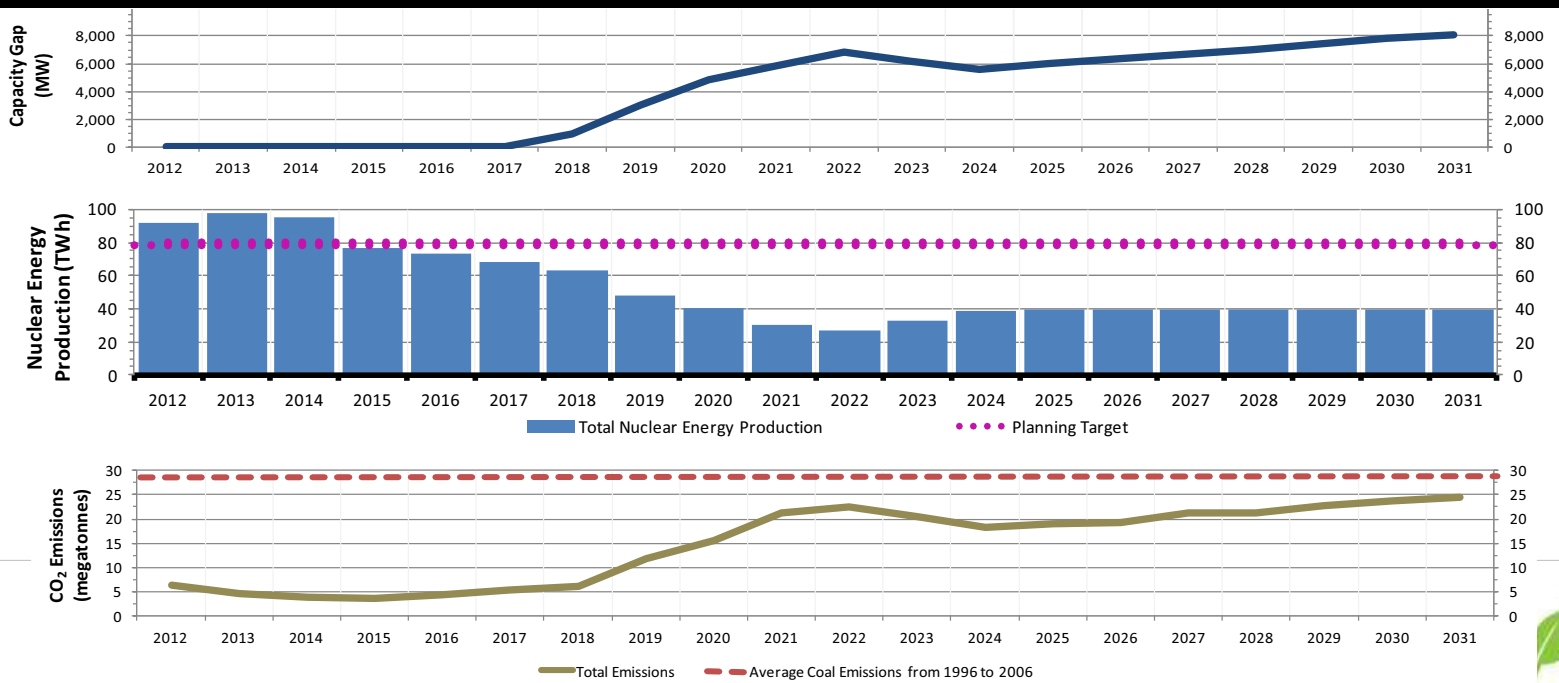


SAMPLE VERSION 2

Shortages will emerge soon without continued operations at Pickering and

NR

Section 17



Not Responsive

From: BOLAND Bruce -COMOPS&ENV <bruce.boland@opg.com>
Sent: September-17-12 2:43 PM
To: Andrew Pietrewicz
Subject: FW: Pickering Life

Andrew, I see Amir is away....over to you. Bruce

From: BOLAND Bruce -COMOPS&ENV
Sent: Monday, September 17, 2012 2:42 PM
To: 'mike.penstone@hydroone.com'; 'Amir Shalaby'
Cc: CROZZOLI Carlo -CBUSDEV&CRO
Subject: Pickering Life

Mike and Amir,

We are getting ready to write the OPA informing them that the CNSC has formally agreed with our analysis that Pickering life can be managed to 2020.

I expect this will have some impact on the Clarington TS discussions H1 is having.

Do you wish to offer any input before such a letter goes?

Bruce

Bruce Boland | Senior Vice President, Commercial Operations & Environment | Ontario Power Generation
700 University Ave, Suite H19 A19, Toronto, ON M5G 1X6 | T 416-592-4480 | F 416-592-6600 | E
bruce.boland@opg.com<mailto:bruce.boland@opg.com>

Clarington residents come out swinging against planned hydro station Clarington This Week Sat Sep 15 2012

Page: 1

Section: News

Byline: Jennifer O'Meara, jomeara@durhamregion.com<mailto:jomeara@durhamregion.com>

CLARINGTON -- There is little middle ground between Clarington homeowners who don't want to live next to a hydro transmission station and officials who say the new station is needed and Clarington is the best place to build it. "We can't believe anything you say, so go away. Find some 100-acre paved site in Pickering and build it there," said Jim Sullivan, a neighbour to the station proposed on Oak Ridges Moraine and greenbelt land. One of the only things the two sides did agree on during a recent meeting was having a technical follow-up meeting with a smaller group of residents acting as an advisory committee. Hydro One promised to provide answers to the outstanding questions in writing. In exchange it asked for what mitigation measures could be put in place so that residents could live with the hydro station. Residents refused and asked their supporters to sign a petition against the project.

"We like the words 'prevent, prohibit, stop, don't ever do'. We like those words more than 'mitigate' which means soften -- it's a weak word," said Mr. Sullivan.

At the Sept. 11 public meeting, Hydro One said a new hydro transfer station will be needed to get power to the east Greater Toronto Area when the Pickering nuclear station closes.

Hydro One has a number of arguments for the chosen site: it has access to both the big volt and mid-level volt power lines; the hydro corridor currently there is an "existing disturbance"; the property is big enough and Hydro One already owns it.

"For those reasons we feel Clarington is the best for the site," said Randy Church, project development manager for Hydro One.

Hydro One plans to begin construction next year and have the station running by the spring of 2015 -- to be ready for the earliest possible closure of the Pickering Nuclear Generating Station. Otherwise there could be blackouts in the east GTA, according to the hydro officials.

"Do I roll the dice and say Pickering is going to last to 2020?" said Joe Toneguzzo, Ontario Power Authority director of transmission integration. "The consequence is very high to the customers in this area. We believe the prudent thing to do is to move forward."

Residents asked Hydro One to slow down the project.

They are worried the station will impact their well water, harm the environment and local wildlife. They want a geohydrological study of the Oak Ridges Moraine's sensitive groundwater system.

Hydro One said it will test local wells before, during and after construction of the transformer station. If there is any damage to water supply caused by the construction, Hydro One will pay to dig a new well.

Residents said a new well won't help much if the groundwater has been contaminated.

"Get it off the Ridges and we'll get off your back," said resident Doug Taylor.

Residents also had concerns about an accident at the Pickering station a few years ago that resulted in an oil spill and small fire.

Hydro One said failures are rare and that in the Pickering breakdown, a small amount of oil was released into a water system. The oil is non-toxic and no damage was done to wildlife or habitat.

"If I could dispel the notion (that) we have transformer stations blowing up around the province -- we don't," said Mr. Church.

Residents disagreed about the benign nature of the oil used and said contamination would be impossible to clean up in the groundwater system.

"We can't replace our water supply and that is our key concern," said Clint Cole.

Homeowners also raised concerns about the impact on property values and said it will now be impossible to sell their homes for a decent price.

"It's my home, my retirement. Every dime I've got is in my property," said Mr. Taylor.

Hydro One said that property values may be affected during the disruption due to construction but that when the project is finished other factors -- such as the economy and mortgage rates -- come into play and it's hard to say if the hydro station has an impact.

That earned murmurs of disagreement from the audience.

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Edition: Final

Length: 691 words

Idnumber: 201209150010

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From: Joe Toneguzzo
Sent: September-17-12 5:18 PM
To: Andrew Pietrewicz
Subject: RE: Pickering Life

Andrew;

It is not clear to me how to interpret this.

Since you are closer to it, does this give you comfort that the Pickering units will continue to operate well beyond 2015 and we don't need to be concerned that about 750 MW of GTA load will be at risk under a single transmission system contingency?

Thanks - Joe

-----Original Message-----

From: Andrew Pietrewicz
Sent: Monday, September 17, 2012 4:58 PM
To: Joe Toneguzzo
Subject: Fw: Pickering Life

Draft language below for review. ap

----- Original Message -----

From: BOLAND Bruce -COMOPS&ENV [mailto:bruce.boland@opg.com]
Sent: Monday, September 17, 2012 04:47 PM
To: Andrew Pietrewicz; Amir Shalaby; 'mike.penstone@hydroone.com' <mike.penstone@hydroone.com>
Cc: CROZZOLI Carlo -CBUSDEV&CRO <carlo.crozzoli@opg.com>
Subject: RE: Pickering Life

The draft letter we would send is below:

Amir,

As you are aware, OPG has been working to confirm the structural fitness of Pickering Nuclear Generating Station fuel channels for operation to 2020.

OPG's recent submission to the Canadian Nuclear Safety Commission (CNSC) sought CNSC staff's agreement that "all life limiting fuel channel structural issues have been addressed for the target service life of the Pickering Nuclear Generating Station...".

We are pleased to report that CNSC staff agree that OPG will, through continued specified monitoring, the successful completion of on-going R&D and specified station improvements, be capable of confirming fitness-for-service of Pickering NGS A and B fuel channels for the duration of the proposed continued operation period. In this regard we have fulfilled our commitment to provide the OPA with the results of this analysis by the end of 2012.

OPG continues to study options to get the most value out of our nuclear assets and we are considering various life management alternatives for both our Pickering [REDACTED] stations. [REDACTED] *Not Responsive*

Not Responsive

Best regards,

Bruce Boland

-----Original Message-----

From: Andrew Pietrewicz [mailto:Andrew.Pietrewicz@powerauthority.on.ca]
Sent: Monday, September 17, 2012 3:21 PM
To: BOLAND Bruce -COMOPS&ENV
Subject: RE: Pickering Life

Thanks, Bruce. Short answer is yes. Is there a copy you could share? Joe Toneguzzo works with us on the transmission side will have a look - we'll take it from there. Thank you, ap

Andrew Pietrewicz
Director, Resource Integration
Power System Planning
Ontario Power Authority

120 Adelaide Street West
Suite 1600
Toronto, Ontario
M5H 1T1

T. 416 969 6040
F. 461 967 1947

www.powerauthority.on.ca

-----Original Message-----

From: BOLAND Bruce -COMOPS&ENV [mailto:bruce.boland@opg.com]
Sent: September 17, 2012 2:43 PM
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Subject: FW: Pickering Life

Andrew, I see Amir is away....over to you. Bruce

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Sent: Monday, September 17, 2012 2:42 PM
To: 'mike.penstone@hydroone.com'; 'Amir Shalaby'
Cc: CROZZOLI Carlo -CBUSDEV&CRO
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Mike and Amir,

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I expect this will have some impact on the Clarington TS discussions H1 is having.

Do you wish to offer any input before such a letter goes?

Bruce

Bruce Boland | Senior Vice President, Commercial Operations & Environment | Ontario Power Generation
700 University Ave, Suite H19 A19, Toronto, ON M5G 1X6 | T 416-592-4480 | F 416-592-6600 | E
bruce.boland@opg.com<mailto:bruce.boland@opg.com>

Clarington residents come out swinging against planned hydro station Clarington This Week Sat Sep 15 2012

Page: 1

Section: News

Byline: Jennifer O'Meara, jomeara@durhamregion.com<mailto:jomeara@durhamregion.com>

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From: Andrew Pietrewicz
Sent: September-17-12 5:37 PM
To: Joe Toneguzzo
Subject: Re: Pickering Life

I will follow-up with you in person tomorrow morning. In the meantime, a preview: we can go ahead and seek additional guarantee from opg. My leaning, however, is that in view of the risk involved and balanced against the cost of advancing vs deferring tx station in-service, it would be prudent to allow for some overlap of the tx and gx elements. My recommendation, subject to further discussion with you tomorrow, is to proceed as we currently are on the Clarington ts. ap

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Thanks - Joe

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Subject: Fw: Pickering Life

Draft language below for review. ap

----- Original Message -----

From: BOLAND Bruce -COMOPS&ENV [mailto:bruce.boland@opg.com]
Sent: Monday, September 17, 2012 04:47 PM
To: Andrew Pietrewicz; Amir Shalaby; 'mike.penstone@hydroone.com' <mike.penstone@hydroone.com>
Cc: CROZZOLI Carlo -CBUSDEV&CRO <carlo.crozzoli@opg.com>
Subject: RE: Pickering Life

The draft letter we would send is below:

Amir,

As you are aware, OPG has been working to confirm the structural fitness of Pickering Nuclear Generating Station fuel channels for operation to 2020.

OPG's recent submission to the Canadian Nuclear Safety Commission (CNSC) sought CNSC staff's agreement that "all life limiting fuel channel structural issues have been addressed for the target service life of the Pickering Nuclear Generating Station...".

We are pleased to report that CNSC staff agree that OPG will, through continued specified monitoring, the successful completion of on-going R&D and specified station improvements, be capable of confirming fitness-for-service of Pickering NGS A and B fuel channels for the duration of the proposed continued operation period. In this regard we have fulfilled our commitment to provide the OPA with the results of this analysis by the end of 2012.

Not Responsive

Best regards,

Bruce Boland

-----Original Message-----

From: Andrew Pietrewicz [mailto:Andrew.Pietrewicz@powerauthority.on.ca]

Sent: Monday, September 17, 2012 3:21 PM

To: BOLAND Bruce -COMOPS&ENV

Subject: RE: Pickering Life

Thanks, Bruce. Short answer is yes. Is there a copy you could share? Joe Toneguzzo works with us on the transmission side will have a look - we'll take it from there. Thank you, ap

Andrew Pietrewicz
Director, Resource Integration
Power System Planning
Ontario Power Authority

120 Adelaide Street West
Suite 1600
Toronto, Ontario
M5H 1T1

T. 416 969 6040
F. 461 967 1947

www.powerauthority.on.ca

-----Original Message-----

From: BOLAND Bruce -COMOPS&ENV [mailto:bruce.boland@opg.com]

Sent: September 17, 2012 2:43 PM

To: Andrew Pietrewicz

Subject: FW: Pickering Life

Andrew, I see Amir is away....over to you. Bruce

From: BOLAND Bruce -COMOPS&ENV
Sent: Monday, September 17, 2012 2:42 PM
To: 'mike.penstone@hydroone.com'; 'Amir Shalaby'
Cc: CROZZOLI Carlo -CBUSDEV&CRO
Subject: Pickering Life

Mike and Amir,

We are getting ready to write the OPA informing them that the CNSC has formally agreed with our analysis that Pickering life can be managed to 2020.

I expect this will have some impact on the Clarington TS discussions H1 is having.

Do you wish to offer any input before such a letter goes?

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Bruce Boland | Senior Vice President, Commercial Operations & Environment | Ontario Power Generation
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bruce.boland@opg.com<mailto:bruce.boland@opg.com>

Clarington residents come out swinging against planned hydro station Clarington This Week Sat Sep 15 2012

Page: 1

Section: News

Byline: Jennifer O'Meara, jomeara@durhamregion.com<mailto:jomeara@durhamregion.com>

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Hydro One plans to begin construction next year and have the station running by the spring of 2015 -- to be ready for the earliest possible closure of the Pickering Nuclear Generating Station. Otherwise there could be blackouts in the east GTA, according to the hydro officials.

"Do I roll the dice and say Pickering is going to last to 2020?" said Joe Toneguzzo, Ontario Power Authority director of transmission integration. "The consequence is very high to the customers in this area. We believe the prudent thing to do is to move forward."

Residents asked Hydro One to slow down the project.

They are worried the station will impact their well water, harm the environment and local wildlife. They want a geohydrological study of the Oak Ridges Moraine's sensitive groundwater system.

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Edition: Final

Length: 691 words

Idnumber: 201209150010

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Byline: Jennifer O'Meara, jomeara@durhamregion.com<mailto:jomeara@durhamregion.com>

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From: Wajiha Shoaib
Sent: September-18-12 2:07 PM
To: Andrew Pietrewicz; Clare Hudson
Cc: Nancy Marconi; Miriam Heinz; Wajiha Shoaib
Subject: FW: OPA Letter
Attachments: OPA Support for Pickering and Not Responsive August 15 2012__Signed.docx.pdf

Hello All,

Please see email below-the letter to OPG from OPA can be considered final. I have saved a copy in the OPG folder on the Regulatory drive, PSP might want to do the same.

Thank you!

Jiya

-----Original Message-----

From: KOHN Ethan -REGAFFAIRS [<mailto:ethan.kohn@opg.com>]
Sent: September 18, 2012 1:59 PM
To: Wajiha Shoaib
Cc: SHEINFELD Joel -REGAFFAIRS; SARDANA Pankaj -REGAFFAIRS
Subject: OPA Letter

Jiha:

Further to your voice mail, we are fine with the letter you provided in the last week of August. Your understanding of the projects is correct, and we appreciate your assistance.

Regards,

Ethan

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120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and Darlington NGS Refurbishment

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS.

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Darlington NGS Refurbishment

The four-units at Darlington NGS (3,512 MW) entered service between 1990 and 1993. The Darlington design includes the need for major refurbishment at mid-life. Without refurbishment, Darlington NGS would cease production in 2020. With refurbishment, Darlington NGS would continue production until 2054 (Appendix 2).

OPG has been active on Darlington NGS refurbishment planning and development work since 2007. Total investment in capital and OM&A is expected to total approximately \$370 M by the end of 2012. To date, there has been significant refinement in scope and OPG has expressed high confidence in project costs and project execution. The Darlington Refurbishment Project is now in the Definition Phase and OPG has proceeded with contracting and procurement of labour and materials.

The OPA's support for expenditures in 2013-2014 to preserve the option of Darlington refurbishment is based on strategic considerations supported by cost comparisons. Strategic considerations prevail given the long time-period under consideration (to 2054) and correspondingly high degree of uncertainty. The cost comparisons developed by the OPA are to be taken in the context of uncertainty, including with respect to the long-term supply and price of natural gas, value of carbon and cost of new nuclear - all three come with a wide range of uncertainty.

On balance, the preservation of approximately 3,500 MW and 28 TWh of nuclear supply on an existing site with access to services and transmission is seen to have merit in terms of shorter lead-time, community acceptance, impacts on the environment and cost. In consideration of the longer-term uncertainties, the OPA's probabilistic analysis suggests a high likelihood that refurbishing Darlington NGS would be less costly than other sources of supply, including new nuclear or new gas-fired facilities, for a wide range of potential future conditions.

In addition to the above considerations, the OPA estimates that the option would not add significantly to carbon emissions in the province. In comparison, an equivalent natural gas-fired alternative would increase CO₂ emissions by an average of 10 megatonnes annually between 2024 and 2054. This would approximately triple the annual volume of CO₂ emissions for Ontario that is otherwise projected for the long-term.

Further, the OPA views Darlington refurbishment as supportive of the diversity and performance of Ontario's long-term electricity supply mix. The rationale for a diverse supply mix relates to considerations of uncertainty, risk mitigation and security of supply. Recognition of nuclear energy in these and other regards is found in the OPA's Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the Ontario Energy Board in 2007 (EB-2007-0707), the Ontario Government's Long-Term Energy Plan issued in 2010 and, subsequently, in the 2011 Supply Mix Directive. Each of these identifies an important role for nuclear energy in Ontario's long-term supply mix. Refurbishment of Darlington, in addition to the merits outlined above, is consistent with this direction.

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

A handwritten signature in black ink, appearing to read 'A. Shalaby', written in a cursive style.

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Attachment 2 - Information Received from OPG Regarding Darlington NGS Refurbishment

Darlington NGS Refurbishment Schedule						
Unit	Unit Shutdown Date	Idle Time (months)	Refurbishment Start Date	Refurbishment End Date	Shutdown Date Post-Refurbishment	Refurb. Duration (months)
1	Same as Refurbishment Start	0	Oct - 2016	Dec - 2019	Dec - 2049	39
2	Same as Refurbishment Start	0	May - 2018	May - 2021	May - 2051	37
3	Same as Refurbishment Start	0	Dec - 2019	Oct - 2022	Oct - 2052	35
4	Jul - 2020	10	May - 2021	Jan - 2024	Jan - 2054	33

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Sent: September-21-12 2:07 PM
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Cc: 'carlo.crozzoli@opg.com'; 'jacquie.hoornweg@opg.com'; 'laura.cooke@HydroOne.com'; 'bruce.boland@opg.com'; Joe Toneguzzo; Andrew Pietrewicz
Subject: Re: Pickering Life

Yes on two grounds:

One is that some of the units will stop production earlier than 2020.

Second is prudence to place new facilities in service in advance of critical need date (to cater for all kinds of uncertainties)

Joe: what are your views?

----- Original Message -----

From: mike.penstone@HydroOne.com [<mailto:mike.penstone@HydroOne.com>]

Sent: Friday, September 21, 2012 01:12 PM

To: Amir Shalaby

Cc: carlo.crozzoli@opg.com <carlo.crozzoli@opg.com>; jacquie.hoornweg@opg.com <jacquie.hoornweg@opg.com>; laura.cooke@HydroOne.com <laura.cooke@HydroOne.com>; bruce.boland@opg.com <bruce.boland@opg.com>

Subject: RE: Pickering Life

Amir- Hope you're feeling better. In your view, does the letter give OPA the latitude to defend a recommended I/S date prior to 2020?

Mike P.

-----Original Message-----

From: BOLAND Bruce -COMOPS&ENV [<mailto:bruce.boland@opg.com>]

Sent: Friday, September 21, 2012 11:53 AM

To: 'Amir Shalaby'; PENSTONE Mike

Cc: CROZZOLI Carlo -CBUSDEV&CRO; HOORNWEG Jacquie -CORPSHRELATN

Subject: Pickering Life

Latest draft version, incorporating input.

OK to sign and send? (Mike, I know you wanted to meet with us; do you need letter to wait till after meeting?)

Bruce

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From: Joe Toneguzzo
Sent: September-21-12 3:35 PM
To: Andrew Pietrewicz
Subject: FW: Pickering Life

Andrew;

We will need to discuss this email before I reply.

I do not think Amir's first point is relevant given the outages I am aware of.

As long as 1,000 MW (2 X 500 MW units) are available at Pickering, split between the Cherrywood buses we do not see overloads on the autotransformers, so Clarington can be deferred until the 2020 date, if we are banking on life extension.

Joe

-----Original Message-----

From: Amir Shalaby
Sent: Friday, September 21, 2012 2:07 PM
To: 'mike.penstone@hydroone.com'
Cc: 'carlo.crozzoli@opg.com'; 'jacquie.hoornweg@opg.com'; 'laura.cooke@HydroOne.com'; 'bruce.boland@opg.com'; Joe Toneguzzo; Andrew Pietrewicz
Subject: Re: Pickering Life

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To: Amir Shalaby
Cc: carlo.crozzoli@opg.com <carlo.crozzoli@opg.com>; jacquie.hoornweg@opg.com <jacquie.hoornweg@opg.com>; laura.cooke@HydroOne.com <laura.cooke@HydroOne.com>; bruce.boland@opg.com <bruce.boland@opg.com>
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delete this e-mail message.

From: Joe Toneguzzo
Sent: September-21-12 3:50 PM
To: Amir Shalaby; Andrew Pietrewicz
Subject: RE: Pickering Life

Hello Amir;

I am very pleased to hear your doing better.

I have not seen the latest version of the letter so cannot comment at this time.

Also, based on the Pickering outage schedules I am aware of it will be difficult to rationalize / defend a date prior to 2020, if life extension is implemented.

Not Responsive

I will discuss further with Andrew.

Thanks - Joe

-----Original Message-----

From: Amir Shalaby
Sent: Friday, September 21, 2012 2:07 PM
To: 'mike.penstone@hydroone.com'
Cc: 'carlo.crozzoli@opg.com'; 'jacquie.hoornweg@opg.com'; 'laura.cooke@HydroOne.com'; 'bruce.boland@opg.com'; Joe Toneguzzo; Andrew Pietrewicz
Subject: Re: Pickering Life

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-----Original Message-----

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Sent: Friday, September 21, 2012 11:53 AM

To: 'Amir Shalaby'; PENSTONE Mike

Cc: CROZZOLI Carlo -CBUSDEV&CRO; HOORNWEG Jacquie -CORPSHRELATN

Subject: Pickering Life

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If you have received this message in error, or are not the named recipient(s), please notify the sender immediately and
delete this e-mail message.

From: BOLAND Bruce -COMOPS&ENV <bruce.boland@opg.com>
Sent: September-25-12 3:39 PM
To: Andrew Pietrewicz; Joe Toneguzzo
Cc: 'mike.penstone@hydroone.com'
Subject: RE: Pickering Continued Operation

Andrew & Joe,

Mike Penstone asked for a meeting as well and it is set up for tomorrow at 4 pm at OPG's offices.

Does it make sense to combine? I think Mike's interest is primarily around the communications angle, and we both have our PR people coming.

Bruce

From: Andrew Pietrewicz [<mailto:Andrew.Pietrewicz@powerauthority.on.ca>]
Sent: Tuesday, September 25, 2012 12:16 PM
To: BOLAND Bruce -COMOPS&ENV
Cc: Joe Toneguzzo
Subject: Pickering Continued Operation

Bruce: I hope this note finds you well. Further to the draft letter you recently shared with us re: Pickering continued operation, can we arrange to have Joe Toneguzzo and me get together with some of your folks over the next week or so to discuss further? So as to better assess implications on plans for Clarington TS, we'd appreciate a bit of an in-person walk-through of the letter as well as OPG's outline of next steps (e.g. at OEB, at CNSC etc). Feel free to call me to discuss further. Thank you kindly in advance and all the best in the meantime,
ap

Andrew Pietrewicz
Director, Resource Integration
Power System Planning
Ontario Power Authority

120 Adelaide Street West
Suite 1600
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F. 461 967 1947

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From: BOLAND Bruce -COMOPS&ENV <bruce.boland@opg.com>
Sent: September-25-12 4:37 PM
To: Andrew Pietrewicz
Subject: RE: Pickering Continued Operation

Are you ok with me getting the letter out prior to the meeting?

From: Andrew Pietrewicz [<mailto:Andrew.Pietrewicz@powerauthority.on.ca>]
Sent: Tuesday, September 25, 2012 4:22 PM
To: BOLAND Bruce -COMOPS&ENV; Joe Toneguzzo
Cc: 'mike.penstone@hydroone.com'
Subject: RE: Pickering Continued Operation

Bruce: excellent idea, but the scheduling does not work out for us. With your indulgence, let us get together at another date with Joe and focus on understanding status and next steps re: Pickering. Thank you for getting back to us so quickly.

ap

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From: BOLAND Bruce -COMOPS&ENV [<mailto:bruce.boland@opg.com>]
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Andrew & Joe,

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Does it make sense to combine? I think Mike's interest is primarily around the communications angle, and we both have our PR people coming.

Bruce

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Sent: Tuesday, September 25, 2012 12:16 PM
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From: BOLAND Bruce -COMOPS&ENV <bruce.boland@opg.com>
Sent: September-26-12 8:24 AM
To: Andrew Pietrewicz
Subject: RE: Pickering Continued Operation

Thx

I'm wondering how technical you want to get—should I have the nuclear engineer in charge come to the meeting? Or are you more interested in the communications side?

From: Andrew Pietrewicz [<mailto:Andrew.Pietrewicz@powerauthority.on.ca>]
Sent: Tuesday, September 25, 2012 4:50 PM
To: BOLAND Bruce -COMOPS&ENV
Subject: Re: Pickering Continued Operation

Yes - the letter is fine. Thanks for asking. We'd simply benefit from some in-person elaboration. It's ok if the letter goes out first. Thank you. ap

From: BOLAND Bruce -COMOPS&ENV [<mailto:bruce.boland@opg.com>]
Sent: Tuesday, September 25, 2012 04:36 PM
To: Andrew Pietrewicz
Subject: RE: Pickering Continued Operation

Are you ok with me getting the letter out prior to the meeting?

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Sent: Tuesday, September 25, 2012 4:22 PM
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From: Bashir Bhana
Sent: May-03-12 4:34 PM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz; Wajiha Shoaib
Subject: RE: Pickering CO Draft for OPG Review
Attachments: OATS Deferral Value 05-03-2012 (BB).xlsx

Jim – as discussed, the deferral value of OATS to 2020 is the following:

- \$59M (2012 \$ NPV) relative to Pickering out of service in early 2015 due to no P7 LM
- \$48M (2012 \$ NPV) relative to Pickering out of service in early 2016 due to P7 LM (per OPG supporting evidence)

Details attached. Happy to discuss further.

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: May 2, 2012 1:05 PM
To: Bashir Bhana
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz; Wajiha Shoaib
Subject: RE: Pickering CO Draft for OPG Review

Hi Bashir,
As we discussed, could you re-calculate the advancement to reflect 5 year advancement – from 2020 to 2015. This updated number will be used in the document supporting H1 Tx rate submission to the OEB.
Thank you
Jim

From: Bashir Bhana
Sent: Thursday, March 29, 2012 9:52 AM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Jim – In our evidence we state the deferral of OATS is from 2015 to 2020 which is consistent with the transmission evidence. We also say that the station I/S would precede the retirement of Pickering (we don't state exactly when).

In the case of continued ops, if Hydro One is aiming for a 2019 I/S, I think we are still ok as far as the evidence goes. We assume that OATS is I/S Jan 1 2020 (for a Pick end of life of Dec 31 2020) although the exact date is not stated in the report. In either case, the deferral cost is virtually the same.

Unless contradicting dates are explicitly stated in either report, which I don't believe they are, I believe we're fine.

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
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120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: March 28, 2012 4:42 PM
To: Bashir Bhana
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Bashir,
The TS need date is based on the scenario of no life management and no life extension. Under that scenario, Pickering retires in early 2015. The letter from Andrew Barrett indicates 2016 retirement date only if life management happens which the OPG is not confirming.

The early 2015 is the earliest date H1 can build the TS. If Pickering goes on to 2020, H1 would build the TS for in-service in 2019.

Thank you
Jim

From: Bashir Bhana
Sent: Wednesday, March 28, 2012 4:31 PM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Jim – \$240M in 2012 dollars is correct. I'll revise the \$240M to \$270M in the next round of edits per your first comment.

On your second comment, we've assumed Oshawa TS to be in-service prior to the out of service of the last two Pickering units. This assumes at least 2 Pickering units need to be available for Oshawa TS to be deferred. Pickering is retired either in March 2016 or Dec 2020. The \$48M represents deferral between this period.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning

Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: March 28, 2012 3:37 PM
To: Bashir Bhana
Cc: George Pessione; Mike Zajmalowski; Joe Toneguzzo
Subject: RE: Pickering CO Draft for OPG Review

Hi Bashir,

I would recommend the following changes to the Section 5.5 Transmission Requirements on page 9. Starting on line 7, it shows:

"The estimated capital investment for Oshawa Area TS is \$240M (net present value in 2012 dollars). Deferral of Oshawa Area TS as a result of Pickering continued operation would result in cash flow savings of \$12 million for each year deferred. Deferring the in-service date from 2015 to 2020 would result in a time value savings of \$50 million over this period."

- 1) I expect the \$240M (net present value in 2012 dollars) to be correct, but could we show the same numbers shown in the H1 Tx rate submission which is \$270 M (for 2015 in-service)? This is just to avoid unnecessary questions.
- 2) The deferral should be from 2015 to 2019 in-service which is four year deferral. The station needs to be in-service before Pickering is retired in 2020. I assume the \$48M represents four year deferral.

Thank you
Jim

From: Bashir Bhana
Sent: Wednesday, March 28, 2012 1:27 PM
To: George Pessione; Mike Zajmalowski; Joe Toneguzzo; Jim Lee
Subject: FW: Pickering CO Draft for OPG Review

Fyi...Pickering continued ops draft report sent for OPG review attached.

Bashir Bhana
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Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: March 28, 2012 1:14 PM
To: Nancy Marconi; Wajiha Shoaib
Cc: Andrew Pietrewicz; Bob Gibbons; Steve Chui; Victor Stein; Bonnie Chan
Subject: Pickering CO Draft for OPG Review

Please find attached a draft of the Pickering CO report which can be forward to OPG.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
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Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

Oshawa Area TS (OATS) - Deferral Value Calculation

Section 17

Economic Assumptions:

Station Capital Cost	\$241 M in \$ 2012
Service Life	40 years
Discount Rate	4% /year (real 2012 \$)
Allocated Cost of Station	\$12 /year (real 2012 \$)
In Service Date	Need a min of 2 Pickering units in-service to avoid Oshawa TS. Assume TS would be in-service just prior to Pickering out of service. Assume allocated cost cash flows begin at the time of in-service of Oshawa TS.

Summary:

Benefit of deferring Oshawa TS from Mar 2016 to Dec 2020 =	\$48 (NPV 2012 \$) (pe
Benefit of deferring Oshawa TS from Jan 2015 to Dec 2020 =	\$59 (NPV 2012 \$)

Potential for Deferral (in real 2012 \$ M)
\$0
\$67
\$101
\$74

Change in Cost Due to Deferring OATS: \$ 2012

	2013	2014	2015	2016
<i>Case 1: Cash Flow for OATS I/S in Early 2016</i>				
Pickering Out of Service in Mar 2016	\$0	\$0	\$0	\$12
Pickering Out of Service in Dec 2020	\$0	\$0	\$0	\$0
Net Change (Dec 2020 vs Mar 2016 OATS I/S)	\$0	\$0	\$0	-\$12
<i>Case 2: Cash Flow for OATS I/S in Early 2015</i>				
Pickering Out of Service in Jan 2015	\$0	\$0	\$12	\$12
Pickering Out of Service in Dec 2020	\$0	\$0	\$0	\$0
Net Change (Dec 2020 vs Jan 2015 OATS I/S)	\$0	\$0	-\$12	-\$12

r Pickering CO Evidence)

2 Real

2017	2018	2019	2020	Total Cost	NPV (@ 4% real s.d.r)
\$12	\$12	\$12	\$12	\$61	\$48
\$0	\$0	\$0	\$0	\$0	\$0
-\$12	-\$12	-\$12	-\$12	-\$61	-\$48
\$12	\$12	\$12	\$12	\$73	\$59
\$0	\$0	\$0	\$0	\$0	\$0
-\$12	-\$12	-\$12	-\$12	-\$73	-\$59

From: KOHN Ethan -REGAFFCRPSTY <ethan.kohn@opg.com>
Sent: January-15-10 4:49 PM
To: Steve Chui
Cc: ROGERS Stephen -CRPINVASTPLN
Subject: RE: Continued Operations data
Attachments: PB CO Data for OPA_Jan 15 2010.xls

Sure. Stephen Rogers has also asked that you let the relevant people (Andrew P.?) know that Ontario CPI was 0.7%, not 0.4%.

Regards,

Ethan

-----Original Message-----

From: Steve Chui [mailto:Steve.Chui@powerauthority.on.ca]
Sent: Friday, January 15, 2010 3:51 PM
To: KOHN Ethan -REGAFFCRPSTY
Cc: Andrew Pietrewicz
Subject: RE: Continued Operations data

Ethan,
Would you please send us the cost table in Excel format? TX

Steve.

-----Original Message-----

From: KOHN Ethan -REGAFFCRPSTY [mailto:ethan.kohn@opg.com]
Sent: January 15, 2010 3:46 PM
To: Andrew Pietrewicz
Cc: Bob Gibbons; ROGERS Stephen -CORPBUSINVPL; BARRETT Andrew P -REGAFFCRPSTY; POWER Donald J - CORPBUSINVPL; PASQUET Paul -PICKERING; MORRISON R.C. Bob -NUCLEAR; SPEKKENS Paul -NUCLEAR; BLAZANIN John - PICKERING; BURKE Paul J -PLANNG&ANALY; Amir Shalaby; Nancy Marconi; Steve Chui; Alexander Forstner
Subject: Continued Operations data

Andrew:

In response to your request for forced loss rates to be provided and for clarification of some of the information provided in my e-mail of January 13 below, and further to our discussions yesterday, please find attached the latest Pickering B Continued Operations data. The forced loss rate data has been added to the original sheet per your request and the cost flows corrected to remove the incremental amounts that were inadvertently included in both the Base Case and the Continued Operations Case for Pickering B. Otherwise, all cost flows and all other information remains the same. Additional clarifying notes have been added to the data sheet to address potential questions.

The answers to your questions are:

1. What is the escalation rate that OPG used in the restatement from 2009 to 2010 constant dollars?

Answer: Ontario CPI for 2009 = 0.4%.

2. What are the forced outage rate assumptions used in the deriving ACFs presented in the pdf document (attached to your email) dated January 12, 2010 (document title is "PB CO Data for OPA_Jan 12 2010 (3).xls")?.

- We require these forced outage rates to perform our production simulations. Forced Outage Rates were provided in the previous version dated November 26, 2009, but are absent in the January 2010 update.

Answer: Please see the new data sheets attached for the forced outage rates.

3. What is the total incremental cost of continued operation expenditures in 2014?

- We require this information to perform a sensitivity where we look at a higher than forecast cost of conducting the continued operation work in the period 2010 - 2014. In the first set of draft data you provided us back in October or November 2009 (when we had our first meeting), one of the tables illustrated a "Summary of Incremental Expenditures (for the business planning period 2010 - 2014)". Can you please provide your current estimate? We don't require that it be provided on a line-by-line item basis, just as a total.

Answer: The assessed incremental costs of Continued Operations in 2014 are \$43.7 million in constant 2010\$ or \$47.4 million in 2014\$. This number has not changed from previously submitted information.

-----Original Message-----

From: KOHN Ethan -REGAFFCRPSTY

Sent: Wednesday, January 13, 2010 4:09 PM

To: 'Bob Gibbons'; 'Andrew Pietrewicz'

Cc: ROGERS Stephen -CORPBUSINVPL; KOHN Ethan -REGAFFCRPSTY; BARRETT

Andrew P -REGAFFCRPSTY; POWER Donald J -CORPBUSINVPL; PASQUET Paul -PICKERING; MORRISON R.C. Bob - NUCLEAR; SPEKKENS Paul -NUCLEAR; BLAZANIN John -PICKERING; BURKE Darin -NANTICOKE; BURKE Paul J - PLANNG&ANALY; Amir Shalaby; Nancy Marconi; Steve Chui; Alexander Forstner

Subject: Revised continued operations data

Bob/Andrew:

At our meeting on January 8, we committed to providing you with updated numbers to assess the continued operations initiative. These are reflected in the attached document. The updated information incorporates:

- * Finalized business plan numbers;
- * Minor assumption changes made to costs and performance information to ensure greater consistency between the Base Case and Continued Operations Case assumptions, e.g. similar aging assumptions added for Pickering A as for Pickering B;
- * As discussed in the January 8th meeting, an assumption of [REDACTED]

Section 17

- * Correction of some errors in cost assumptions;
- * A restatement from 2009 to 2010 constant dollars.

If you would like further clarification, we would be pleased to arrange a conference call between your group and our Corporate Business and Investment Planning group.

Regards,
Ethan

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PICKERING A & B: BASE CASE AND CONTINUED OPERATIONS DATA
(Life Management of P7 for Cont. Ops. Only)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Base Case: 210 KEFPH (No Life Management of P7)										
Pickering A	Section 17										
Pickering B											
	Continued Operations: 240 KEFPH (Life Management of P7)										
Pickering A	Section 17										
Pickering B											
	Difference: Continued Operations - Base Case										
Pickering A	Section 17										
Pickering B											

Notes:

1. OM&A costs include OM&A project costs. For simplicity, sustaining capital projects are also included in this line. Total OM&A also includes each station's share of incremental allocated nuclear support and corporate support costs.
2. In the years when units transition to out-of-service, rules are applied to calculate the station annual OM&A.
3. This analysis does not show the impact of extending the unit lives on OPG's Decommissioning, Low & Intermediate Level Waste and Used Fuel management provisions.
4. FLR is an average of the unit FLR's for those units which are operating during a year.
5. Shaded cells indicate partial year operation of 1 or 2 units depending on the case.
6. \$43.7 million (2010\$) of incremental Pickering B costs in 2014 are attributed to work to enable Continued Operations. The remaining Costs, Fuel and Energy differences from 2014 to 2020 are not attributable to work to implement Continued Operations, but reflect the fact that the Pickering A and B units are assumed to operate beyond the period assumed in the Base Case.

OPG Confidential - Commercially Sensitive; contains information of a commercial nature which could harm the competitive position of OPG, if disclosed.

EOL = End of Life
PO = Planned Outage

From: ROGERS Stephen -CRPINVASTPLN <stephen.rogers@opg.com>
Sent: June-29-11 2:48 PM
To: George Pessione
Cc: HALPERIN David T -FIN & C CTRL; Bashir Bhana; Victor Stein; EDEN Dave - CRPINVASTPLN; GARCIA LEE Violeta -CRPINVASTPLN; JEFFERIES Kevan - CRPINVASTPLN; BURKE Paul J -PLANNG&ANALY; JANOSSY Eva -PLANNG&ANALY; KOHN Ethan -REGAFFCRPSTY
Subject: RE: Telecon to Discuss Pickering Incremental Costs
Attachments: RE: Continued Operations data

PRIVILEGED AND CONFIDENTIAL

George,

Further to our discussion this morning, I would like to reconfirm that OPG's view of the incremental costs of operating Pickering A and B in the Continued Operations period remains as provided to the OPA in the e-mail and attachments sent to Andrew Pietrewicz by Ethan Kohn on January 15th, 2010. Analysis of these costs results in the conclusion that non-fuel operating costs average [REDACTED] *Section 17* during the Continued Operations period.

As further discussed, the incremental costs of operating the Pickering stations during this period is a derived number, based on OPG's assessment of what percentage of the central nuclear and corporate supports costs which are allocated to the Pickering units are incremental, and are inherently uncertain. See the discussion in my e-mail below. [REDACTED]

[REDACTED] *Section 17*

I'd also like to re-iterate another point in our discussion, i.e. that nuclear station non-fuel operating costs, other than fuel and fuel-related costs do not vary significantly depending on the production level in a particular year. Thus, as discussed, a station operating at 90% capacity factor for a year would not be expected to have significantly different non-fuel operating costs from a station that operates at, say, 75% capacity factor. Thus, expressing the non-fuel operating costs as a \$/MWh number and using it in that manner in an economic analysis may not be the best approach.

Please examine the spreadsheet included in the attached e-mail. It may be more useful to your analysis to look at the annual non-fuel operating costs OPG has forecast for Pickering A and Pickering B in 2019 and 2020 and use those numbers (in \$millions), rather than use a \$/MWh number.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN
Sent: Wednesday, June 29, 2011 10:44 AM
To: 'George Pessione'

Cc: HALPERIN David T -FIN & C CTRL; Bashir Bhana; Victor Stein; EDEN Dave -CRPINVASTPLN; GARCIA LEE Violeta - CRPINVASTPLN; JEFFERIES Kevan -CRPINVASTPLN
Subject: RE: Telecon to Discuss Pickering Incremental Costs

PRIVILEGED AND CONFIDENTIAL

George,

Some points to inform our discussion today. My intent in today's phone call is not to land on a specific number but to discuss the reasons why OPG has an "incremental" view" of the costs of operating the nuclear units. These are more philosophical points to ensure that everyone is on the same page when we have a discussion about this on the phone today:

- OPG's costs of operating a nuclear station in a particular year can be considered to be made up of the following major components:
- Direct Station OM&A (this has two components - station base OM&A & outage OM&A)
- Fuel
- Sustaining Investments (Both Capital & OM&A Projects) at that station
- Central Nuclear Support Costs (largely OM&A) allocated to each station from our Nuclear Support Groups (e.g. Engineering, Nuclear Programs, Training, Regulatory etc.
- Central Corporate Costs allocated to each station from the Corporate Head Office (e.g. HR, Finance, Business and IT Services, Exec Office, Legal, Reg. Affairs, Insurance, Pensions, Other Post-Employment Benefits).

While the first three categories (Direct Station OM&A, Fuel, and Investments) above are clearly incremental to the operation of the station, i.e. are expected to effectively be reduced to zero should those stations be removed from service, previous analysis has shown that only a portion of the Central Nuclear Support Costs that are "allocated" to that station annually are truly incremental to that station's operation. Similarly, previous analysis has shown that only a relatively small portion of the Central Corporate Costs that are allocated to that station annually are truly incremental to that station's operation. Another way of saying this are that there are economies of scale in the provision of nuclear and corporate support to multiple stations rather than to a single station or fewer stations. While there may always be opportunities to drive more efficiencies into the cost structure, the general principle of losses of economies of scale as a fleet of operating units shrinks still continues to hold.

In assessing the economics of a generation option, OPG attempts to determine as best as possible, the costs of that station which are truly incremental, as the non-incremental costs will continue to be paid for by the customer in the rates to be charged for any remaining generation. This is particularly true for costs such as pension, insurance and other post-employment benefits.

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

From: George Pessione [mailto:George.Pessione@powerauthority.on.ca]
Sent: Wednesday, June 29, 2011 9:07 AM

To: ROGERS Stephen -CRPINVASTPLN
Cc: HALPERIN David T -FIN & C CTRL; Bashir Bhana; Victor Stein
Subject: RE: Telecon to Discuss Pickering Incremental Costs

Stephen - Sounds good. Will you call me (416-969-6261)? I will also have Victor Stein and Bashir Bhana from my shop in my office if that's ok. Thx George

George Pessione
Director, Resource Integration - Power System Planning

Ontario Power Authority
120 Adelaide St. W., Suite 1600
Toronto, Ontario M5H 1T1
Phone
FAX 416-969-6384
george.pessione@powerauthority.on.ca
www.powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: June 28, 2011 5:11 PM
To: George Pessione
Cc: HALPERIN David T -FIN & C CTRL
Subject: Telecon to Discuss Pickering Incremental Costs

George,

David and I discussed your telecon message to him re Pickering incremental costs and we would like to have a brief phone call with you at 11:30 AM tomorrow, if possible.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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From: KOHN Ethan -REGAFFCRPSTY <ethan.kohn@opg.com>
Sent: January-15-10 4:49 PM
To: Steve Chui
Cc: ROGERS Stephen -CRPINVASTPLN
Subject: RE: Continued Operations data
Attachments: PB CO Data for OPA_Jan 15 2010.xls

Sure. Stephen Rogers has also asked that you let the relevant people (Andrew P.?) know that Ontario CPI was 0.7%, not 0.4%.

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Sent: January 15, 2010 3:46 PM
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Cc: Bob Gibbons; ROGERS Stephen -CORPBUSINVPL; BARRETT Andrew P -REGAFFCRPSTY; POWER Donald J - CORPBUSINVPL; PASQUET Paul -PICKERING; MORRISON R.C. Bob -NUCLEAR; SPEKKENS Paul -NUCLEAR; BLAZANIN John - PICKERING; BURKE Paul J -PLANNG&ANALY; Amir Shalaby; Nancy Marconi; Steve Chui; Alexander Forstner
Subject: Continued Operations data

Andrew:

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The answers to your questions are:

1. What is the escalation rate that OPG used in the restatement from 2009 to 2010 constant dollars?

Answer: Ontario CPI for 2009 = 0.4%.

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Answer: Please see the new data sheets attached for the forced outage rates.

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Answer: The assessed incremental costs of Continued Operations in 2014 are \$43.7 million in constant 2010\$ or \$47.4 million in 2014\$. This number has not changed from previously submitted information.

-----Original Message-----

From: KOHN Ethan -REGAFFCRPSTY

Sent: Wednesday, January 13, 2010 4:09 PM

To: 'Bob Gibbons'; 'Andrew Pietrewicz'

Cc: ROGERS Stephen -CORPBUSINVPL; KOHN Ethan -REGAFFCRPSTY; BARRETT

Andrew P -REGAFFCRPSTY; POWER Donald J -CORPBUSINVPL; PASQUET Paul -PICKERING; MORRISON R.C. Bob - NUCLEAR; SPEKKENS Paul -NUCLEAR; BLAZANIN John -PICKERING; BURKE Darin -NANTICOKE; BURKE Paul J - PLANNG&ANALY; Amir Shalaby; Nancy Marconi; Steve Chui; Alexander Forstner

Subject: Revised continued operations data

Bob/Andrew:

At our meeting on January 8, we committed to providing you with updated numbers to assess the continued operations initiative. These are reflected in the attached document. The updated information incorporates:

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- * Minor assumption changes made to costs and performance information to ensure greater consistency between the Base Case and Continued Operations Case assumptions, e.g. similar aging assumptions added for Pickering A as for Pickering B;
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Section 17

- * Correction of some errors in cost assumptions;
- * A restatement from 2009 to 2010 constant dollars.

If you would like further clarification, we would be pleased to arrange a conference call between your group and our Corporate Business and Investment Planning group.

Regards,
Ethan

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OPG Confidential - Commercially Sensitive



Updated: Jan 15, 2010

PICKERING A & B: BASE CASE AND CONTINUED OPERATIONS DATA
(Life Management of P7 for Cont. Ops. Only)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Base Case: 210 KEFPH (No Life Management of P7)										
Pickering A	Section 17										
Pickering B											
	Continued Operations: 240 KEFPH (Life Management of P7)										
Pickering A	Section 17										
Pickering B											
	Difference: Continued Operations - Base Case										
Pickering A	Section 17										
Pickering B											

Notes:

1. OM&A costs include OM&A project costs. For simplicity, sustaining capital projects are also included in this line. Total OM&A also includes each station's share of incremental allocated nuclear support and corporate support costs.
2. In the years when units transition to out-of-service, rules are applied to calculate the station annual OM&A.
3. This analysis does not show the impact of extending the unit lives on OPG's Decommissioning, Low & Intermediate Level Waste and Used Fuel management provisions.
4. FLR is an average of the unit FLR's for those units which are operating during a year.
5. Shaded cells indicate partial year operation of 1 or 2 units depending on the case.
6. \$43.7 million (2010\$) of incremental Pickering B costs in 2014 are attributed to work to enable Continued Operations. The remaining Costs, Fuel and Energy differences from 2014 to 2020 are not attributable to work to implement Continued Operations, but reflect the fact that the Pickering A and B units are assumed to operate beyond the period assumed in the Base Case.

OPG Confidential - Commercially Sensitive; contains information of a commercial nature which could harm the competitive position of OPG, if disclosed.

BASE CASE: No Continued Operations (210 kEFPH, no Life Management of P7)
Sample Outage Plan 2010 - 2016

ONTARIO POWER
GENERATION

EOL = End of Life
PO = Planned Outage


337

OPG Confidential - Commercially Sensitive

Continued Operations: (240 kEFP, Life Management of P7)
Sample Outage Plan 2010 - 2020

Revised: Jan. 15, 2010





ONTARIO POWER GENERATION

Section 17

2010

Unit	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2011

Unit	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2012

Unit	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2013

Unit	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2014

Unit	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2015

Unit	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2016

Unit	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2017

Unit	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2018

Unit	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2019

Unit	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

2020

Unit	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
Outage												
P1												
P4												
P5												
P6												
P7												
P8												

EOL = End of Life
PO = Planned Outage
LM = Life Management

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From: Bashir Bhana
Sent: June-29-11 5:08 PM
To: Bashir Bhana; Victor Stein; George Pessione
Cc: Salvatore Provvidenza
Subject: RE: Source of Estimated \$300/kW-yr OPG Nuclear OM&A
Attachments: Summary of OPG Cost Assumptions 06-29-2011 (BB).xlsx

I hit the send button too soon.

The \$300/kW-year works out to about \$38/MWh (at 90% ACF) or \$12.9M/unit/month $(= (\$300/\text{kW-yr} * 515\text{MW}/\text{unit} * 1000\text{kW}/\text{MW}) / 12\text{months}/\text{year})$.

Not Responsive

Looking at the fixed costs provided by OPG (as used in the Pickering continued operations study in Jan 2010), the fixed cost of Pickering A works out to about \$15.4M/unit/month (or \$50/MWh or \$359/kW-yr) and for Pickering B about \$12.2M/unit/month (or \$39/MWh or \$285/kW-yr).

I don't see the average cost coming out to \$50/MWh as quoted in Stephen's email and as assumed in the 2010 study. The average actually works out to \$45/MWh.

Not Responsive

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Victor Stein
Sent: June 29, 2011 3:53 PM
To: George Pessione
Cc: Bashir Bhana; Salvatore Provvidenza; Victor Stein
Subject: Source of Estimated \$300/kW-yr OPG Nuclear OM&A

George,
The estimate of \$300/kW-yr for fixed nuclear OM&A was based on:

OPG 2009 Financial Results, March 8, 2010

Page 26

Table – Regulated Nuclear Generation Segment

Operations, maintenance and administration..... \$2057 million in 2009

This was divided into the capacity of OPG-operated nuclear fleet, taken to be 6588 MW (=4 x 881 + 2 x 500 + 4 x 516)

2057 million / 6588 MW = \$312/kW, which I rounded to \$300/kW for 2009 and for subsequent years in real terms.

Best Regards,

Victor Stein

Senior Planner,
Power System Planning.
Ontario Power Authority
Toronto, Canada
Tel. 416.969.6409
Cell 416.786.8391
Fax 416.969.6369

PICKERING A & B: BASE CASE AND CONTINUED

		2010	2011	2012	2013	2014
Base Case: 210 kEFPH (No Life I						
Pickering A	Total OM&A (M2010\$)	376	353	373	368	335
	Fuel (M2010\$)	23	29	32	32	30
	Energy (TWh)	6.7	7.4	7.7	7.7	7.3
	PO Days	145	82	75	78	30
	ACF (%)	73.7	82.6	85.3	84.8	91.5
	FLR (%)	8.0	7.0	5.0	5.0	4.0
Pickering B	Total OM&A (M2010\$)	562	531	598	596	483
	Fuel (M2010\$)	55	69	75	78	50
	Energy (TWh)	14.1	15.8	16.0	16.3	10.5
	PO Days	263	120	116	85	65
	ACF (%)	77.9	87.7	88.4	90.4	89.4
	FLR (%)	5.8	5.0	4.5	4.0	4.0
Continued Operations: 240 kEFPH (L						
Pickering A	Total OM&A (M2010\$)	376	353	373	368	381
	Fuel (M2010\$)	23	29	32	32	32
	Energy (TWh)	6.7	7.4	7.7	7.7	7.8
	PO Days	145	82	75	78	70
	ACF (%)	73.7	82.6	85.3	84.8	86.8
	FLR (%)	8.0	7.0	5.0	5.0	4.0
Pickering B	Total OM&A (M2010\$)	576	580	638	630	642
	Fuel (M2010\$)	53	64	72	72	69
	Energy (TWh)	13.8	14.6	15.4	15.3	14.5
	PO Days	291	222	172	177	238
	ACF (%)	76.1	81.0	84.7	84.4	80.4
	FLR (%)	5.8	5.0	4.5	4.0	4.0
Difference: Continued Operati						
Pickering A	Total OM&A (M2010\$)	0	0	0	0	45
	Fuel (M2010\$)	0	0	0	0	2
	Energy (TWh)	0	0	0	0	1
	PO Days	0	0	0	0	n/a
	ACF (%)	0.0	0.0	0.0	0.0	n/a
	FLR (%)	0.0	0.0	0.0	0.0	n/a
Pickering B	Total OM&A (M2010\$)	14	50	41	35	158
	Fuel (M2010\$)	-1	-5	-3	-5	19
	Energy (TWh)	0	-1	-1	-1	4
	PO Days	28	102	56	92	n/a
	ACF (%)	-1.8	-6.7	-3.7	-6.0	n/a
	FLR (%)	0.0	0.0	0.0	0.0	n/a

Notes:

1. OM&A costs include OM&A project costs. For simplicity, sustaining capital projects are also
2. In the years when units transition to out-of-service, rules are applied to calculate the station ;
3. This analysis does not show the impact of extending the unit lives on OPG's Decommissioni
4. FLR is an average of the unit FLR's for those units which are operating during a year.
5. Shaded cells indicate partial year operation of 1 or 2 units depending on the case.
6. \$43.7 million (2010\$) of incremental Pickering B costs in 2014 are attributed to work to enab

Updated: Jan 15, 2010

OPERATIONS DATA

2015	2016	2017	2018	2019	2020
Management of P7)					
0	0	0	0	0	0
0	0	0	0	0	0
0.0	0.0	0.0	0.0	0.0	0.0
0	0	0	0	0	0
n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a
292	39	0	0	0	0
21	3	0	0	0	0
4.3	0.6	0.0	0.0	0.0	0.0
0	0	0	0	0	0
96.0	96.0	n/a	n/a	n/a	n/a
4.0	4.0	n/a	n/a	n/a	n/a
Life Management of P7)					
377	377	377	377	377	153
32	32	32	32	33	14
7.8	7.8	7.7	7.8	8.0	3.3
70	70	70	60	30	0
86.8	86.4	85.9	86.3	88.7	90.5
4.0	4.5	5.0	6.0	7.5	9.5
584	584	584	519	409	166
65	71	67	54	40	16
13.8	15.0	14.2	11.3	8.4	3.4
296	192	247	165	0	0
76.3	82.8	78.6	80.1	93.3	91.5
4.3	4.6	5.4	6.5	6.8	8.5
ons - Base Case					
377	377	377	377	377	153
32	32	32	32	33	14
8	8	8	8	8	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	n/a	n/a
292	545	584	519	409	166
45	68	67	54	40	16
9	14	14	11	8	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	n/a	n/a

Fixed Costs

Pickering A \$/unit/month
\$/MWh
\$/kW-yr

Pickering B \$/unit/month
\$/MWh
\$/kW-yr

Fixed Costs

Pickering A \$/unit/month
\$/MWh
\$/kW-yr

Pickering B \$/unit/month
\$/MWh
\$/kW-yr

included in this line. Total OM&A also includes each annual OM&A.
ng, Low & Intermediate Level Waste

le Continued Operations. The remaining Costs, Fuel and

2010	2011	2012	2013	2014	2015	2016	2017	2018
15.6	14.7	15.5	15.4	14.0				
56.5	47.4	48.3	48.1	46.1				
365	342	362	358	326				

11.7 11.1 12.5 12.4 10.1
39.9 33.5 37.3 36.4 45.8
273 258 290 289 235

2010	2011	2012	2013	2014	2015	2016	2017	2018
15.6	14.7	15.5	15.4	15.9	15.7	15.7	15.7	15.7
56.5	47.4	48.3	48.1	48.6	48.2	48.3	48.7	48.5
365	342	362	358	370	366	366	366	366

12.0 12.1 13.3 13.1 13.4 12.2 12.2 12.2 10.8
41.9 39.6 41.6 41.3 44.2 42.3 38.9 41.1 45.9
280 282 310 306 311 283 283 283 252

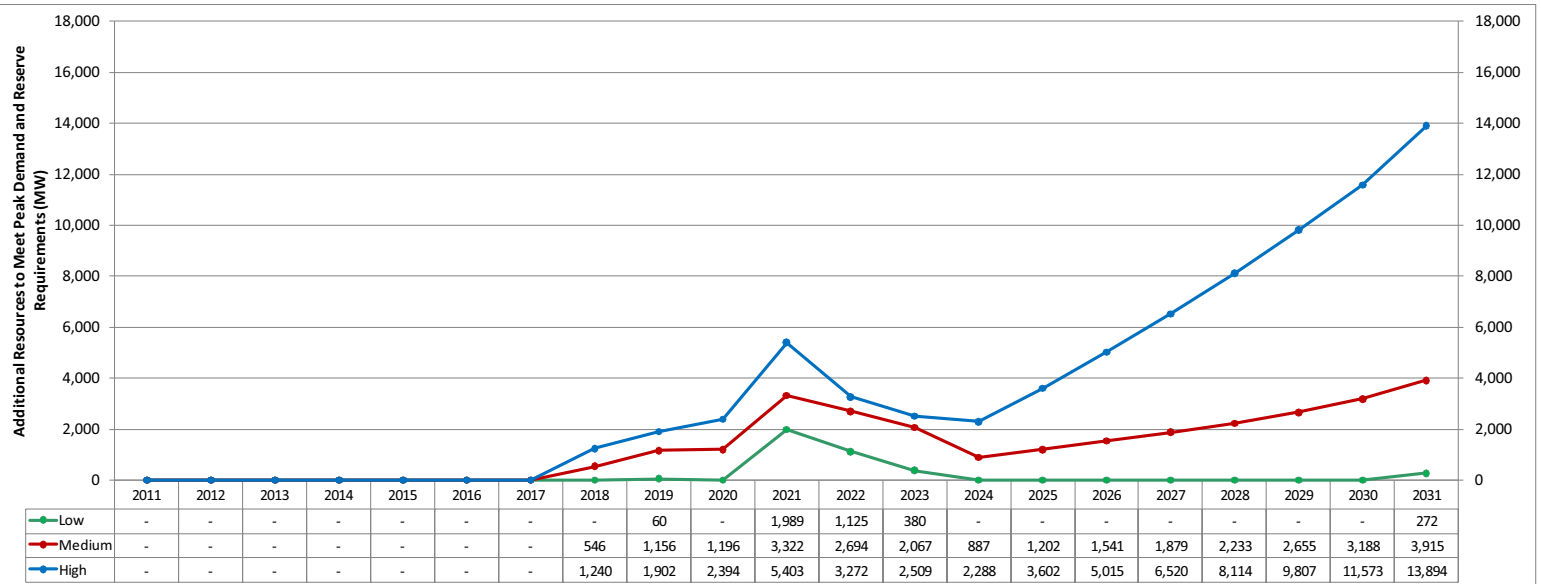
2019	2020	Average (exclude 2014)
		15.3
		50.1
		356.7

11.9
36.8
277.5

2019	2020	Average (exclude 2018-2020)
15.7	6.4	15.5
47.1	46.1	49.2
366	149	361.9

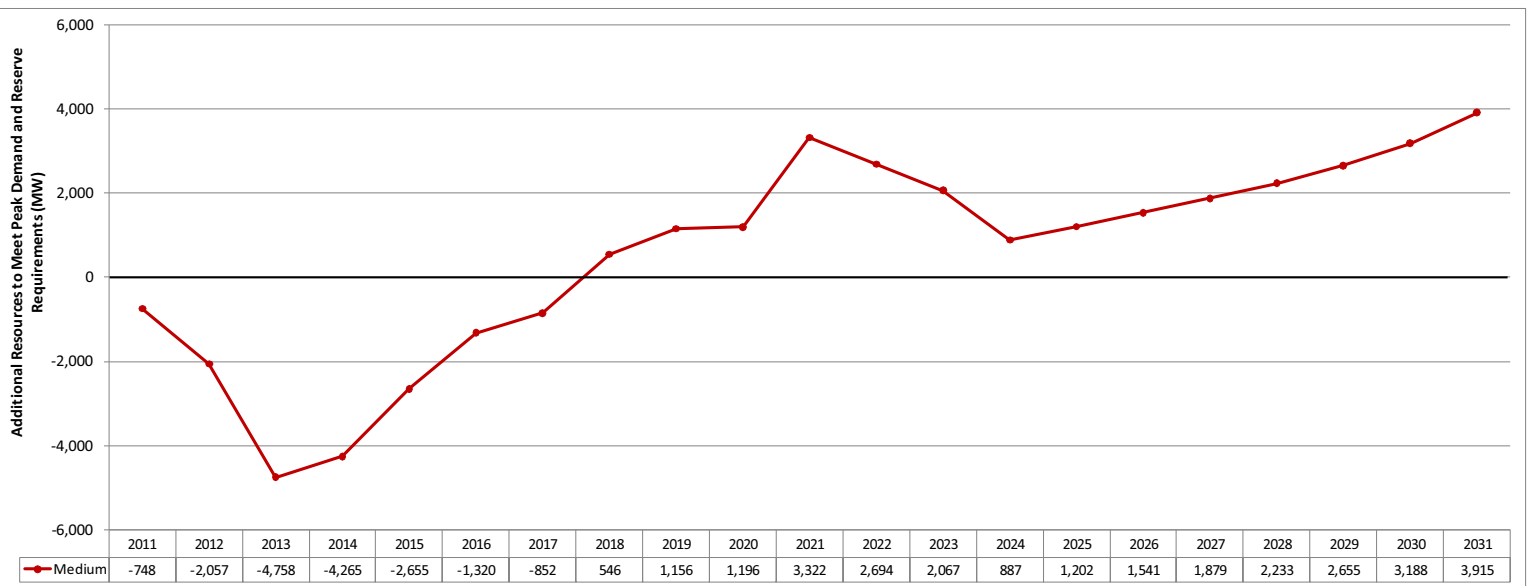
8.5 3.5 12.5
48.5 49.3 41.3
198 81 292.3

Capacity Gap – Low, Medium and High Growth



- Assuming Pickering continued operation and no new nuclear

Capacity Gap – Medium Growth



- Negative requirements show that there is no need for supply
- Positive requirements show that there is need for supply (ie. Capacity Gap)

System Impact of Pickering Continued Operations

Assumption	July 2010 Study	2011 Study
Basic Approach	<p>Assessed additional OM&A and PO costs during pre-continued op period versus savings due to lower energy costs during continued op period. Included impact on Oshawa Area TS.</p> <p>Created a reference case and examined sensitivity to changes in assumptions</p>	<p>Assess system costs with and without Pickering continued operation and determine the difference based on a reference case and sensitivity cases.</p> <p>Cost to customer impacts not considered.</p>
Analytical Method	Based on historical data to determine marginal generation	<p>Based on UPLAN simulations / IPSP2 assumptions (including demand)</p> <p>Assume no P7 life management for no continued ops case. Assume P7 life management for continued ops case</p>
Reference Case Pickering Operational Data Provided by OPG	<ul style="list-style-type: none"> • EOSL dates for Pickering units with (without) P7 life management • PO dates with and without continued op. 	<p>OPG to provide updated information.</p> <p><i>Q. Should we assume P7 life management?</i></p>
Reference case annual Pickering Economic/Financial Assumptions Provided by OPG	<ul style="list-style-type: none"> • Total OM&A (excluding corporate overheads) • Fuel cost • Energy • PO days • ACF % • FLR% 	OPG to provide updated information with and without continued operation
Nuclear refurb schedules	Coordinated nuclear refurb schedule	IPSP2 updated coordinated refurb schedule
Ref Case Carbon Cost	20\$/ton 2012 - 2020	zero carbon cost
Sensitivities	<ul style="list-style-type: none"> • Lower than forecast production during CO period • Shorter than planned duration of CO period • Higher than forecast costs in support of CO • Lower natural gas prices • Lower carbon cost 	<p>Same sensitivities as 2010 study except:</p> <ul style="list-style-type: none"> • Examine impact of x\$/ton carbon cost beginning in 20xx • Examine impact of changes in refurb schedule • Examine impact of lower demand

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2012 Pickering Continued Operations Study Scope/Summary

Date: December 8, 2011

1. Overview

OPG has approached the OPA to conduct an independent assessment of its Pickering Continued Operation initiative. As part of this assessment, the OPA will study:

- (1) The integrated power system impacts of Pickering continued operation including downside risks and favourable contingencies; and
- (2) The merits of associated expenditures and outages taken by OPG in the 2012-2014 period.

2. Context

The six units at Pickering NGS could cease operation as early as 2014-2016. OPG is currently establishing the technical feasibility of extending the operating life of each of the generating units to enable continued operation until 2018-2020. The results of this study are expected to be known in 2012. To preserve the option of continued operation prior to the study results being known, OPG will need to incur additional OM&A costs as well as increase unit planned outage hours during the period prior to 2015 to perform the necessary work.

3. Study

Continued operation of Pickering could have a number of system impacts, both positive and negative. System impacts that will be considered in the analysis include:

- Changes in production from other generation resources;
- Need/timing of capacity (for adequacy) and transmission investments (Oshawa TS);
- Changes in import costs and export revenues;
- Impact on potential surplus energy; and
- Total system cost.

System impacts would be influenced by a number of factors, including:

- Demand for electricity;
- Ontario's supply mix;
- Performance of generators, including Pickering during the continued operation period; and
- Cost of Pickering continued operation relative to other supply sources.

4. Assumptions

Study inputs assume the following:

- Pickering operation/financial assumptions to be provided by OPG
- All other assumptions with respect demand, generation mix, and transmission will be consistent with IPSP 2

5. Scenarios/Assessment

Two cases will serve as the starting point or “Reference Scenario” for this analysis:

- (1) Pickering continued operation without Life Management
- (2) Pickering early retirement with Life Management

Each case will be assessed using the OPA’s production simulation software, taking into account electricity transactions between Ontario and its neighbouring jurisdictions for each hour of the year between 2012 and 2020. Economic analysis will be performed considering generation operating costs, capital investments, import costs, and export revenues.

The difference in system impacts between these two cases will be an indicator of the net benefit or net cost associated with Pickering continued operations.

With respect to transmission investments, Pickering continued operations may defer the in-service of Oshawa TS, which is required to provide load supply to parts of eastern Ontario in the absence of Pickering. The benefit of deferring this investment will be assessed.

Sensitivity analysis will be performed to test the robustness of the Reference Scenario under various system conditions. The sensitivities to be assessed include:

- Lower than forecast Pickering production during the continued operation period;
- Shorter than planned duration of the continued operation period;
- Higher than forecast costs in support of continued operation;
- Lower natural gas prices;
- Examine impact of carbon costs;
- Examine impact of changes in the nuclear refurbishment schedule; and
- Examine impact of lower than forecast demand.

6. Deliverables

A detailed report will be produced summarizing the OPA’s assessment and position on the Pickering Continued Operations initiative. This will be delivered to OPG for potential submission as evidence in OPG’s 2012-2014 Rate Filing.

From: ROGERS Stephen -CRPINVASTPLN <stephen.rogers@opg.com>
Sent: December-20-11 4:06 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J - PLANNG&ANALY; REUBER Barbara -REGAFFCRPSTY; Victor Stein; POWER Donald J - CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Dec 20_ 2011_Final.xlsx

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

As promised, please find enclosed an updated workbook with the Pickering Continued Operations data for your analysis. A new tab (Tab 7) has been added which shows the Unit Level performance data that you had requested. As well, a correction has been made to the energy for Pickering Units 5 – 8 in 2019 in Tab 3 of the original workbook (as discussed with Bashir).

We are continuing to refine our estimates of the severance costs and the decommissioning liability impacts and will send those additional items to you as soon as possible.

Please call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: ROGERS Stephen -CRPINVASTPLN
Sent: Friday, December 16, 2011 3:18 PM
To: 'Bob Gibbons'
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; Bashir Bhana; REUBER Barbara -REGAFFCRPSTY; 'Victor Stein'; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

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Bob,

Following our discussion on Monday, please find attached the first draft of OPG's information on Pickering Continued Operations in order to commence the OPA's assessment.

Please consider this information preliminary. OPG continues to refine its assessment of the incremental costs of operating the Pickering units over the next decade and the potential cost impacts if Pickering Continued Operations were not achieved, and may, therefore, issue a revised version of this information for your assessment in the next few

weeks. In particular, as we discussed, the data set we are providing does not explicitly show the severance costs OPG would incur under the two different scenarios and also does not show the impact on the decommissioning liability for the two different scenarios. As discussed, these two impacts relate to the timing of cost flows and therefore impacts the Net Present Value difference between the alternatives. OPG quantifies both of these impacts and factors in the impact of severance cost timing differences into its NPV analysis, but does not factor in the impact of the decommissioning cost timing differences. These two impacts will be provided separately.

As well, OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back of various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-Life date projections for each of the Pickering units without P7 life management and without Continued Operations. Note that OPG no longer considers this to be the reference case for No Continued Operations and has not developed costs for this case.

Tab 2: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and the Continued Operations Case (with later P7 life management) **assuming the final units S/D in mid-2020** (i.e. achieve 240,000 Effective Full Power Hours). This tab also shows the differences in costs and performance between the two cases.

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (with later P7 life management) **assuming the final units S/D at the end of 2020** (i.e. achieve 247,000 Effective Full Power Hours (EFPH), but last 4 units operate only to end 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: A schematic of the No Continued Operations Case (with early P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 5: A schematic of the first Continued Operations Case (240,000 EFPH, with later P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 6: A schematic of the second Continued Operations Case (247,000 EFPH, with later P7 life management) showing the timing of the planned outages and unit shutdowns for that case

As you have also requested, OPG will be providing, via separate e-mail, the detailed performance forecast for each of the Pickering units. OPG's information is currently aggregated at the level of Pickering Units 1 & 4 and Pickering Units 5-8.

I have also enclosed a marked up version of the document "System Impact of Continued Operations" which you had sent in your e-mail. OPG is suggesting that additional sensitivity scenarios be analysed, beyond the ones originally listed.

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bob Gibbons [<mailto:Bob.Gibbons@powerauthority.on.ca>]

Sent: Tuesday, December 06, 2011 4:37 PM

To: BURKE Paul J -PLANNG&ANALY

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; ROGERS Stephen -CRPINVASTPLN; Nancy Marconi; Bashir Bhana; Steve Chui; Bonnie Chan

Subject: RE: Response to OPA/OPG meeting on OEB Support

CONFIDENTIAL

Hi Paul,

We would like to get our evaluation of Pickering continued operation underway as soon as possible. [REDACTED]

[REDACTED] Section 17. We intend to use a similar approach as last year except that we will use IPSP2 assumptions in our evaluation of avoided supply costs. Other assumptions are summarized in the second attachment.

It would be helpful if you could provide us with the following information as soon as possible:

1. EOSL dates for Pickering units with continued operation with P7 life management
2. EOSL dates for Pickering units without continued operation without P7 life management
3. Annual values for the following with continued operation and with P7 life management:
 - Total Pickering OM&A dollars (excluding allocated corporate overheads)
 - Unit Fuel cost
 - Unit Energy production
 - Unit PO days
 - Unit ACF %
 - Unit FLR %
4. As in 3. above without continued operation and without P7 life management

If it would be helpful, we would be glad to meet with you to discuss further. Just let me know.

Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: BARRETT Andrew P -REGAFFCRPSTY [<mailto:andrew.barrett@opg.com>]

Sent: December 2, 2011 5:55 PM

To: Michael Lyle; George Pessione; Nancy Marconi; Bob Gibbons

Cc: KOHN Ethan -REGAFFCRPSTY; POWER Donald J -CRPINVASTPLN; BURKE Paul J -PLANNG&ANALY;
ROGERS Stephen -CRPINVASTPLN; JANOSSY Eva -PLANNG&ANALY

Subject: Response to our meeting on OEB Support

Folks,

Sorry for the delay in getting back to you - it has and is taking us a little time to get ourselves organized on this.

In terms of points of contact, I can advise that

Not Responsive

and Eva Janossy will be our point of contact on the PGS project.

In addition, Paul Burke and Stephen Rogers will be contacting you (prob via Bob) to get some additional information on how you proposed to undertake the Pickering Continued Operations analysis that was discussed at our meeting.

Andrew

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PNGS No Continued Operations with No P7 Life Management

December 16, 2011

Section 17Section 17

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Dec. 16, 2011

PICKERING CONTINUED OPERATIONS Assessment Data
(later P7 Life Management and P5-8 Unit Operation of 240k EFPH to mid 2020)

Section 1 - Operating Costs (M\$)								
	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (240k EFPH) with P7 Life Management								
Total OM&A& Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	Section 17							
Effect of on-going operation on Total OM&A & Capital								
OM&A Costs to enable Cont. Ops including FCLM project								
Fuel & Fuel Related Costs								

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance will be provided later.
3. EFPH: Effective Full Power Hours

Section 2 - Production Related Data								
Forced Loss Rate (%)								
	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops								
Capability Factor Including Impact of Life Mgmt Days (%)								
	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops								
Planned Outage & Life Management Days								
	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								
Energy (TWh)								
	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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Dec. 16, 2011

PICKERING CONTINUED OPERATIONS Assessment Data
(later P7 Life Management and P5-8 Unit Operation of 247k EFPH to year-end 2020)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A& Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	Section 17							
Effect of on-going operation on Total OM&A & Capital								
OM&A Costs to enable Cont. Ops including FCLM project								
Fuel & Fuel Related Costs								

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance will be provided later.
3. EFPH: Effective Full Power Hours

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

PNGS No Continued Operations with Early P7 Life Management

December 16, 2011

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

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DRAFT

PNGS Continued Operations with Pickering Units 5-8 Operating to 240k EFPH and Later P7 Life Management

December 16, 2011

[illegible]

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div style="text-align: center;">Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to YE 2020 and Later P7 Life Management

December 16, 2011

Section 17Section 17Section 17

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Section 17

PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4 P5 - P8	Section 17							
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 240k EFPH Pressure Tube Life with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4 P5 - P8	Section 17							
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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Dec. 20, 2011

**3. Continued Operations of 247k EFPH Presure Tube Life to Year End
2020 with Later P7 Life Management**

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	<i>Section 17</i>							

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LITIGATION

From: Bashir Bhana
Sent: January-03-12 11:13 AM
To: Bob Gibbons
Cc: Bonnie Chan; Steve Chui
Subject: Pickering ACF
Attachments: Pickering Historical ACF 01-03-2012 (BB).xlsx

Hi Bob,

Attached is the historical capacity factor for Pickering along with the ACF to assume in the respective sensitivity cases. I've added in 2011 data this morning.

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

Pickering Historical ACF and Sensitivity Cases for Pickering Study

	Nuclear Unit Capacity Factor (%)							
	PICKERING ²							
Year	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8
1971	68.6	61.5						
1972	48.9	56.6	42.8					
1973	92.3	69.4	85.0	79.2				
1974	72.0	88.4	43.3	94.0				
1975	80.3	86.0	58.1	24.4				
1976	92.9	93.6	94.0	68.8				
1977	85.8	91.3	95.9	91.5				
1978	95.0	84.4	82.1	89.7				
1979	82.9	84.9	79.4	89.9				
1980	74.2	83.3	91.9	81.8				
1981	87.5	84.4	89.1	91.8				
1982	77.6	91.4	86.4	91.7	7.5			
1983	68.1	58.1	85.0	92.4	70.9	38.5		
1984	--	--	81.6	82.5	77.6	84.2	57.3	
1985	--	--	61.7	76.2	74.5	72.8	90.6	
1986	--	--	70.4	81.7	90.0	75.1	74.6	89.0
1987	18.5	--	76.4	83.6	79.7	87.4	96.0	83.2
1988	88.1	14.4	84.5	70.0	97.0	99.2	95.8	81.9
1989	71.4	74.5	38.1	50.0	75.2	87.4	75.4	95.0
1990	67.4	65.0	--	23.7	86.0	76.8	77.5	66.7
1991	67.6	72.6	34.5	47.2	63.9	98.9	94.2	99.2
1992	64.6	90.6	89.6	--	29.7	89.4	82.2	92.9
1993	76.5	94.8	75.8	73.4	85.0	59.5	97.7	81.2
1994	19.9	86.4	91.3	88.9	68.0	89.4	82.1	96.1
1995	44.6	--	59.8	62.2	74.6	77.3	89.8	88.8
1996	66.6	28.5	24.3	25.1	67.1	57.2	45.2	28.7
1997	88.5	69.2	66.0	--	86.8	74.9	65.0	8.0
1998	--	--	--	--	77.2	69.3	68.2	77.3
1999	--	--	--	--	55.6	74.2	98.1	77.6
2000	--	--	--	--	58.1	60.4	46.3	59.8
2001	--	--	--	--	65.9	57.9	89.0	77.5
2002	--	--	--	--	58.8	88.1	94.0	79.8
2003	--	--	--	69.8	72.9	72.3	39.6	86.8
2004	--	--	--	72.2	91.8	61.4	68.8	54.9
2005	13.0	--	--	66.4	52.1	63.1	97.1	92.8
2006	76.9	--	--	66.0	88.7	86.3	58.7	64.4
2007	38.8	--	--	43.4	56.8	71.2	81.2	85.0
2008	61.7	--	--	80.8	88.84	95.39	33.76	64.4
2009	91.1	--	--	35.9	69.49	77.28	93.6	91.0
2010	52.7	--	--	71.0	83.4	85.51	64.6	68.2
2011	81.0	--	--	53.0	43.7	70.4	95.6	89.5

Source: 1971-2010: www.iaea.org/programmes/a2/, for 2011 Based on IESO Data

Notes:

- History to 2007 filed with IPSP in I-22-113 GEC
- Ontario Power Generation replaced the pressure tubes of the Pickering units P1 - P4 between 1984 and 1993 after the discovery of a design flaw. Starting in 1997, units P1 – P4 were placed in a lay-up state. P1 and P4 were restarted in 2005 and 2003, respectively. Ontario Power Generation made a decision in 2005 to mothball P2 and P3 and to place them into a safe storage state for eventual decommissioning.

	Nuclear Unit Capacity Factor (%) - Historic 5-Year Average						
	PICKERING ²						
Year	P-1	P-2	P-3	P-4	P-5	P-6	P-7
1971	--	--	--	--	--	--	--
1972	--	--	--	--	--	--	--
1973	--	--	--	--	--	--	--
1974	--	--	--	--	--	--	--
1975	72.4	--	--	--	--	--	--
1976	77.3	--	--	--	--	--	--
1977	84.6	--	--	71.6	--	--	--
1978	85.2	--	--	73.7	--	--	--
1979	87.4	--	--	72.9	--	--	--
1980	86.2	--	--	84.3	--	--	--
1981	85.1	--	--	88.9	--	--	--
1982	83.4	--	--	89.0	--	--	--
1983	78.1	--	--	89.5	--	--	--
1984	78.1	--	--	88.1	--	--	--
1985	78.1	--	--	86.9	--	--	--
1986	78.1	--	--	84.9	64.1	--	--
1987	65.2	--	--	83.3	78.5	71.6	--
1988	67.9	--	--	78.8	83.8	83.7	82.9
1989	64.7	--	--	72.3	83.3	84.4	86.5
1990	62.7	--	--	61.8	85.6	85.2	83.9
1991	62.6	--	--	54.9	80.3	89.9	87.8
1992	71.8	--	--	54.9	70.4	90.3	85.0
1993	69.5	--	--	52.9	67.9	82.4	85.4
1994	59.2	--	--	56.6	66.5	82.8	86.7
1995	54.6	--	--	59.1	64.2	82.9	89.2
1996	54.4	--	--	59.4	64.9	74.6	79.4
1997	59.2	--	--	59.4	76.3	71.7	75.9
1998	59.2	--	--	59.4	74.8	73.6	70.1
1999	59.2	--	--	59.4	72.3	70.6	73.3
2000	59.2	--	--	59.4	69.0	67.2	64.6
2001	59.2	--	--	59.4	68.7	67.3	73.3
2002	59.2	--	--	59.4	63.1	70.0	79.1
2003	59.2	--	--	63.9	62.2	70.6	73.4
2004	59.2	--	--	63.6	69.5	68.0	67.5
2005	46.5	--	--	59.1	68.3	68.5	77.7
2006	57.9	--	--	59.9	72.8	74.2	71.6
2007	56.8	--	--	63.6	72.5	70.8	69.1
2008	55.8	--	--	65.8	75.6	75.4	67.9
2009	56.3	--	--	58.5	71.2	78.6	72.9
2010	64.2	--	--	59.4	77.5	83.1	66.4
2011	65.1	--	--	56.8	68.5	79.9	73.7

overall average

overall ave

Average	
P-8	Overall Average
--	--
--	--
--	--
--	--
--	72.4
--	77.3
--	78.1
--	79.4
--	80.1
--	85.2
--	87.0
--	86.2
--	83.8
--	83.1
--	82.5
--	75.7
--	74.6
--	79.4
--	78.2
83.2	77.0
85.2	76.8
87.1	76.6
87.0	74.2
87.2	73.2
91.6	73.6
77.5	68.4
60.5	67.2
59.8	66.1
56.1	65.1
50.3	61.6
60.0	64.7
74.4	67.5
76.3	67.6
71.7	66.6
78.3	66.4
75.7	68.7
76.8	68.2
72.3	68.8
79.5	69.5
74.6	70.9
79.6	70.6

average - min

61.6

<= March 31, 2010 reports quotes ~63%. Minor difference maybe due

N		
	2013	2014
	Capa	
P1	83%	61%
P4	61%	83%
P5	66%	95%
P6	70%	95%
P7	94%	71%
P8	94%	70%

Source: OPG email Continued Operations

Better than Expected		
	Capa	
	2013	2014
P1	83%	61%
P4	61%	83%
P5	66%	95%
P6	70%	95%
P7	94%	71%
P8	94%	70%

Lower than Expected		
	Capa	
	2013	2014
P1	83%	61%
P4	61%	83%
P5	66%	95%
P6	70%	95%
P7	94%	71%
P8	94%	70%

average - max 87.0

Medium Case (from OPG)					
2015	2016	2017	2018	2019	2020
Availability Factor Including Impact of Life Mgmt Days (%)					
88%	69%	88%	67%	86%	86%
69%	88%	67%	88%	68%	86%
69%	94%	75%	93%	92%	n/a
76%	94%	75%	93%	n/a	n/a
48%	73%	24%	74%	92%	91%
95%	76%	94%	61%	92%	91%

of 240k EFPH Pressure Tube Life with Later P7 Life Management

Expected Production = Highest 5-year average					
Availability Factor Including Impact of Life Mgmt Days (%)					
2015	2016	2017	2018	2019	2020
88%	87	87	87	87	87
69%	90	90	90	90	90
69%	86	86	86	86	n/a
76%	90	90	90	n/a	n/a
48%	89	24%	89	89	89
95%	92	92	92	92	92

Expected Production = Lowest 5-year average					
Availability Factor Including Impact of Life Mgmt Days (%)					
2015	2016	2017	2018	2019	2020
88%	47	47	47	47	47
69%	53	53	53	53	53
69%	62	62	62	62	n/a
76%	67	67	67	n/a	n/a
48%	65	24%	65	65	65
95%	50	50	50	50	50

due to averaging method or rounding.

From: Bashir Bhana
Sent: January-03-12 12:09 PM
To: 'ROGERS Stephen -CRPINVASTPLN'
Cc: Bob Gibbons; Bonnie Chan
Subject: RE: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Dec 21_ 2011_with Outage Dates_Final.xlsx

Hi Stephen,

Happy New Year...hope you had a good holiday!

I wanted to better understand the OM&A/Capital costs provided in the latest data file. Does the capital cost portion consist of activities directly related to enabling continued operations only (such as material testing, work on the reactors, etc)? I assume these would be incurred in 2013/2014 and go away post 2014 leaving just OM&A costs and incremental nuclear/corporate support costs?

Could you provide the split between the OM&A and capital costs?

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: December 21, 2011 3:17 PM
To: Bonnie Chan
Cc: Bob Gibbons; Steve Chui; Victor Stein; Bashir Bhana; Alan Leung
Subject: RE: Response to OPA/OPG meeting on OEB Support

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Bonnie,

As requested, attached is an updated version of the file we submitted with the outage dates shown, corresponding to the schematics for the various scenarios. The added information is as follows:

Tab 4a – Outage Dates for No Cont Ops with P7 LM (corresponding to schematics in Tab 4)
Tab 5a – Outage Dates for Cont Ops to 240k EFPH with P7 LM (corresponding to schematics in Tab 5)
Tab 6a – Outage Dates for Cont Ops to 247k EFPH with P7 LM (corresponding to schematics in Tab 6)

Note that exact outage dates are highly confidential.

Please call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bonnie Chan [<mailto:Bonnie.Chan@powerauthority.on.ca>]
Sent: Wednesday, December 21, 2011 11:00 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Steve Chui; Victor Stein; Bashir Bhana; Alan Leung
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Thank you for the information you provided us last week. In reviewing the workbook, it would be helpful if you could also provide the start and end date (indicating the day, month and year) of the outages and the end of life schematics for:

- No Cont Ops with P7 LM
- Cont Ops to 240k EFPH with P7 LM
- Cont Ops to 247k EFPH with P7 LM

If you could provide this information to us as soon as possible it would be much appreciated.

Thanks,
Bonnie

From: Bob Gibbons
Sent: December 16, 2011 3:22 PM
To: Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: December 16, 2011 3:18 PM
To: Bob Gibbons
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; Bashir Bhana; REUBER Barbara -REGAFFCRPSTY; Victor Stein; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

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Bob,

Following our discussion on Monday, please find attached the first draft of OPG's information on Pickering Continued Operations in order to commence the OPA's assessment.

Please consider this information preliminary. OPG continues to refine its assessment of the incremental costs of operating the Pickering units over the next decade and the potential cost impacts if Pickering Continued Operations were not achieved, and may, therefore, issue a revised version of this information for your assessment in the next few weeks. In particular, as we discussed, the data set we are providing does not explicitly show the severance costs OPG would incur under the two different scenarios and also does not show the impact on the decommissioning liability for the two different scenarios. As discussed, these two impacts relate to the timing of cost flows and therefore impacts the Net Present Value difference between the alternatives. OPG quantifies both of these impacts and factors in the impact of severance cost timing differences into its NPV analysis, but does not factor in the impact of the decommissioning cost timing differences. These two impacts will be provided separately.

As well, OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back of various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-Life date projections for each of the Pickering units without P7 life management and without Continued Operations. Note that OPG no longer considers this to be the reference case for No Continued Operations and has not developed costs for this case.

Tab 2: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and the Continued Operations Case (with later P7 life management) **assuming the final units S/D in mid-2020** (i.e. achieve 240,000 Effective Full Power Hours). This tab also shows the differences in costs and performance between the two cases.

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (with later P7 life management) **assuming the final units S/D at the end of 2020** (i.e. achieve 247,000 Effective Full Power Hours (EFPH), but last 4 units operate only to end 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: A schematic of the No Continued Operations Case (with early P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 5: A schematic of the first Continued Operations Case (240,000 EFPH, with later P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 6: A schematic of the second Continued Operations Case (247,000 EFPH, with later P7 life management) showing the timing of the planned outages and unit shutdowns for that case

As you have also requested, OPG will be providing, via separate e-mail, the detailed performance forecast for each of the Pickering units. OPG's information is currently aggregated at the level of Pickering Units 1 & 4 and Pickering Units 5-8.

I have also enclosed a marked up version of the document "System Impact of Continued Operations" which you had sent in your e-mail. OPG is suggesting that additional sensitivity scenarios be analysed, beyond the ones originally listed.

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bob Gibbons [<mailto:Bob.Gibbons@powerauthority.on.ca>]

Sent: Tuesday, December 06, 2011 4:37 PM

To: BURKE Paul J -PLANNG&ANALY

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; ROGERS Stephen -CRPINVASTPLN; Nancy Marconi; Bashir Bhana; Steve Chui; Bonnie Chan

Subject: RE: Response to OPA/OPG meeting on OEB Support

CONFIDENTIAL

Hi Paul,

We would like to get our evaluation of Pickering continued operation underway as soon as possible. [REDACTED]

Section 17

[REDACTED]. We intend to use a similar approach as last year except that we will use IPSP2 assumptions in our evaluation of avoided supply costs. Other assumptions are summarized in the second attachment.

It would be helpful if you could provide us with the following information as soon as possible:

1. EOSL dates for Pickering units with continued operation with P7 life management
2. EOSL dates for Pickering units without continued operation without P7 life management
3. Annual values for the following with continued operation and with P7 life management:
 - Total Pickering OM&A dollars (excluding allocated corporate overheads)
 - Unit Fuel cost
 - Unit Energy production
 - Unit PO days
 - Unit ACF %
 - Unit FLR %

4. As in 3. above without continued operation and without P7 life management

If it would be helpful, we would be glad to meet with you to discuss further. Just let me know.

Regards,

Bob Gibbons
Director, Resource Integration

Ontario Power Authority

Phone: (416) 969-6043

Fax: (416) 967-1947

E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: BARRETT Andrew P -REGAFFCRPSTY [<mailto:andrew.barrett@opg.com>]

Sent: December 2, 2011 5:55 PM

To: Michael Lyle; George Pessione; Nancy Marconi; Bob Gibbons

Cc: KOHN Ethan -REGAFFCRPSTY; POWER Donald J -CRPINVASTPLN; BURKE Paul J -PLANNG&ANALY;

ROGERS Stephen -CRPINVASTPLN; JANOSSY Eva -PLANNG&ANALY

Subject: Response to our meeting on OEB Support

Folks,

Sorry for the delay in getting back to you - it has and is taking us a little time to get ourselves organized on this.

In terms of points of contact, I can advise that [REDACTED] *Not Responsive* and Eva Janossy will be our point of contact on the PGS project.

In addition, Paul Burke and Stephen Rogers will be contacting you (prob via Bob) to get some additional information on how you proposed to undertake the Pickering Continued Operations analysis that was discussed at our meeting.

Andrew

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PNGS No Continued Operations with No P7 Life Management December 16, 2011

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

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Dec. 16, 2011

PICKERING CONTINUED OPERATIONS Assessment Data
(later P7 Life Management and P5-8 Unit Operation of 240k EFPH to mid 2020)

Section 1 - Operating Costs (M\$)		2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management									
Total OM&A & Capital	Section 17								
Fuel & Fuel Related Costs									
PNGS Continued Operations (240k EFPH) with P7 Life Management									
Total OM&A & Capital	Section 17								
Fuel & Fuel Related Costs									
Difference: Continued Operations - No Continued Operations									
Total OM&A & Capital	Section 17								
Effect of on-going operation on Total OM&A & Capital									
OM&A Costs to enable Cont. Ops including FCLM project									
Fuel & Fuel Related Costs									

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance will be provided later.
3. EFPH: Effective Full Power Hours

Section 2 - Production Related Data

Forced Loss Rate (%)		2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17								
P5-8 Originally Assumed Life									
P1&4 Life to Match Continued Ops	Section 17								
P5-8 Continued Ops									
Capability Factor Including Impact of Life Mgmt Days (%)		2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17								
P5-8 Originally Assumed Life									
P1&4 Life to Match Continued Ops	Section 17								
P5-8 Continued Ops									
Planned Outage & Life Management Days		2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17								
P5-8 Originally Assumed Life									
P1&4 Life to Match Continued Ops	Section 17								
P5-8 Continued Ops									
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17								
Diff P5-8 Cont. Ops - P5-8 Orig. Life									
Energy (TWh)		2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17								
P5-8 Originally Assumed Life									
P1&4 Life to Match Continued Ops	Section 17								
P5-8 Continued Ops									
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17								
Diff P5-8 Cont. Ops - P5-8 Orig. Life									

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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Dec. 16, 2011

PICKERING CONTINUED OPERATIONS Assessment Data
(later P7 Life Management and P5-8 Unit Operation of 247k EFPH to year-end 2020)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A& Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	Section 17							
Effect of on-going operation on Total OM&A & Capital								
OM&A Costs to enable Cont. Ops including FCLM project								
Fuel & Fuel Related Costs								

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance will be provided later.
3. EFPH: Effective Full Power Hours

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

PNGS No Continued Operations with Early P7 Life Management

December 16, 2011

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

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PNGS Scenario 3: No Cont Ops with P7 LM

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
------------------	------------	--	--	--	--	--	--	--	--	--	--	--

PB Outage	PA Outage	Off the Grid
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Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PNGS Scenario 2: Cont Ops Mid 2020

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

-87

	2018				2019				2020			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
------------------	------------	--	--	--	--	--	--	--	--	--	--	--

PB Outage	PA Outage	Off the Grid
-----------	-----------	--------------

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PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to YE 2020 and Later P7 Life Management December 16, 2011

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

2018													2019													2020												
Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec		
Month																																						
P1	<div>Section 17</div>																																					
P4																																						
P5																																						
P6																																						
P7																																						
P8																																						

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Units 7 & P6 End of Life
Units 1 & 4 off the Grid
As of December 31, 2020

PNGS Scenario 3: Cont Ops YE 2020

Scenario Dates												
2012					2013				2014			
Outage	Start	End	# of Days		Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

2015					2016				2017			
Outage	Start	End	# of Days		Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

2018					2019				2020			
Outage	Start	End	# of Days		Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4 P5 - P8	Section 17							
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 240k EFPH Pressure Tube Life with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4 P5 - P8	Section 17							
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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Dec. 20, 2011

**3. Continued Operations of 247k EFPH Presure Tube Life to Year End
2020 with Later P7 Life Management**

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

Section 17

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Pickering Historical ACF and Sensitivity Cases for Pickering Study

	Nuclear Unit Capacity Factor (%)							
	PICKERING ²							
Year	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8
1971	68.6	61.5						
1972	48.9	56.6	42.8					
1973	92.3	69.4	85.0	79.2				
1974	72.0	88.4	43.3	94.0				
1975	80.3	86.0	58.1	24.4				
1976	92.9	93.6	94.0	68.8				
1977	85.8	91.3	95.9	91.5				
1978	95.0	84.4	82.1	89.7				
1979	82.9	84.9	79.4	89.9				
1980	74.2	83.3	91.9	81.8				
1981	87.5	84.4	89.1	91.8				
1982	77.6	91.4	86.4	91.7	7.5			
1983	68.1	58.1	85.0	92.4	70.9	38.5		
1984	--	--	81.6	82.5	77.6	84.2	57.3	
1985	--	--	61.7	76.2	74.5	72.8	90.6	
1986	--	--	70.4	81.7	90.0	75.1	74.6	89.0
1987	18.5	--	76.4	83.6	79.7	87.4	96.0	83.2
1988	88.1	14.4	84.5	70.0	97.0	99.2	95.8	81.9
1989	71.4	74.5	38.1	50.0	75.2	87.4	75.4	95.0
1990	67.4	65.0	--	23.7	86.0	76.8	77.5	66.7
1991	67.6	72.6	34.5	47.2	63.9	98.9	94.2	99.2
1992	64.6	90.6	89.6	--	29.7	89.4	82.2	92.9
1993	76.5	94.8	75.8	73.4	85.0	59.5	97.7	81.2
1994	19.9	86.4	91.3	88.9	68.0	89.4	82.1	96.1
1995	44.6	--	59.8	62.2	74.6	77.3	89.8	88.8
1996	66.6	28.5	24.3	25.1	67.1	57.2	45.2	28.7
1997	88.5	69.2	66.0	--	86.8	74.9	65.0	8.0
1998	--	--	--	--	77.2	69.3	68.2	77.3
1999	--	--	--	--	55.6	74.2	98.1	77.6
2000	--	--	--	--	58.1	60.4	46.3	59.8
2001	--	--	--	--	65.9	57.9	89.0	77.5
2002	--	--	--	--	58.8	88.1	94.0	79.8
2003	--	--	--	69.8	72.9	72.3	39.6	86.8
2004	--	--	--	72.2	91.8	61.4	68.8	54.9
2005	13.0	--	--	66.4	52.1	63.1	97.1	92.8
2006	76.9	--	--	66.0	88.7	86.3	58.7	64.4
2007	38.8	--	--	43.4	56.8	71.2	81.2	85.0
2008	61.7	--	--	80.8	88.84	95.39	33.76	64.4
2009	91.1	--	--	35.9	69.49	77.28	93.6	91.0
2010	52.7	--	--	71.0	83.4	85.51	64.6	68.2
2011	81.0	--	--	53.0	43.7	70.4	95.6	89.5

Source: 1971-2010: www.iaea.org/programmes/a2/, for 2011 Based on IESO Data

Notes:

- History to 2007 filed with IPSP in I-22-113 GEC
- Ontario Power Generation replaced the pressure tubes of the Pickering units P1 - P4 between 1984 and 1993 after the discovery of a design flaw. Starting in 1997, units P1 – P4 were placed in a lay-up state. P1 and P4 were restarted in 2005 and 2003, respectively. Ontario Power Generation made a decision in 2005 to mothball P2 and P3 and to place them into a safe storage state for eventual decommissioning.

	Nuclear Unit Capacity Factor (%) - Historic 5-Year Average						
	PICKERING ²						
Year	P-1	P-2	P-3	P-4	P-5	P-6	P-7
1971	--	--	--	--	--	--	--
1972	--	--	--	--	--	--	--
1973	--	--	--	--	--	--	--
1974	--	--	--	--	--	--	--
1975	72.4	--	--	--	--	--	--
1976	77.3	--	--	--	--	--	--
1977	84.6	--	--	71.6	--	--	--
1978	85.2	--	--	73.7	--	--	--
1979	87.4	--	--	72.9	--	--	--
1980	86.2	--	--	84.3	--	--	--
1981	85.1	--	--	88.9	--	--	--
1982	83.4	--	--	89.0	--	--	--
1983	78.1	--	--	89.5	--	--	--
1984	78.1	--	--	88.1	--	--	--
1985	78.1	--	--	86.9	--	--	--
1986	78.1	--	--	84.9	64.1	--	--
1987	65.2	--	--	83.3	78.5	71.6	--
1988	67.9	--	--	78.8	83.8	83.7	82.9
1989	64.7	--	--	72.3	83.3	84.4	86.5
1990	62.7	--	--	61.8	85.6	85.2	83.9
1991	62.6	--	--	54.9	80.3	89.9	87.8
1992	71.8	--	--	54.9	70.4	90.3	85.0
1993	69.5	--	--	52.9	67.9	82.4	85.4
1994	59.2	--	--	56.6	66.5	82.8	86.7
1995	54.6	--	--	59.1	64.2	82.9	89.2
1996	54.4	--	--	59.4	64.9	74.6	79.4
1997	59.2	--	--	59.4	76.3	71.7	75.9
1998	59.2	--	--	59.4	74.8	73.6	70.1
1999	59.2	--	--	59.4	72.3	70.6	73.3
2000	59.2	--	--	59.4	69.0	67.2	64.6
2001	59.2	--	--	59.4	68.7	67.3	73.3
2002	59.2	--	--	59.4	63.1	70.0	79.1
2003	59.2	--	--	63.9	62.2	70.6	73.4
2004	59.2	--	--	63.6	69.5	68.0	67.5
2005	46.5	--	--	59.1	68.3	68.5	77.7
2006	57.9	--	--	59.9	72.8	74.2	71.6
2007	56.8	--	--	63.6	72.5	70.8	69.1
2008	55.8	--	--	65.8	75.6	75.4	67.9
2009	56.3	--	--	58.5	71.2	78.6	72.9
2010	64.2	--	--	59.4	77.5	83.1	66.4
2011	65.1	--	--	56.8	68.5	79.9	73.7

overall average

overall ave

Average	
P-8	Overall Average
--	--
--	--
--	--
--	--
--	72.4
--	77.3
--	78.1
--	79.4
--	80.1
--	85.2
--	87.0
--	86.2
--	83.8
--	83.1
--	82.5
--	75.7
--	74.6
--	79.4
--	78.2
83.2	77.0
85.2	76.8
87.1	76.6
87.0	74.2
87.2	73.2
91.6	73.6
77.5	68.4
60.5	67.2
59.8	66.1
56.1	65.1
50.3	61.6
60.0	64.7
74.4	67.5
76.3	67.6
71.7	66.6
78.3	66.4
75.7	68.7
76.8	68.2
72.3	68.8
79.5	69.5
74.6	70.9
79.6	70.6

average - min

61.6

<= March 31, 2010 reports quotes ~63%. Minor difference maybe due

N		
	2013	2014
	Capa	
P1	83%	61%
P4	61%	83%
P5	66%	95%
P6	70%	95%
P7	94%	71%
P8	94%	70%

Source: OPG email Continued Operations

Better than Expected		
	Capa	
	2013	2014
P1	83%	61%
P4	61%	83%
P5	66%	95%
P6	70%	95%
P7	94%	71%
P8	94%	70%

Lower than Expected		
	Capa	
	2013	2014
P1	83%	61%
P4	61%	83%
P5	66%	95%
P6	70%	95%
P7	94%	71%
P8	94%	70%

average - max 87.0

Medium Case (from OPG)					
2015	2016	2017	2018	2019	2020
Availability Factor Including Impact of Life Mgmt Days (%)					
88%	69%	88%	67%	86%	86%
69%	88%	67%	88%	68%	86%
69%	94%	75%	93%	92%	n/a
76%	94%	75%	93%	n/a	n/a
48%	73%	24%	74%	92%	91%
95%	76%	94%	61%	92%	91%

of 240k EFPH Pressure Tube Life with Later P7 Life Management

Expected Production = Highest 5-year average					
Availability Factor Including Impact of Life Mgmt Days (%)					
2015	2016	2017	2018	2019	2020
88%	87	87	87	87	87
69%	90	90	90	90	90
69%	86	86	86	86	n/a
76%	90	90	90	n/a	n/a
48%	89	24%	89	89	89
95%	92	92	92	92	92

Expected Production = Lowest 5-year average					
Availability Factor Including Impact of Life Mgmt Days (%)					
2015	2016	2017	2018	2019	2020
88%	47	47	47	47	47
69%	53	53	53	53	53
69%	62	62	62	62	n/a
76%	67	67	67	n/a	n/a
48%	65	24%	65	65	65
95%	50	50	50	50	50

due to averaging method or rounding.

From: GARCIA LEE Violeta -CRPINVASTPLN <violeta.garcia.lee@opg.com>
Sent: January-05-12 10:43 AM
To: Bashir Bhana
Cc: ROGERS Stephen -CRPINVASTPLN; GARCIA LEE Violeta -CRPINVASTPLN; Bob Gibbons; Bonnie Chan
Subject: RE: Response to OPA/OPG meeting on OEB Support

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Hi Bashir.

I am following up on our discussions yesterday. To clarify, your questions pertain to the Operations Costs sections on Tabs 2 & 3 of the data file attached to your email, below.

As I mentioned, the capital portion of the Total OM&A & Capital annual cost forecast for the scenarios of (i) PNGS No Continued Operations and (ii) PNGS Continued Operations is quite small. In reviewing the annual forecast of operating costs, [REDACTED] Section 17

[REDACTED] The capital cost forecast is primarily made up of capital projects involved in the ongoing operations of the station, as well as some minor fixed assets.

Note that the 'OM&A Costs to enable Continued Ops including FCLM project' during 2013 and 2014 are OM&A costs and do not include any material capital costs.

Regards,

Violeta Garcia-Lee
Finance - Corporate Investment & Asset Planning
Ontario Power Generation Inc.
416.592.6997 (work)
416.592.6071 (facsimile)
H7B2 / violeta.garcia.lee@opg.com

From: ROGERS Stephen -CRPINVASTPLN
Sent: Tuesday, January 03, 2012 5:33 PM
To: GARCIA LEE Violeta -CRPINVASTPLN
Subject: Fw: Response to OPA/OPG meeting on OEB Support

Please develop a split between cap & OM&A.

Thanks.

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: Tuesday, January 03, 2012 12:09 PM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons <Bob.Gibbons@powerauthority.on.ca>; Bonnie Chan <Bonnie.Chan@powerauthority.on.ca>
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Happy New Year...hope you had a good holiday!

I wanted to better understand the OM&A/Capital costs provided in the latest data file. Does the capital cost portion consist of activities directly related to enabling continued operations only (such as material testing, work on the reactors, etc)? I assume these would be incurred in 2013/2014 and go away post 2014 leaving just OM&A costs and incremental nuclear/corporate support costs?

Could you provide the split between the OM&A and capital costs?

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: December 21, 2011 3:17 PM
To: Bonnie Chan
Cc: Bob Gibbons; Steve Chui; Victor Stein; Bashir Bhana; Alan Leung
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bonnie,

As requested, attached is an updated version of the file we submitted with the outage dates shown, corresponding to the schematics for the various scenarios. The added information is as follows:

Tab 4a – Outage Dates for No Cont Ops with P7 LM (corresponding to schematics in Tab 4)
Tab 5a – Outage Dates for Cont Ops to 240k EFPH with P7 LM (corresponding to schematics in Tab 5)
Tab 6a – Outage Dates for Cont Ops to 247k EFPH with P7 LM (corresponding to schematics in Tab 6)

Note that exact outage dates are highly confidential.

Please call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bonnie Chan [<mailto:Bonnie.Chan@powerauthority.on.ca>]
Sent: Wednesday, December 21, 2011 11:00 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Steve Chui; Victor Stein; Bashir Bhana; Alan Leung
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Thank you for the information you provided us last week. In reviewing the workbook, it would be helpful if you could also provide the start and end date (indicating the day, month and year) of the outages and the end of life schematics for:

- No Cont Ops with P7 LM
- Cont Ops to 240k EFPH with P7 LM
- Cont Ops to 247k EFPH with P7 LM

If you could provide this information to us as soon as possible it would be much appreciated.

Thanks,
Bonnie

From: Bob Gibbons
Sent: December 16, 2011 3:22 PM
To: Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: December 16, 2011 3:18 PM
To: Bob Gibbons
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; Bashir Bhana; REUBER Barbara -REGAFFCRPSTY; Victor Stein; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bob,

Following our discussion on Monday, please find attached the first draft of OPG's information on Pickering Continued Operations in order to commence the OPA's assessment.

Please consider this information preliminary. OPG continues to refine its assessment of the incremental costs of operating the Pickering units over the next decade and the potential cost impacts if Pickering Continued Operations were not achieved, and may, therefore, issue a revised version of this information for your assessment in the next few weeks. In particular, as we discussed, the data set we are providing does not explicitly show the severance costs OPG would incur under the two different scenarios and also does not show the impact on the decommissioning liability for the two different scenarios. As discussed, these two impacts relate to the timing of cost flows and therefore impacts the Net Present Value difference between the alternatives. OPG quantifies both of these impacts and factors in the impact of severance cost timing differences into its NPV analysis, but does not factor in the impact of the decommissioning cost timing differences. These two impacts will be provided separately.

As well, OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back of various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-Life date projections for each of the Pickering units without P7 life management and without Continued Operations. Note that OPG no longer considers this to be the reference case for No Continued Operations and has not developed costs for this case.

Tab 2: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and the Continued Operations Case (with later P7 life management) **assuming the final units S/D in mid-2020** (i.e. achieve 240,000 Effective Full Power Hours). This tab also shows the differences in costs and performance between the two cases.

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (with later P7 life management) **assuming the final units S/D at the end of 2020** (i.e. achieve 247,000 Effective Full Power Hours (EFPH), but last 4 units operate only to end 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: A schematic of the No Continued Operations Case (with early P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 5: A schematic of the first Continued Operations Case (240,000 EFPH, with later P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 6: A schematic of the second Continued Operations Case (247,000 EFPH, with later P7 life management) showing the timing of the planned outages and unit shutdowns for that case

As you have also requested, OPG will be providing, via separate e-mail, the detailed performance forecast for each of the Pickering units. OPG's information is currently aggregated at the level of Pickering Units 1 & 4 and Pickering Units 5-8.

I have also enclosed a marked up version of the document "System Impact of Continued Operations" which you had sent in your e-mail. OPG is suggesting that additional sensitivity scenarios be analysed, beyond the ones originally listed.

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bob Gibbons [<mailto:Bob.Gibbons@powerauthority.on.ca>]

Sent: Tuesday, December 06, 2011 4:37 PM

To: BURKE Paul J -PLANNG&ANALY

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; ROGERS Stephen -CRPINVASTPLN; Nancy Marconi; Bashir Bhana; Steve Chui; Bonnie Chan

Subject: RE: Response to OPA/OPG meeting on OEB Support

CONFIDENTIAL

Hi Paul,

We would like to get our evaluation of Pickering continued operation underway as soon as possible. [REDACTED]

Section 17

[REDACTED]. We intend to use a similar approach as last year except that we will use IPSP2 assumptions in our evaluation of avoided supply costs. Other assumptions are summarized in the second attachment.

It would be helpful if you could provide us with the following information as soon as possible:

1. EOSL dates for Pickering units with continued operation with P7 life management
2. EOSL dates for Pickering units without continued operation without P7 life management
3. Annual values for the following with continued operation and with P7 life management:
 - Total Pickering OM&A dollars (excluding allocated corporate overheads)
 - Unit Fuel cost
 - Unit Energy production
 - Unit PO days
 - Unit ACF %
 - Unit FLR %

4. As in 3. above without continued operation and without P7 life management

If it would be helpful, we would be glad to meet with you to discuss further. Just let me know.

Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043

Fax: (416) 967-1947

E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: BARRETT Andrew P -REGAFFCRPSTY [<mailto:andrew.barrett@opg.com>]

Sent: December 2, 2011 5:55 PM

To: Michael Lyle; George Pessione; Nancy Marconi; Bob Gibbons

Cc: KOHN Ethan -REGAFFCRPSTY; POWER Donald J -CRPINVASTPLN; BURKE Paul J -PLANNG&ANALY;

ROGERS Stephen -CRPINVASTPLN; JANOSSY Eva -PLANNG&ANALY

Subject: Response to our meeting on OEB Support

Folks,

Sorry for the delay in getting back to you - it has and is taking us a little time to get ourselves organized on this.

In terms of points of contact, I can advise that [REDACTED] *Not Responsive* [REDACTED] and Eva Janossy will be our point of contact on the PGS project.

In addition, Paul Burke and Stephen Rogers will be contacting you (prob via Bob) to get some additional information on how you proposed to undertake the Pickering Continued Operations analysis that was discussed at our meeting.

Andrew

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A: Early Retirement with Early P7 LM													B: Continued Operation with Late P7 LM												
1: Reference													1: Reference												
Energy Production (GWh)	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Energy Production (GWh)	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	95,143	94,602	89,551	71,158	57,805	52,708	50,404	47,819	559,190	--	--	--	Nuclear	96,458	99,321	94,158	89,501	76,855	72,067	66,196	56,319	650,875	--		
Other Baseload	21,892	25,140	28,209	30,202	30,864	32,476	31,908	31,883	232,575	--	--	--	Other Baseload	21,520	23,535	26,616	26,714	29,888	32,246	31,825	31,741	224,084	--		
Hydro	39,506	41,682	42,936	43,113	42,932	42,894	42,913	43,031	339,006	--	--	--	Hydro	39,449	41,470	42,917	42,789	42,932	42,894	42,913	43,031	338,593	--		
Fossil/Gas	2,730	2,758	1,868	6,507	9,944	11,874	13,653	14,895	63,728	--	--	--	Fossil/Gas	2,760	1,518	1,197	2,155	5,108	7,251	9,478	13,399	42,866	--		
Imports	2,178	1,390	2,208	7,472	12,380	14,726	16,107	18,249	74,711	--	--	--	Imports	1,749	953	1,669	2,574	5,324	6,988	9,499	14,387	43,143	--		
Exports	16,956	20,073	18,789	12,135	8,046	8,162	7,687	6,985	98,833	--	--	--	Exports	17,443	21,798	20,573	17,416	14,227	14,929	12,613	9,986	128,985	--		
Dispatch Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Dispatch Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	\$766	\$771	\$732	\$604	\$498	\$454	\$434	\$412	\$412	\$4,670	\$3,860	\$3,860	Nuclear	\$774	\$801	\$760	\$719	\$628	\$570	\$537	\$470	\$5,259	\$4,321		
Other Baseload	\$636	\$685	\$725	\$664	\$602	\$559	\$503	\$496	\$496	\$4,869	\$3,978	\$3,978	Other Baseload	\$593	\$638	\$692	\$613	\$578	\$538	\$484	\$478	\$4,614	\$3,766		
Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Fossil/Gas	\$123	\$119	\$127	\$406	\$610	\$729	\$836	\$900	\$3,850	\$2,941	\$2,941	\$2,941	Fossil/Gas	\$122	\$83	\$84	\$144	\$308	\$437	\$569	\$772	\$2,518	\$1,910		
Import Cost	\$44	\$33	\$33	\$33	\$262	\$514	\$796	\$961	\$1,079	\$3,722	\$2,785	\$2,785	Import Cost	\$39	\$21	\$18	\$47	\$169	\$303	\$473	\$873	\$1,943	\$1,432		
Export Revenue	\$310	\$258	\$182	\$283	\$278	\$278	\$421	\$442	\$373	\$2,547	\$2,029	\$2,029	Export Revenue	\$313	\$217	\$162	\$230	\$258	\$428	\$490	\$404	\$2,502	\$1,981		
Capital & Fixed Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Capital & Fixed Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	\$1,030	\$980	\$755	\$190	\$0	\$0	\$0	\$0	\$0	\$2,955	\$2,625	\$2,625	Nuclear	\$1,087	\$1,083	\$1,061	\$1,055	\$1,042	\$1,048	\$820	\$416	\$7,612	\$6,253		
Other Baseload	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Other Baseload	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Fossil/Gas	\$0	\$0	\$0	\$93	\$220	\$242	\$194	\$0	\$749	\$576	\$576	\$576	Fossil/Gas	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Import Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Import Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Export Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Export Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
A minus B: Delta (+ve => benefit of CO)													A minus B: Delta (+ve => benefit of CO)												
1: Reference													1: Reference												
Energy Production (GWh)	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Energy Production (GWh)	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	-1,315	-4,718	-4,607	-18,343	-19,050	-19,359	-15,793	-8,500	-91,685	--	--	--	Nuclear	-1,315	-4,718	-4,607	-18,343	-19,050	-19,359	-15,793	-8,500	-91,685	--		
Other Baseload	372	1,605	1,593	3,488	976	231	84	141	8,491	--	--	--	Other Baseload	372	1,605	1,593	3,488	976	231	84	141	8,491	--		
Hydro	57	212	19	324	0	0	0	0	612	--	--	--	Hydro	57	212	19	324	0	0	0	0	612	--		
Fossil/Gas	-31	140	671	4,352	4,836	4,623	4,175	1,496	20,862	--	--	--	Fossil/Gas	-31	140	671	4,352	4,836	4,623	4,175	1,496	20,862	--		
Imports	429	437	539	4,998	7,055	7,738	6,608	3,862	31,567	--	--	--	Imports	429	437	539	4,998	7,055	7,738	6,608	3,862	31,567	--		
Exports	-487	-1,724	-1,785	-5,281	-6,182	-6,767	-4,926	-3,001	-30,152	--	--	--	Exports	-487	-1,724	-1,785	-5,281	-6,182	-6,767	-4,926	-3,001	-30,152	--		
Dispatch Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Dispatch Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	-88	-529	-528	-1,115	-1,310	-1,116	-1,013	-558	-5589	-\$460	-\$460	-\$460	Nuclear	-88	-529	-528	-1,115	-1,310	-1,116	-1,013	-558	-5589	-\$460		
Other Baseload	\$43	\$47	\$33	\$51	\$24	\$21	\$19	\$18	\$255	\$212	\$212	\$212	Other Baseload	\$43	\$47	\$33	\$51	\$24	\$21	\$19	\$18	\$255	\$212		
Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Fossil/Gas	\$1	\$35	\$44	\$261	\$302	\$292	\$268	\$128	\$1,331	\$1,031	\$1,031	\$1,031	Fossil/Gas	\$1	\$35	\$44	\$261	\$302	\$292	\$268	\$128	\$1,331	\$1,031		
Import Cost	\$5	\$12	\$15	\$12	\$345	\$493	\$488	\$206	\$1,779	\$1,354	\$1,354	\$1,354	Import Cost	\$5	\$12	\$15	\$12	\$345	\$493	\$488	\$206	\$1,779	\$1,354		
Export Revenue	-\$3	\$41	\$20	\$53	\$19	-\$7	-\$48	-\$31	\$44	\$48	\$48	\$48	Export Revenue	-\$3	\$41	\$20	\$53	\$19	-\$7	-\$48	-\$31	\$44	\$48	\$48	
Capital & Fixed Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Capital & Fixed Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	-\$57	-\$103	-\$306	-\$865	-\$1,042	-\$1,048	-\$820	-\$416	-\$4,657	-\$3,628	-\$3,628	-\$3,628	Nuclear	-\$57	-\$103	-\$306	-\$865	-\$1,042	-\$1,048	-\$820	-\$416	-\$4,657	-\$3,628		
Other Baseload	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Other Baseload	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Fossil/Gas	\$0	\$0	\$0	\$0	\$93	\$220	\$242	\$194	\$0	\$749	\$576	\$576	Fossil/Gas	\$0	\$0	\$0	\$0	\$93	\$220	\$242	\$194	\$0	\$749	\$576	
Import Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Import Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Export Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Export Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Net Benefit - 2010 \$M CDN (ve cost, +ve benefit)	-513	-580	-\$264	-\$413	-\$300	-\$107	\$93	-\$91	-\$1,176	-\$963	-\$963	-\$963	Net Benefit - 2010 \$M CDN (ve cost, +ve benefit)	-513	-580	-\$264	-\$413	-\$300	-\$107	\$93	-\$91	-\$1,176	-\$963		
Net Benefit - 2011 \$M CDN (ve cost, +ve benefit)	-\$14	-\$82	-\$269	-\$421	-\$306	-\$109	\$95	-\$93	-\$1,199	-\$983	-\$983	-\$983	Net Benefit - 2011 \$M CDN (ve cost, +ve benefit)	-\$14	-\$82	-\$269	-\$421	-\$306	-\$109	\$95	-\$93	-\$1,199	-\$983		

Reference Case Assumptions:

- Pickering Energy Production, Total OM&A & Capital Costs, and Fuel Costs provided by OPG
- Gas Price = \$6 / MMBTU at Henry Hub (2013-2020)
- Carbon = \$0 / tonne
- Discount Rate = 4% / year (real)
- Inflation Rate = 2% / year
- Cost of Replacement Capacity = \$94 / kW-year
- Resource mix consistent with PSP 2
- Darlington refurbishment as per OPG Dec 14th, 2011 email
- Supply gap in the mid term filled with HQ (no limit on block size) for modelling purposes

Scenario Summary:

- Reference Case
- 2 & 3. Lower and Higher Demand (as per PSP2 forecasts)
- 4 & 5. Lower and Higher Natural Gas Prices (\$4 - \$12 / MMBTU at Henry Hub)
6. Carbon Price of \$15 / tonne in 2015 increasing to \$27 / tonne in 2020 (OPA medium trajectory forecast)
- 7 & 8. Lower and Higher Pickering Production (based on worst and best 5-year average historical ACF)
- 9 & 10. Longer and Shorter Continued Operation Period from 240K (50% shorter duration, extend end of life to end of 2020)
- 11 & 12. Lower and Higher OM&A Costs (10% lower, 50% higher)

From: Bonnie Chan
Sent: January-10-12 10:32 AM
To: Steve Chui; Bashir Bhana
Subject: Pickering Tally Case 10B

Hi,

Tally Case 10B is now available:

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 (BC).xlsx)

This tally includes the update to the Darlington refurbishment expected in service date. The “Directed” units that come back to service after refurb now have a start date that is the first of the month (ie. Darlington U1 refurb ends on Dec 31, 2019, so it comes back to service on Jan 1, 2020).

This tally also includes a summary in the “Nuclear” sheet that sums up the total installed MW of the nuclear units by “UPLAN year”.

Bonnie Chan | Planner, Power System Planning

Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1

T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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From: Bashir Bhana
Sent: January-11-12 10:57 AM
To: 'ROGERS Stephen -CRPINVASTPLN'
Cc: Bob Gibbons; Bonnie Chan; Victor Stein
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

For the Pickering study, when can we expect to receive the “severance” and “decommissioning liability” cost impacts mentioned below?

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: December 20, 2011 4:06 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; REUBER Barbara -REGAFFCRPSTY; Victor Stein; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

As promised, please find enclosed an updated workbook with the Pickering Continued Operations data for your analysis. A new tab (Tab 7) has been added which shows the Unit Level performance data that you had requested. As well, a correction has been made to the energy for Pickering Units 5 – 8 in 2019 in Tab 3 of the original workbook (as discussed with Bashir).

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Please call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration

From: ROGERS Stephen -CRPINVASTPLN
Sent: Friday, December 16, 2011 3:18 PM
To: 'Bob Gibbons'
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; Bashir Bhana; REUBER Barbara -REGAFFCRPSTY; 'Victor Stein'; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bob,

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Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bob Gibbons [<mailto:Bob.Gibbons@powerauthority.on.ca>]

Sent: Tuesday, December 06, 2011 4:37 PM

To: BURKE Paul J -PLANNG&ANALY

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; ROGERS Stephen -CRPINVASTPLN; Nancy Marconi; Bashir Bhana; Steve Chui; Bonnie Chan

Subject: RE: Response to OPA/OPG meeting on OEB Support

CONFIDENTIAL

Hi Paul,

We would like to get our evaluation of Pickering continued operation underway as soon as possible.

[REDACTED] Section 17
[REDACTED] We intend to use a similar approach as last year except that we will use IPSP2 assumptions in our evaluation of avoided supply costs. Other assumptions are summarized in the second attachment.

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2. EOSL dates for Pickering units without continued operation without P7 life management
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- Unit Fuel cost
- Unit Energy production
- Unit PO days
- Unit ACF %
- Unit FLR %

4. As in 3. above without continued operation and without P7 life management

If it would be helpful, we would be glad to meet with you to discuss further. Just let me know.

Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: BARRETT Andrew P -REGAFFCRPSTY [<mailto:andrew.barrett@opg.com>]
Sent: December 2, 2011 5:55 PM
To: Michael Lyle; George Pessione; Nancy Marconi; Bob Gibbons
Cc: KOHN Ethan -REGAFFCRPSTY; POWER Donald J -CRPINVASTPLN; BURKE Paul J -PLANNG&ANALY;
ROGERS Stephen -CRPINVASTPLN; JANOSSY Eva -PLANNG&ANALY
Subject: Response to our meeting on OEB Support

Folks,

Sorry for the delay in getting back to you - it has and is taking us a little time to get ourselves organized on this.

In terms of points of contact, I can advise that [REDACTED] *Not Responsive* and Eva Janossy will be our point of contact on the PGS project.

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Andrew

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From: ROGERS Stephen -CRPINVASTPLN <stephen.rogers@opg.com>
Sent: January-11-12 10:59 AM
To: Bashir Bhana
Cc: Bob Gibbons; Bonnie Chan; Victor Stein
Subject: RE: Response to OPA/OPG meeting on OEB Support

Bashir,

I am working on it and have put in a request for the decommissioning liability impacts. I expect to have these by Monday next week.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bashir Bhana [mailto:Bashir.Bhana@powerauthority.on.ca]
Sent: Wednesday, January 11, 2012 10:57 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Bonnie Chan; Victor Stein
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

For the Pickering study, when can we expect to receive the “severance” and “decommissioning liability” cost impacts mentioned below?

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: December 20, 2011 4:06 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; REUBER

Barbara -REGAFFCRPSTY; Victor Stein; POWER Donald J -CRPINVASTPLN

Subject: RE: Response to OPA/OPG meeting on OEB Support

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To: BURKE Paul J -PLANNG&ANALY

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; ROGERS Stephen -CRPINVASTPLN; Nancy Marconi; Bashir Bhana; Steve Chui; Bonnie Chan

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From: Bonnie Chan
Sent: January-11-12 4:55 PM
To: Steve Chui; Bashir Bhana
Subject: RE: Pickering Tally Case 3A

Hi Steve,

Case 3A No Continued Ops, High Growth is now available:

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3A. ER. P7LM. Med Performance. High Demand. 2012-01-11 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3A. ER. P7LM. Med Performance. High Demand. 2012-01-11 (BC).xlsx)

The capacity gap post 2020 is not managed in the tally since the Pickering Cont'd Ops study only goes out to 2020. In other words, the capacity plan is filled with gas if required up to 2020, but it left as a supply deficit post 2020.

Similar to Case 10B, this tally includes the update to the Darlington refurbishment expected in service date. The "Directed" units that come back to service after refurb now have a start date that is the first of the month (ie. Darlington U1 refurb ends on Dec 31, 2019, so it comes back to service on Jan 1, 2020).

This tally also includes a summary in the "Nuclear" sheet that sums up the total installed MW of the nuclear units by "UPLAN year".

Thanks,
Bonnie

From: Bonnie Chan
Sent: January 10, 2012 10:32 AM
To: Steve Chui; Bashir Bhana
Subject: Pickering Tally Case 10B

Hi,

Tally Case 10B is now available:

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 (BC).xlsx)

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Bonnie Chan | Planner, Power System Planning
Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1
T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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To: Steve Chui; Bashir Bhana
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Sent: January 10, 2012 10:32 AM
To: Steve Chui; Bashir Bhana
Subject: Pickering Tally Case 10B

Hi,

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[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 (BC).xlsx)

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From: Steve Chui
Sent: January-12-12 8:02 AM
To: Alan Leung
Subject: FW: Pickering Tally Case 3A

From: Bonnie Chan
Sent: Wednesday, January 11, 2012 4:55 PM
To: Steve Chui; Bashir Bhana
Subject: RE: Pickering Tally Case 3A

Hi Steve,

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From: Jim Lee
Sent: January-12-12 11:47 AM
To: Bashir Bhana
Cc: Joe Toneguzzo
Subject: RE: Pickering Study

Bashir,
Please use \$260 million in-service dollar for 2015.
Thank you,
Jim

From: Bashir Bhana
Sent: January 11, 2012 11:27 AM
To: Joe Toneguzzo; Jim Lee
Subject: Pickering Study

Joe/Jim,

For the Pickering continued operations study, could you please provide updated costs for Oshawa Area TS. Specifically, the total capital expenditure associated with the TS.

Happy to discuss further.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
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120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: January-12-12 11:50 AM
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Sent: January 12, 2012 11:47 AM
To: Bashir Bhana
Cc: Joe Toneguzzo
Subject: RE: Pickering Study

Bashir,
Please use \$260 million in-service dollar for 2015.
Thank you,
Jim

From: Bashir Bhana
Sent: January 11, 2012 11:27 AM
To: Joe Toneguzzo; Jim Lee
Subject: Pickering Study

Joe/Jim,

For the Pickering continued operations study, could you please provide updated costs for Oshawa Area TS. Specifically, the total capital expenditure associated with the TS.

Happy to discuss further.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: January-12-12 3:22 PM
To: Steve Chui; Bashir Bhana; Alan Leung
Subject: RE: Pickering Tally Case 3A

Case 3B with Continued Ops under High Growth is now available. It is based off of Case 3A.

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3B. CO. P7LM. Med Performance. High Demand. 2012-01-12 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3B. CO. P7LM. Med Performance. High Demand. 2012-01-12 (BC).xlsx)

Thanks,
Bonnie

From: Bonnie Chan
Sent: January 11, 2012 4:55 PM
To: Steve Chui; Bashir Bhana
Subject: RE: Pickering Tally Case 3A

Hi Steve,

Case 3A No Continued Ops, High Growth is now available:

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3A. ER. P7LM. Med Performance. High Demand. 2012-01-11 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3A. ER. P7LM. Med Performance. High Demand. 2012-01-11 (BC).xlsx)

The capacity gap post 2020 is not managed in the tally since the Pickering Cont'd Ops study only goes out to 2020. In other words, the capacity plan is filled with gas if required up to 2020, but it left as a supply deficit post 2020.

Similar to Case 10B, this tally includes the update to the Darlington refurbishment expected in service date. The "Directed" units that come back to service after refurb now have a start date that is the first of the month (ie. Darlington U1 refurb ends on Dec 31, 2019, so it comes back to service on Jan 1, 2020).

This tally also includes a summary in the "Nuclear" sheet that sums up the total installed MW of the nuclear units by "UPLAN year".

Thanks,
Bonnie

From: Bonnie Chan
Sent: January 10, 2012 10:32 AM
To: Steve Chui; Bashir Bhana
Subject: Pickering Tally Case 10B

Hi,

Tally Case 10B is now available:

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 (BC).xlsx)

This tally includes the update to the Darlington refurbishment expected in service date. The “Directed” units that come back to service after refurb now have a start date that is the first of the month (ie. Darlington U1 refurb ends on Dec 31, 2019, so it comes back to service on Jan 1, 2020).

This tally also includes a summary in the “Nuclear” sheet that sums up the total installed MW of the nuclear units by “UPLAN year”.

Bonnie Chan | Planner, Power System Planning

Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1

T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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2011 Pickering Continued Operations Study - Case Summary

Case Description		Case ID	Pickering	
			Availability	Performance
Reference Case		1 A	ER	Medium
		1 B	CO	Medium
Sensitivities - One Variable	Lower Demand	2 A	ER	Medium
		2 B	CO	Medium
	Higher Demand	3 A	ER	Medium
		3 B	CO	Medium
	Lower Natural Gas Prices	4 A	ER	Medium
		4 B	CO	Medium
	Higher Natural Gas Prices	5 A	ER	Medium
		5 B	CO	Medium
	Carbon Price	6 A	ER	Medium
		6 B	CO	Medium
	Lower Pickering Production	7 A		
		7 B	CO	Worst 5 year Average ACF
	Higher Pickering Production	8 A		
		8 B	CO	Best 5 year Average ACF
	Longer CO Period (from 240K)	9 A		
		9 B	CO	5 months of additional production in 2020
	Shorter CO Period (from 240K)	10 A		
		10 B	CO	50% of planned duration
	Lower OMA Costs	11 A	ER	Medium
		11 B	CO	Medium
	Higher OMA Costs	12 A	ER	Medium
		12 B	CO	Medium
Sensitivities - Multi Variable	Low Demand and Lower Pickering Production	13 A	ER	Medium
		13 B	CO	Worst 5 year Average ACF
	Low Demand and Low Natural Gas Prices	14 A	ER	Medium
		14 B	CO	Medium
	Low Demand, Low Natural Gas Prices, and Lower Pickering Production	15 A	ER	Medium
		15 B	CO	Worst 5 year Average ACF
	High Demand, High Natural Gas Prices, and Carbon Price	16 A	ER	Medium
		16 B	CO	Medium

Assumptions:

Pickering Availability

- early retirement, continued operations cases per OF
- outage dates and EOL dates per OPG Dec 21, 2011 e

Pickering Performance

- Medium per OPG email
- low/high production based on historic 5-year average

Pickering OM&A Costs

- Medium per OPG email
- low/high assume +/- 10% of Medium costs (based on OPG email)

Demand

- Low/Medium/High consistent with IPSP2/LTEP

Gas Price Forecast

- Low = \$6/MMBTU, Medium = \$6.60/MMBTU, High = \$7.20/MMBTU

Carbon Cost Forecast

- 2015 - \$15/tonne; increasing by \$3/tonne to \$30/tonne by 2025

Other System Assumptions

- Resource mix consistent with IPSP 2
- Darlington refurbishment as per OPG Dec 14th, 2011
- Supply gap in the mid term will be filled with HQ (nuclear)
- Options for the long term gap will be filled in with gas

OM&A Costs	Demand Forecast	Natural Gas Price Forecast	Carbon Cost Forecast	Requires UPLAN Run?
Medium	Medium	Mid-Range	None	Yes
Medium	Medium	Mid-Range	None	Yes
Medium	Low	Mid-Range	None	Yes
Medium	Low	Mid-Range	None	Yes
Medium	High	Mid-Range	None	Yes
Medium	High	Mid-Range	None	Yes
Medium	Medium	Low Range	None	Yes
Medium	Medium	Low Range	None	Yes
Medium	Medium	High Range	None	Yes
Medium	Medium	High Range	None	Yes
Medium	Medium	Mid-Range	Starting in 2015	Yes
Medium	Medium	Mid-Range	Starting in 2015	Yes
Same as 1A				No
Medium	Medium	Mid-Range	None	Yes
Same as 1A				No
Medium	Medium	Mid-Range	None	Yes
Same as 1A				No
Medium	Medium	Mid-Range	None	Yes
Same as 1A				No
Lower	Medium	Mid-Range	None	Yes
Lower	Medium	Mid-Range	None	No
Lower	Medium	Mid-Range	None	No
Higher	Medium	Mid-Range	None	No
Higher	Medium	Mid-Range	None	No
Medium	Low	Mid-Range	None	Yes
Medium	Low	Mid-Range	None	Yes
Medium	Low	Low Range	None	Yes
Medium	Low	Low Range	None	Yes
Medium	Low	Low Range	None	Yes
Medium	Low	Low Range	None	Yes
Medium	High	High Range	Starting in 2018	Yes
Medium	High	High Range	Starting in 2018	Yes

PG Dec 16, 2011 email.
email

ges using date from XX

n discussion with OPG)

= \$8/MMBTU (consistent with Darlington study range, from CERA)

nne in 2020 (Based on discussion with Resource Integration II)

1 email

› limit on block size)

as (block size limit to 250MW)

Requires New Tally?	Priority	UPLAN Completed?	Tally Completed?
Yes	Highest		Yes
Yes	Highest		Yes Derived from 1A
Yes	High		Yes Derived from 1A
Yes	High		Yes Derived from 1B
Yes	Medium		Yes Derived from 1A
Yes	Medium		
No	High		
No	High		
No	Medium		
No	Medium		
No	High		
No	High		
No	High		
No	High		
No	High		
No	High		
Yes	Medium		Same as 1A
Yes	Medium		Yes Derived from 1B
No	High		Same as 1A
Yes	High		Yes Derived from 1B
No	Medium		
No	Medium		
No	Medium		
No	Medium		
Yes	Low - time permitting		
Yes	Low - time permitting		
No	Low - time permitting		
No	Low - time permitting		
Yes	Low - time permitting		
Yes	Low - time permitting		
No	Low - time permitting		
No	Low - time permitting		

ER => Early Retirement, with P7 LM

CO => Continued Operation, with P7 LM

From: Bonnie Chan
Sent: January-12-12 3:49 PM
To: Steve Chui; Bashir Bhana; Alan Leung
Subject: RE: Pickering Tally Case 3A

Case 9B with longer (5 additional months) Continued Operations under Medium Growth is now available. It is based off of Case 1B.

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 9B. CO. P7LM. 247k. Med Demand. 2011-12-28 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 9B. CO. P7LM. 247k. Med Demand. 2011-12-28 (BC).xlsx)

Thanks,
Bonnie

From: Bonnie Chan
Sent: January 12, 2012 3:22 PM
To: Steve Chui; Bashir Bhana; Alan Leung
Subject: RE: Pickering Tally Case 3A

Case 3B with Continued Ops under High Growth is now available. It is based off of Case 3A.

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3B. CO. P7LM. Med Performance. High Demand. 2012-01-12 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3B. CO. P7LM. Med Performance. High Demand. 2012-01-12 (BC).xlsx)

Thanks,
Bonnie

From: Bonnie Chan
Sent: January 11, 2012 4:55 PM
To: Steve Chui; Bashir Bhana
Subject: RE: Pickering Tally Case 3A

Hi Steve,

Case 3A No Continued Ops, High Growth is now available:

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3A. ER. P7LM. Med Performance. High Demand. 2012-01-11 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 3A. ER. P7LM. Med Performance. High Demand. 2012-01-11 (BC).xlsx)

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Similar to Case 10B, this tally includes the update to the Darlington refurbishment expected in service date. The "Directed" units that come back to service after refurb now have a start date that is the first of the month (ie. Darlington U1 refurb ends on Dec 31, 2019, so it comes back to service on Jan 1, 2020).

This tally also includes a summary in the "Nuclear" sheet that sums up the total installed MW of the nuclear units by "UPLAN year".

Thanks,
Bonnie

From: Bonnie Chan
Sent: January 10, 2012 10:32 AM
To: Steve Chui; Bashir Bhana
Subject: Pickering Tally Case 10B

Hi,

Tally Case 10B is now available:

[S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Tally\Case 10B. CO. P7LM. 50% Duration. Med Demand. 2011-12-28 \(BC\).xlsx](#)

This tally includes the update to the Darlington refurbishment expected in service date. The “Directed” units that come back to service after refurb now have a start date that is the first of the month (ie. Darlington U1 refurb ends on Dec 31, 2019, so it comes back to service on Jan 1, 2020).

This tally also includes a summary in the “Nuclear” sheet that sums up the total installed MW of the nuclear units by “UPLAN year”.

Bonnie Chan | Planner, Power System Planning

Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1

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From: Bob Gibbons
Sent: January-18-12 5:14 PM
To: Bashir Bhana
Subject: Pickering study

Did you include LM in the no continued ops case? If not this could account for the cost difference in the pre-2016 period.

From: Bashir Bhana
Sent: January-18-12 5:21 PM
To: Bob Gibbons
Subject: RE: Pickering study

Yes. As per the schedule OPG provided. OPG did not provide cost info for a "no continued ops no LM case". Stephen Rogers confirmed the with LM case was the case to use when I raised the issue again (for consistency with opg bus plan)

The cost diff in the period before 2016 is due 1) additional OM&A to do the work necessary to preserve the option for CO, and 2) longer planned outages to do the work (gas burn increases a bit during this period as a result).

Section 17

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: Bob Gibbons
Sent: January 18, 2012 5:14 PM
To: Bashir Bhana
Subject: Pickering study

Did you include LM in the no continued ops case? If not this could account for the cost difference in the pre-2016 period.

From: Bob Gibbons
Sent: January-18-12 5:24 PM
To: Bashir Bhana
Subject: Re: Pickering study

Does our conclusion re CO still hold?

----- Original Message -----

From: Bashir Bhana
Sent: Wednesday, January 18, 2012 05:21 PM
To: Bob Gibbons
Subject: RE: Pickering study

Yes. As per the schedule OPG provided. OPG did not provide cost info for a "no continued ops no LM case". Stephen Rogers confirmed the with LM case was the case to use when I raised the issue again (for consistency with opg bus plan)

The cost diff in the period before 2016 is due 1) additional OM&A to do the work necessary to preserve the option for CO, and 2) longer planned outages to do the work (gas burn increases a bit during this period as a result).

Section 17

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: Bob Gibbons
Sent: January 18, 2012 5:14 PM
To: Bashir Bhana
Subject: Pickering study

Did you include LM in the no continued ops case? If not this could account for the cost difference in the pre-2016 period.

From: Bashir Bhana
Sent: January-18-12 5:26 PM
To: Bob Gibbons
Subject: RE: Pickering study

Yes, our conclusion still holds.

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: Bob Gibbons
Sent: January 18, 2012 5:24 PM
To: Bashir Bhana
Subject: Re: Pickering study

Does our conclusion re CO still hold?

----- Original Message -----

From: Bashir Bhana
Sent: Wednesday, January 18, 2012 05:21 PM
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Subject: RE: Pickering study

Yes. As per the schedule OPG provided. OPG did not provide cost info for a "no continued ops no LM case". Stephen Rogers confirmed the with LM case was the case to use when I raised the issue again (for consistency with opg bus plan)

The cost diff in the period before 2016 is due 1) additional OM&A to do the work necessary to preserve the option for CO, and 2) longer planned outages to do the work (gas burn increases a bit during this period as a result).

Section 17

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263

E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: Bob Gibbons

Sent: January 18, 2012 5:14 PM

To: Bashir Bhana

Subject: Pickering study

Did you include LM in the no continued ops case? If not this could account for the cost difference in the pre-2016 period.

From: Bashir Bhana
Sent: January-20-12 4:16 PM
To: Bob Gibbons
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Dec 21_ 2011_with Outage Dates_Final.xlsx

Hi Bob – attached is the “final” set of cost/operational data provide by OPG for the PCO study. Let me know if you have any questions.

Bashir

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: December 21, 2011 3:17 PM
To: Bonnie Chan
Cc: Bob Gibbons; Steve Chui; Victor Stein; Bashir Bhana; Alan Leung
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bonnie,

As requested, attached is an updated version of the file we submitted with the outage dates shown, corresponding to the schematics for the various scenarios. The added information is as follows:

Tab 4a – Outage Dates for No Cont Ops with P7 LM (corresponding to schematics in Tab 4)
Tab 5a – Outage Dates for Cont Ops to 240k EFPH with P7 LM (corresponding to schematics in Tab 5)
Tab 6a – Outage Dates for Cont Ops to 247k EFPH with P7 LM (corresponding to schematics in Tab 6)

Note that exact outage dates are highly confidential.

Please call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bonnie Chan [<mailto:Bonnie.Chan@powerauthority.on.ca>]
Sent: Wednesday, December 21, 2011 11:00 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Steve Chui; Victor Stein; Bashir Bhana; Alan Leung
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Thank you for the information you provided us last week. In reviewing the workbook, it would be helpful if you could also provide the start and end date (indicating the day, month and year) of the outages and the end of life schematics for:

- No Cont Ops with P7 LM
- Cont Ops to 240k EFPH with P7 LM
- Cont Ops to 247k EFPH with P7 LM

If you could provide this information to us as soon as possible it would be much appreciated.

Thanks,
Bonnie

From: Bob Gibbons
Sent: December 16, 2011 3:22 PM
To: Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: December 16, 2011 3:18 PM
To: Bob Gibbons
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; Bashir Bhana; REUBER Barbara -REGAFFCRPSTY; Victor Stein; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bob,

Following our discussion on Monday, please find attached the first draft of OPG's information on Pickering Continued Operations in order to commence the OPA's assessment.

Please consider this information preliminary. OPG continues to refine its assessment of the incremental costs of operating the Pickering units over the next decade and the potential cost impacts if Pickering Continued Operations were not achieved, and may, therefore, issue a revised version of this information for your assessment in the next few weeks. In particular, as we discussed, the data set we are providing does not explicitly show the severance costs OPG would incur under the two different scenarios and also does not show the impact on the decommissioning liability for the two different scenarios. As discussed, these two impacts relate to the timing of cost flows and therefore impacts the Net Present Value difference between the alternatives. OPG quantifies both of these impacts and factors in the impact of severance cost timing differences into its NPV analysis, but does not factor in the impact of the decommissioning cost timing differences. These two impacts will be provided separately.

As well, OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back of various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-Life date projections for each of the Pickering units without P7 life management and without Continued Operations. Note that OPG no longer considers this to be the reference case for No Continued Operations and has not developed costs for this case.

Tab 2: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and the Continued Operations Case (with later P7 life management) **assuming the final units S/D in mid-2020** (i.e. achieve 240,000 Effective Full Power Hours). This tab also shows the differences in costs and performance between the two cases.

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (with later P7 life management) **assuming the final units S/D at the end of 2020** (i.e. achieve 247,000 Effective Full Power Hours (EFPH), but last 4 units operate only to end 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: A schematic of the No Continued Operations Case (with early P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 5: A schematic of the first Continued Operations Case (240,000 EFPH, with later P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 6: A schematic of the second Continued Operations Case (247,000 EFPH, with later P7 life management) showing the timing of the planned outages and unit shutdowns for that case

As you have also requested, OPG will be providing, via separate e-mail, the detailed performance forecast for each of the Pickering units. OPG's information is currently aggregated at the level of Pickering Units 1 & 4 and Pickering Units 5-8.

I have also enclosed a marked up version of the document "System Impact of Continued Operations" which you had sent in your e-mail. OPG is suggesting that additional sensitivity scenarios be analysed, beyond the ones originally listed.

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bob Gibbons [<mailto:Bob.Gibbons@powerauthority.on.ca>]

Sent: Tuesday, December 06, 2011 4:37 PM

To: BURKE Paul J -PLANNG&ANALY

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; ROGERS Stephen -CRPINVASTPLN; Nancy Marconi; Bashir Bhana; Steve Chui; Bonnie Chan

Subject: RE: Response to OPA/OPG meeting on OEB Support

CONFIDENTIAL

Hi Paul,

We would like to get our evaluation of Pickering continued operation underway as soon as possible. [REDACTED]

Section 17

[REDACTED]. We intend to use a similar approach as last year except that we will use IPSP2 assumptions in our evaluation of avoided supply costs. Other assumptions are summarized in the second attachment.

It would be helpful if you could provide us with the following information as soon as possible:

1. EOSL dates for Pickering units with continued operation with P7 life management
2. EOSL dates for Pickering units without continued operation without P7 life management
3. Annual values for the following with continued operation and with P7 life management:
 - Total Pickering OM&A dollars (excluding allocated corporate overheads)
 - Unit Fuel cost
 - Unit Energy production
 - Unit PO days
 - Unit ACF %
 - Unit FLR %
4. As in 3. above without continued operation and without P7 life management

If it would be helpful, we would be glad to meet with you to discuss further. Just let me know.

Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: BARRETT Andrew P -REGAFFCRPSTY [<mailto:andrew.barrett@opg.com>]
Sent: December 2, 2011 5:55 PM
To: Michael Lyle; George Pessione; Nancy Marconi; Bob Gibbons
Cc: KOHN Ethan -REGAFFCRPSTY; POWER Donald J -CRPINVASTPLN; BURKE Paul J -PLANNG&ANALY;
ROGERS Stephen -CRPINVASTPLN; JANOSSY Eva -PLANNG&ANALY
Subject: Response to our meeting on OEB Support

Folks,

Sorry for the delay in getting back to you - it has and is taking us a little time to get ourselves organized on this.

In terms of points of contact, I can advise that Don Power will be the point of contact for the Darlington Refurb analysis and Eva Janossy will be our point of contact on the PGS project.

In addition, Paul Burke and Stephen Rogers will be contacting you (prob via Bob) to get some additional information on how you proposed to undertake the Pickering Continued Operations analysis that was discussed at our meeting.

Andrew

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PNGS No Continued Operations with No P7 Life Management

December 16, 2011

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

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Dec. 16, 2011

PICKERING CONTINUED OPERATIONS Assessment Data
(later P7 Life Management and P5-8 Unit Operation of 240k EFPH to mid 2020)

Section 1 - Operating Costs (M\$)		2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management									
Total OM&A & Capital		Section 17							
Fuel & Fuel Related Costs									
PNGS Continued Operations (240k EFPH) with P7 Life Management									
Total OM&A & Capital		Section 17							
Fuel & Fuel Related Costs									
Difference: Continued Operations - No Continued Operations									
Total OM&A & Capital		Section 17							
Effect of on-going operation on Total OM&A & Capital									
OM&A Costs to enable Cont. Ops including FCLM project									
Fuel & Fuel Related Costs									

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance will be provided later.
3. EFPH: Effective Full Power Hours

Section 2 - Production Related Data		Forced Loss Rate (%)								
		2013	2014	2015	2016	2017	2018	2019	2020	
P1&4 No Continued Operations		Section 17								
P5-8 Originally Assumed Life										
P1&4 Life to Match Continued Ops		Section 17								
P5-8 Continued Ops										
		Capability Factor Including Impact of Life Mgmt Days (%)								
		2013	2014	2015	2016	2017	2018	2019	2020	
P1&4 No Continued Operations		Section 17								
P5-8 Originally Assumed Life										
P1&4 Life to Match Continued Ops		Section 17								
P5-8 Continued Ops										
		Planned Outage & Life Management Days								
		2013	2014	2015	2016	2017	2018	2019	2020	
P1&4 No Continued Operations		Section 17								
P5-8 Originally Assumed Life										
P1&4 Life to Match Continued Ops		Section 17								
P5-8 Continued Ops										
Diff P1&4 Cont'd - P1&4 No Cont'd		Section 17								
Diff P5-8 Cont. Ops - P5-8 Orig. Life										
		Energy (TWh)								
		2013	2014	2015	2016	2017	2018	2019	2020	
P1&4 No Continued Operations		Section 17								
P5-8 Originally Assumed Life										
P1&4 Life to Match Continued Ops		Section 17								
P5-8 Continued Ops										
Diff P1&4 Cont'd - P1&4 No Cont'd		Section 17								
Diff P5-8 Cont. Ops - P5-8 Orig. Life										

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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Dec. 16, 2011

PICKERING CONTINUED OPERATIONS Assessment Data
 (later P7 Life Management and P5-8 Unit Operation of 247k EFPH to year-end 2020)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A& Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	Section 17							
Effect of on-going operation on Total OM&A & Capital								
OM&A Costs to enable Cont. Ops including FCLM project								
Fuel & Fuel Related Costs								

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance will be provided later.
3. EFPH: Effective Full Power Hours

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	Section 17							
Diff P5-8 Cont. Ops - P5-8 Orig. Life								

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

PNGS No Continued Operations with Early P7 Life Management

December 16, 2011

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5	Section 17																																			
P6																																				
P7																																				
P8																																				

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Scenario 3: No Cont Ops with P7 LM

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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PNGS Continued Operations with Pickering Units 5-8 Operating to 240k EFPH and Later P7 Life Management

December 16, 2011

Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Scenario 2: Cont Ops Mid 2020

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

-87

	2018				2019				2020			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to YE 2020 and Later P7 Life Management

December 16, 2011

NOS Continued Operations with Pickering Units 3&4 Operating to 24/7 EFPH to YE 2020 and Later P7 Line Management																																December 16, 2016					
Year		2012												2013												2014											
Month		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1		Section 17																																			
P4																																					
P5																																					
P6																																					
P7																																					
P8																																					

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

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PNGS Scenario 3: Cont Ops YE 2020

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

	2018				2019				2020			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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Printed at:
13/03/2014 2:18 PM

PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4 P5 - P8	Section 17							
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 240k EFPH Pressure Tube Life with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4 P5 - P8	Section 17							
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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LITIGATION

Dec. 20, 2011

3. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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From: Steve Chui
Sent: January-23-12 3:01 PM
To: Alan Leung
Subject: Darlington-Pickering-Bruce Outages 2011-2031 v3.xlsx
Attachments: Darlington-Pickering-Bruce Outages 2011-2031 v3.xlsx

Not Responsive

PICKERING - Outage Schedule in Days/Year																					
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
P1		86		78		78		85													
P4			80		79		87		76												
P5			86		100		73														
P6			115		73		73														
P7		107		100		67		73													
P8		97		84		73		123													

*Bruce with revised outage schedule. Pickering with OPG's Dec. 16 outage schedule
**Light red = refurbishments , Light gray = no outages

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Unit Name	Unit Size	Receive Point	Zone Name
E_PickeringA G1	515	PICK_A_GS-G1	IESO_TORONTO
E_PickeringA G1	515	PICK_A_GS-G1	IESO_TORONTO
E_PickeringA G1	515	PICK_A_GS-G1	IESO_TORONTO
E_PickeringA G1	515	PICK_A_GS-G1	IESO_TORONTO
E_PickeringA G4	515	PICK_A_GS-4	IESO_TORONTO
E_PickeringA G4	515	PICK_A_GS-4	IESO_TORONTO
E_PickeringA G4	515	PICK_A_GS-4	IESO_TORONTO
E_PickeringA G4	515	PICK_A_GS-4	IESO_TORONTO
E_PickeringA G4	515	PICK_A_GS-4	IESO_TORONTO
E_PickeringB G5	516	PICK_B_GS-5	IESO_TORONTO
E_PickeringB G5	516	PICK_B_GS-5	IESO_TORONTO
E_PickeringB G5	516	PICK_B_GS-5	IESO_TORONTO
E_PickeringB G5	516	PICK_B_GS-5	IESO_TORONTO
E_PickeringB G6	516	PICK_B_GS-6	IESO_TORONTO
E_PickeringB G6	516	PICK_B_GS-6	IESO_TORONTO
E_PickeringB G6	516	PICK_B_GS-6	IESO_TORONTO
E_PickeringB G6	516	PICK_B_GS-6	IESO_TORONTO
E_PickeringB G7 P1	516	PICK_B_GS-7	IESO_TORONTO
E_PickeringB G7 P1	516	PICK_B_GS-7	IESO_TORONTO
E_PickeringB G7 P1	516	PICK_B_GS-7	IESO_TORONTO
E_PickeringB G7 P1	516	PICK_B_GS-7	IESO_TORONTO
E_PickeringB G7 P1	516	PICK_B_GS-7	IESO_TORONTO
E_PickeringB G7 P1	516	PICK_B_GS-7	IESO_TORONTO
E_PickeringB G8 P1	516	PICK_B_GS-8	IESO_TORONTO
E_PickeringB G8 P1	516	PICK_B_GS-8	IESO_TORONTO
E_PickeringB G8 P1	516	PICK_B_GS-8	IESO_TORONTO
E_PickeringB G8 P1	516	PICK_B_GS-8	IESO_TORONTO

Company	Fuel Type	Start Date	End Date
Ontario Power Generation Inc	URA	September-26-12	December-09-12
Ontario Power Generation Inc	URA	October-15-16	December-28-16
Ontario Power Generation Inc	URA	September-01-18	October-30-18
Ontario Power Generation Inc	URA	October-01-14	December-12-14
Ontario Power Generation Inc	URA	September-01-17	November-09-17
Ontario Power Generation Inc	URA	October-16-13	December-19-13
Ontario Power Generation Inc	URA	September-15-19	October-14-19
Ontario Power Generation Inc	URA	September-02-15	November-04-15
Ontario Power Generation Inc	URA	September-21-11	December-10-11
Ontario Power Generation Inc	URA	February-07-11	May-30-11
Ontario Power Generation Inc	URA	March-18-13	June-03-13
Ontario Power Generation Inc	URA	February-23-15	May-11-15
Ontario Power Generation Inc	URA	April-01-17	May-24-17
Ontario Power Generation Inc	URA	September-05-11	December-19-11
Ontario Power Generation Inc	URA	September-02-13	December-19-13
Ontario Power Generation Inc	URA	October-05-15	November-23-15
Ontario Power Generation Inc	URA	September-15-17	November-05-17
Ontario Power Generation Inc	URA	September-03-12	December-31-12
Ontario Power Generation Inc	URA	February-06-18	April-16-18
Ontario Power Generation Inc	URA	December-18-13	December-31-13
Ontario Power Generation Inc	URA	January-01-14	October-30-14
Ontario Power Generation Inc	URA	January-01-13	July-03-13
Ontario Power Generation Inc	URA	September-15-16	November-12-16
Ontario Power Generation Inc	URA	April-01-16	May-27-16
Ontario Power Generation Inc	URA	February-24-14	May-16-14
Ontario Power Generation Inc	URA	February-01-18	May-05-18
Ontario Power Generation Inc	URA	February-06-12	May-12-12

	Duration	Year
PickeringA G1	74	2012
PickeringA G1	74	2016
PickeringA G1	59	2018
PickeringA G1	72	2014
PickeringA G4	69	2017
PickeringA G4	64	2013
PickeringA G4	29	2019
PickeringA G4	63	2015
PickeringA G4	80	2011
PickeringB G5	112	2011
PickeringB G5	77	2013
PickeringB G5	77	2015
PickeringB G5	53	2017
PickeringB G6	105	2011
PickeringB G6	108	2013
PickeringB G6	49	2015
PickeringB G6	51	2017
PickeringB G7 P1	119	2012
PickeringB G7 P1	69	2018
PickeringB G7 P1	13	2013
PickeringB G7 P1	302	2014
PickeringB G7 P1	183	2013
PickeringB G7 P1	58	2016
PickeringB G8 P1	56	2016
PickeringB G8 P1	81	2014
PickeringB G8 P1	93	2018
PickeringB G8 P1	96	2012

	2011	2012	2013
P1		86	
P4			80
P5			86
P6			115
P7		107	
P8		97	

PICKERING - Outage Schedule in Days/Year

2014	2015	2016	2017	2018	2019	2020	2021	2022
78		78		85				
	79		87		76			
	100		73					
	73		73					
100		67		73				
84		73		123				

2023	2024	2025	2026	2027	2028	2029	2030	2031

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

E_Pickering OPG	1.8 PICK_A_GS_G2	CHERRYWOOD	10/01/2001
E_Pickering OPG_R	1.8 PICK_A_GS_G2	CHERRYWOOD	10/01/2021
E_PickeringA G1	515 PICK_A_GS-G1	CHERRYWOOD	01/01/1971
E_PickeringA G4	515 PICK_A_GS-4	CHERRYWOOD	01/01/1971
E_PickeringB G5	516 PICK_B_GS-5	CHERRYWOOD	01/01/1982
E_PickeringB G6	516 PICK_B_GS-6	CHERRYWOOD	01/01/1982
E_PickeringB G7 P1	516 PICK_B_GS-7	CHERRYWOOD	01/01/1982
E_PickeringB G8 P1	516 PICK_B_GS-8	CHERRYWOOD	01/01/1982

Not Responsive

09/30/2021	Pickering OPG
09/30/2041	Pickering OPG_R
09/06/2020	PickeringA G1
09/06/2020	PickeringA G4
01/30/2019	PickeringB G5
08/26/2018	PickeringB G6
09/06/2020	PickeringB G7 P1
09/06/2020	PickeringB G8 P1

Simplified Pickering Continued Operations Study Model

Parameter	Value
Increase in Pickering Energy Production (Between 2016-2020)	91
% of Energy Increase that is PSE	44%
Gas Energy Production Displaced	51
Pickering Fuel Cost	\$6
Pickering Fixed Costs	\$50
Gas Fuel Cost	\$60
<i>Natural Gas Price</i>	\$6.35
<i>Heat Rate</i>	9,500
Gas Fixed Cost	\$3.50
Cost of Increased Pickering Energy Production	\$5.10
Savings in Displaced Gas Energy Production	\$3.25
Net System Benefit	-\$1.84

Note:

Units/Notes
TWh (91 TWh from OPG data)
(note: current assessment shows 44% of increase in nuclear energy is PSE)
TWh
/MWh (\$6/MWh based on OPG data)
/MWh (\$50/MWh based on OPG data)
/MWh
/MMBtu (\$6/MMBtu is the reference case forecast + Gas Basis)
Btu/kWh (the average heat rate of Ontario gas fleet between 2016-2020)
/MWh (from uplan/various sources)
Billion (real dollars, Not on NPV Basis) => Nuclear energy times fuel cost plus fixed cost
Billion (real dollars, Not on NPV Basis) => Gas energy times fuel cost plus fixed cost
Billion (real dollars, Not on NPV Basis)

"+" denote net savings

"-" denote net cost

From: Bashir Bhana
Sent: January-23-12 3:04 PM
To: Bob Gibbons; Victor Stein
Subject: Simple Pickering Model
Attachments: Simplified Pickering Study Model 01-23-2012 (BB).xlsx

Attached is a simple spreadsheet model for calculating the value of Pickering CO.

You can play around with the PSE and fuel costs and see how that affects the net benefit.

The default values are more or less consistent with the current detailed study.

Bashir

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Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

Simplified Pickering Continued Operations Study Model

Parameter	Value
Increase in Pickering Energy Production (Between 2016-2020)	91
% of Energy Increase that is PSE	44%
Gas Energy Production Displaced	51
Pickering Fuel Cost	\$6
Pickering Fixed Costs	\$50
Gas Fuel Cost	\$60
<i>Natural Gas Price</i>	\$6.35
<i>Heat Rate</i>	9,500
Gas Fixed Cost	\$3.50
Cost of Increased Pickering Energy Production	\$5.10
Savings in Displaced Gas Energy Production	\$3.25
Net System Benefit	-\$1.84

Note:

Units/Notes
TWh (91 TWh from OPG data)
(note: current assessment shows 44% of increase in nuclear energy is PSE)
TWh
/MWh (\$6/MWh based on OPG data)
/MWh (\$50/MWh based on OPG data)
/MWh
/MMBtu (\$6/MMBtu is the reference case forecast + Gas Basis)
Btu/kWh (the average heat rate of Ontario gas fleet between 2016-2020)
/MWh (from uplan/various sources)
Billion (real dollars, Not on NPV Basis) => Nuclear energy times fuel cost plus fixed cost
Billion (real dollars, Not on NPV Basis) => Gas energy times fuel cost plus fixed cost
Billion (real dollars, Not on NPV Basis)

"+" denote net savings

"-" denote net cost

Simplified Pickering Continued Operations Study Model

NPV Basis

Parameter	Value
Increase in Pickering Energy Production (Between 2016-2020)	75
% of Energy Increase that is PSE	47%
Gas Energy Production Displaced	40
Pickering Fuel Cost	\$6
Pickering Fixed Costs	\$52
Gas Fuel Cost	\$60
<i>Natural Gas Price</i>	\$6.35
<i>Heat Rate</i>	9,500
Capacity Credit	\$0.70
Cost of Increased Pickering Energy Production	\$4.39
Savings in Displaced Gas Energy Production	\$3.10
Net System Benefit	-\$1.29

Note:

Units/Notes
TWh (Source: OPG)
TWh
/MWh (Source: OPG)
/MWh (Source: OPG)
/MWh
/MMBtu (\$6/MMBtu is the reference case forecast + Gas Basis)
Btu/kWh (the average heat rate of Ontario gas fleet between 2016-2020)
Billion (real dollars)
Billion (real dollars) => Nuclear energy times fuel cost plus fixed cost
Billion (real dollars) => Gas energy times fuel cost plus fixed cost
Billion (real dollars)

"+" denote net savings

"-" denote net cost

Simplified Pickering Continued Operations Study Model**Not NPV Basis**

Parameter	Value
Increase in Pickering Energy Production (Between 2016-2020)	92
% of Energy Increase that is PSE	44%
Gas Energy Production Displaced	52
Pickering Fuel Cost	\$6
Pickering Fixed Costs	\$50
Gas Fuel Cost	\$60
<i>Natural Gas Price</i>	\$6.35
<i>Heat Rate</i>	<i>9,500</i>
Capacity Credit	\$0.75
Cost of Increased Pickering Energy Production	\$5.15
Savings in Displaced Gas Energy Production	\$3.86
Net System Benefit	-\$1.30

Note:

Units/Notes
TWh (Source: OPG)
TWh
/MWh (Source: OPG)
/MWh (Source: OPG)
/MWh
/MMBtu (\$6/MMBtu is the reference case forecast + Gas Basis)
Btu/kWh (the average heat rate of Ontario gas fleet between 2016-2020)
Billion (real dollars)
Billion (real dollars) => Nuclear energy times fuel cost plus fixed cost
Billion (real dollars) => Gas energy times fuel cost plus fixed cost
Billion (real dollars)

"+" denote net savings

"-" denote net cost

From: Bashir Bhana
Sent: January-24-12 9:47 AM
To: Bonnie Chan
Subject: Pickering Study

Hi Bonnie,

For the Pickering Study, would you be able to put together the following graphs?

1. Plot of peak demand forecasts – low, med, high (line graph)
2. Plot of energy demand forecasts – low, med, high (line graph)
3. Plot of resource mix (bar graph) broken out as follows. Show annual installed MW by calendar year.
 - Pickering continued ops increment (reference case)
 - Nuclear
 - Gas
 - Coal
 - Solar
 - Wind
 - Bio
 - Hydro
 - DR
 - (I think that's all?)

Thanks!
Bashir

Bashir Bhana
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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: January-24-12 9:57 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

Sure, I'm putting together some figures/tables for the Darlington report so I can do this as well.

Bonnie

From: Bashir Bhana
Sent: January 24, 2012 9:47 AM
To: Bonnie Chan
Subject: Pickering Study

Hi Bonnie,

For the Pickering Study, would you be able to put together the following graphs?

1. Plot of peak demand forecasts – low, med, high (line graph)
2. Plot of energy demand forecasts – low, med, high (line graph)
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 - (I think that's all?)

Thanks!

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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: January-24-12 10:24 AM
To: Bashir Bhana
Subject: RE: Pickering Study

For the following graphs, I will only plot from 2013 to 2020.

From: Bashir Bhana
Sent: January 24, 2012 9:47 AM
To: Bonnie Chan
Subject: Pickering Study

Hi Bonnie,

For the Pickering Study, would you be able to put together the following graphs?

1. Plot of peak demand forecasts – low, med, high (line graph)
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E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: January-24-12 11:36 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

You can find the following three graphs in the Pickering Case 1A Tally, in worksheet "Figures for Pickering Study" :
[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 (BC).xlsx)

Thanks,
Bonnie

From: Bashir Bhana
Sent: January 24, 2012 9:47 AM
To: Bonnie Chan
Subject: Pickering Study

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 - (I think that's all?)

Thanks!
Bashir

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T: 416-969-6263

E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: January-24-12 11:38 AM
To: Bonnie Chan
Subject: RE: Pickering Study

Thanks Bonnie !

Bashir Bhana
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Power System Planning
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To: Bashir Bhana
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From: JEFFERIES Kevan -CRPINVASTPLN <kevan.jefferies@opg.com>
Sent: February-01-12 11:27 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Section 15 & 17

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: February 1, 2012 10:03 AM
To: JEFFERIES Kevan -CRPINVASTPLN
Subject: Pickering Study

Hi Kevan,

I'm sorry about the delay in getting back to you.

Can you refresh my memory on what specifically you were looking for on Section 1...?

Bashir

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From: JEFFERIES Kevan -CRPINVASTPLN <kevan.jefferies@opg.com>
Sent: February-01-12 11:51 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Section 15 & 17

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: February 1, 2012 11:37 AM
To: JEFFERIES Kevan -CRPINVASTPLN
Subject: RE: Pickering Study

How do you intend to use these? Just for comparison purposes only or something else? Reason I ask is that these may change after we re-run the cases with the updated data you will be providing. If there's no urgency, could this wait till we have the updated results?

Bashir

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From: JEFFERIES Kevan -CRPINVASTPLN [<mailto:kevan.jefferies@opg.com>]
Sent: February 1, 2012 11:27 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Section 15 & 17

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: February 1, 2012 10:03 AM
To: JEFFERIES Kevan -CRPINVASTPLN
Subject: Pickering Study

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Bashir

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From: Bashir Bhana
Sent: February-01-12 11:53 AM
To: Bob Gibbons; Steve Chui
Cc: Victor Stein; Bonnie Chan
Subject: FW: Pickering Study

FYI, Let's discuss. - Bashir

From: JEFFERIES Kevan -CRPINVASTPLN [<mailto:kevan.jefferies@opg.com>]
Sent: February 1, 2012 11:51 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Section 15 & 17

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: February 1, 2012 11:37 AM
To: JEFFERIES Kevan -CRPINVASTPLN
Subject: RE: Pickering Study

How do you intend to use these? Just for comparison purposes only or something else? Reason I ask is that these may change after we re-run the cases with the updated data you will be providing. If there's no urgency, could this wait till we have the updated results?

Bashir

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E: Bashir.Bhana@powerauthority.on.ca

From: JEFFERIES Kevan -CRPINVASTPLN [<mailto:kevan.jefferies@opg.com>]
Sent: February 1, 2012 11:27 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Section 15 & 17

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]

Sent: February 1, 2012 10:03 AM

To: JEFFERIES Kevan -CRPINVASTPLN

Subject: Pickering Study

Hi Kevan,

I'm sorry about the delay in getting back to you.

Can you refresh my memory on what specifically you were looking for on Section 1...?

Bashir

Bashir Bhana
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From: Bashir Bhana
Sent: February-01-12 4:10 PM
To: 'JEFFERIES Kevan -CRPINVASTPLN'
Cc: Bob Gibbons; Steve Chui; Victor Stein; Bonnie Chan
Subject: RE: Pickering Study

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Kevan – as requested, here is the Section 15 & 17 for both Pickering cases. Please treat as preliminary and draft. These will be updated when we receive the updated cases from you.

Section 15 & 17

Let me know if you have any questions.

Bashir

Bashir Bhana
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Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: JEFFERIES Kevan -CRPINVASTPLN [mailto:kevan.jefferies@opg.com]
Sent: February 1, 2012 11:51 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Section 15 & 17

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: February 1, 2012 11:37 AM
To: JEFFERIES Kevan -CRPINVASTPLN
Subject: RE: Pickering Study

How do you intend to use these? Just for comparison purposes only or something else? Reason I ask is that these may change after we re-run the cases with the updated data you will be providing. If there's no urgency, could this wait till we have the updated results?

Bashir

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From: JEFFERIES Kevan -CRPINVASTPLN [<mailto:kevan.jefferies@opg.com>]
Sent: February 1, 2012 11:27 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Section 15 & 17

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: February 1, 2012 10:03 AM
To: JEFFERIES Kevan -CRPINVASTPLN
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From: Bashir Bhana
Sent: February-06-12 11:30 AM
To: Bonnie Chan
Subject: RE: Pickering Study

Heyy Bonnie,

If you have a few moments, would you be able to put together the following graphs?

1. A graph showing installed capacity of existing and committed resources only
2. A graph showing installed capacity of directed resources, unspecified resources, and Pickering continued ops increment

Same break out and time period as #3 below.

Thanks!

Bashir

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Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: January 24, 2012 11:36 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

You can find the following three graphs in the Pickering Case 1A Tally, in worksheet "Figures for Pickering Study" :
[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](#)

Thanks,
Bonnie

From: Bashir Bhana
Sent: January 24, 2012 9:47 AM
To: Bonnie Chan
Subject: Pickering Study

Hi Bonnie,

For the Pickering Study, would you be able to put together the following graphs?

1. Plot of peak demand forecasts – low, med, high (line graph)
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 - Pickering continued ops increment (reference case)
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Thanks!

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120 Adelaide Street West, Suite 1600
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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: February-08-12 11:09 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

You can find the following two graphs in installed capacity by calendar year in the Pickering Case 1A Tally, in worksheet "Figures for Pickering Study" :

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 (BC).xlsx)

As we suspected, the ratio between non-discretionary (existing and committee) and discretionary (Pickering continued ops increment, directed and other) resources is about 85% to 15%. The amount of discretionary resources is comprised of:

- Increment from Pickering continued ops
- Bruce and Darlington refurbishment
- Tbay and Atikokan Conversions
- Amount of unspecified gas that's required to meet reserve requirements
- Future procurements that do have contracts (future FIT, future CHP/CESOP, NUG renegotiations)
- Future Demand Response

Let me know if you need clarifications on the graphs.

Also, graph # 3 below had an error in calculating the total. I fixed it in this version, so please update your report accordingly.

Thanks,
Bonnie

From: Bashir Bhana
Sent: February 6, 2012 11:30 AM
To: Bonnie Chan
Subject: RE: Pickering Study

Heyy Bonnie,

If you have a few moments, would you be able to put together the following graphs?

1. A graph showing installed capacity of existing and committed resources only
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Same break out and time period as #3 below.

Thanks!
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Sent: January 24, 2012 11:36 AM
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 - (I think that's all?)

Thanks!
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Bashir Bhana

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120 Adelaide Street West, Suite 1600
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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: February-08-12 2:26 PM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

I put together a graph that shows the total resources by fuel type at the time of peak, and included in this graph is a line showing the annual peak & reserve.

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 (BC).xlsx)

The annual peak & reserve is a bit hard to see because we have so many colours. Anyways, take a look and let me know if you need anything else for your report.

Thanks,
Bonnie

From: Bonnie Chan
Sent: February 8, 2012 11:09 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

You can find the following two graphs in installed capacity by calendar year in the Pickering Case 1A Tally, in worksheet "Figures for Pickering Study" :

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 (BC).xlsx)

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Sent: February 6, 2012 11:30 AM
To: Bonnie Chan
Subject: RE: Pickering Study

Heyy Bonnie,

If you have a few moments, would you be able to put together the following graphs?

1. A graph showing installed capacity of existing and committed resources only
2. A graph showing installed capacity of directed resources, unspecified resources, and Pickering continued ops increment

Same break out and time period as #3 below.

Thanks!

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: January 24, 2012 11:36 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

You can find the following three graphs in the Pickering Case 1A Tally, in worksheet "Figures for Pickering Study" :
[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](#)

Thanks,
Bonnie

From: Bashir Bhana
Sent: January 24, 2012 9:47 AM
To: Bonnie Chan
Subject: Pickering Study

Hi Bonnie,

For the Pickering Study, would you be able to put together the following graphs?

1. Plot of peak demand forecasts – low, med, high (line graph)
2. Plot of energy demand forecasts – low, med, high (line graph)

3. Plot of resource mix (bar graph) broken out as follows. Show annual installed MW by calendar year.

- Pickering continued ops increment (reference case)
- Nuclear
- Gas
- Coal
- Solar
- Wind
- Bio
- Hydro
- DR
- (I think that's all?)

Thanks!

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: February-08-12 2:29 PM
To: Bonnie Chan
Subject: RE: Pickering Study

Thanks!

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bonnie Chan
Sent: February 8, 2012 2:26 PM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

I put together a graph that shows the total resources by fuel type at the time of peak, and included in this graph is a line showing the annual peak & reserve.

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 (BC).xlsx)

The annual peak & reserve is a bit hard to see because we have so many colours. Anyways, take a look and let me know if you need anything else for your report.

Thanks,
Bonnie

From: Bonnie Chan
Sent: February 8, 2012 11:09 AM
To: Bashir Bhana
Subject: RE: Pickering Study

Hi Bashir,

You can find the following two graphs in installed capacity by calendar year in the Pickering Case 1A Tally, in worksheet "Figures for Pickering Study" :

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2011-12-20 (BC).xlsx)

As we suspected, the ratio between non-discretionary (existing and committee) and discretionary (Pickering continued ops increment, directed and other) resources is about 85% to 15%. The amount of discretionary resources is comprised of:

- Increment from Pickering continued ops
- Bruce and Darlington refurbishment
- Tbay and Atikokan Conversions
- Amount of unspecified gas that's required to meet reserve requirements
- Future procurements that do have contracts (future FIT, future CHP/CESOP, NUG renegotiations)
- Future Demand Response

Let me know if you need clarifications on the graphs.

Also, graph # 3 below had an error in calculating the total. I fixed it in this version, so please update your report accordingly.

Thanks,
Bonnie

From: Bashir Bhana
Sent: February 6, 2012 11:30 AM
To: Bonnie Chan
Subject: RE: Pickering Study

Heyy Bonnie,

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Same break out and time period as #3 below.

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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

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Subject: RE: Pickering Study

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 - Nuclear
 - Gas
 - Coal
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 - Wind
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 - Hydro
 - DR
 - (I think that's all?)

Thanks!
Bashir

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Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bob Gibbons
Sent: February-24-12 8:34 AM
To: Steve Chui
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops_Feb 23 2012_Final Draft.xlsx

FYI

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [\[mailto:stephen.rogers@opg.com\]](mailto:stephen.rogers@opg.com)
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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PNGS No Continued Operations with Early P7 Life Management

February 23, 2012

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017													
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec		
P1	<div>Section 17</div>																																					
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P8																																						

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PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
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PB Outage	PA Outage	Off the Grid
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PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

February 23, 2012

N80s Continued Operations with Pickering Units 3-8 Operating to 247K EFPH to Year End 2020 and Later P7 Life Management																																				February 23, 2019											
Year 2012																		Year 2013																		Year 2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec											
P1	<div>Section 17</div>																																														
P4																																															
P5																																															
P6																																															
P7																																															
P8																																															

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

Year	2018										2019										2020																	
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec		
P1																																						
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P6	Section 17																																					
P7																																						
P8																																						

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Section 17

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

			2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
Difference: Continued Operations - No Continued Operations										
Total OM&A & Capital			56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital			18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project			38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs			8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

23-Feb-12

TIGATION

TIGATION

From: Bob Gibbons
Sent: February-24-12 8:35 AM
To: Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 23 2012_Final Draft.xlsx

FYI

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

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As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

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We look forward to receiving the results of your analysis as early as possible.

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Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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PNGS No Continued Operations with Early P7 Life Management

February 23, 2012

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
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P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
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P8																																				

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PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

February 23, 2012

[illegible]

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Section 17

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

Section 17: Operating Costs (m\$ per year)		2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management									
Total OM&A & Capital	Section 17								
Fuel & Fuel Related Costs									
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management									
Total OM&A & Capital	Section 17								
Fuel & Fuel Related Costs									
Difference: Continued Operations - No Continued Operations									
Total OM&A & Capital	56	98	282	764	878	889	821	575	
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575	
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0	
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93	

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	
Pickering A	
Pickering A +B Total	

Section 17

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	

Section 17

23-Feb-12

TIGATION

TIGATION

From: Bashir Bhana
Sent: February-24-12 8:53 AM
To: Victor Stein; Steve Chui; Bonnie Chan
Cc: Bob Gibbons
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 23 2012_Final Draft.xlsx

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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PNGS No Continued Operations with Early P7 Life Management

February 23, 2012

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
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PB Outage	PA Outage	Off the Grid
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Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates

	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

	2018				2019				2020			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

Section 17: Operating Costs (m\$/y)			2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management										
Total OM&A & Capital	Section 17									
Fuel & Fuel Related Costs										
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management										
Total OM&A & Capital	Section 17									
Fuel & Fuel Related Costs										
Difference: Continued Operations - No Continued Operations										
Total OM&A & Capital	56	98	282	764	878	889	821	575		
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575		
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0		
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93		

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

23-Feb-12

TIGATION

TIGATION

From: Victor Stein
Sent: February-24-12 11:12 AM
To: Bob Gibbons
Cc: Steve Chui; Bashir Bhana
Subject: RE: Response to OPA/OPG meeting on OEB Support

Bob, We need to talk about the assumptions re OPA vs OPG sensitivities, probabilities, etc. Can we meet soon?
V.

-----Original Message-----

From: Bob Gibbons
Sent: February 24, 2012 10:57 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bashir Bhana; Steve Chui; Bonnie Chan; BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR; Nancy Marconi
Subject: RE: Response to OPA/OPG meeting on OEB Support

Stephen,

Thank-you for providing updated information regarding Pickering Continued Operation.

As we have agreed, our target date for producing a first draft of both the Pickering and Not Responsive assessment reports is mid-March and our target date for producing final reports is the end of March. You will appreciate that any further substantial changes in information at this point may jeopardize our ability to meet these dates.

Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

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In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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it is strictly prohibited. If you have received this message in error, or are not the named recipient(s), please notify the
sender immediately and delete this e-mail message.

From: Bob Gibbons
Sent: February-24-12 11:12 AM
To: Victor Stein
Cc: Steve Chui; Bashir Bhana
Subject: RE: Response to OPA/OPG meeting on OEB Support

Are you free now??

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: Victor Stein
Sent: February 24, 2012 11:12 AM
To: Bob Gibbons
Cc: Steve Chui; Bashir Bhana
Subject: RE: Response to OPA/OPG meeting on OEB Support

Bob, We need to talk about the assumptions re OPA vs OPG sensitivities, probabilities, etc. Can we meet soon?
V.

-----Original Message-----

From: Bob Gibbons
Sent: February 24, 2012 10:57 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bashir Bhana; Steve Chui; Bonnie Chan; BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR; Nancy Marconi
Subject: RE: Response to OPA/OPG meeting on OEB Support

Stephen,

Thank-you for providing updated information regarding Pickering Continued Operation.

As we have agreed, our target date for producing a first draft of both the Pickering and Not Responsive assessment reports is mid-March and our target date for producing final reports is the end of March. You will appreciate that any further substantial changes in information at this point may jeopardize our ability to meet these dates.

Regards,

Bob Gibbons

Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

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Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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From: Bashir Bhana
Sent: February-24-12 1:57 PM
To: Bob Gibbons; Bonnie Chan; Steve Chui; Victor Stein
Subject: Pickering Study - Case Summary
Attachments: March 2012 Pickering Study - Case Summary 02-24-2012 (BB).xlsx

Updated case tracking sheet attached. Also [here](#). Will bring copies at 3.

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

March 2012 Pickering Continued Operations Study - Case Summary

Case Description		Case ID	Pickering	
			Availability	Performance
Reference Case		1 A	ER	per OPG
		1 B	CO (247K)	per OPG
Sensitivities	Lower Demand	2 A	ER	per OPG
		2 B	CO (247K)	per OPG
	Higher Demand	3 A	ER	per OPG
		3 B	CO (247K)	per OPG
	Lower Natural Gas Prices	4 A	ER	per OPG
		4 B	CO (247K)	per OPG
	Higher Natural Gas Prices	5 A	ER	per OPG
		5 B	CO (247K)	per OPG
	Carbon Price	6 A	ER	per OPG
		6 B	CO (247K)	per OPG
	Lower Pickering Production	7 A		
		7 B	CO (247K)	Worst 5 year Average ACF
	Higher Pickering Production	8 A		
		8 B	CO (247K)	Best 5 year Average ACF
	Shorter CO Period (from 247K)	9 A		
		9 B	CO (247K)	50% of planned duration
	Lower OMA Costs	10 A	ER	per OPG
		10 B	CO (247K)	per OPG
	Higher OMA Costs	11 A	ER	per OPG
		11 B	CO (247K)	per OPG
	Low Demand and Low Natural Gas Prices	12 A	ER	per OPG
		12 B	CO (247K)	per OPG
	High Demand, High Natural Gas Prices, and Carbon Price	13 A	ER	per OPG
		13 B	CO (247K)	per OPG

ER => Early Retirement, with P7 LM

CO (247K) => Continued Operation at 247 K EFPH, with P7 LM

Assumptions:

Study Period

- Jan 1 2013 to Dec 31 2020

Pickering Performance

- Per OPG Feb 23, 2012 email. Assume this represents
- low/high production based on historic 5-year average

Pickering OM&A Costs

- Per OPG Feb 23, 2012 email. Assume this represents
- low/high assume (-10%/+20%) of OPG costs

Gas Price Forecast

- Low = \$4/MMBTU, Medium = \$5.50/MMBTU, High =

Other System Assumptions

- Resource mix consistent with IPSP 2
- Darlington refurbishment as per OPG Dec 14th, 2011
- Supply gap in the mid term will be filled with gas (no

OM&A Costs	Demand Forecast	Natural Gas Price Forecast	Carbon Cost Forecast	Requires UPLAN Run?	Requires New Tally?
per OPG	Medium	\$5.50/MMBtu	None	Yes	Yes
per OPG	Medium	\$5.50/MMBtu	None	Yes	Yes
per OPG	Low	\$5.50/MMBtu	None	Yes	Yes
per OPG	Low	\$5.50/MMBtu	None	Yes	Yes
per OPG	High	\$5.50/MMBtu	None	Yes	Yes
per OPG	High	\$5.50/MMBtu	None	Yes	Yes
per OPG	Medium	\$4/MMBtu	None	Yes	No
per OPG	Medium	\$4/MMBtu	None	Yes	No
per OPG	Medium	\$12/MMBtu	None	Yes	No
per OPG	Medium	\$12/MMBtu	None	Yes	No
per OPG	Medium	\$5.50/MMBtu	Starting in 2015	Yes	No
per OPG	Medium	\$5.50/MMBtu	Starting in 2015	Yes	No
Same as 1A				No	No
per OPG	Medium	\$5.50/MMBtu	None	Yes	No
Same as 1A				No	No
per OPG	Medium	\$5.50/MMBtu	None	Yes	No
Same as 1A				No	No
per OPG	Medium	\$5.50/MMBtu	None	Yes	Yes
Lower by 10%	Medium	\$5.50/MMBtu	None	No	No
Lower by 10%	Medium	\$5.50/MMBtu	None	No	No
Higher by 20%	Medium	\$5.50/MMBtu	None	No	No
Higher by 20%	Medium	\$5.50/MMBtu	None	No	No
per OPG	Low	\$4/MMBtu	None	Yes	No
per OPG	Low	\$4/MMBtu	None	Yes	No
per OPG	High	\$12/MMBtu	Starting in 2015	Yes	No
per OPG	High	\$12/MMBtu	Starting in 2015	Yes	No

Pickering Availability

- Early retirement (210K) and continued operation (247K)
- outage dates and EOL dates per OPG Feb 23, 2012 en

a "Medium" case
as ACF

Demand

- Low/Medium/High consistent with IPSP2/LTEP

a "Medium" case

Carbon Cost Forecast

- \$0/tonne in reference case
- sensitivity case assumes 2015 - \$15/tonne; increasing

\$12/MMBTU (all at Dawn)

email

limit on block size) and modelled as a swing generator

Priority	UPLAN Completed?	Tally Completed?
Highest		
Highest		
High		
High		
Medium		
Medium		
High		
High		
Medium		
Medium		
High		
High		
Medium		
Medium		
Medium		
Medium		
Medium		
Medium		
Medium		
Medium		
Medium		
Medium		
Medium		
Lowest		
Lowest		
Lowest		
Lowest		

7K) cases per OPG Feb 23, 2012 email.
 nail

by \$3/tonne to \$30/tonne in 2020 (Based on discussion with Resource Integration II)

From: Bonnie Chan
Sent: February-24-12 4:19 PM
To: Wajiha Shoaib
Subject: FW: Response to OPA/OPG meeting on OEB Support

Hi Wajiha,

Not Responsive

), but because we just received updated information from Stephen Rogers re: Pickering assumptions yesterday, we may not be able to meet that deadline.

As a result, we are aiming to get a first draft of both the Pickering and Not Responsive report by mid-March, and the final reports by end of March.

Hope this helps!

Bonnie

-----Original Message-----

From: Bob Gibbons
Sent: February 24, 2012 10:57 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bashir Bhana; Steve Chui; Bonnie Chan; BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR; Nancy Marconi
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Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]

Sent: February 23, 2012 5:13 PM

To: Bob Gibbons; Bashir Bhana

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR

Subject: Response to OPA/OPG meeting on OEB Support

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Regards,

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Corporate Investment & Asset Planning
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Ph: (416) 592-3993

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From: Bonnie Chan
Sent: February-27-12 11:08 AM
To: Bob Gibbons; Bashir Bhana; Victor Stein; Steve Chui
Subject: Pickering Tally Cases 2A and 2B - Updated Schedules

Pickering Case 2A Low Demand, Early Retirement and Case 2B Low Demand, Continued Operation are now available. They are derived from Case 1A and 1B from this morning.

Case 2A: Lo Demand, ER

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2A. ER. P7LM. Med Performance. Lo Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2A. ER. P7LM. Med Performance. Lo Demand. 2012-02-27 (BC).xlsx)

As compared to the Dec Case 2A Tally, there is no change except:

- Unit 6 end of life is now May 9, 2014, changed from May 13, 2014.

Case 2B: Lo Demand, CO

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2B. CO. P7LM. Med Performance. Lo Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2B. CO. P7LM. Med Performance. Lo Demand. 2012-02-27 (BC).xlsx)

As compared to the Dec Case 2B Tally:

- 2017 has more capacity surplus with Unit 7 being available at peak due to the LM outage schedule shifted from the summer 2017 to winter 2016.
- 2018 has more capacity surplus with Unit 6 being available due to the change from 240k to 247k.
- 2019 is now a year of capacity surplus with Unit 5 being available due to the change from 240k to 247k.
- 2020 has less capacity deficit with Units 1, 4, 7, and 8 being available due to the change from 240k to 247k.

Thanks,
Bonnie

From: Bonnie Chan
Sent: February 27, 2012 10:16 AM
To: Bob Gibbons; Bashir Bhana; Victor Stein; Steve Chui
Subject: Pickering Tally Cases - Updated Schedules

Hello,

Please see below for the updated March Tally reference cases for the Pickering early retirement (ER) and continued operation (CO) @ 247k.

Reference Case 1A: ER

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2012-02-27 (BC).xlsx)

There was no change in Case 1A as compared to the Dec schedule except for Unit 6 end of life is now May 9, 2014, changed from May 13, 2014.

Reference Case 1B: CO

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 1B. CO. P7LM. Med Performance. Med Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 1B. CO. P7LM. Med Performance. Med Demand. 2012-02-27 (BC).xlsx)

Case 1B provides more capacity in 2017 due to a shift in Unit 7's LM outage schedule from summer 2017 (Dec schedule) to winter of 2016 (Feb Schedule), and more capacity in 2018 – 2020 due to changing from 240k to 247k EFPHs.

The sensitivity cases will soon follow.

Thanks,

Bonnie Chan | Planner, Power System Planning

Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1

T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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From: Bonnie Chan
Sent: February-27-12 12:04 PM
To: Bob Gibbons; Bashir Bhana; Victor Stein; Steve Chui
Subject: Pickering Tally Cases 3A and 3B - Updated Schedules

Pickering Case 3A High Demand, Early Retirement and Case 3B High Demand, Continued Operation are now available.

Case 3A is derived from Case 1A from this morning, and any changes are tracked by revision #15. Case 3B is derived from Case 1B from this morning, and any changes are tracked by revision #16.

Case 3A: High Demand, ER

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 3A. ER. P7LM. Med Performance. Hi Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 3A. ER. P7LM. Med Performance. Hi Demand. 2012-02-27 (BC).xlsx)

As compared to the Dec Case 3A Tally, there is no change except:

- Unit 6 end of life is now May 9, 2014, changed from May 13, 2014.

Case 3B: High Demand, CO

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 3B. CO. P7LM. Med Performance. Hi Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 3B. CO. P7LM. Med Performance. Hi Demand. 2012-02-27 (BC).xlsx)

As compared to the Dec Case 3B Tally:

- 2017 is now a year of capacity surplus with Unit 7 being available at peak due to the LM outage schedule shifted from the summer 2017 to winter 2016.
- 2018 has less capacity deficit with Unit 6 being available due to the change from 240k to 247k.
- 2019 has less capacity deficit with Unit 5 being available due to the change from 240k to 247k.
- 2020 has less capacity deficit with Units 1, 4, 7, and 8 being available due to the change from 240k to 247k.

Thanks,
Bonnie

From: Bonnie Chan
Sent: February 27, 2012 11:08 AM
To: Bob Gibbons; Bashir Bhana; Victor Stein; Steve Chui
Subject: Pickering Tally Cases 2A and 2B - Updated Schedules

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Case 2A: Lo Demand, ER

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2A. ER. P7LM. Med Performance. Lo Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2A. ER. P7LM. Med Performance. Lo Demand. 2012-02-27 (BC).xlsx)

As compared to the Dec Case 2A Tally, there is no change except:

- Unit 6 end of life is now May 9, 2014, changed from May 13, 2014.

Case 2B: Lo Demand, CO

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2B. CO. P7LM. Med Performance. Lo Demand. 2012-02-27 \(BC\).xlsx](S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 2B. CO. P7LM. Med Performance. Lo Demand. 2012-02-27 (BC).xlsx)

As compared to the Dec Case 2B Tally:

- 2017 has more capacity surplus with Unit 7 being available at peak due to the LM outage schedule shifted from the summer 2017 to winter 2016.
- 2018 has more capacity surplus with Unit 6 being available due to the change from 240k to 247k.
- 2019 is now a year of capacity surplus with Unit 5 being available due to the change from 240k to 247k.
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From: Bonnie Chan
Sent: February 27, 2012 10:16 AM
To: Bob Gibbons; Bashir Bhana; Victor Stein; Steve Chui
Subject: Pickering Tally Cases - Updated Schedules

Hello,

Please see below for the updated March Tally reference cases for the Pickering early retirement (ER) and continued operation (CO) @ 247k.

Reference Case 1A: ER

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 1A. ER. P7LM. Med Performance. Med Demand. 2012-02-27 \(BC\).xlsx](#)

There was no change in Case 1A as compared to the Dec schedule except for Unit 6 end of life is now May 9, 2014, changed from May 13, 2014.

Reference Case 1B: CO

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Tally\Case 1B. CO. P7LM. Med Performance. Med Demand. 2012-02-27 \(BC\).xlsx](#)

Case 1B provides more capacity in 2017 due to a shift in Unit 7's LM outage schedule from summer 2017 (Dec schedule) to winter of 2016 (Feb Schedule), and more capacity in 2018 – 2020 due to changing from 240k to 247k EFPHs.

The sensitivity cases will soon follow.

Thanks,

Bonnie Chan | Planner, Power System Planning
 Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1
 T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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From: Bashir Bhana
Sent: February-27-12 1:52 PM
To: 'ROGERS Stephen -CRPINVASTPLN'
Cc: Bob Gibbons; Bonnie Chan; Steve Chui
Subject: RE: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops_Feb 23 2012_Final Draft.xlsx

Hi Stephen,

Could you please confirm the P7 LM outage dates for the 247K case? There appears to be inconsistencies between the schedules presented in Tabs 2 and 2a.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back

various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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February 23, 2012

Year	2015											2016											2017															
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec		
P1																																						
P4																																						
P5																																						
P6	Section 17																																					
P7																																						
P8																																						

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

Section 17 - Operating Costs (in \$m)		2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management									
Total OM&A & Capital	Section 17								
Fuel & Fuel Related Costs									
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management									
Total OM&A & Capital	Section 17								
Fuel & Fuel Related Costs									
Difference: Continued Operations - No Continued Operations									
Total OM&A & Capital	56	98	282	764	878	889	821	575	
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575	
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0	
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93	

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	
Pickering A	
Pickering A +B Total	

Section 17

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	

Section 17

23-Feb-12

TIGATION

TIGATION

From: Bashir Bhana
Sent: February-27-12 1:52 PM
To: 'ROGERS Stephen -CRPINVASTPLN'
Cc: Bob Gibbons; Bonnie Chan; Steve Chui
Subject: RE: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops_Feb 23 2012_Final Draft.xlsx

Hi Stephen,

Could you please confirm the P7 LM outage dates for the 247K case? There appears to be inconsistencies between the schedules presented in Tabs 2 and 2a.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

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Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

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In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

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Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

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Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

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Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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February 23, 2012

Section 17Section 17

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
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PB Outage	PA Outage	Off the Grid
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Section 17Section 17Section 17

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
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	Capability Factor Including Impact of Life Mgmt Days (%)							
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P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

23-Feb-12

TIGATION

TIGATION

From: ROGERS Stephen -CRPINVASTPLN <stephen.rogers@opg.com>
Sent: February-27-12 2:23 PM
To: Bashir Bhana
Cc: Bob Gibbons; Steve Chui; Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops_Feb 23 2012_Final Draft.xlsx

Bashir,

Thanks for catching the typo in Tab 2a. The schematic in Tab 2 was correct for the 2016 P7 LM outage. The dates in Tab 2a were typed in incorrectly and have been corrected in this version (cells G25, H25) and shaded in orange. I apologize for the inconvenience.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

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Sent: Monday, February 27, 2012 1:52 PM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Bonnie Chan; Steve Chui
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Could you please confirm the P7 LM outage dates for the 247K case? There appears to be inconsistencies between the schedules presented in Tabs 2 and 2a.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]

Sent: February 23, 2012 5:13 PM

To: Bob Gibbons; Bashir Bhana

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR

Subject: Response to OPA/OPG meeting on OEB Support

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Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

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Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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PNGS No Continued Operations with Early P7 Life Management

February 23, 2012

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
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PB Outage	PA Outage	Off the Grid
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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Section 17

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
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	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
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P6								
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P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
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	Capability Factor Including Impact of Life Mgmt Days (%)							
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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

23-Feb-12

TIGATION

TIGATION

From: Bashir Bhana
Sent: February-27-12 2:54 PM
To: 'ROGERS Stephen -CRPINVASTPLN'
Subject: RE: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 23 2012_Final Draft.xlsx

Hi Stephen - I just left a message on your machine. Just spotted a similar issue with the LM dates between tab 1 and 1a (the 210K case). Could you please confirm. Thanks.

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

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From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 27, 2012 2:23 PM
To: Bashir Bhana
Cc: Bob Gibbons; Steve Chui; Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support

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Corporate Investment & Asset Planning
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Ph: (416) 592-3993

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Subject: Response to OPA/OPG meeting on OEB Support

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PNGS No Continued Operations with Early P7 Life Management

February 23, 2012

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
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PNGS No Continued Operations with Early P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
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PB Outage	PA Outage	Off the Grid
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Year	2012												2013												2014																																														
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec																																			
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Section 17																																																																							

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
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P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

Section 17: Operating Costs (in \$m)			2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
Difference: Continued Operations - No Continued Operations										
Total OM&A & Capital			56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital			18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project			38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs			8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
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P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

23-Feb-12

TIGATION

TIGATION

From: ROGERS Stephen -CRPINVASTPLN <stephen.rogers@opg.com>
Sent: February-28-12 11:58 AM
To: Bashir Bhana
Cc: Bob Gibbons; Steve Chui; Bonnie Chan
Subject: RE: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 27 2012_Draft.xlsx

Bashir,

Thanks for reviewing the file in detail. The minor discrepancies that you have detected have been corrected in the updated file attached, dated Feb 27. These changes are as follows:

1. Tab 1 (210k EFPH case): [REDACTED] *Section 17*

2. Tab 2a (247k case): [REDACTED] *Section 17*

Please note that the schematics in Tabs 1 and 2 are cannot be used to mimic the exact timing of the planned outages, as the resolution is only to the nearest one-half of a month. This is why we have provided the corresponding outage start and end dates in Tabs 1a and 2a for your use. The schematics are intended as a visual aid to see how all of the outages align.

Also, to expedite the analysis, if there are minor any further discrepancies between the schematics, the outage dates and the data provided in Tabs 3 and 4 in the attached file, please consider the data in Tabs 3 & 4 as over-riding any other data.

Please call if there are further questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

From: Bashir Bhana [mailto:Bashir.Bhana@powerauthority.on.ca]
Sent: Monday, February 27, 2012 2:54 PM
To: ROGERS Stephen -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen - I just left a message on your machine. Just spotted a similar issue with the LM dates between tab 1 and 1a (the 210K case). Could you please confirm. Thanks.

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

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Subject: FW: Response to OPA/OPG meeting on OEB Support

Bashir,

Thanks for catching the typo in Tab 2a. The schematic in Tab 2 was correct for the 2016 P7 LM outage. The dates in Tab 2a were typed in incorrectly and have been corrected in this version (cells G25, H25) and shaded in orange. I apologize for the inconvenience.

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From: Bashir Bhana [mailto:Bashir.Bhana@powerauthority.on.ca]
Sent: Monday, February 27, 2012 1:52 PM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Bonnie Chan; Steve Chui
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Could you please confirm the P7 LM outage dates for the 247K case? There appears to be inconsistencies between the schedules presented in Tabs 2 and 2a.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600

Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case(assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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If you have received this message in error, or are not the named recipient(s), please notify the sender immediately and delete this e-mail message.

PNGS No Continued Operations with Early P7 Life Management

February 27, 2012

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

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PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
------------------	------------

PB Outage	PA Outage	Off the Grid
-----------	-----------	--------------

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February 23, 2012

Section 17

Section 1

Section 17

Section 17

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	<i>Section 17</i>							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	<i>Section 17</i>							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	<i>Section 17</i>							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	<i>Section 17</i>							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	<i>Section 17</i>							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	<i>Section 17</i>							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	<i>Section 17</i>							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	<i>Section 17</i>							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
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P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
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LITIGATION

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	
Pickering A	
Pickering A +B Total	Section 17

Pickering B	Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.
Pickering A	Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)
Pickering A + B Total	Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

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From: Bashir Bhana
Sent: February-28-12 12:06 PM
To: Victor Stein
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 27 2012_Draft.xlsx

fyi

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
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E: Bashir.Bhana@powerauthority.on.ca

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Corporate Investment & Asset Planning
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Ph: (416) 592-3993

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Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Could you please confirm the P7 LM outage dates for the 247K case? There appears to be inconsistencies between the schedules presented in Tabs 2 and 2a.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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PNGS No Continued Operations with Early P7 Life Management

February 27, 2012

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017													
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec		
P1	<div>Section 17</div>																																					
P4																																						
P5																																						
P6																																						
P7																																						
P8																																						

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PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1		98			n/a	n/a	n/a	n/a
P4	<i>Section 17</i>							
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B	Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.
Pickering A	Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)
Pickering A + B Total	Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

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From: Bonnie Chan
Sent: February-28-12 3:34 PM
To: Steve Chui; Bashir Bhana
Cc: Bob Gibbons; Victor Stein
Subject: Pickering Sensitivity Assumptions - Case 7B, 8B, 9B

Hi Steve,

I have put together the appropriate information that would be required to run the UPLAN simulations for Case 7B (CO with Lower Pickering Production), Case 8B (CO with Higher Pickering Production), and Case 9B (CO with Shorter Continued Operation Period from 247K).

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Sensitivity Analysis Assumptions\Pickering Historical ACF w POF and EFOR 02-27-2012 \(BBBC\).xlsx](#)

Case 7B (CO with Lower Pickering Production) and Case 8B (CO with Higher Pickering Production)

Refer to the worksheet "Lo&Hi Production PO, EFOR" which contains the ACF (%), planned outage days, POF (%), EFOR (%), and the expected energy (TWh) for the lower and higher than expected production at Pickering.

Refer to the worksheet "PO Dates" which contain the planned outage dates that should be used to simulate the lower and higher than expected production cases.

Case 7B (lower production) has the same PO schedule as the Case 1B (reference case). To achieve a lower ACF, the EFOR was increased.

To achieve a higher ACF for Case 8B (higher production), the EFOR was reduced up to the 4.2%, which represent the smallest EFOR for Pickering B units. The PO were then shortened as required to achieve a higher ACF.

Case 9B (CO with Shorter Continued Operation Period from 247K)

Refer to worksheet "Pickering Shorter CO Period" which contains the EOL dates for the shorter CO period. The EFORs in Case 9B will be the same as Case 1B.

Please let me know if there are any questions.

Thanks,

Bonnie Chan | Planner, Power System Planning

Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1

T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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From: Bonnie Chan
Sent: February-28-12 3:34 PM
To: Steve Chui; Bashir Bhana
Cc: Bob Gibbons; Victor Stein
Subject: Pickering Sensitivity Assumptions - Case 7B, 8B, 9B

Hi Steve,

I have put together the appropriate information that would be required to run the UPLAN simulations for Case 7B (CO with Lower Pickering Production), Case 8B (CO with Higher Pickering Production), and Case 9B (CO with Shorter Continued Operation Period from 247K).

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Analysis March 2012\Sensitivity Analysis Assumptions\Pickering Historical ACF w POF and EFOR 02-27-2012 \(BBBC\).xlsx](#)

Case 7B (CO with Lower Pickering Production) and Case 8B (CO with Higher Pickering Production)

Refer to the worksheet "Lo&Hi Production PO, EFOR" which contains the ACF (%), planned outage days, POF (%), EFOR (%), and the expected energy (TWh) for the lower and higher than expected production at Pickering.

Refer to the worksheet "PO Dates" which contain the planned outage dates that should be used to simulate the lower and higher than expected production cases.

Case 7B (lower production) has the same PO schedule as the Case 1B (reference case). To achieve a lower ACF, the EFOR was increased.

To achieve a higher ACF for Case 8B (higher production), the EFOR was reduced up to the 4.2%, which represent the smallest EFOR for Pickering B units. The PO were then shortened as required to achieve a higher ACF.

Case 9B (CO with Shorter Continued Operation Period from 247K)

Refer to worksheet "Pickering Shorter CO Period" which contains the EOL dates for the shorter CO period. The EFORs in Case 9B will be the same as Case 1B.

Please let me know if there are any questions.

Thanks,

Bonnie Chan | Planner, Power System Planning

Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1

T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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From: Chuck Farmer
Sent: February-29-12 4:00 PM
To: Bonnie Chan; Angelina Tan; Charlene de Boer; Mike Zajmalowski
Cc: Clare Hudson
Subject: RE: Is this the Planning Outlook BOD Deck?
Attachments: Overview Presentation to MacMaster Engineering February 13 2012.pptx

I think it may be a bit of a merger of this deck and the decks used for IPSP consultation, a deck I used recently is attached.

I will start a blank deck and we can fill it in, using existing slides is always good

Chuck Farmer

From: Bonnie Chan
Sent: February 29, 2012 3:57 PM
To: Chuck Farmer; Angelina Tan; Charlene de Boer; Mike Zajmalowski
Cc: Clare Hudson
Subject: Is this the Planning Outlook BOD Deck?

Hi Chuck,

I was able to locate a Nov 2011 Planning Outlook Presentation to the Board of Directors.
<http://intranet/projects/PSPPresentation/Conferences/Planning%20Outlook.ppt>

Was this the last planning deck they've seen?

If so, I can make a copy of this deck and rename it for us to work on the April Presentation.

Bonnie Chan | Planner, Power System Planning
Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1
T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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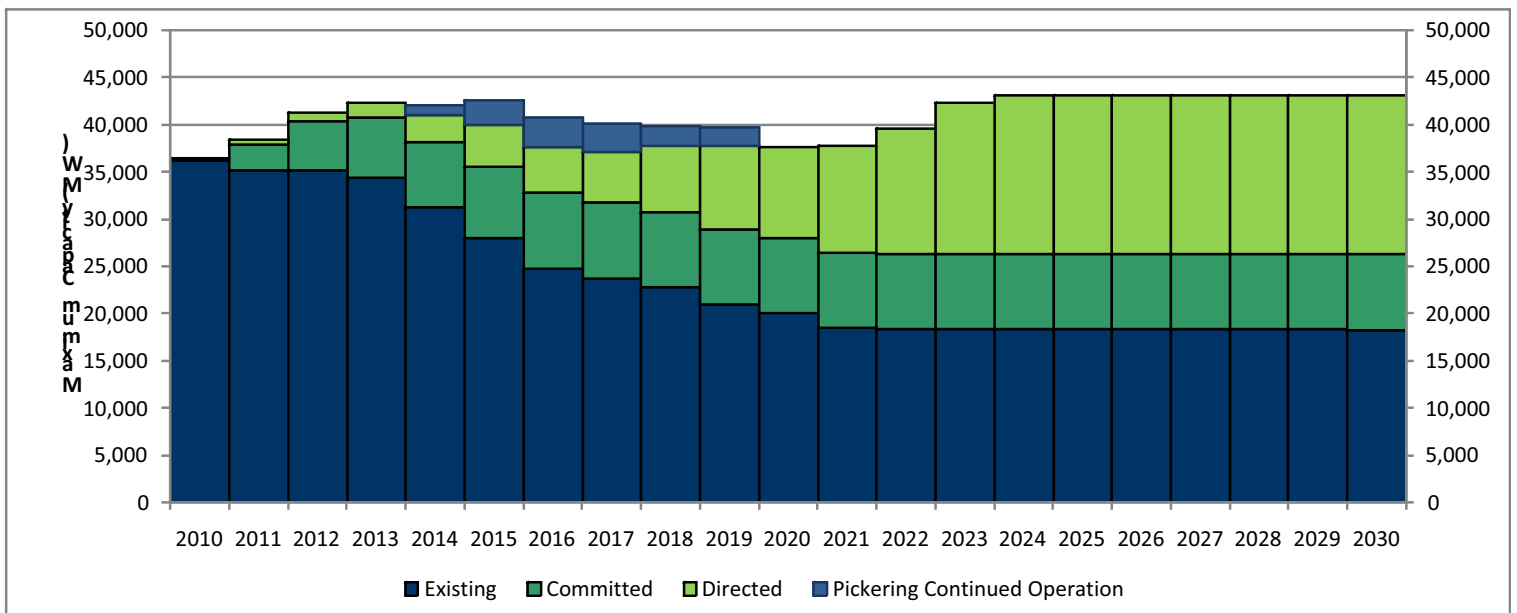
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More Generation is Committed and Directed



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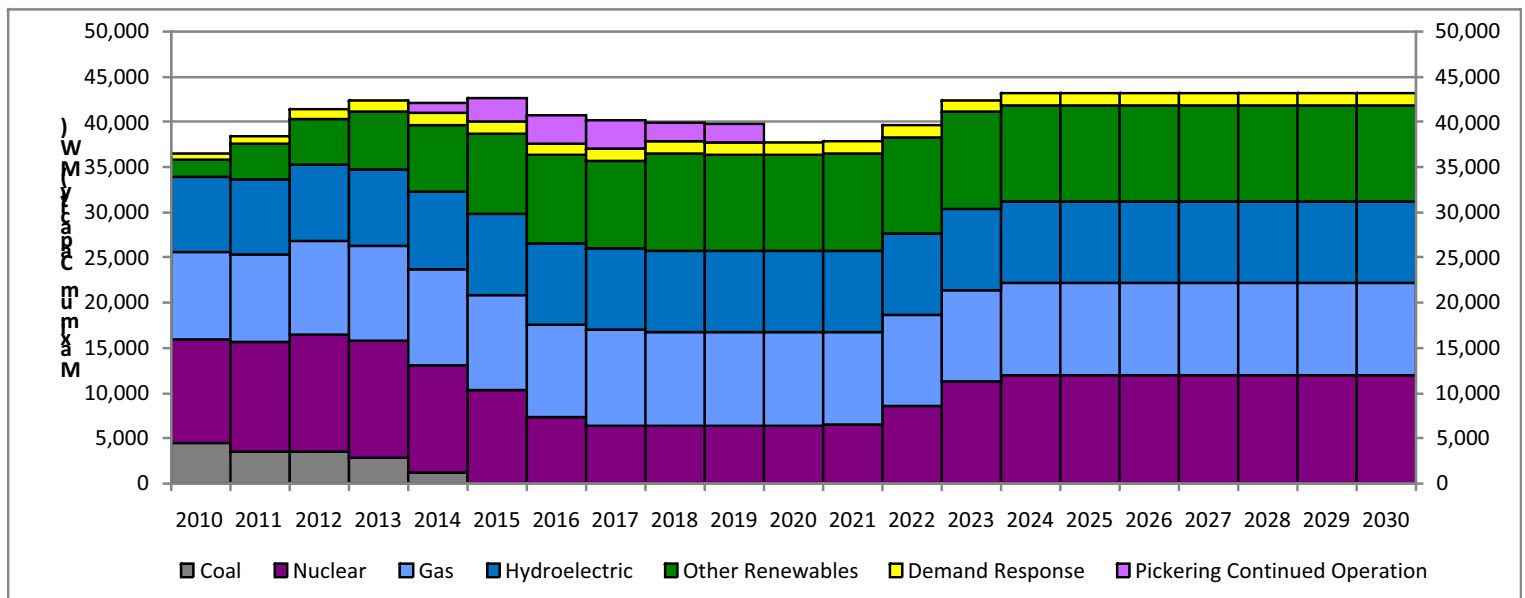
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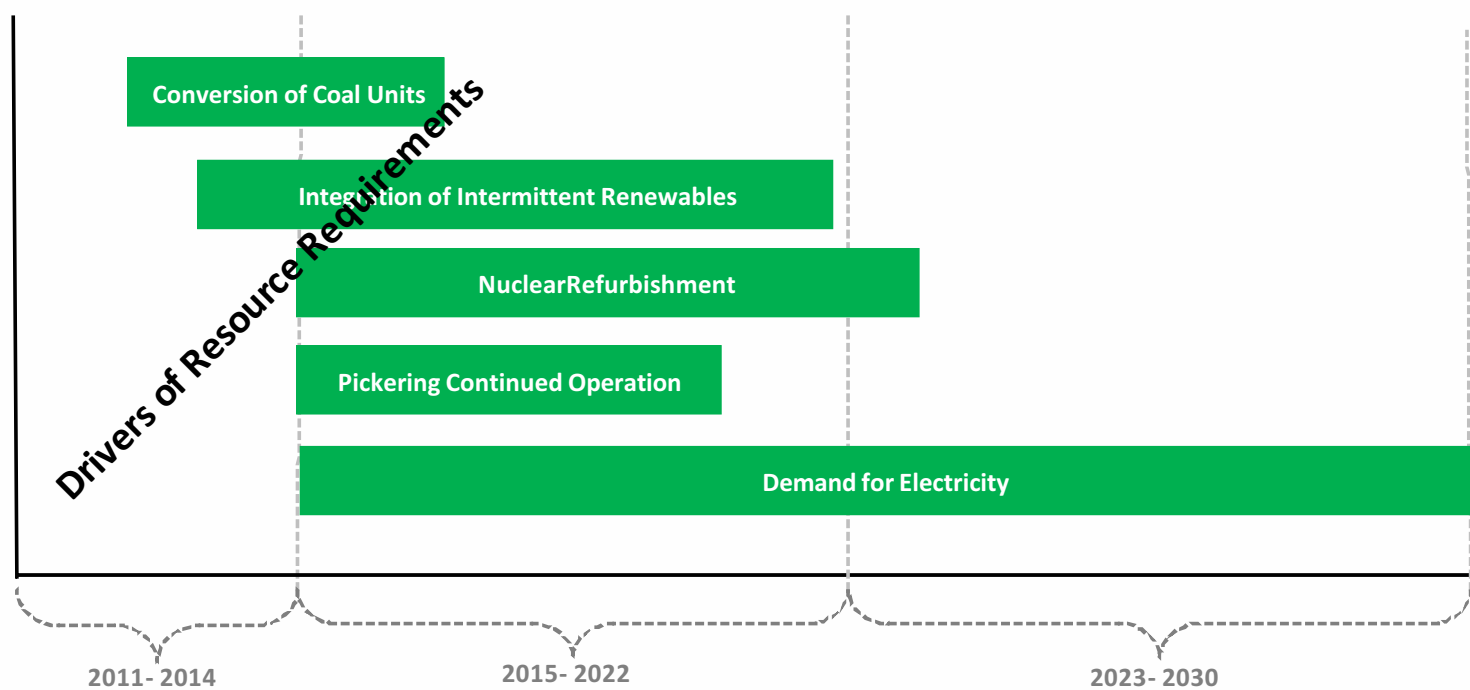
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Installed Capacity – Pickering Continued Operations



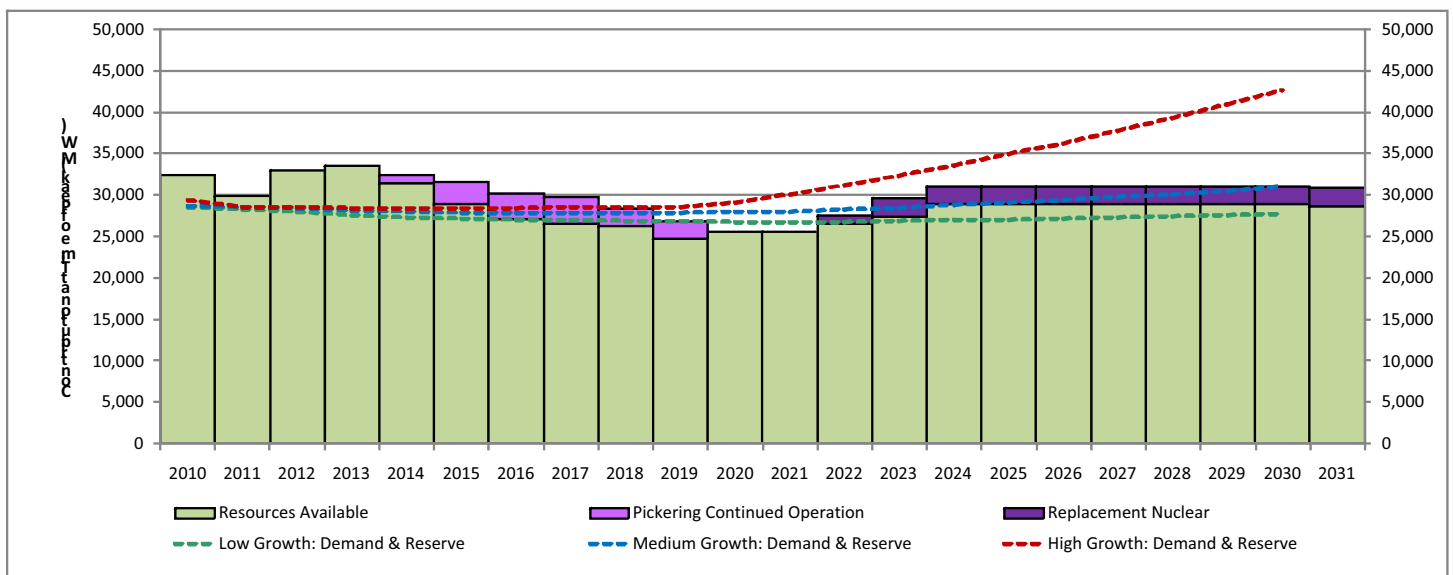
Capacity Outlook Will be Impacted by the Following Factors



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Ontario is in Good Shape Until 2018



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From: Bashir Bhana
Sent: March-13-12 11:25 AM
To: Bob Gibbons
Cc: Bashir Bhana
Subject: Nuclear Presentation for PSP Team Meeting next Monday
Attachments: PSPTeamMeeting_Nuclear_03-12-2012 (BB) v2.ppt

Hi Bob,

When you have a few moments, can you review the attached presentation?

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca



Integration of Nuclear Resources in Power System Planning

Bashir Bhana, Planner, Power System Planning Division

Prepared for PSP Team Meeting

March 19, 2012

Not Responsive

Not Responsive

3 Nuclear Power Plants in Operation...

Station	Not Responsive	Pickering NGS
Site		
Installed Capacity		3,100 MW
Annual Energy		19 TWh
Transmission Connection		230 kV
In-Service		1970s - 1980s
End of Service Life		As early as 2015
Cost Recovery		OEB Regulated Rates

Planning Activities Regarding Nuclear Integration

Not Responsive

- Ongoing planning activities include:

—

Not Responsive

—

Pickering continued operation study

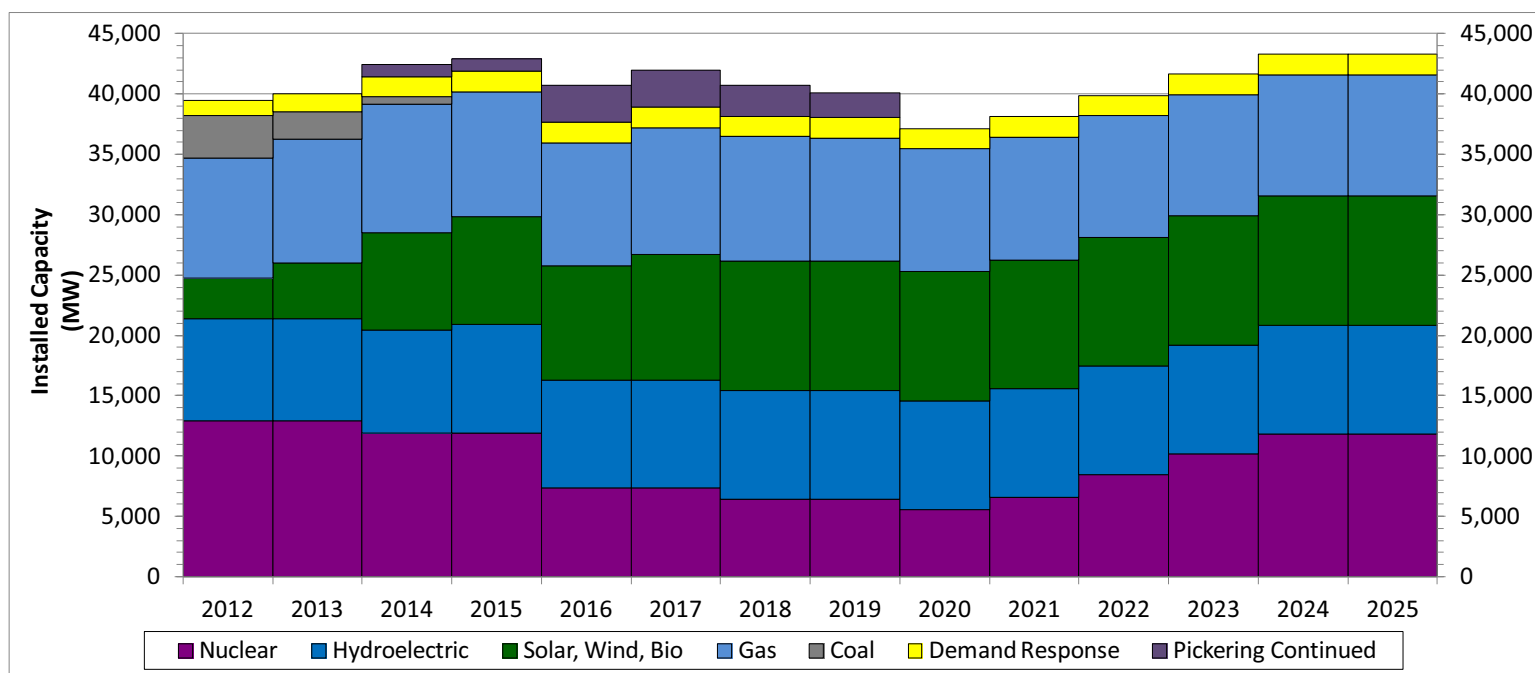
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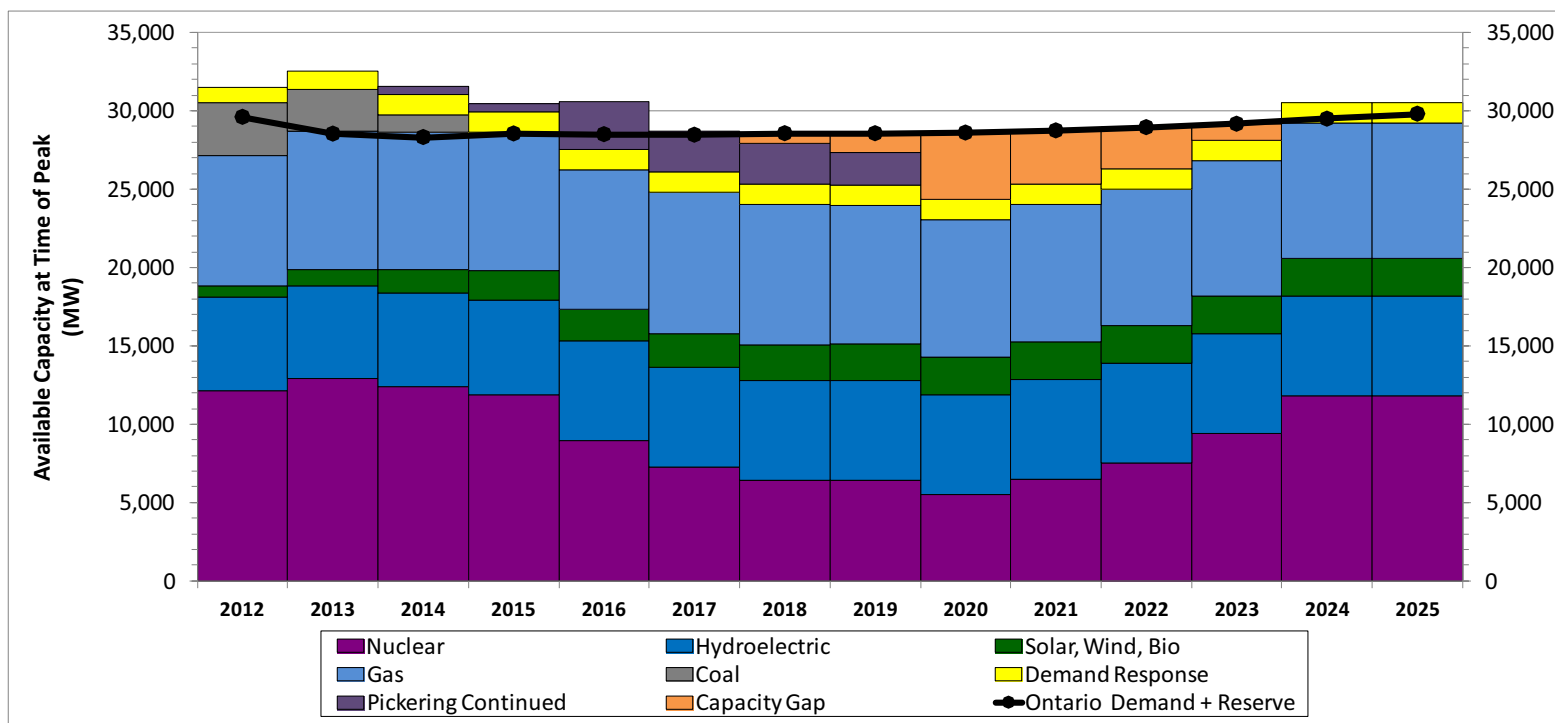
Resource Planning Outlook to 2025

- About 41,000 MW installed capacity over planning period



Need & Timing of Capacity Investments

- Driven primarily by nuclear availability, short duration

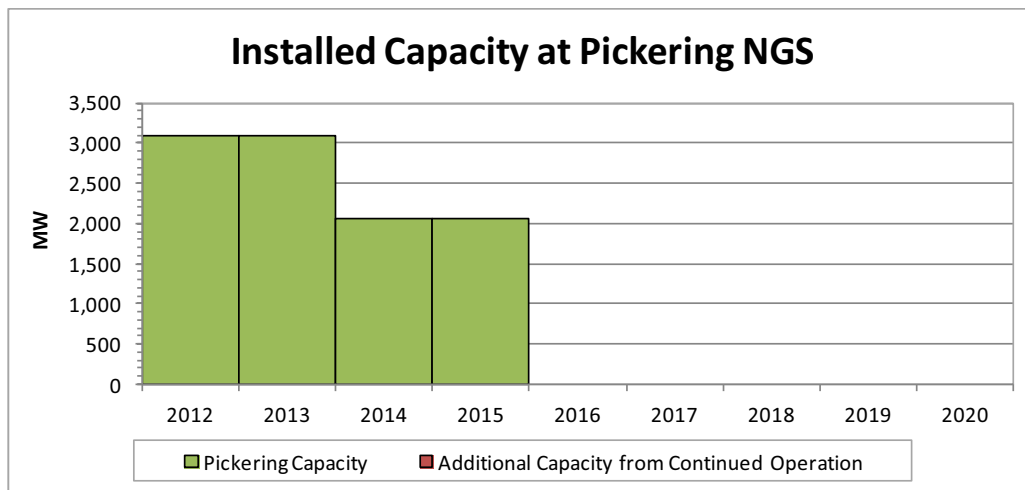


Section 17

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Pickering NGS Continued Operation

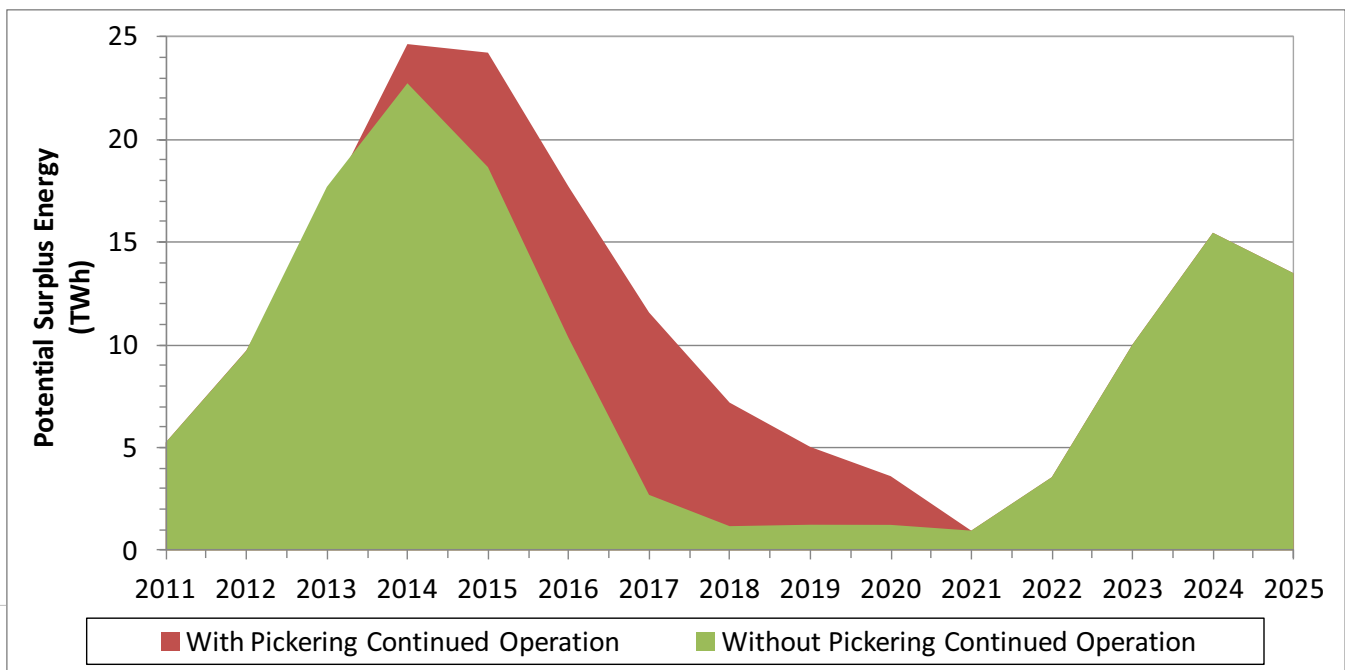
- Pickering NGS could reach its end of service life as early as 2015
- OPG is currently studying the technical feasibility of extending the operating life of each unit by four years



- Currently evaluating system value for OPG's 2013/2014 rate application and working with Hydro One on transmission needs

Potential Surplus Energy

- Significant potential surplus energy forecast in the near term
- Opportunities to maximize energy production during high value periods



Not Responsive

Not Responsive

Not Responsive

Thank You...

From: CHAN Peter -HYDRO <peter.chan@opg.com>
Sent: March-15-12 10:26 AM
To: Steve Chui
Subject: Nuclear Refurbishment

Steve I am looking at the energy supply diagram for Ontario. Is my interpretation correct?

Pickering 56. 2019/2020

Pickering 1478. 2019/2020/2021 shutdown

Not Responsive

Maybe these are current assumptions.

Tx p

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From: Steve Chui
Sent: March-15-12 11:19 AM
To: CHAN Peter -HYDRO
Subject: RE: Nuclear Refurbishment

Hi, Peter, I'm not sure which diagram you're referring to. But, according to the latest info from OPG If OPG is able to achieve 247K EFPH (Equivalent Full Power Hours) at Pickering, then the EOL (End-Of-Life) will be:

Section 17

Not Responsive

Steve

-----Original Message-----

From: CHAN Peter -HYDRO [<mailto:peter.chan@opg.com>]

Sent: Thursday, March 15, 2012 10:26 AM

To: Steve Chui

Subject: Nuclear Refurbishment

Steve I am looking at the energy supply diagram for Ontario. Is my interpretation correct?

Pickering 56. 2019/2020

Pickering 1478. 2019/2020/2021 shutdown

Not Responsive

Maybe these are current assumptions.

Tx p

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From: Steve Chui
Sent: March-15-12 11:32 AM
To: CHAN Peter -HYDRO
Subject: RE: Nuclear Refurbishment

Section 17

-----Original Message-----

From: CHAN Peter -HYDRO [\[mailto:peter.chan@opg.com\]](mailto:peter.chan@opg.com)
Sent: Thursday, March 15, 2012 11:24 AM
To: Steve Chui
Subject: Re: Nuclear Refurbishment

Not bad. It is close. Good enough. The chart they provided is likely stale anyway. It is for our Business Transformation communication. Nothing too critical. I just don't want to be totally off when I speak to the staff tomorrow. It is all a moving target.

Tx p

----- Original Message -----

From: Steve Chui [\[mailto:Steve.Chui@powerauthority.on.ca\]](mailto:Steve.Chui@powerauthority.on.ca)
Sent: Thursday, March 15, 2012 11:19 AM
To: CHAN Peter -HYDRO
Subject: RE: Nuclear Refurbishment

Hi, Peter, I'm not sure which diagram you're referring to. But, according to the latest info from OPG If OPG is able to achieve 247K EFPH (Equivalent Full Power Hours) at Pickering, then the EOL (End-Of-Life) will be:

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Not Responsive

Steve

-----Original Message-----

From: CHAN Peter -HYDRO [\[mailto:peter.chan@opg.com\]](mailto:peter.chan@opg.com)
Sent: Thursday, March 15, 2012 10:26 AM
To: Steve Chui
Subject: Nuclear Refurbishment

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Maybe these are current assumptions.

Tx p

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If you have received this message in error, or are not the named recipient(s), please notify the sender immediately and delete this e-mail message.

From: Bashir Bhana
Sent: March-16-12 4:11 PM
To: Bonnie Chan
Subject: Nuke Presentation for PSP Team Mtg
Attachments: PSPTeamMeeting_Nuclear_03-14-2012 (BB) v4.ppt

As requested. Been trying to find things to cut - if you have any ideas in the next 30 mins, let me know what you think.

Bashir



Integration of Nuclear Resources in Power System Planning

Bashir Bhana, Planner, Power System Planning Division

Prepared for PSP Team Meeting

March 19, 2012

Not Responsive

Not Responsive

3 Nuclear Power Plants in Operation...

Station		Pickering NGS
Site		
Installed Capacity	Not Responsive	3,100 MW
Annual Energy		20 TWh
Transmission Connection		230 kV
In-Service		1970s - 1980s
End of Service Life		As early as 2015
Cost Recovery		OEB Regulated Rates

Planning Activities Regarding Nuclear Integration

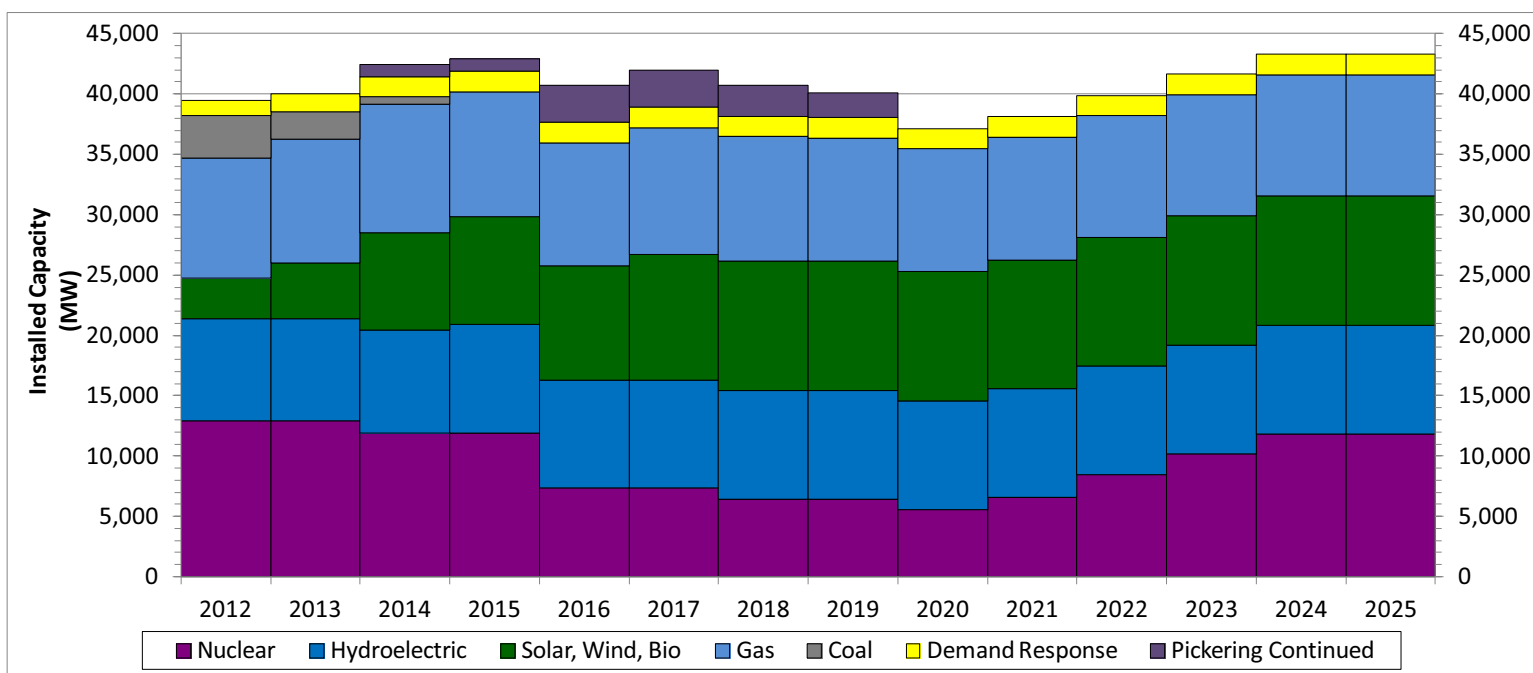
Not Responsive

- Pickering Continued Operation/ *Not Responsive*

Not Responsive

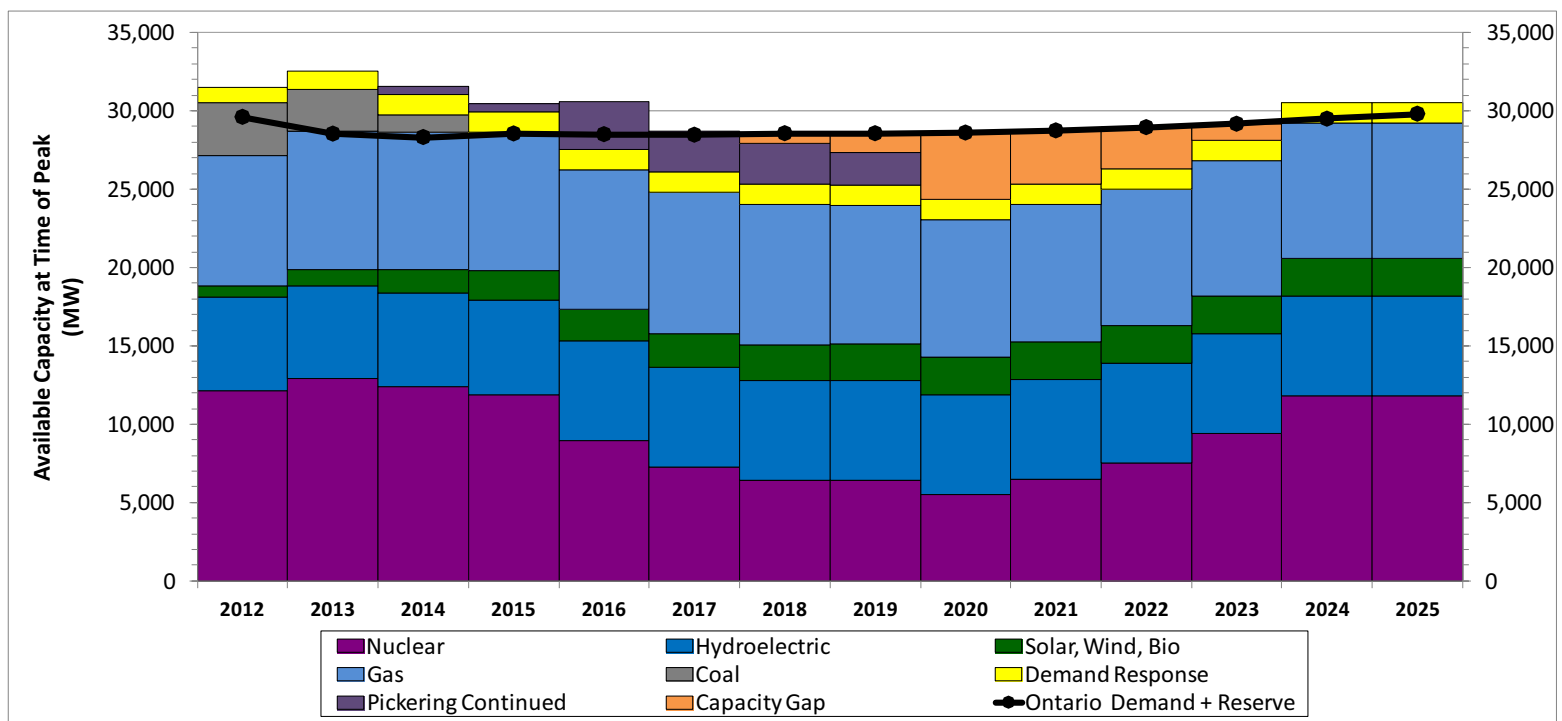
Resource Planning Outlook to 2025

- About 41,000 MW installed capacity over planning period



Need & Timing of Capacity Investments

- Driven primarily by nuclear availability, short duration



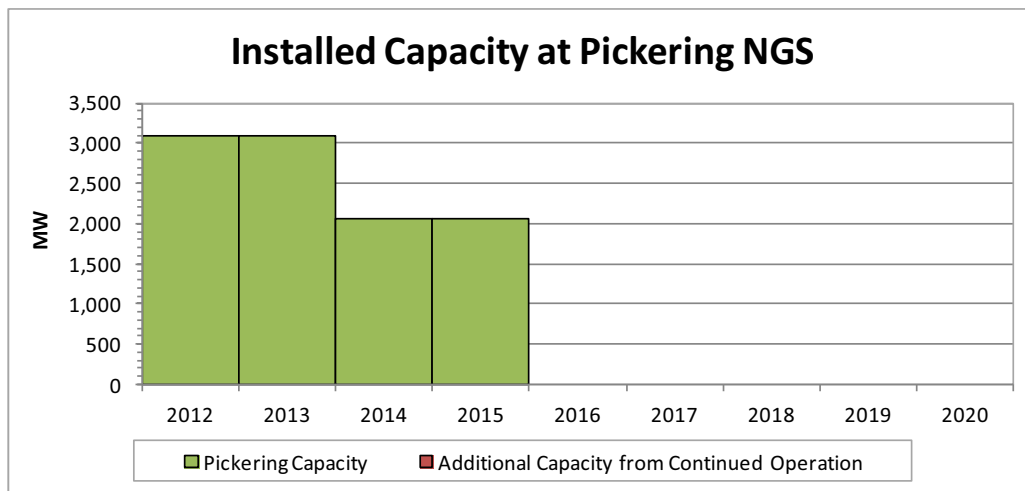
Section 17

Not Responsive

Not Responsive

Pickering NGS Continued Operation

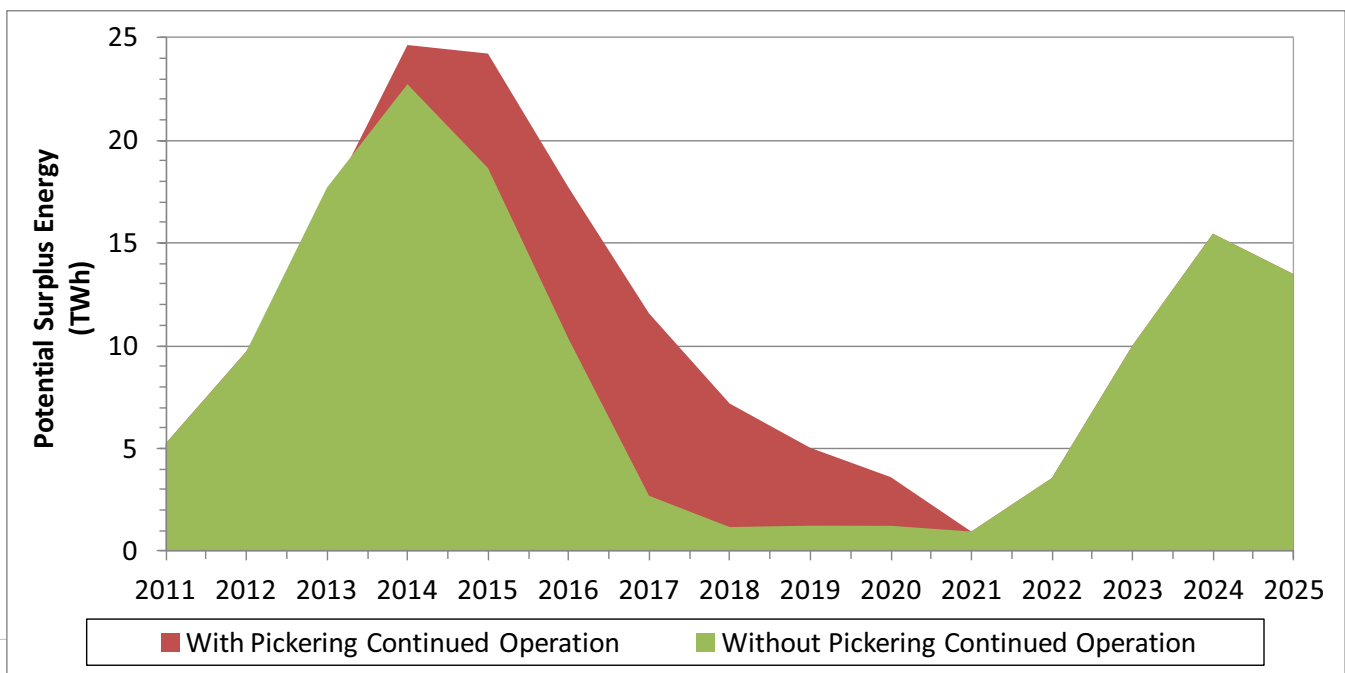
- Pickering NGS end of service life as early as 2015
- OPG is studying the technical feasibility of extending life to 2020



- Evaluating option for OPG's 2013/2014 rate application and working with Hydro One on transmission needs

Potential Surplus Energy

- Significant potential surplus energy forecast in the near term
- Some maneuverability of existing nuclear fleet



Not Responsive

Not Responsive

Not Responsive

Thank You...

From: Bashir Bhana
Sent: March-20-12 4:27 PM
To: Alan Leung
Subject: RE: Comparison of generation by fuel type outside Ontario between Case 1A and Case 1B of Pickering Cont Op Study from 2013 to 2020

Thanks Alan!

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Alan Leung
Sent: March 20, 2012 4:26 PM
To: Bashir Bhana
Cc: Steve Chui
Subject: Comparison of generation by fuel type outside Ontario between Case 1A and Case 1B of Pickering Cont Op Study from 2013 to 2020

Hi Bashir,

This file shows the updated comparison of generation by fuel type outside Ontario between Case 1A and Case 1B of Pickering Cont Op Study from 2013 to 2020.

Alan

From: Bashir Bhana
Sent: March 20, 2012 10:54 AM
To: Alan Leung
Cc: Steve Chui
Subject: RE: Comparison of generation by fuel type outside Ontario between Case 1A and Case 1B of Pickering Cont Op Study from 2013 to 2020

Thanks Alan – can you group them as follows:

Coal, Gas, Nuclear, Hydro, Non-Hydro Renewables, Others

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning

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Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Alan Leung
Sent: March 20, 2012 10:41 AM
To: Bashir Bhana
Cc: Steve Chui
Subject: Comparison of generation by fuel type outside Ontario between Case 1A and Case 1B of Pickering Cont Op Study from 2013 to 2020

Hi Bashir,

This file shows the comparison of generation by fuel type outside Ontario between Case 1A and Case 1B of Pickering Cont Op Study from 2013 to 2020.

Alan

From: Bashir Bhana
Sent: March-21-12 3:33 PM
To: Bob Gibbons; Andrew Pietrewicz; Victor Stein; Bonnie Chan; Steve Chui
Cc: Nancy Marconi; Wajiha Shoaib
Subject: Pickering Study - Review of OPG Results

Sorry for this long email. I've reviewed OPG's modelling results (provided in this morning's meeting) and have come to the conclusion that key differences between our two assessments are with respect to *export price* and *renewable curtailment* assumptions:

Export Prices

OPG prices exports at its value to the overall electricity market whereas the OPA prices exports at the Ontario marginal cost (consistent with current market rules). OPG said they will look into this.

Section 17

Renewable Curtailment

In our assessment, we observe a 9 TWh reduction in renewable production in the presence of continued operation

Section 17

Impact on Pickering Net Benefit

Accounting for the above differences and including the impact of Clarington TS, the net impact on OPG's assessment would be as follows:

Section 17

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I will give Kevan Jefferies a call tomorrow to discuss the above observations.

Bashir

Bashir Bhana
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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bob Gibbons
Sent: March-21-12 3:59 PM
To: Bashir Bhana
Subject: RE: Pickering Study - Review of OPG Results

Thanks Bashir – good work

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

From: Bashir Bhana
Sent: March 21, 2012 3:33 PM
To: Bob Gibbons; Andrew Pietrewicz; Victor Stein; Bonnie Chan; Steve Chui
Cc: Nancy Marconi; Wajiha Shoaib
Subject: Pickering Study - Review of OPG Results

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E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: March-23-12 5:35 PM
To: Bob Gibbons
Cc: Andrew Pietrewicz; Steve Chui
Subject: RE: Pickering Study - Review of OPG Results

Bob – an update on my discussions with Kevan Jefferies. They continue to look at their (and our) analysis of Pickering.

He agrees that the calculation of the export revenues is where the majority of the difference lies.

Section 18

Based on the conversation, I don't think they're finding much issue with other areas of the results or model.

Bashir

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Power System Planning
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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: March 21, 2012 3:33 PM
To: Bob Gibbons; Andrew Pietrewicz; Victor Stein; Bonnie Chan; Steve Chui
Cc: Nancy Marconi; Wajiha Shoaib
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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Victor Stein
Sent: March-27-12 10:20 AM
To: Bob Gibbons; Bashir Bhana
Cc: Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: RE: Pickering CO Draft Report

Gas price upper bound at \$8/MMBtu?

I thought we decided a wk ago that it would be \$12, in both short term and longterm.

Does this mean that the Darl. Refurb report has to be changed from \$12 to \$8 in short term (while retaining the existing \$12 in longterm)?

Best Regards,

Victor Stein

Senior Planner,
Power System Planning.
Ontario Power Authority
Toronto, Canada
Tel. 416.969.6409
Cell 416.786.8391
Fax 416.969.6369

From: Bob Gibbons
Sent: March 27, 2012 10:09 AM
To: Bashir Bhana
Cc: Victor Stein; Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: RE: Pickering CO Draft Report

Bashir – I have suggested some edits in the attached version (also found [here](#)), particularly with respect to export revenues.

Bob G

From: Bashir Bhana
Sent: March 26, 2012 4:16 PM
To: Bob Gibbons
Cc: Victor Stein; Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: Pickering CO Draft Report

Bob – I've updated the report based on our discussion as well as Amir's comments (verbally provided this morning).

I would like to wait for OPG's comments before updating the gas price for the high gas scenario but estimate the net benefit to be \$1.3B with gas price at \$8/MMBtu. I've included comments in that regard.

Please see tracked version for specific edits, clean version for a smoother read.

Also found [here](#).

Bashir

Bashir Bhana
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Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Victor Stein
Sent: March-27-12 11:00 AM
To: Bob Gibbons; Bashir Bhana
Cc: Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: RE: Pickering CO Draft Report

I've added some comments.
V.

From: Bob Gibbons
Sent: March 27, 2012 10:09 AM
To: Bashir Bhana
Cc: Victor Stein; Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: RE: Pickering CO Draft Report

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Please see tracked version for specific edits, clean version for a smoother read.

Also found [here](#).

Bashir

Bashir Bhana
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Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Beverly Nollert
Sent: April-20-12 4:25 PM
To: Bonnie Chan
Subject: RE: Latest Tally

Thanks Bonnie, I will be cautious with this version of the Tally until updates are finalized.

Have a great weekend!

Bev

Beverly Nollert P.Eng, MBA
Planner, Resource Integration
Power System Planning
Ontario Power Authority
T: 416.969.6283
E-mail: Beverly.Nollert@powerauthority.on.ca
Web: www.powerauthority.on.ca

From: Bonnie Chan
Sent: April 20, 2012 4:08 PM
To: Beverly Nollert
Subject: RE: Latest Tally

Hi Bev,

As discussed, this is the latest Q4 2011 Tally, assuming Pickering continued operation at 247k. Note that this is still under development so it is not final yet. Once final, we will send out an official link to everyone.
[S:\Resource Integration\Capacity\Tally\Q2 2011 Under Development\Case 1. Med Load. Q42011. PickeringContOpLM - 2012-04-03 \(BC\) UNDER DEVELOPMENT USE THIS ONE.xlsx](#)

Thanks,
Bonnie

From: Beverly Nollert
Sent: April 20, 2012 3:37 PM
To: Bonnie Chan
Subject: Latest Tally

Hi Bonnie,

I hope you are having a great Friday.

Could you kindly send me the link to the latest Tally?

Thank you!

Bev

Beverly Nollert P.Eng, MBA

Planner, Resource Integration

Power System Planning

Ontario Power Authority

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E-mail: Beverly.Nollert@powerauthority.on.ca

Web: www.powerauthority.on.ca

From: Bashir Bhana
Sent: April-24-12 4:51 PM
To: Andrew Pietrewicz
Cc: Bob Gibbons
Subject: Updated Demand/Pickering

Andrew – here is a quick comparison of the new demand forecast relative to the LTEP forecasts (used in the Pickering study).

The updated peak demand forecast is about the same as in the LTEP low growth forecast up to 2018 (~23,000 MW). Between 2019-2020, the updated peak demand forecast falls between the LTEP low and LTEP medium forecasts (23,400 MW).

The updated energy demand forecast is lower than the LTEP low growth forecast by an average 3 TWh per year beginning in 2015. The average updated energy demand forecast between 2013-2020 is 136 TWh/year. In comparison, the LTEP low and medium forecasts average 138 TWh/year and 146 TWh/year, respectively between 2013-2020.

Regarding the Pickering study, I would expect the new demand forecast to produce a net benefit similar to that in the low demand sensitivity case (net cost of \$760M).



Section 18

Section 18

Bashir

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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: May-03-12 4:34 PM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz; Wajiha Shoaib
Subject: RE: Pickering CO Draft for OPG Review
Attachments: OATS Deferral Value 05-03-2012 (BB).xlsx

Jim – as discussed, the deferral value of OATS to 2020 is the following:

- \$59M (2012 \$ NPV) relative to Pickering out of service in early 2015 due to no P7 LM
- \$48M (2012 \$ NPV) relative to Pickering out of service in early 2016 due to P7 LM (per OPG supporting evidence)

Details attached. Happy to discuss further.

Bashir

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E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: May 2, 2012 1:05 PM
To: Bashir Bhana
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz; Wajiha Shoaib
Subject: RE: Pickering CO Draft for OPG Review

Hi Bashir,

As we discussed, could you re-calculate the advancement to reflect 5 year advancement – from 2020 to 2015. This updated number will be used in the document supporting H1 Tx rate submission to the OEB.

Thank you

Jim

From: Bashir Bhana
Sent: Thursday, March 29, 2012 9:52 AM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Jim – In our evidence we state the deferral of OATS is from 2015 to 2020 which is consistent with the transmission evidence. We also say that the station I/S would precede the retirement of Pickering (we don't state exactly when).

In the case of continued ops, if Hydro One is aiming for a 2019 I/S, I think we are still ok as far as the evidence goes. We assume that OATS is I/S Jan 1 2020 (for a Pick end of life of Dec 31 2020) although the exact date is not stated in the report. In either case, the deferral cost is virtually the same.

Unless contradicting dates are explicitly stated in either report, which I don't believe they are, I believe we're fine.

Bashir

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E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: March 28, 2012 4:42 PM
To: Bashir Bhana
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Bashir,
The TS need date is based on the scenario of no life management and no life extension. Under that scenario, Pickering retires in early 2015. The letter from Andrew Barrett indicates 2016 retirement date only if life management happens which the OPG is not confirming.

The early 2015 is the earliest date H1 can build the TS. If Pickering goes on to 2020, H1 would build the TS for in-service in 2019.

Thank you
Jim

From: Bashir Bhana
Sent: Wednesday, March 28, 2012 4:31 PM
To: Jim Lee
Cc: Joe Toneguzzo; Bob Gibbons; Andrew Pietrewicz
Subject: RE: Pickering CO Draft for OPG Review

Jim – \$240M in 2012 dollars is correct. I'll revise the \$240M to \$270M in the next round of edits per your first comment.

On your second comment, we've assumed Oshawa TS to be in-service prior to the out of service of the last two Pickering units. This assumes at least 2 Pickering units need to be available for Oshawa TS to be deferred. Pickering is retired either in March 2016 or Dec 2020. The \$48M represents deferral between this period.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning

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120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Jim Lee
Sent: March 28, 2012 3:37 PM
To: Bashir Bhana
Cc: George Pessione; Mike Zajmalowski; Joe Toneguzzo
Subject: RE: Pickering CO Draft for OPG Review

Hi Bashir,

I would recommend the following changes to the Section 5.5 Transmission Requirements on page 9. Starting on line 7, it shows:

"The estimated capital investment for Oshawa Area TS is \$240M (net present value in 2012 dollars). Deferral of Oshawa Area TS as a result of Pickering continued operation would result in cash flow savings of \$12 million for each year deferred. Deferring the in-service date from 2015 to 2020 would result in a time value savings of \$50 million over this period."

- 1) I expect the \$240M (net present value in 2012 dollars) to be correct, but could we show the same numbers shown in the H1 Tx rate submission which is \$270 M (for 2015 in-service)? This is just to avoid unnecessary questions.
- 2) The deferral should be from 2015 to 2019 in-service which is four year deferral. The station needs to be in-service before Pickering is retired in 2020. I assume the \$48M represents four year deferral.

Thank you
Jim

From: Bashir Bhana
Sent: Wednesday, March 28, 2012 1:27 PM
To: George Pessione; Mike Zajmalowski; Joe Toneguzzo; Jim Lee
Subject: FW: Pickering CO Draft for OPG Review

Fyi...Pickering continued ops draft report sent for OPG review attached.

Bashir Bhana
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From: Bashir Bhana
Sent: March 28, 2012 1:14 PM
To: Nancy Marconi; Wajiha Shoaib
Cc: Andrew Pietrewicz; Bob Gibbons; Steve Chui; Victor Stein; Bonnie Chan
Subject: Pickering CO Draft for OPG Review

Please find attached a draft of the Pickering CO report which can be forward to OPG.

Thanks,
Bashir

Bashir Bhana
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Oshawa Area TS (OATS) - Deferral Value Calculation

Section 17

Economic Assumptions:

Station Capital Cost	\$241 M in \$ 2012
Service Life	40 years
Discount Rate	4% /year (real 2012 \$)
Allocated Cost of Station	\$12 /year (real 2012 \$)
In Service Date	Need a min of 2 Pickering units in-service to avoid Oshawa TS. Assume TS would be in-service just prior to Pickering out of service. Assume allocated cost cash flows begin at the time of in-service of Oshawa TS.

Summary:

Benefit of deferring Oshawa TS from Mar 2016 to Dec 2020 =	\$48 (NPV 2012 \$) (pe
Benefit of deferring Oshawa TS from Jan 2015 to Dec 2020 =	\$59 (NPV 2012 \$)

Potential for Deferral (in real 2012 \$ M)
\$0
\$67
\$101
\$74

Change in Cost Due to Deferring OATS: \$ 2012

	2013	2014	2015	2016
<i>Case 1: Cash Flow for OATS I/S in Early 2016</i>				
Pickering Out of Service in Mar 2016	\$0	\$0	\$0	\$12
Pickering Out of Service in Dec 2020	\$0	\$0	\$0	\$0
Net Change (Dec 2020 vs Mar 2016 OATS I/S)	\$0	\$0	\$0	-\$12
<i>Case 2: Cash Flow for OATS I/S in Early 2015</i>				
Pickering Out of Service in Jan 2015	\$0	\$0	\$12	\$12
Pickering Out of Service in Dec 2020	\$0	\$0	\$0	\$0
Net Change (Dec 2020 vs Jan 2015 OATS I/S)	\$0	\$0	-\$12	-\$12

r Pickering CO Evidence)

2 Real

2017	2018	2019	2020	Total Cost	NPV (@ 4% real s.d.r)
\$12	\$12	\$12	\$12	\$61	\$48
\$0	\$0	\$0	\$0	\$0	\$0
-\$12	-\$12	-\$12	-\$12	-\$61	-\$48
\$12	\$12	\$12	\$12	\$73	\$59
\$0	\$0	\$0	\$0	\$0	\$0
-\$12	-\$12	-\$12	-\$12	-\$73	-\$59

Nuclear Available Capacity (MW) (Excludes Impact of Planned Outages)

Case 1B (With PCO and P7 LM). NRCWG refurb schedule (Jan 2011) reflecting updated Darlington schedule from

By Unit

Unit	2013										
	J	F	M	A	M	J	J	A	S	O	N
<i>Not Responsive</i>											
Pickering 1	515	515	515	515	515	515	515	515	515	515	515
Pickering 4	515	515	515	515	515	515	515	515	515	515	515
Pickering 5	516	516	516	516	516	516	516	516	516	516	516
Pickering 6	516	516	516	516	516	516	516	516	516	516	516
Pickering 7	516	516	516	516	516	516	516	516	516	516	516
Pickering 8	516	516	516	516	516	516	516	516	516	516	516

Total

<i>Not Responsive</i>											
Pickering	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094
Total Nuclear	Section 17										

n OPG (Dec 2011).

	2014											
D	J	F	M	A	M	J	J	A	S	O	N	D
Not Responsive												
515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516

Not Responsive												
3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094
Section 17												

2015												
J	F	M	A	M	J	J	A	S	O	N	D	J
<i>Not Responsive</i>												
515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516
0	0	0	0	0	0	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516

<i>Not Responsive</i>												
2,578	2,578	2,578	2,578	2,578	2,578	3,094	3,094	3,094	3,094	3,094	3,094	3,094
Section 17												

2016													
F	M	A	M	J	J	A	S	O	N	D	J	F	M
<i>Not Responsive</i>													
515	515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	0	0	0	0
516	516	516	516	516	516	516	516	516	516	516	516	516	516

<i>Not Responsive</i>													
3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	2,578	2,578	2,578	2,578
Section 17													

2017													
A	M	J	J	A	S	O	N	D	J	F	M	A	M
Not Responsive													
515	515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516	516
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516	516	516	516	516	516	516	516	516	516	516	516	516	516

Not Responsive													
2,578	2,578	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094
	Section 17												

2018							2019							
J	J	A	S	O	N	D	J	F	M	A	M	J	J	A
Not Responsive														
515	515	515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	0	0	0	0	0
516	516	516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516	516	516

Not Responsive														
3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	2,578	2,578	2,578	2,578	2,578
Section 17														

				2020										
S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Not Responsive														
515	515	515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
516	516	516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516	516	516

Not Responsive														
2,578	2,578	2,578	2,578	2,578	2,578	2,062	2,062	2,062	2,062	2,062	2,062	2,062	2,062	2,062
Section 17														

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s. 17

From: Bashir Bhana
Sent: May-10-12 1:32 PM
To: Andrew Pietrewicz
Subject: RE: No rush: when you get a chance, could you please send me a link to the
Attachments: Monthly Nuclear Availability in Pickering Study (Case 1B) 05-10-2012 (BB).xlsx

Andrew – attached is the monthly nuclear available capacity used in the Pickering study (case with PCO and P7 LM).

Please note that Bonnie is currently producing a monthly capacity tally for all resources. This will show the monthly capacity gap and reflect resource planned/maintenance outages. This will be available shortly and will provide a more detailed and broader picture of the attached. I will forward when ready.

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Andrew Pietrewicz
Sent: May 10, 2012 10:37 AM
To: Bashir Bhana
Subject: No rush: when you get a chance, could you please send me a link to the

Monthly nuclear capacity tally used in the Pickering study? I'd like to get better acquainted with the Bruce/Pickering interplay at the monthly level. Thank you,
ap

Nuclear Available Capacity (MW) (Excludes Impact of Planned Outages)

Case 1B (With PCO and P7 LM). NRCWG refurb schedule (Jan 2011) reflecting updated Darlington schedule from

By Unit

Unit	2013										
	J	F	M	A	M	J	J	A	S	O	N
<i>Not Responsive</i>											
Pickering 1	515	515	515	515	515	515	515	515	515	515	515
Pickering 4	515	515	515	515	515	515	515	515	515	515	515
Pickering 5	516	516	516	516	516	516	516	516	516	516	516
Pickering 6	516	516	516	516	516	516	516	516	516	516	516
Pickering 7	516	516	516	516	516	516	516	516	516	516	516
Pickering 8	516	516	516	516	516	516	516	516	516	516	516

Total

<i>Not Responsive</i>											
Pickering	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094
Total Nuclear	Section 17										

n OPG (Dec 2011).

	2014											
D	J	F	M	A	M	J	J	A	S	O	N	D
Not Responsive												
515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516

Not Responsive												
3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094
Section 17												

2015												
J	F	M	A	M	J	J	A	S	O	N	D	J
Not Responsive												
515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515
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516	516	516	516	516	516	516	516	516	516	516	516	516

Not Responsive												
2,578	2,578	2,578	2,578	2,578	2,578	3,094	3,094	3,094	3,094	3,094	3,094	3,094
Section 17												

2016													
F	M	A	M	J	J	A	S	O	N	D	J	F	M
<i>Not Responsive</i>													
515	515	515	515	515	515	515	515	515	515	515	515	515	515
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516	516	516	516	516	516	516	516	516	516	516	516	516	516

<i>Not Responsive</i>													
3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	2,578	2,578	2,578	2,578
Section 17													

2017													
A	M	J	J	A	S	O	N	D	J	F	M	A	M
Not Responsive													
515	515	515	515	515	515	515	515	515	515	515	515	515	515
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Not Responsive													
2,578	2,578	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094
	Section 17												

2018							2019							
J	J	A	S	O	N	D	J	F	M	A	M	J	J	A
Not Responsive														
515	515	515	515	515	515	515	515	515	515	515	515	515	515	515
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516	516	516	516	516	516	516	516	516	516	516	516	516	516	516
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Not Responsive														
3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	3,094	2,578	2,578	2,578	2,578	2,578
Section 17														

				2020										
S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Not Responsive														
515	515	515	515	515	515	515	515	515	515	515	515	515	515	515
515	515	515	515	515	515	515	515	515	515	515	515	515	515	515
516	516	516	516	516	516	0	0	0	0	0	0	0	0	0
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516	516	516	516	516	516	516	516	516	516	516	516	516	516	516
516	516	516	516	516	516	516	516	516	516	516	516	516	516	516

Not Responsive														
2,578	2,578	2,578	2,578	2,578	2,578	2,062	2,062	2,062	2,062	2,062	2,062	2,062	2,062	2,062
Section 17														

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Not Resp...
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s. 17

From: JANOSSY Eva -INTREVPLAN'G <eva.janossy@opg.com>
Sent: July-11-12 10:39 AM
To: Bashir Bhana
Subject: RE: Nuclear Outages

Bashir,

For nuclear OPG publishes nuclear unit capability factors by station. The calculation includes planned and forced outages. Would that be good enough?

Eva

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: Wednesday, July 11, 2012 10:10 AM
To: JANOSSY Eva -INTREVPLAN'G
Subject: Nuclear Outages

Hi Eva,

I hope everything is going well.

I'm looking for information on historical actual forced outage rates and planned outage days for Pickering and Darlington. For years 2007 to 2011 and by individual units.

Is this something you could help provide?

Thanks!

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

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120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 1, 2011

Mr. Andrew Barrett
Vice President, Regulatory Affairs and Corporate Strategy
Ontario Power Generation
700 University Avenue,
Toronto Ontario
M5G 1X6

Dear Andrew,

Re: Pickering NGS Continued Operation and **Not Responsive**

Summary

The purpose of this letter is to provide an assessment of the system benefits provided by Ontario Power Generation's ("OPG") proposal for the continued operation of Pickering NGS and **Not Responsive**.

The assessment provided herein is an independent study performed by the Ontario Power Authority ("OPA") based on the information provided by OPG (attached) and on OPA's assessment of system impacts. Updated Pickering NGS and **Not Responsive** capital and operating related cost and production information provided by OPG is accepted as given.

Given the information currently available and the potential for significant benefits arising from Pickering NGS continued operation and **Not Responsive**, the OPA believes it is prudent for OPG to continue to develop implementation plans and initiate work necessary to enable these options. Specifically, the OPA believes it is prudent, on balance, to spend funds in 2013 and 2014 to enable the option of Pickering NGS continued operation should it prove to be technically feasible and

Not Responsive

Rationale

Pickering NGS Continued Operation

In the absence of continued operation, the six generating units (3,094 MW) that are currently in operation at the Pickering Nuclear Generating Station ("Pickering NGS") are expected to cease operation beginning in approximately 2015. The technical feasibility of continued operation is expected to be known in 2012. A study is currently being conducted under the auspices of the CANDU

Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur \$190 million in additional capital and operating related costs associated with Pickering NGS. Of this, \$85 million is associated with preserving the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work. The remaining \$105 million is associated with the operation of Pickering NGS during the 2013 to 2014 period.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS between approximately 2015 and 2020 (Appendix 1).

The OPA has evaluated the effect of Pickering NGS continued operation on various factors related to the integrated power system including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications. The OPA's assessment assumes that resources directed by the Ontario government will proceed as planned. Delays in achieving directive requirements could increase the amount of capacity and energy needed to meet system supply requirements. Pickering NGS continued operation could mitigate potential impacts if these delays were to materialize.

There are several potential benefits to Pickering NGS continued operation. These include:

- To meet NPCC/NERC reliability criteria, sufficient capacity must exist to meet peak demand and system reserve requirements. Between 2016 and 2020, in the absence of Pickering NGS continued operation and assuming that directed resources proceed as planned, between approximately 980 MW and 3,100 MW of capacity would have to be replaced. Pickering NGS continued operation would allow for a reduction in the need for replacement capacity and energy and associated acquisition costs during the front end of the nuclear refurbishment period (2016 to 2024);
- A hedge against factors including increased demand, delay in achieving conservation targets, higher natural gas or carbon prices, nuclear refurbishment delays, or delays in the in-service of directed resources;
- Compliance with the Ontario government Supply Mix policy direction of 50% nuclear energy. This policy is consistent with the OPA Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the OEB in 2007 and in subsequent OPA planning;
- A reduction in Ontario CO₂ emissions of 11 megatonnes by 2020. The replacement energy provided by gas-fired generation is a source of increased CO₂ emissions which is not consistent with government policy to reduce greenhouse gas emissions. Pickering NGS continued operation produces virtually no CO₂ emissions in operation;

- Reduced reliance on imports, particularly during the nuclear refurbishment period. Further, imports are likely to come from thermal generation in NYISO and PJM. Emissions reductions in jurisdictions outside Ontario due to reduced imports were not considered in this analysis although would further increase the benefit; and
- Deferral of transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS.

The OPA's assessment of system cost impacts indicate that there is a net system benefit associated with Pickering NGS continued operation but could range from -\$0.76 billion to \$1.33 billion. Savings are the result of reduced gas-fired generation dispatch and associated reduction in replacement capacity and energy costs. These benefits could be greater or reduced or become negative depending on a number of factors. These factors include higher or lower than forecast demand or natural gas prices; implementation of carbon prices; a shorter continued operation period; higher or lower capital and fixed operating costs; and/or higher or lower production at Pickering NGS during the continued operation period.

Not Responsive

Not Responsive

Conclusion

Given the information currently available with respect to Pickering NGS continued operation and *Not Responsive* and the OPA's assessment of the benefits, the OPA concludes that:

- 1) Based on the potential benefits that have been identified, it is prudent, on balance, to proceed with an expenditure of funds in 2013 and 2014 to enable Pickering NGS continued operation should it prove technically feasible.

4.

Not Responsive

The OPA recognizes that as Ontario's supply and demand outlook evolves, additional information will become available and the anticipated benefits of OPG's proposals may change. The OPA is prepared to provide updated and detailed evidence in support of the integrated power system impacts of Pickering NGS continued operation

Not Responsive

Please feel free to contact us should you require any clarification or additional information.

Yours truly,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Bashir Bhana
Sent: July-31-12 3:39 PM
To: Andrew Pietrewicz
Subject: OPG Nuclear Support Letter
Attachments: OPA Evidence Support for Pickering and Darlington - DRAFT - July 31, 2012 (BB).doc

Andrew – draft attached for discussion. If able to discuss tomorrow, I'll set something up.

Also available here:

S:\Resource Integration\Projects\Pickering\2012 OPG Support Letter for Pickering_Darlington

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca



120 Adelaide Street West
Suite 1600
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F 416-967-1947
www.powerauthority.on.ca

August 1, 2011

Mr. Andrew Barrett
Vice President, Regulatory Affairs and Corporate Strategy
Ontario Power Generation
700 University Avenue,
Toronto Ontario
M5G 1X6

Dear Andrew,

Re: Pickering NGS Continued Operation and *Not Responsive*

Summary

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The assessment provided herein is an independent study performed by the Ontario Power Authority ("OPA") based on the information provided by OPG (attached) and on OPA's assessment of system impacts. Updated Pickering NGS and *Not Responsive* capital and operating related cost and production information provided by OPG is accepted as given.

Given the information currently available and the potential for significant benefits arising from Pickering NGS continued operation and *Not Responsive*, the OPA believes it is prudent for OPG to continue to develop implementation plans and initiate work necessary to enable these options. Specifically, the OPA believes it is prudent, on balance, to spend funds in 2013 and 2014 to enable the option of Pickering NGS continued operation should it prove to be technically feasible and the *Not Responsive*.

Rationale

Pickering NGS Continued Operation

In the absence of continued operation, the six generating units (3,094 MW) that are currently in operation at the Pickering Nuclear Generating Station ("Pickering NGS") are expected to cease operation beginning in approximately 2015. The technical feasibility of continued operation is expected to be known in 2012. A study is currently being conducted under the auspices of the CANDU

Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

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The OPA has evaluated the effect of Pickering NGS continued operation on various factors related to the integrated power system including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications. The OPA's assessment assumes that resources directed by the Ontario government will proceed as planned. Delays in achieving directive requirements could increase the amount of capacity and energy needed to meet system supply requirements. Pickering NGS continued operation could mitigate potential impacts if these delays were to materialize.

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- A hedge against factors including increased demand, delay in achieving conservation targets, higher natural gas or carbon prices, nuclear refurbishment delays, or delays in the in-service of directed resources;
- Compliance with the Ontario government Supply Mix policy direction of 50% nuclear energy. This policy is consistent with the OPA Supply Mix Advice provided to the Ontario Government in December 2005, the Integrated Power System Plan submitted to the OEB in 2007 and in subsequent OPA planning;
- A reduction in Ontario CO₂ emissions of 11 megatonnes by 2020. The replacement energy provided by gas-fired generation is a source of increased CO₂ emissions which is not consistent with government policy to reduce greenhouse gas emissions. Pickering NGS continued operation produces virtually no CO₂ emissions in operation;

- Reduced reliance on imports, particularly during the nuclear refurbishment period. Further, imports are likely to come from thermal generation in NYISO and PJM. Emissions reductions in jurisdictions outside Ontario due to reduced imports were not considered in this analysis although would further increase the benefit; and
- Deferral of transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS.

The OPA's assessment of system cost impacts indicate that there is a net system benefit associated with Pickering NGS continued operation but could range from -\$0.76 billion to \$1.33 billion. Savings are the result of reduced gas-fired generation dispatch and associated reduction in replacement capacity and energy costs. These benefits could be greater or reduced or become negative depending on a number of factors. These factors include higher or lower than forecast demand or natural gas prices; implementation of carbon prices; a shorter continued operation period; higher or lower capital and fixed operating costs; and/or higher or lower production at Pickering NGS during the continued operation period.

Not Responsive

Not Responsive

Conclusion

Given the information currently available with respect to Pickering NGS continued operation and Darlington NGS refurbishment and the OPA's assessment of the benefits, the OPA concludes that:

- 1) Based on the potential benefits that have been identified, it is prudent, on balance, to proceed with an expenditure of funds in 2013 and 2014 to enable Pickering NGS continued operation should it prove technically feasible.

4.

Not Responsive

The OPA recognizes that as Ontario's supply and demand outlook evolves, additional information will become available and the anticipated benefits of OPG's proposals may change. The OPA is prepared to provide updated and detailed evidence in support of the integrated power system impacts of Pickering NGS continued operation

Not Responsive

Please feel free to contact us should you require any clarification or additional information.

Yours truly,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Bashir Bhana
Sent: August-02-12 2:51 PM
To: Andrew Pietrewicz
Subject: Exports in Pickering Study

Looks like we gutted the section on “export profits” from the report. What we say with respect to export revenues is:

“Hourly exports occur due to economic opportunities that exist between Ontario and external electricity markets. The revenues associated with these transactions are based on the Hourly Ontario Electricity Price (HOEP). Export revenues decrease by \$0.05 billion over the period as the average value of HOEP decreases due to the lower cost of supply resulting from Pickering NGS continued operation.”

Here’s what I had written in an older draft:

“In the absence of bilateral contracts between Ontario and external electricity markets, the full value of electricity exports is not received by Ontario ratepayers. The value or profit from Ontario electricity exports is currently captured by energy traders, including OPG. OPG as an energy trader may be able to return some of these proceeds to Ontario ratepayers by way of a reduction in the revenue they seek in rate applications before the Ontario Energy Board or to Ontario taxpayers by way of dividend payments to government and increased government tax revenues.”

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Andrew Pietrewicz
Sent: August-03-12 2:29 PM
To: Bashir Bhana
Cc: Victor Stein
Subject: [REDACTED] *Not Responsive* here's a rough draft of what i've put together for Pickering, building on Bashir's first draft. Will continue to work on it and get a good version for your review early next week...

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

Summary

The purpose of this letter is to convey to you the Ontario Power Authority's perspective on Ontario Power Generation's proposals for continued operation at Pickering NGS and [REDACTED] *Not Responsive*

The Ontario Power Authority ("OPA") has independently evaluated these proposals and will continue to evaluate them in the course of its ongoing planning activities. At this time, the OPA considers that it would be prudent for Ontario Power Generation ("OPG") to continue to develop implementation plans and initiate work necessary in 2013 and 2014 to enable the option of Pickering NGS continued operation, should it prove to be technically feasible. [REDACTED] *Not Responsive*

Discussion

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning in approximately 2015. The technical feasibility of continued operation is expected to be known in 2012. A study is currently being conducted under the auspices of the CANDU Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur \$190 million in additional capital and operating related costs associated with Pickering NGS. Of this, \$85 million is associated with preserving the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work. The remaining \$105 million is associated with the operation of Pickering NGS during the 2013 to 2014 period.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS between approximately 2015 and 2020 (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all directed resources proceeded as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.
- A hedge against mid-term uncertainties and potential risks, including nuclear refurbishment delays, other generator implementation delays or failures, delays in achieving conservation targets, increased demand and higher natural gas or carbon prices.
- An approximately 11 megatonne cumulative reduction in Ontario CO₂ emissions by 2020.
- Deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).

The OPA's assessment of system cost impacts suggests a relatively modest, but positive economic advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements.

The OPA expects that continued availability of Pickering NGS between 2015 and approximately 2020 would increase opportunities for electricity exports. While the OPA's economic assessment accounts for electricity export contributions to the Ontario Export Transmission Tariff (and hence to a partial defrayal of transmission service costs for Ontario customers), it does not reflect any benefits of export-related profits that might accrue to OPG or to other Ontario exporters. The OPA realizes that this distinction tends to understate the benefits of electricity exports in general and, in this particular context, of the potential contribution of continued operation at Pickering toward increased export revenues for Ontario. The economic benefit of reduced carbon emissions was also not considered, nor was the potential for cost minimization through coordination of other nuclear plans with plans for continued operations at Pickering. The OPA expects to explore this latter consideration over the coming year.

The OPA's assessments illustrate that economic implications of Pickering continued operation could vary depending on a wide range of circumstances. Key factors in this regard include total level of electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

Based on evaluation conducted thus far, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These represent illustrative bookends and explore combinations of factors that together would tend to increase the economic value of Pickering continued operation and factors that would tend to reduce the economic value. Some of the factors outlined are clearly out of OPG's control, while others, such as station operational performance and cost are within OPG's control. In view of the absolute magnitude of capital and non-fuel OM&A costs involved in operating Pickering NGS, these represent particularly important areas for cost management focus.

A key consideration for the OPA that was not quantitatively reflected in its economic assessment of Pickering continued operation, but which informs its perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties and potential risks. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario, features multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances), stands to host a non-negligible degree of potential gas-fired generator retirements, relies on sizeable contributions from conservation interventions over and above already significant levels of anticipated

natural efficiency gains in the Ontario economy, poses a number of possibilities around the future pace and trajectory of economic recovery in the province and relies on successful and timely implementation of a substantial number of supply resources that are presently contractually committed or directed. In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present a certain degree of planning risk. Continued operation at Pickering is seen by the OPA as a potentially helpful source of insurance within this dynamic context.

From: Andrew Pietrewicz
Sent: August-03-12 2:46 PM
To: Bonnie Chan; Alan Leung
Subject: FW: [REDACTED] *Not Responsive* here's a rough draft of what i've put together for Pickering, building on Bashir's first draft. Will continue to work on it and get a good version for your review early next week...

fyi

From: Andrew Pietrewicz
Sent: August 3, 2012 2:29 PM
To: Bashir Bhana
Cc: Victor Stein
Subject: [REDACTED] *Not Responsive* here's a rough draft of what i've put together for Pickering, building on Bashir's first draft. Will continue to work on it and get a good version for your review early next week...

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

Summary

The purpose of this letter is to convey to you the Ontario Power Authority's perspective on Ontario Power Generation's proposals for continued operation at Pickering NGS and [REDACTED] *Not Responsive*

The Ontario Power Authority ("OPA") has independently evaluated these proposals and will continue to evaluate them in the course of its ongoing planning activities. At this time, the OPA considers that it would be prudent for Ontario Power Generation ("OPG") to continue to develop implementation plans and initiate work necessary in 2013 and 2014 to enable the option of Pickering NGS continued operation, should it prove to be technically feasible. [REDACTED] *Not Responsive*

Discussion

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning in approximately 2015. The technical feasibility of continued operation is expected to be known in 2012. A study is currently being conducted under the auspices of the CANDU Owner's Group to establish the technical feasibility of extending by approximately four years the operating life of each of the generating units that are in current operation. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur \$190 million in additional capital and operating related costs associated with Pickering NGS. Of this, \$85 million is associated with preserving the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work. The remaining \$105 million is associated with the operation of Pickering NGS during the 2013 to 2014 period.

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The OPA's analysis to date identifies a number of potential merits to continued operation at Pickering NGS. These include:

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- A hedge against mid-term uncertainties and potential risks, including nuclear refurbishment delays, other generator implementation delays or failures, delays in achieving conservation targets, increased demand and higher natural gas or carbon prices.
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The OPA expects that continued availability of Pickering NGS between 2015 and approximately 2020 would increase opportunities for electricity exports. While the OPA's economic assessment accounts for electricity export contributions to the Ontario Export Transmission Tariff (and hence to a partial defrayal of transmission service costs for Ontario customers), it does not reflect any benefits of export-related profits that might accrue to OPG or to other Ontario exporters. The OPA realizes that this distinction tends to understate the benefits of electricity exports in general and, in this particular context, of the potential contribution of continued operation at Pickering toward increased export revenues for Ontario. The economic benefit of reduced carbon emissions was also not considered, nor was the potential for cost minimization through coordination of other nuclear plans with plans for continued operations at Pickering. The OPA expects to explore this latter consideration over the coming year.

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Based on evaluation conducted thus far, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These represent illustrative bookends and explore combinations of factors that together would tend to increase the economic value of Pickering continued operation and factors that would tend to reduce the economic value. Some of the factors outlined are clearly out of OPG's control, while others, such as station operational performance and cost are within OPG's control. In view of the absolute magnitude of capital and non-fuel OM&A costs involved in operating Pickering NGS, these represent particularly important areas for cost management focus.

A key consideration for the OPA that was not quantitatively reflected in its economic assessment of Pickering continued operation, but which informs its perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties and potential risks. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario, features multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances), stands to host a non-negligible degree of potential gas-fired generator retirements, relies on sizeable contributions from conservation interventions over and above already significant levels of anticipated natural efficiency gains in the Ontario economy, poses a number of possibilities around the future pace and trajectory of economic recovery in the province and relies on successful and timely implementation of a substantial number of supply resources that are presently contractually committed or directed. In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present a certain degree of planning risk. Continued operation at Pickering is seen by the OPA as a potentially helpful source of insurance within this dynamic context.

From: JANOSSY Eva -INTREVPLAN'G <eva.janossy@opg.com>
Sent: August-09-12 2:19 PM
To: Bashir Bhana
Cc: NOONAN Karen -FIN & C CTRL; BECHARBHAI Hamant -FIN & C CTRL; NOONAN Karen -FIN & C CTRL; CARMICHAEL Carla -FIN & C CTRL; VACCA Mario -FIN & C CTRL; BURKE Paul J -INTREVPLAN'G
Subject: FW: Nuclear Outages
Attachments: Historical 2007 to 2011.xlsx

Bashir,

Per your request below, please find enclosed the historical planned outage days and forced loss rates for our Nuclear units. The Forced Extension to Planned Outages information is also included.

Please let me know if you have any questions or concerns,

Thank you, Karen, for putting this information together.

Eva

Eva Janossy
Director, Model Development and Analytics
OPG Energy Markets
Tel: 416-592-7981
e-mail: eva.janossy@opg.com

From: Bashir Bhana [<mailto:Bashir.Bhana@powerauthority.on.ca>]
Sent: Wednesday, July 11, 2012 10:10 AM
To: JANOSSY Eva -INTREVPLAN'G
Subject: Nuclear Outages

Hi Eva,

I hope everything is going well.

I'm looking for information on historical actual forced outage rates and planned outage days for Pickering [REDACTED]

Not Responsive For years 2007 to 2011 and by individual units.

Is this something you could help provide?

Thanks!
Bashir

Bashir Bhana

Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
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E: Bashir.Bhana@powerauthority.on.ca

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2007		
DNG1(E)	Forced Loss Rate (FLR) (%)	1.71
DNG2(E)	Forced Loss Rate (FLR) (%)	0.01
DNG3(E)	Forced Loss Rate (FLR) (%)	0.02
DNG4(E)	Forced Loss Rate (FLR) (%)	2.86
PND-A1(E)	Forced Loss Rate (FLR) (%)	50.77
PND-A4(E)	Forced Loss Rate (FLR) (%)	48.95
PND-B5(E)	Forced Loss Rate (FLR) (%)	21.16
PND-B6(E)	Forced Loss Rate (FLR) (%)	8.13
PND-B7(E)	Forced Loss Rate (FLR) (%)	9.62
PND-B8(E)	Forced Loss Rate (FLR) (%)	12.15

DNG1(E)	Planned Outage Time (Days)	0.0
DNG2(E)	Planned Outage Time (Days)	59.7
DNG3(E)	Planned Outage Time (Days)	16.0
DNG4(E)	Planned Outage Time (Days)	58.5
PND-A1(E)	Planned Outage Time (Days)	65.1
PND-A4(E)	Planned Outage Time (Days)	0.0
PND-B5(E)	Planned Outage Time (Days)	69.4
PND-B6(E)	Planned Outage Time (Days)	62.4
PND-B7(E)	Planned Outage Time (Days)	0.0
PND-B8(E)	Planned Outage Time (Days)	0.0

DNG1(E)	FEPO Duration (Days)	0.0
DNG2(E)	FEPO Duration (Days)	0.0
DNG3(E)	FEPO Duration (Days)	2.7
DNG4(E)	FEPO Duration (Days)	0.0
PND-A1(E)	FEPO Duration (Days)	11.0
PND-A4(E)	FEPO Duration (Days)	49.2
PND-B5(E)	FEPO Duration (Days)	24.7
PND-B6(E)	FEPO Duration (Days)	15.6
PND-B7(E)	FEPO Duration (Days)	28.0
PND-B8(E)	FEPO Duration (Days)	0.0

2008	2009	2010	2011
0.06	0.61	4.27	0.38
1.16	2	0.65	0.99
0.05	1.89	0.05	0.74
1.45	2.09	8.49	0.21
37.18	8.27	22.22	18.04
18.62	47.79	17.62	29.23
7.16	7.11	3.77	10.38
4.05	3.13	2.98	0.48
65.92	5.18	1.38	2.94
17.77	7.67	8.91	8.9
69.1	30.1	0.0	60.3
0.0	32.0	61.7	0.0
0.0	79.5	4.9	0.0
0.0	28.7	56.5	0.0
0.0	0.0	98.0	0.0
0.0	74.0	46.5	80.9
1.7	57.3	41.9	113.0
0.0	68.2	39.4	101.1
0.0	0.0	117.2	0.0
60.4	0.0	76.4	0.0
0.0	0.0	0.0	0.0
0.0	3.2	0.0	0.0
0.0	7.7	0.0	0.0
0.0	1.0	13.9	0.0
1.1	0.0	12.3	0.0
0.0	32.5	0.0	6.8
5.3	27.7	0.0	63.9
0.0	0.0	0.0	0.0
0.0	0.0	2.2	0.0
13.2	0.0	7.0	0.0

From: Andrew Pietrewicz
Sent: August-16-12 2:01 PM
To: Alan Leung; Bashir Bhana; Bonnie Chan; Steve Chui; Victor Stein
Subject: FYI, draft letter to OPG.
Attachments: OPA Support for Pickering and [Not Responsive] - DRAFT - August 15 2012.docx

For your information, a draft letter from us to OPG re: Pickering [Not Responsive]. Thank you to Bashir and Victor for their help in putting this together. In its current form, the letter reflects feedback from Amir and affords lots of scope for verbal supplementation. By way of process, it is going to Colin this weekend and will be discussed with Regulatory Affairs next week. Following any further revisions stemming from those reviews, we will then pass it along to OPG.

ap

From: Andrew Pietrewicz
Sent: August 16, 2012 1:27 PM
To: Amir Shalaby
Cc: Clare Hudson; George Pessione
Subject: RE: Deadline - CEO Weekend Reading

Two items for weekend reading attached:

- 1) Draft letter from OPA to OPG supporting OPG's proposed spending in 2013/2014 to maintain the options of Pickering continued operation and [Not Responsive]
- 2) [Not Responsive]

ap.

[Not Responsive]



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED].
Not Responsive

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Andrew Pietrewicz
Sent: August-23-12 12:46 PM
To: Alan Leung; Bashir Bhana; Bonnie Chan; Steve Chui; Victor Stein
Subject: FYI, letter for OPG
Attachments: OPA Support for Pickering and Not Responsive - August 15 2012.docx

Fyi. Thank you again to Bashir and Victor for putting this together. ap

From: Andrew Pietrewicz
Sent: August 23, 2012 12:45 PM
To: Bob Chow; Chuck Farmer; George Pessione; Joe Toneguzzo
Subject: FYI, letter for OPG

In support of work in 2013 - 2014 to preserve the options of Pickering continued operation and
Not Responsive. Signed pdf will follow. ap



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED].
Not Responsive

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
[TBD]
[TBD]
[TBD]
[TBD]
[TBD]

Attachment 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
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Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

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Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Andrew Pietrewicz
Sent: September-06-12 1:44 PM
To: Bashir Bhana
Subject: FW: Letter ready for delivery
Attachments: OPA Support for Pickering and *Not Responsive* _August 15 2012__Signed.docx.pdf

From: Andrew Pietrewicz
Sent: August 24, 2012 10:07 AM
To: Wajiha Shoaib
Cc: Nancy Marconi
Subject: Letter ready for delivery

...CCs added, e-signature added, confirmation received from Amir that it's ok to bring this to OPG. Thank you,

ap

p.s. Please confirm once you've delivered it.



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and [REDACTED] *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] *Not Responsive*

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

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Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

A handwritten signature in black ink, appearing to read 'A. Shalaby'.

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
Ethan Kohn
Joel Sheinfield
Colin Andersen
Michael Lyle
Andrew Pietrewicz

Appendix 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
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Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Bonnie Chan
Sent: September-13-12 10:34 AM
To: Victor Stein
Subject: 2012 - 2060 Supply Outlook: Illustrative View
Attachments: 2012-2060 Illustrative View 2012-07-31 (BC).pptx

Hi Victor,

Here is the deck that I put together that illustrates the supply outlook to 2060.

Bonnie Chan | Planner, Power System Planning
Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1
T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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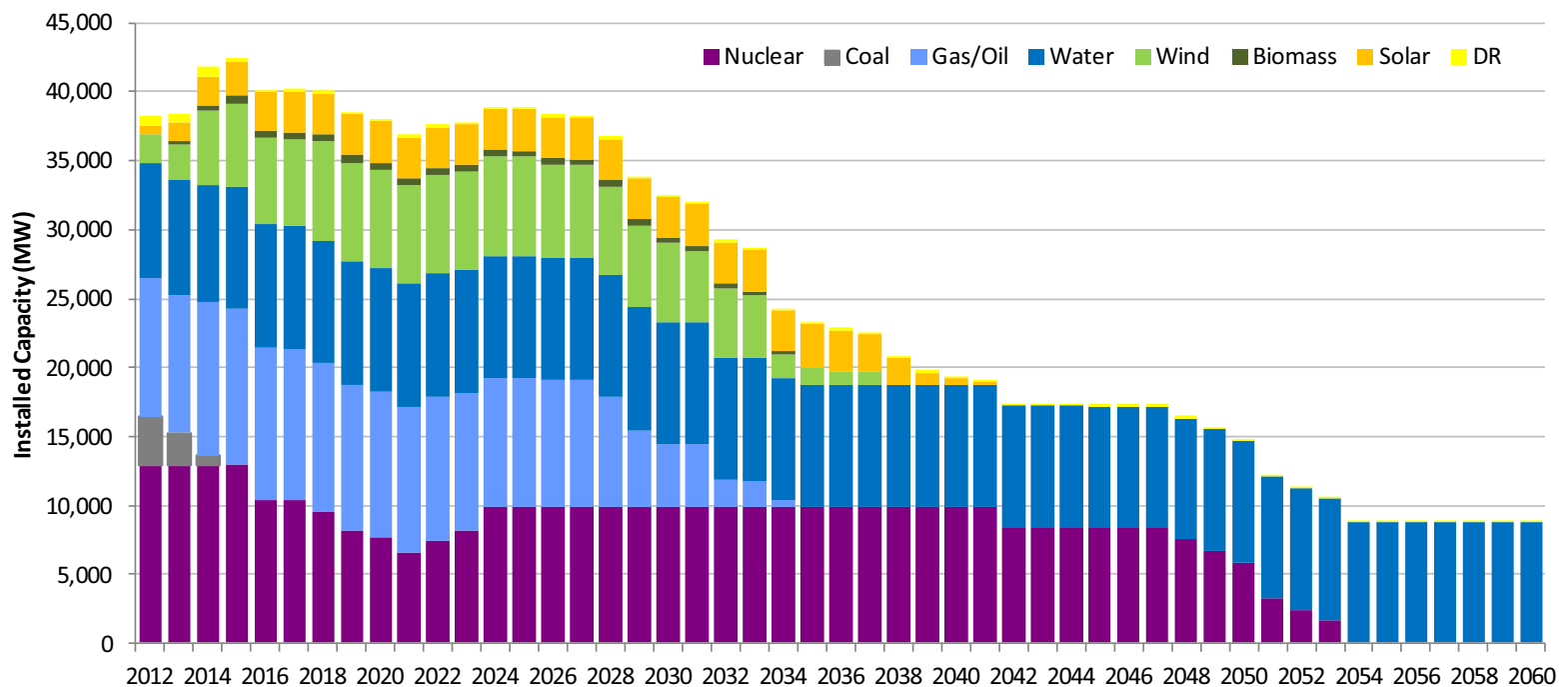
Illustrative Supply Outlook: 2012 - 2060

August 03, 2012

Outlook

- Provide insight on longer term planning considerations
- This deck illustrates the supply and demand balance beyond our current 20-year view, and takes a look out to to 2060 under current plans/assumptions
 - No new generation assumed beyond what is already planned

Illustrative Supply Outlook: 2012 - 2060

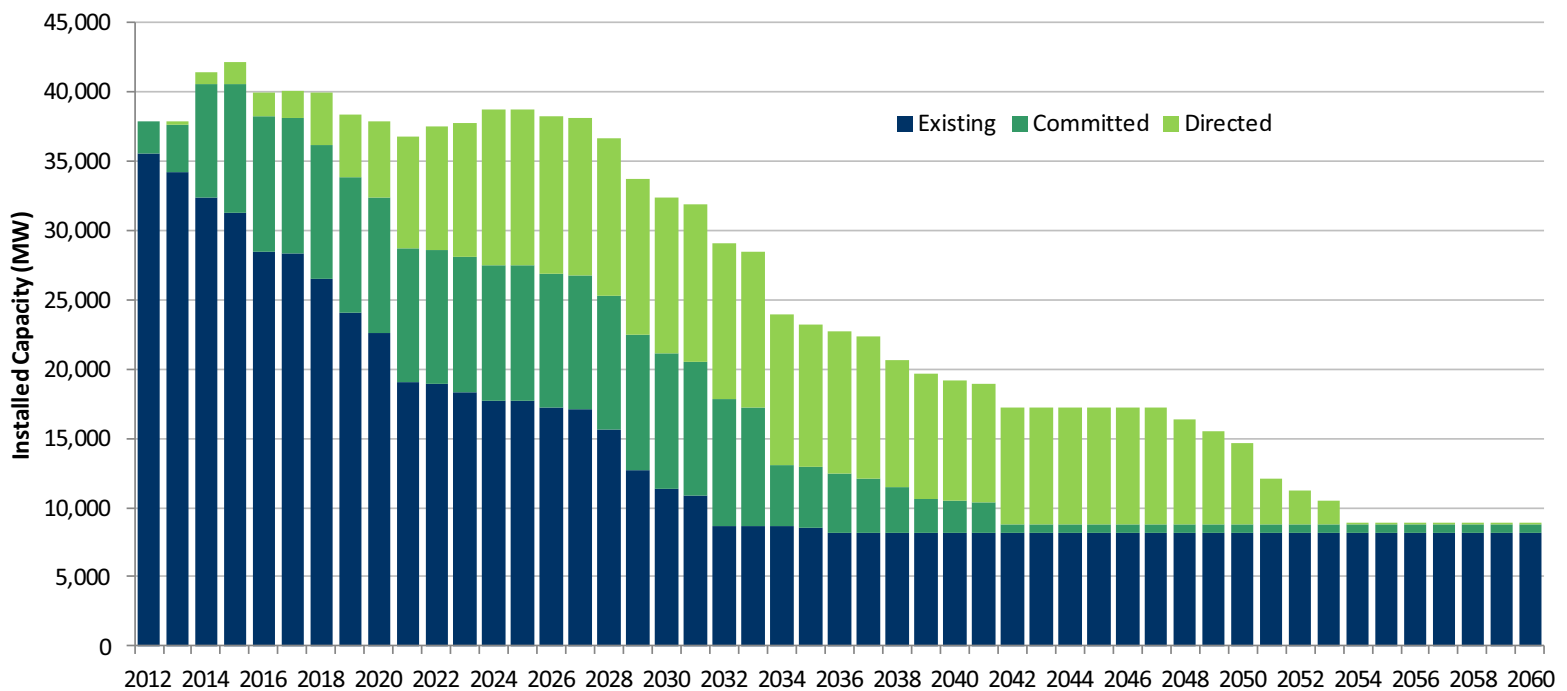


Assumptions on physical life differ by fuel source

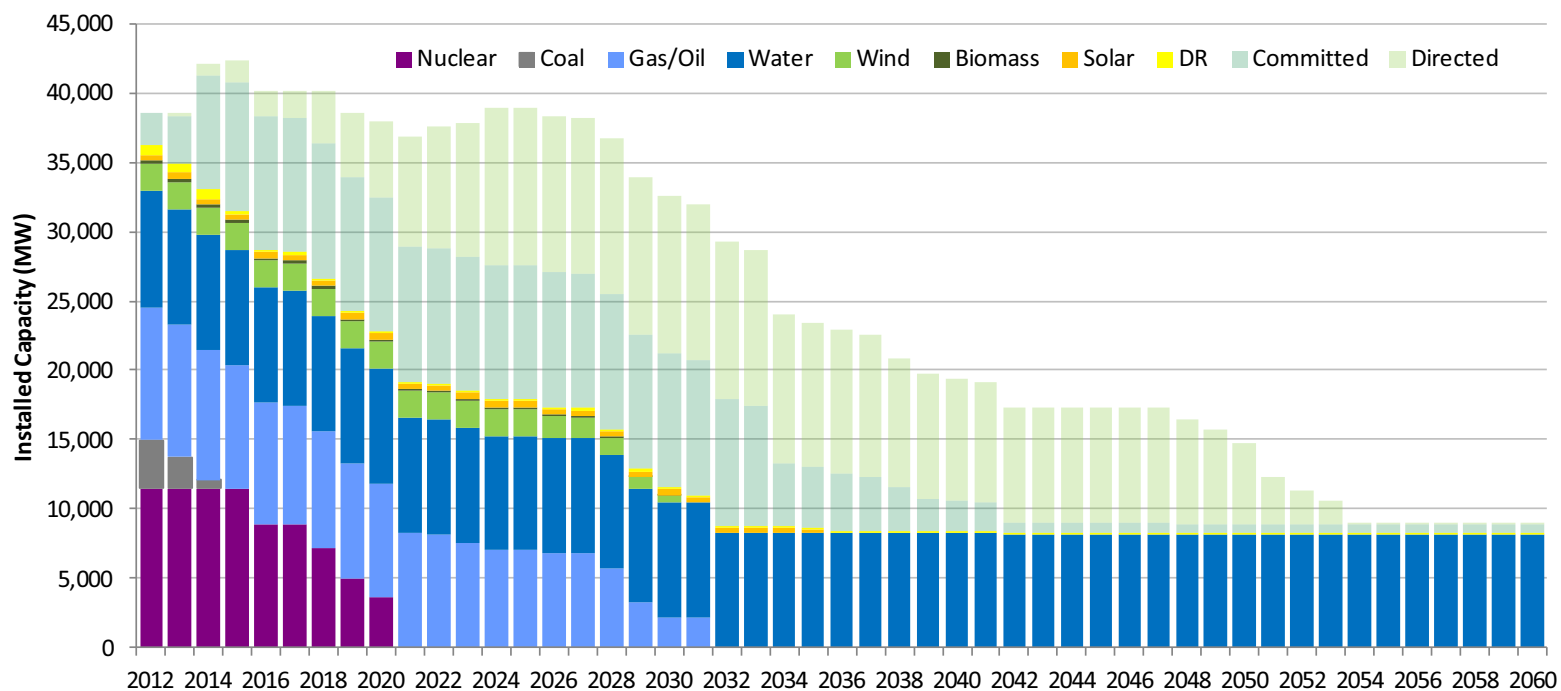
- Nuclear 30 yrs, Gas 20 yrs, Hydro 100 yrs, Wind 20 yrs, Biomass 20 yrs, Solar 25 yrs

Supply outlook assumes Pickering Continued Operation an **Not Responsive**

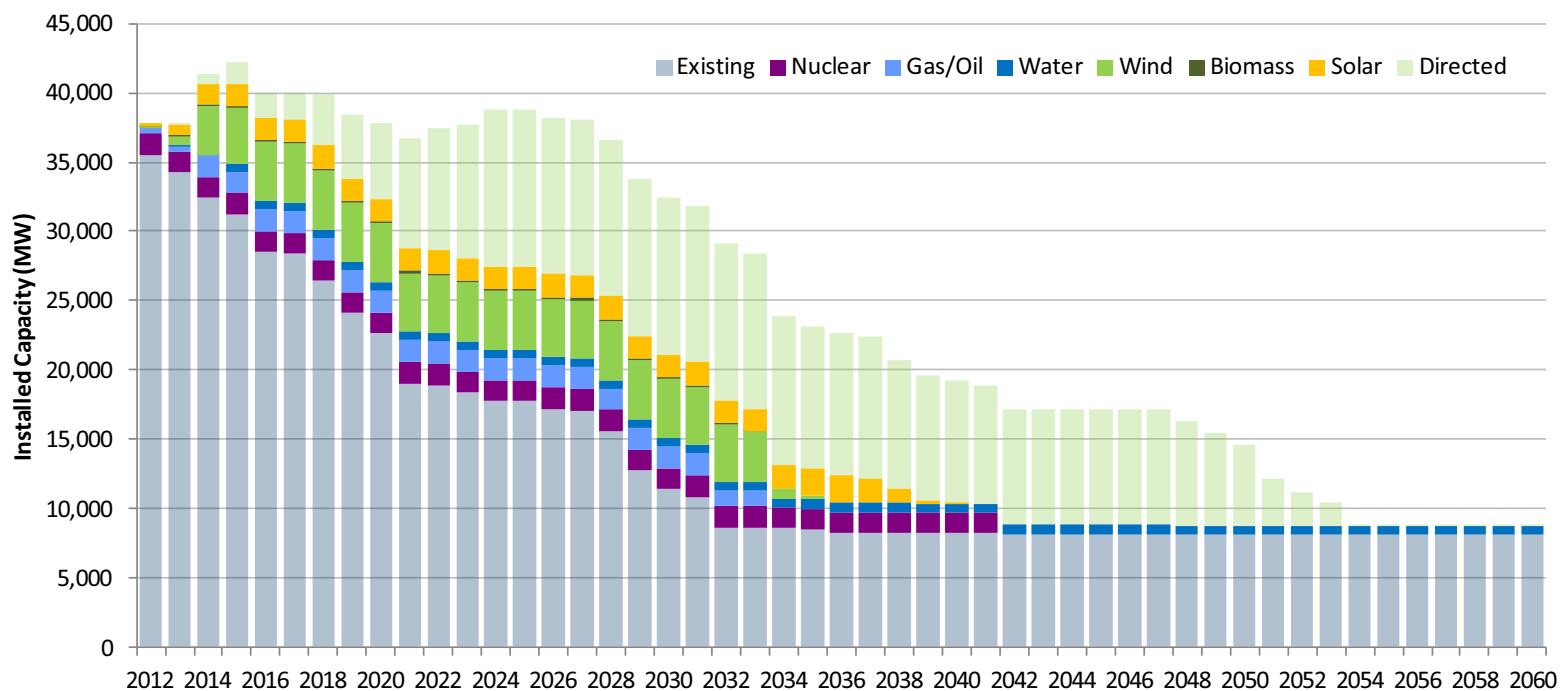
Illustrative Supply Outlook: 2012 - 2060



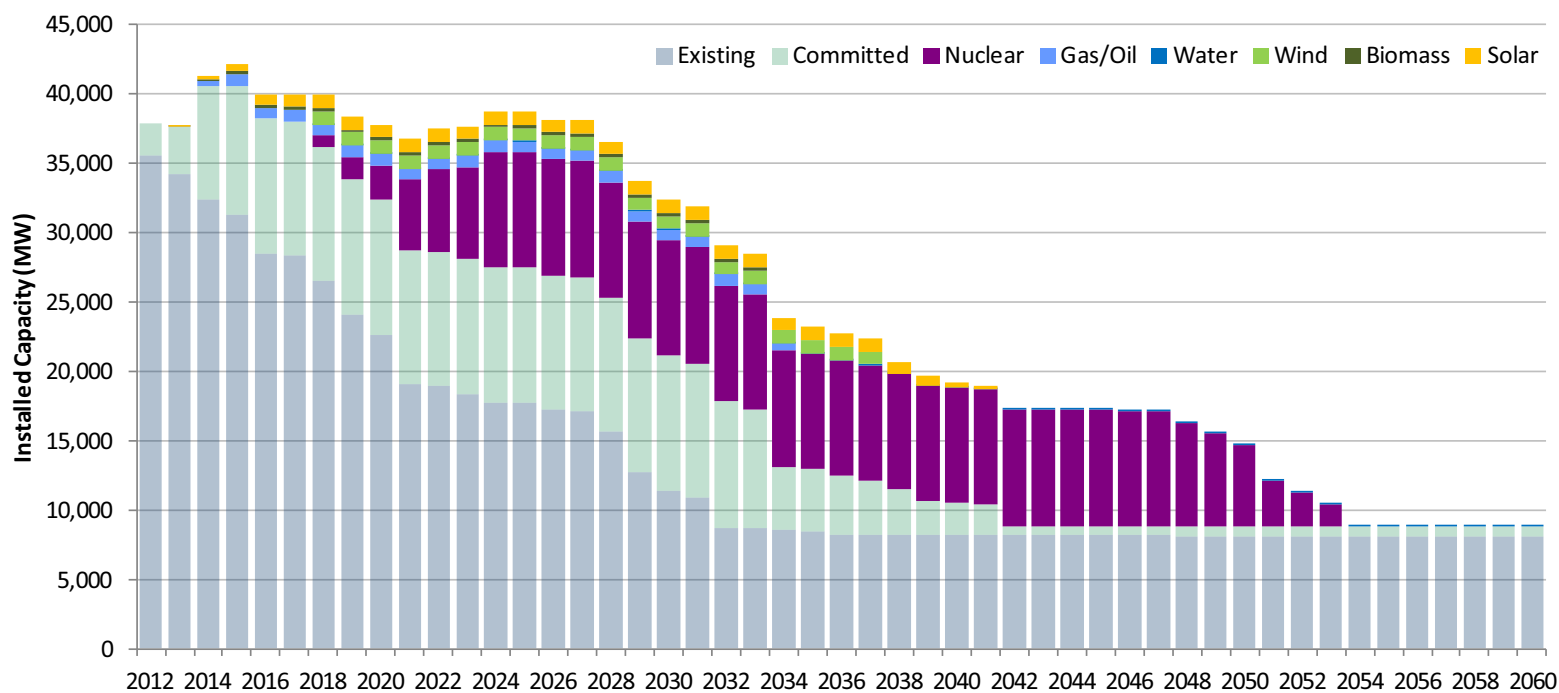
Details on Existing Supply



Details on Committed Supply



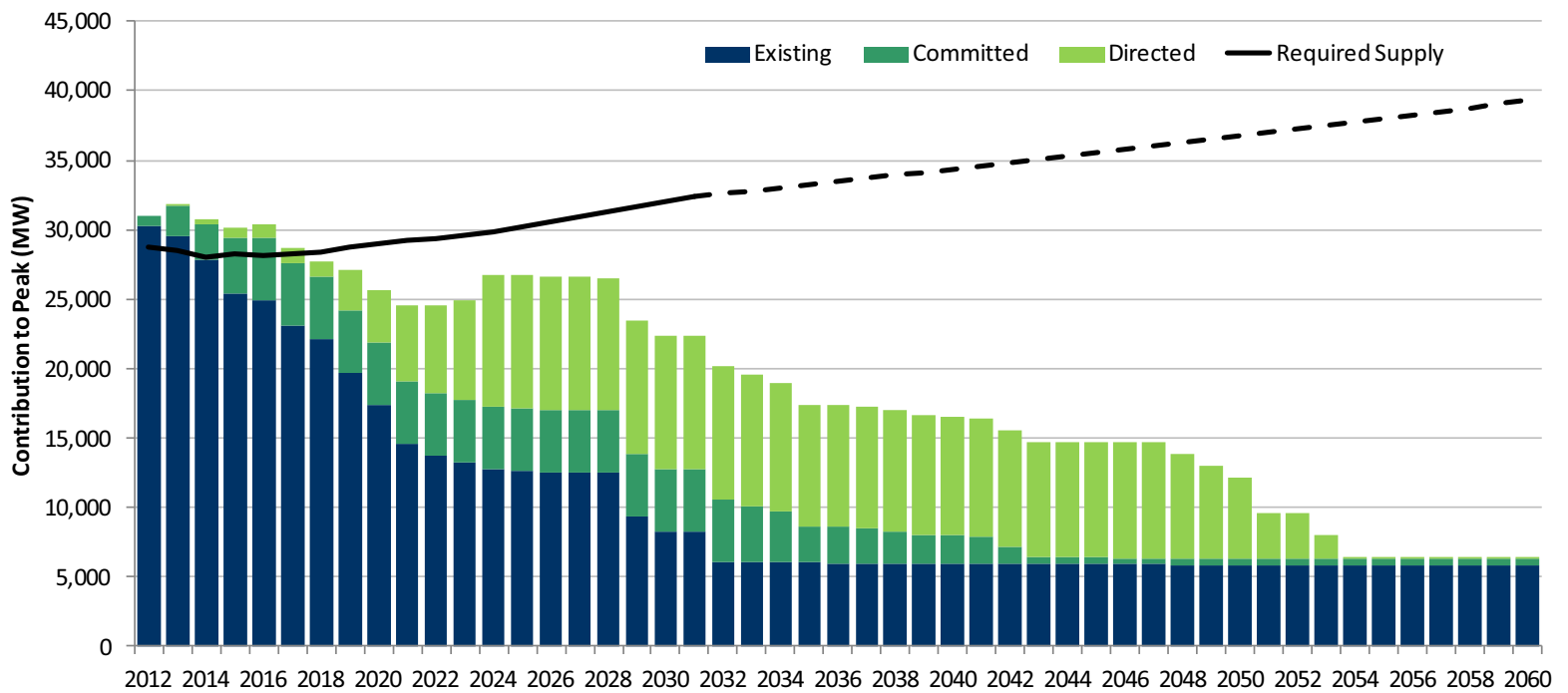
Details on Directed Supply



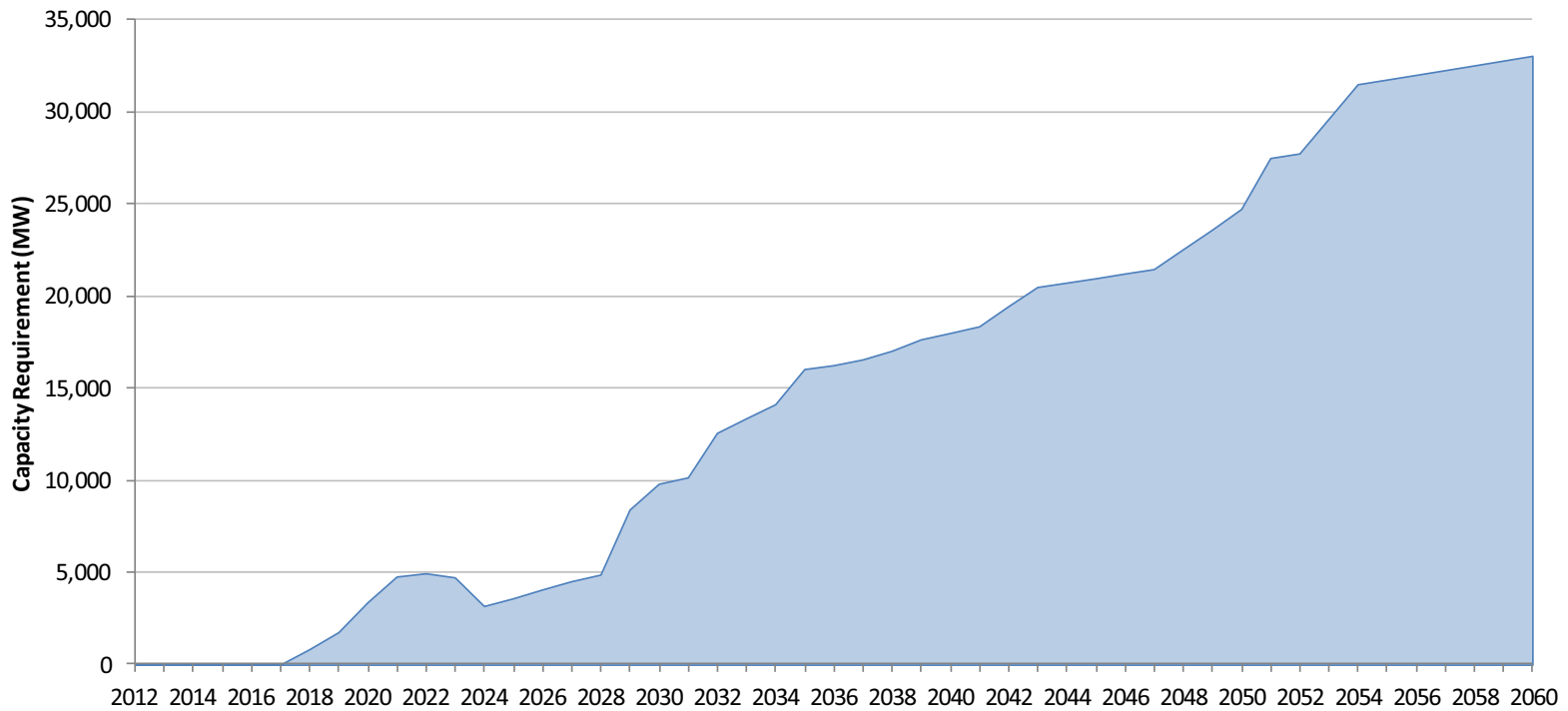
Outlook on Nuclear

Section 17

Contribution to Peak



Capacity Requirement



Year to Year Additions & Retirements

Section 17

From: Bashir Bhana
Sent: September-14-12 11:17 AM
To: Andrew Pietrewicz
Subject: Nuclear Deck - Capacity/Energy/Emissions Slides
Attachments: Prototype - Illustrative Case Summary 09-13-2012 (BB).ppt; Ontario Greenhouse Gas Emissions Targets A Technical Brief June 2007.pdf

Andrew – sample slides attached.

Not Responsive

Please advise on which version is preferred and I will update the remaining case slides accordingly.

Bashir Bhana, P.Eng.
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

Not Responsive

Not Responsive

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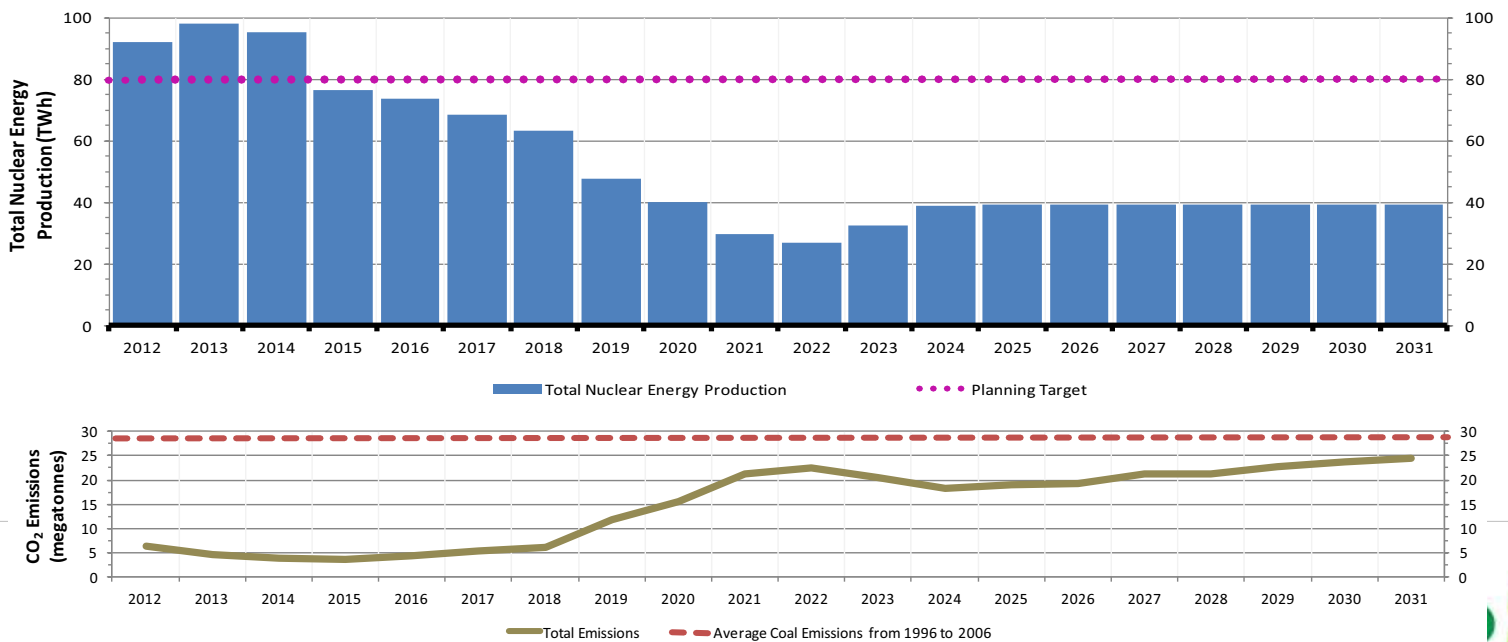
Not Responsive

SAMPLE VERSION 1

Shortages will emerge soon without continued operations at Pickering and

NR

Section 17

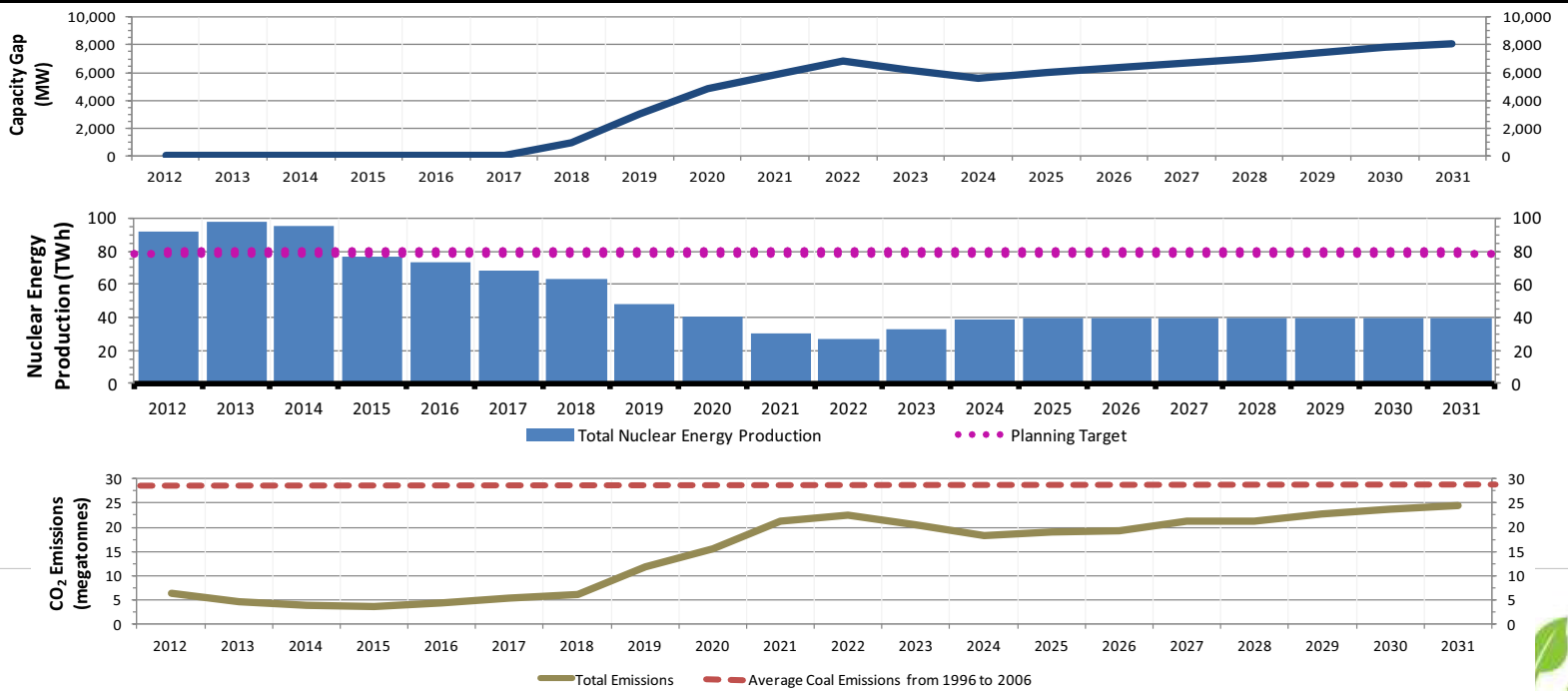


SAMPLE VERSION 2

Shortages will emerge soon without continued operations at Pickering and

NR

Section 17



Not Responsive

From: Bashir Bhana
Sent: September-14-12 1:58 PM
To: Andrew Pietrewicz
Subject: RE: Nuclear Deck - Capacity/Energy/Emissions Slides
Attachments: Illustrative Case Summary 09-14-2012 (BB).ppt

Please see attached.

From: Andrew Pietrewicz
Sent: September 14, 2012 12:19 PM
To: Bashir Bhana
Subject: RE: Nuclear Deck - Capacity/Energy/Emissions Slides

Thank you. Please go with version 1 for DM briefing (i.e. no capacity gap picture).

From: Bashir Bhana
Sent: September 14, 2012 11:17 AM
To: Andrew Pietrewicz
Subject: Nuclear Deck - Capacity/Energy/Emissions Slides

Andrew – sample slides attached.

Not Responsive

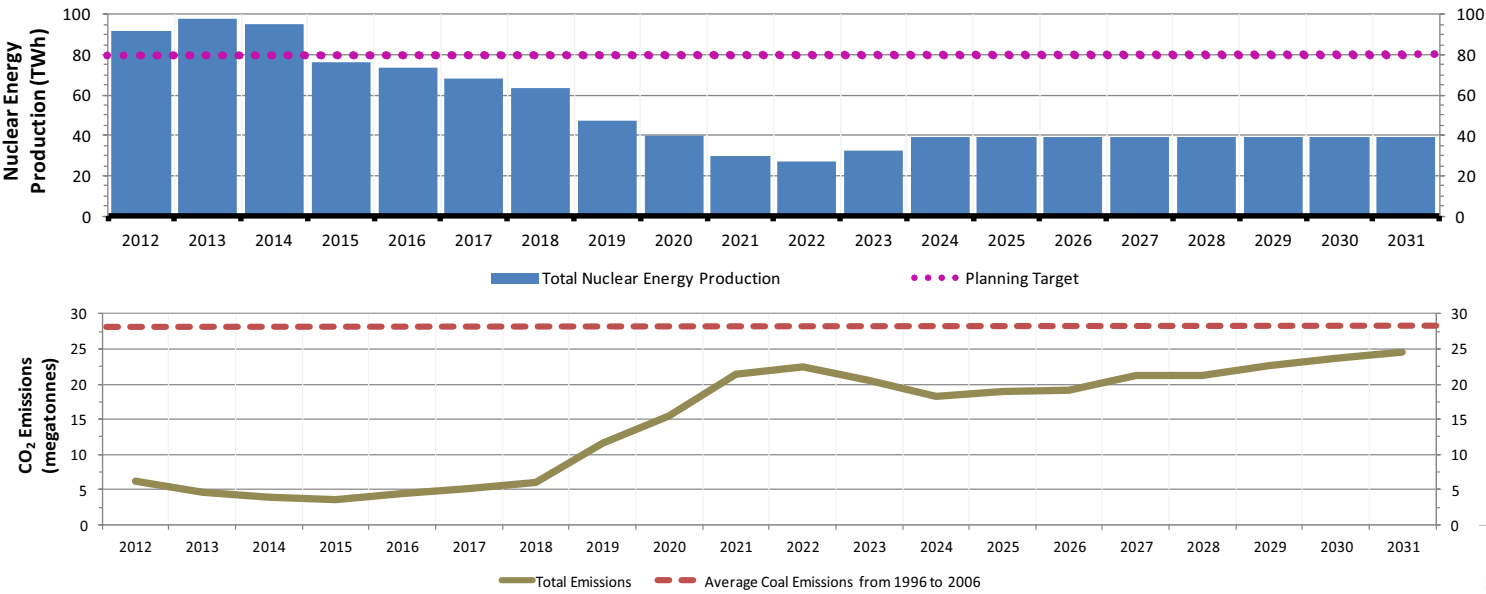
Please advise on which version is preferred and I will update the remaining case slides accordingly.

Bashir Bhana, P.Eng.
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

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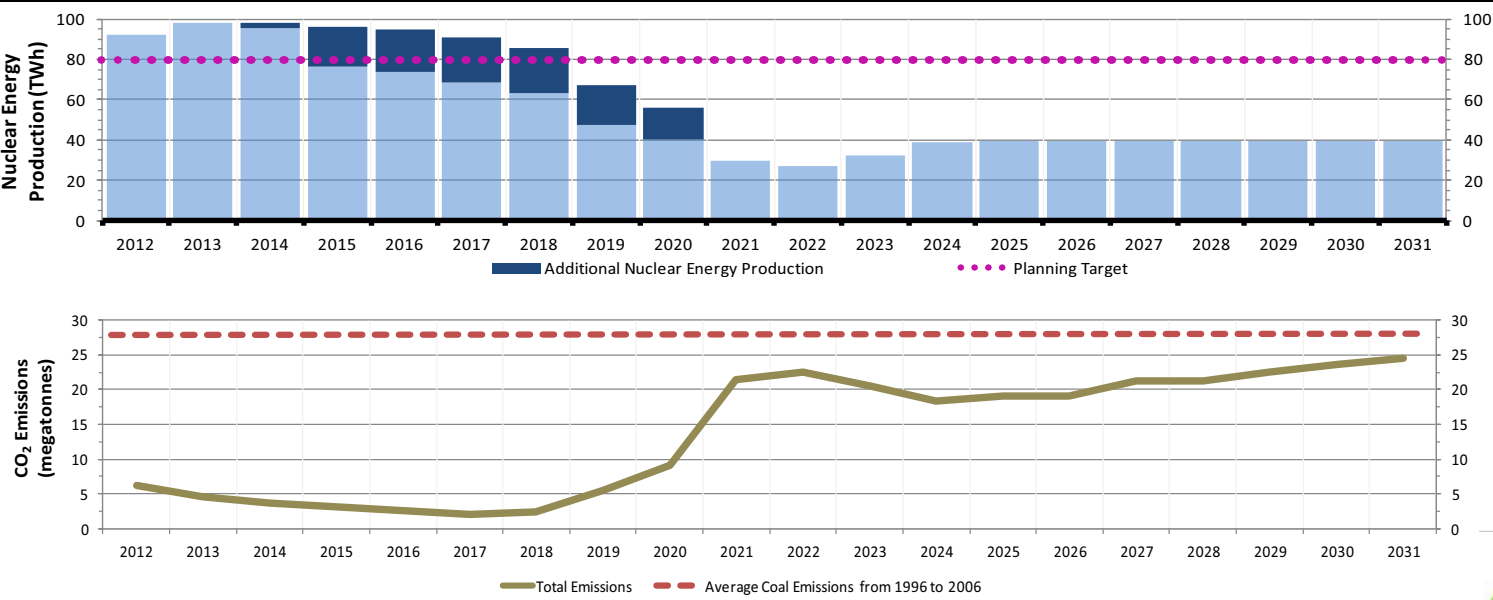
NR

Section 17



Pickering continued operation adds energy, but only to 2020

Section 17



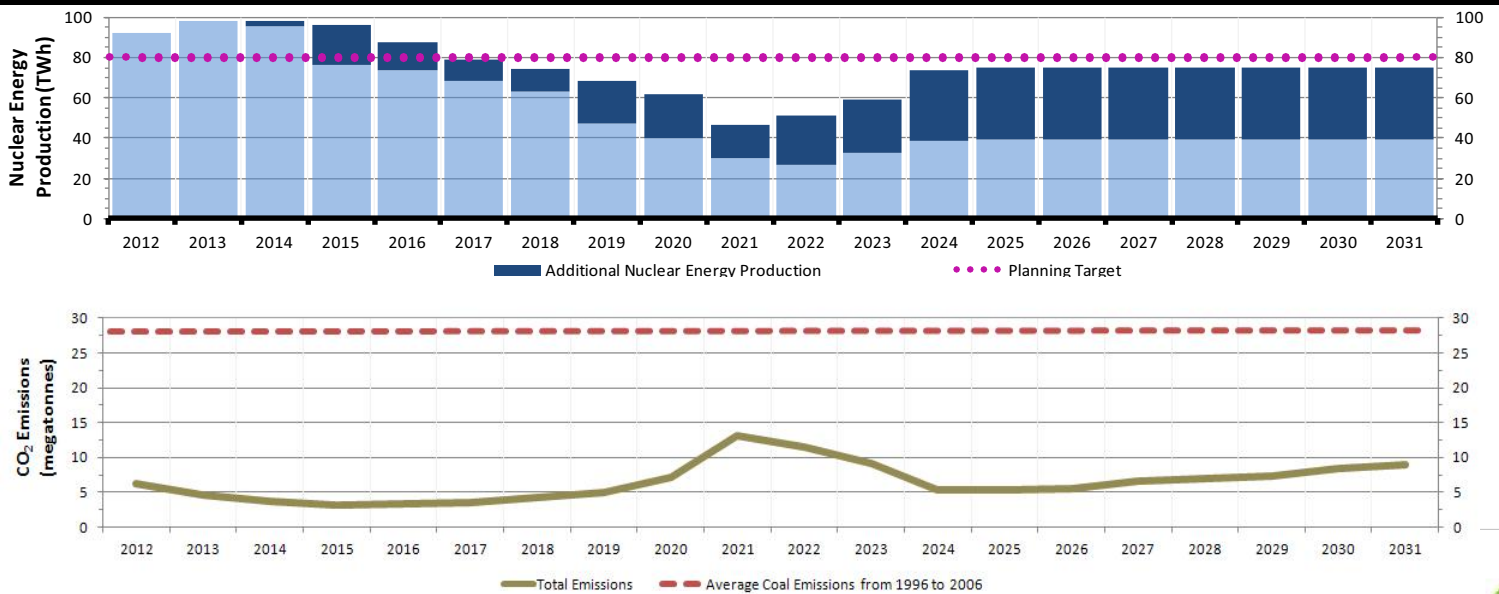
Not Responsive

Not Responsive

Not Responsive

while Pickering provides cover for front end of bathtub

Section 17



From: Bashir Bhana
Sent: September-14-12 2:01 PM
To: Andrew Pietrewicz
Subject: RE: Nuclear Deck - Capacity/Energy/Emissions Slides
Attachments: Illustrative Case Summary 09-14-2012 (BB).ppt

Fyi – if additional changes are needed, you can find me at Victor’s desk for the next little while...- Bashir

From: Bashir Bhana
Sent: September 14, 2012 1:58 PM
To: Andrew Pietrewicz
Subject: RE: Nuclear Deck - Capacity/Energy/Emissions Slides

Please see attached.

From: Andrew Pietrewicz
Sent: September 14, 2012 12:19 PM
To: Bashir Bhana
Subject: RE: Nuclear Deck - Capacity/Energy/Emissions Slides

Thank you. Please go with version 1 for DM briefing (i.e. no capacity gap picture).

From: Bashir Bhana
Sent: September 14, 2012 11:17 AM
To: Andrew Pietrewicz
Subject: Nuclear Deck - Capacity/Energy/Emissions Slides

Andrew – sample slides attached.

Also included is a slide on historical coal emissions and attached separately the source report. Note I’ve expanded the historical average to 1996-2006 – pegging coal emissions at 28 Mt/year.

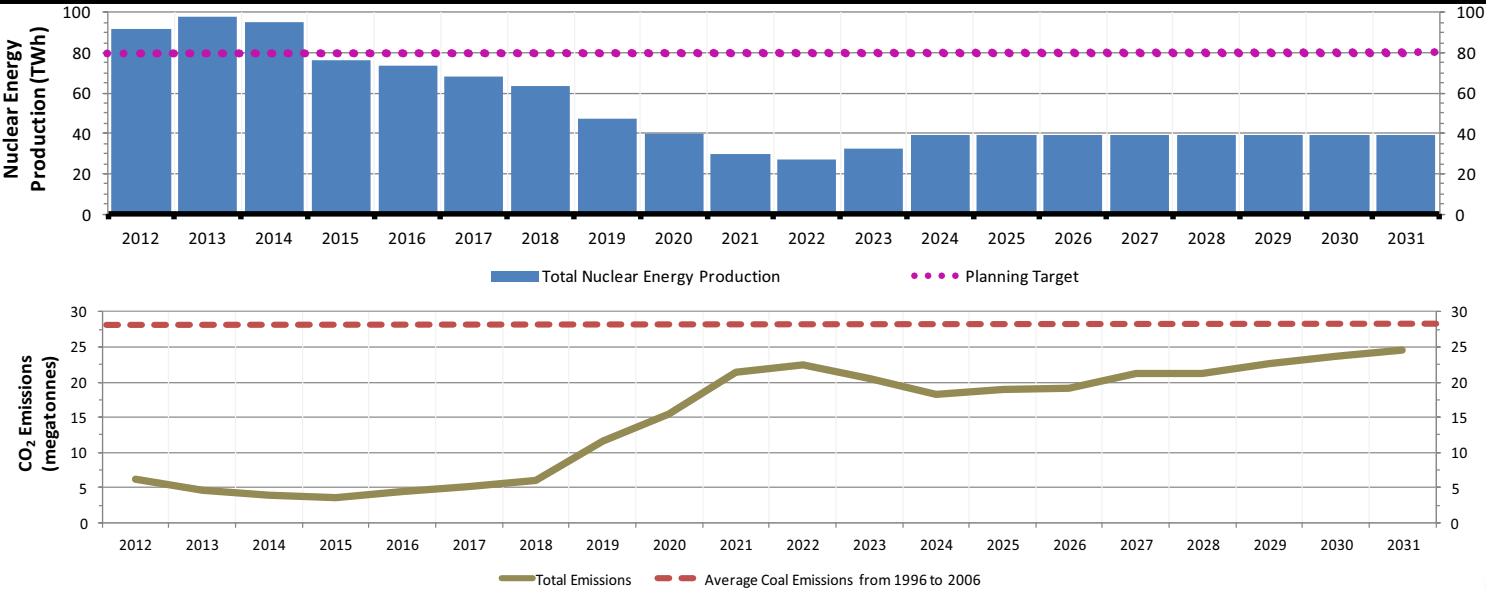
Please advise on which version is preferred and I will update the remaining case slides accordingly.

Bashir Bhana, P.Eng.
Planner, Resource Integration
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120 Adelaide Street West, Suite 1600
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T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

Shortages will emerge soon without continued operations at Pickering and

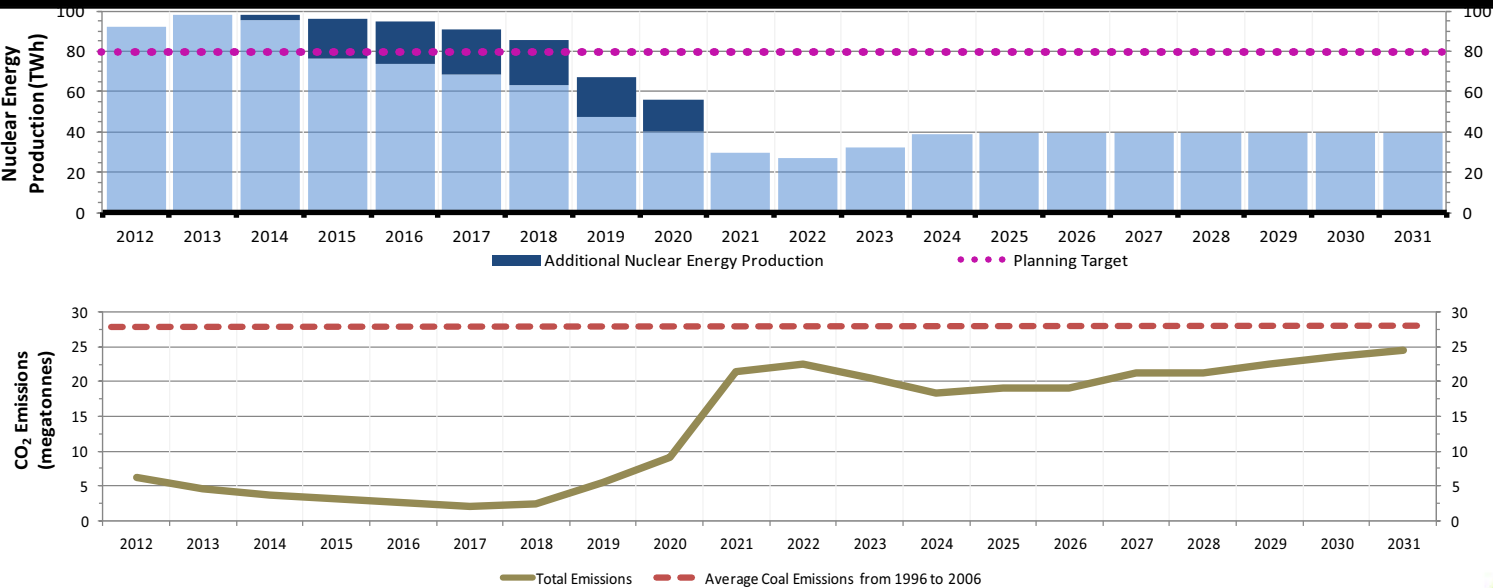
Not Responsive

Section 17



Pickering continued operation adds energy, but only to 2020

Section 17



Not Responsive

Not Responsive

Section 17

From: Andrew Pietrewicz
Sent: September-18-12 8:41 AM
To: Bashir Bhana
Subject: FW: Pickering Life

Fyi,don't recall whether you were on the distribution to the chain below. ap

-----Original Message-----

From: Joe Toneguzzo
Sent: September 17, 2012 5:43 PM
To: Andrew Pietrewicz
Subject: RE: Pickering Life

This is consistent with my thinking.

Thanks - Joe

-----Original Message-----

From: Andrew Pietrewicz
Sent: Monday, September 17, 2012 5:37 PM
To: Joe Toneguzzo
Subject: Re: Pickering Life

I will follow-up with you in person tomorrow morning. In the meantime, a preview: we can go ahead and seek additional guarantee from opg. My leaning, however, is that in view of the risk involved and balanced against the cost of advancing vs deferring tx station in-service, it would be prudent to allow for some overlap of the tx and gx elements. My recommendation, subject to further discussion with you tomorrow, is to proceed as we currently are on the Clarington ts. ap

----- Original Message -----

From: Joe Toneguzzo
Sent: Monday, September 17, 2012 05:18 PM
To: Andrew Pietrewicz
Subject: RE: Pickering Life

Andrew;

It is not clear to me how to interpret this.

Since you are closer to it, does this give you comfort that the Pickering units will continue to operate well beyond 2015 and we don't need to be concerned that about 750 MW of GTA load will be at risk under a single transmission system contingency?

Thanks - Joe

-----Original Message-----

From: Andrew Pietrewicz
Sent: Monday, September 17, 2012 4:58 PM

To: Joe Toneguzzo
Subject: Fw: Pickering Life

Draft language below for review. ap

----- Original Message -----

From: BOLAND Bruce -COMOPS&ENV [mailto:bruce.boland@opg.com]
Sent: Monday, September 17, 2012 04:47 PM
To: Andrew Pietrewicz; Amir Shalaby; 'mike.penstone@hydroone.com' <mike.penstone@hydroone.com>
Cc: CROZZOLI Carlo -CBUSDEV&CRO <carlo.crozzoli@opg.com>
Subject: RE: Pickering Life

The draft letter we would send is below:

Amir,

As you are aware, OPG has been working to confirm the structural fitness of Pickering Nuclear Generating Station fuel channels for operation to 2020.

OPG's recent submission to the Canadian Nuclear Safety Commission (CNSC) sought CNSC staff's agreement that "all life limiting fuel channel structural issues have been addressed for the target service life of the Pickering Nuclear Generating Station...".

We are pleased to report that CNSC staff agree that OPG will, through continued specified monitoring, the successful completion of on-going R&D and specified station improvements, be capable of confirming fitness-for-service of Pickering NGS A and B fuel channels for the duration of the proposed continued operation period. In this regard we have fulfilled our commitment to provide the OPA with the results of this analysis by the end of 2012.

Not Responsive

Best regards,

Bruce Boland

-----Original Message-----

From: Andrew Pietrewicz [mailto:Andrew.Pietrewicz@powerauthority.on.ca]
Sent: Monday, September 17, 2012 3:21 PM
To: BOLAND Bruce -COMOPS&ENV
Subject: RE: Pickering Life

Thanks, Bruce. Short answer is yes. Is there a copy you could share? Joe Toneguzzo works with us on the transmission side will have a look - we'll take it from there. Thank you, ap

Andrew Pietrewicz
Director, Resource Integration
Power System Planning
Ontario Power Authority

120 Adelaide Street West

Suite 1600
Toronto, Ontario
M5H 1T1

T. 416 969 6040
F. 461 967 1947

www.powerauthority.on.ca

-----Original Message-----

From: BOLAND Bruce -COMOPS&ENV [mailto:bruce.boland@opg.com]
Sent: September 17, 2012 2:43 PM
To: Andrew Pietrewicz
Subject: FW: Pickering Life

Andrew, I see Amir is away....over to you. Bruce

From: BOLAND Bruce -COMOPS&ENV
Sent: Monday, September 17, 2012 2:42 PM
To: 'mike.penstone@hydroone.com'; 'Amir Shalaby'
Cc: CROZZOLI Carlo -CBUSDEV&CRO
Subject: Pickering Life

Mike and Amir,

We are getting ready to write the OPA informing them that the CNSC has formally agreed with our analysis that Pickering life can be managed to 2020.

I expect this will have some impact on the Clarington TS discussions H1 is having.

Do you wish to offer any input before such a letter goes?

Bruce

Bruce Boland | Senior Vice President, Commercial Operations & Environment | Ontario Power Generation
700 University Ave, Suite H19 A19, Toronto, ON M5G 1X6 | T 416-592-4480 | F 416-592-6600 | E
bruce.boland@opg.com<<mailto:bruce.boland@opg.com>>

Clarington residents come out swinging against planned hydro station Clarington This Week Sat Sep 15 2012

Page: 1

Section: News

Byline: Jennifer O'Meara, jomeara@durhamregion.com<<mailto:jomeara@durhamregion.com>>

CLARINGTON -- There is little middle ground between Clarington homeowners who don't want to live next to a hydro transmission station and officials who say the new station is needed and Clarington is the best place to build it.

"We can't believe anything you say, so go away. Find some 100-acre paved site in Pickering and build it there," said Jim Sullivan, a neighbour to the station proposed on Oak Ridges Moraine and greenbelt land.

One of the only things the two sides did agree on during a recent meeting was having a technical follow-up meeting with a smaller group of residents acting as an advisory committee.

Hydro One promised to provide answers to the outstanding questions in writing. In exchange it asked for what mitigation measures could be put in place so that residents could live with the hydro station.

Residents refused and asked their supporters to sign a petition against the project.

"We like the words 'prevent, prohibit, stop, don't ever do'. We like those words more than 'mitigate' which means soften -- it's a weak word," said Mr. Sullivan.

At the Sept. 11 public meeting, Hydro One said a new hydro transfer station will be needed to get power to the east Greater Toronto Area when the Pickering nuclear station closes.

Hydro One has a number of arguments for the chosen site: it has access to both the big volt and mid-level volt power lines; the hydro corridor currently there is an "existing disturbance"; the property is big enough and Hydro One already owns it.

"For those reasons we feel Clarington is the best for the site," said Randy Church, project development manager for Hydro One.

Hydro One plans to begin construction next year and have the station running by the spring of 2015 -- to be ready for the earliest possible closure of the Pickering Nuclear Generating Station. Otherwise there could be blackouts in the east GTA, according to the hydro officials.

"Do I roll the dice and say Pickering is going to last to 2020?" said Joe Toneguzzo, Ontario Power Authority director of transmission integration. "The consequence is very high to the customers in this area. We believe the prudent thing to do is to move forward."

Residents asked Hydro One to slow down the project.

They are worried the station will impact their well water, harm the environment and local wildlife. They want a geohydrological study of the Oak Ridges Moraine's sensitive groundwater system.

Hydro One said it will test local wells before, during and after construction of the transformer station. If there is any damage to water supply caused by the construction, Hydro One will pay to dig a new well.

Residents said a new well won't help much if the groundwater has been contaminated.

"Get it off the Ridges and we'll get off your back," said resident Doug Taylor.

Residents also had concerns about an accident at the Pickering station a few years ago that resulted in an oil spill and small fire.

Hydro One said failures are rare and that in the Pickering breakdown, a small amount of oil was released into a water system. The oil is non-toxic and no damage was done to wildlife or habitat.

"If I could dispel the notion (that) we have transformer stations blowing up around the province -- we don't," said Mr. Church.

Residents disagreed about the benign nature of the oil used and said contamination would be impossible to clean up in the groundwater system.

"We can't replace our water supply and that is our key concern," said Clint Cole.

Homeowners also raised concerns about the impact on property values and said it will now be impossible to sell their homes for a decent price.

"It's my home, my retirement. Every dime I've got is in my property," said Mr. Taylor.

Hydro One said that property values may be affected during the disruption due to construction but that when the project is finished other factors -- such as the economy and mortgage rates -- come into play and it's hard to say if the hydro station has an impact.

That earned murmurs of disagreement from the audience.

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If you have received this message in error, or are not the named recipient(s), please notify the sender immediately and
delete this e-mail message.

From: Bonnie Chan
Sent: September-18-12 2:39 PM
To: Bashir Bhana
Subject: Schedule for No Continued Operation at Pickering

Hi Bashir,

I am at the final stages of finalizing the capacity plan. The case I am developing currently assumes Pickering Continued Op with unit 7 LM - the schedule that is assumed for this case is the one from the March 2012 Pickering Study, worksheet "Tab 2a":

[S:\Resource Integration\Projects\Pickering\2012 Pickering Continued Operations Study\Data From OPG\March 2012 Study\OPA Data PB Cont Ops Feb 27 2012 Draft.xlsx](#)

What schedule should be used for the case that does not assume continued operation?

Thanks,

Bonnie Chan | Planner, Power System Planning
Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1
T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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Pickering 1	March 20, 2015
Pickering 4	March 20, 2015
Pickering 5	Dec 22, 2014
Pickering 6	May 9, 2014
Pickering 7	March 20
Pickering 8	March 20

Note that P7 “life management” is assumed not to take place under this scenario.

Let me know if you have any questions.

Thanks,
Bashir

Bashir Bhana, P.Eng.
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From: Bob Gibbons
Sent: January-06-12 11:51 AM
To: George Pessione; Bob Chow
Cc: Victor Stein; Bashir Bhana; Bonnie Chan; Peter Huang
Subject: FW: Price Forecast as of December 31, 2011

FYI. For our evaluation of Not Responsive and Pickering Continued Operation in support of OPG's rate submission, we plan to use the following gas price forecast values and probabilities:

Low	4.0 (cumulative probability = 15%)
Reference	6.0 (cumulative probability = 50%)
High	12.0 (cumulative probability = 98%)

Not Responsive

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

From: Sproule [<mailto:noreply@sproule.com>]
Sent: Thursday, January 05, 2012 6:04 PM
To: Steve Chui
Subject: Price Forecast as of December 31, 2011

Below in Excel format is Sproule's price forecast, as of December 31, 2011 as well as the constant price model for December 31, 2011. Should you have any questions, please do not hesitate to [CONTACT US](#).

December Price Forecast:

[December 30 2011.xls](#)

Constant Prices as per SEC and NI 51-101 Regulation

[December 31 2011 Constant.xls](#)

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The tables attached to this email present the product prices and market forecasts for the Canadian Oil and Gas industry prepared by Sproule Associates Limited. These prices and forecasts are based on information obtained from various sources, including government agencies, industry publications, Canadian oil refiners, and natural gas marketers, available up to and including December 2011. The information was accepted as is, and Sproule Associates Limited accepts no responsibility for any inaccuracies within it. The forecasts presented here are

based on an informed interpretation of the information, and can be considered reasonable at the time they were published (December 30, 2011).

Users of this information are asked to recognize the high degree of uncertainty associated with forecasting oil and gas prices, and Sproule Associates Limited takes no responsibility for the application of these numbers by anyone other than the professionals of Sproule Associates Limited.

These forecasts are revised monthly. Revisions could be considerable. Sproule Associates Limited and its subsidiaries are not liable for any errors, omissions, or inaccuracies in the numbers provided on this site.

You are welcome to print the tables provided. It is recommended that you set your printer to landscape for the historical tables.



From: Bashir Bhana
Sent: January-10-12 10:06 AM
To: Bob Gibbons; Victor Stein; Bonnie Chan; Steve Chui
Subject: Pickering Reference Case
Attachments: Pickering Study - Reference Case Results Summary for Amir Meeting 01-10-2012 (BB).pdf

Attached is the Reference Case results summary which we plan to present to Amir today.

Excel file found here.:

<S:\Resource Integration\Projects\Pickering\2011 Continued Operations Study\Studies>

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
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A: Early Retirement with Early P7 LM													B: Continued Operation with Late P7 LM												
1: Reference													1: Reference												
Energy Production (GWh)	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Energy Production (GWh)	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	95,143	94,602	89,551	71,158	57,805	52,708	50,404	47,819	559,190	--	--	--	Nuclear	96,458	99,321	94,158	89,501	76,855	72,067	66,196	56,319	650,875	--		
Other Baseload	21,892	25,140	28,209	30,202	30,864	32,476	31,908	31,883	232,575	--	--	--	Other Baseload	21,520	23,535	26,616	26,714	29,888	32,246	31,825	31,741	224,084	--		
Hydro	39,506	41,682	42,936	43,113	42,932	42,894	42,913	43,031	339,006	--	--	--	Hydro	39,449	41,470	42,917	42,789	42,932	42,894	42,913	43,031	338,593	--		
Fossil/Gas	2,730	2,758	1,868	6,507	9,944	11,874	13,653	14,895	63,728	--	--	--	Fossil/Gas	2,760	1,518	1,197	2,155	5,108	7,251	9,478	13,399	42,866	--		
Imports	2,178	1,390	2,208	7,472	12,380	14,726	16,107	18,249	74,711	--	--	--	Imports	1,749	953	1,669	2,574	5,324	6,988	9,499	14,387	43,143	--		
Exports	16,956	20,073	18,789	12,135	8,046	8,162	7,687	6,985	98,833	--	--	--	Exports	17,443	21,798	20,573	17,416	14,227	14,929	12,613	9,986	128,985	--		
Dispatch Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Dispatch Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	\$766	\$771	\$732	\$604	\$498	\$454	\$434	\$412	\$412	\$4,670	\$3,860	\$3,860	Nuclear	\$774	\$801	\$760	\$719	\$628	\$570	\$537	\$470	\$5,259	\$4,321		
Other Baseload	\$636	\$685	\$725	\$664	\$602	\$559	\$503	\$496	\$496	\$4,869	\$3,978	\$3,978	Other Baseload	\$593	\$638	\$692	\$613	\$578	\$538	\$484	\$478	\$4,614	\$3,766		
Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Fossil/Gas	\$123	\$119	\$127	\$406	\$610	\$729	\$836	\$900	\$3,850	\$2,941	\$2,941	\$2,941	Fossil/Gas	\$122	\$83	\$84	\$144	\$308	\$437	\$569	\$772	\$2,518	\$1,910		
Import Cost	\$44	\$33	\$33	\$33	\$262	\$514	\$796	\$961	\$1,079	\$3,722	\$2,785	\$2,785	Import Cost	\$39	\$21	\$18	\$47	\$169	\$303	\$473	\$873	\$1,943	\$1,432		
Export Revenue	\$310	\$258	\$182	\$283	\$278	\$421	\$442	\$373	\$373	\$2,547	\$2,029	\$2,029	Export Revenue	\$313	\$217	\$162	\$230	\$258	\$428	\$490	\$404	\$2,502	\$1,981		
Capital & Fixed Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	NPV	Capital & Fixed Costs - 2010 \$M CDN	2013	2014	2015	2016	2017	2018	2019	2020	2020	Total	NPV	
Nuclear	\$1,030	\$980	\$755	\$190	\$0	\$0	\$0	\$0	\$0	\$2,955	\$2,625	\$2,625	Nuclear	\$1,087	\$1,083	\$1,061	\$1,055	\$1,042	\$1,048	\$820	\$416	\$7,612	\$6,253		
Other Baseload	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Other Baseload	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Hydro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Fossil/Gas	\$0	\$0	\$0	\$93	\$220	\$242	\$194	\$0	\$749	\$749	\$576	\$576	Fossil/Gas	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Import Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Import Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Export Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	Export Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		

Reference Case Assumptions:

- Picking Energy Production, Total OM&A & Capital Costs, and Fuel Costs provided by OPD

- Gas Price = \$6 / MMBTU at Henry Hub (2013-2020)

- Carbon = \$0 / tonne

- Discount Rate = 4% / year (real)

- Inflation Rate = 2% / year

- Cost of Replacement Capacity = \$94 / kW-year

- Resource mix consistent with IPS2 2

- Darlington refurbishment as per OPG Dec 14th, 2011 email

- Supply gap in the mid term filled with HC (no limit on block size) for modelling purposes

Scenario Summary:

1. Reference Case

2 & 3. Lower and Higher Demand (as per IPS2 forecasts)

4 & 5. Lower and Higher Natural Gas Prices (\$4 - \$12 / MMBTU at Henry Hub)

6. Carbon Price of \$15 / tonne in 2015 increasing to \$27 / tonne in 2020 (OPA medium trajectory)

7 & 8. Lower and Higher Picking Production (based on best and worst 5-year average fossil fuel prices)

9 & 10. Longer and Shorter Continued Operation Period from 240X (50% shorter duration, end of 2020)

11 & 12. Lower and Higher OM&A Costs (10% lower, 50% higher)

Net Benefit - 2010 \$M CDN (ve cost, +ve benefit)	-\$13	-\$80	-\$264	-\$413	-\$300	-\$107	\$93	-\$91	-\$1,176	-\$963
Net Benefit - 2011 \$M CDN (ve cost, +ve benefit)	-\$14	-\$82	-\$269	-\$421	-\$306	-\$109	\$95	-\$93	-\$1,199	-\$983

Reference Case Assumptions:

- Pickering Energy Production, Total OM&A & Capital Costs, and Fuel Costs provided by OPG
- Gas Price = \$6 / MMBTU at Henry Hub (2013-2020)
- Carbon = \$0 / tonne
- Discount Rate = 4% / year (real)
- Inflation Rate = 2% / year
- Cost of Replacement Capacity = \$94 / kW-year
- Resource mix consistent with PSP 2
- Darlington refurbishment as per OPG Dec 14th, 2011 email
- Supply gap in the mid term filled with HQ (no limit on block size) for modelling purposes

Scenario Summary:

- Reference Case
- 2 & 3. Lower and Higher Demand (as per PSP2 forecasts)
- 4 & 5. Lower and Higher Natural Gas Prices (\$4 - \$12 / MMBTU at Henry Hub)
6. Carbon Price of \$15 / tonne in 2015 increasing to \$27 / tonne in 2020 (OPA medium trajectory forecast)
- 7 & 8. Lower and Higher Pickering Production (based on worst and best 5-year average historical ACF)
- 9 & 10. Longer and Shorter Continued Operation Period from 240K (50% shorter duration, extend end of life to end of 2020)
- 11 & 12. Lower and Higher OM&A Costs (10% lower, 50% higher)

From: Bashir Bhana
Sent: January-11-12 10:57 AM
To: 'ROGERS Stephen -CRPINVASTPLN'
Cc: Bob Gibbons; Bonnie Chan; Victor Stein
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

For the Pickering study, when can we expect to receive the “severance” and “decommissioning liability” cost impacts mentioned below?

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: December 20, 2011 4:06 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; REUBER Barbara -REGAFFCRPSTY; Victor Stein; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

As promised, please find enclosed an updated workbook with the Pickering Continued Operations data for your analysis. A new tab (Tab 7) has been added which shows the Unit Level performance data that you had requested. As well, a correction has been made to the energy for Pickering Units 5 – 8 in 2019 in Tab 3 of the original workbook (as discussed with Bashir).

We are continuing to refine our estimates of the severance costs and the decommissioning liability impacts and will send those additional items to you as soon as possible.

Please call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration

From: ROGERS Stephen -CRPINVASTPLN
Sent: Friday, December 16, 2011 3:18 PM
To: 'Bob Gibbons'
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; Bashir Bhana; REUBER Barbara -REGAFFCRPSTY; 'Victor Stein'; POWER Donald J -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

Bob,

Following our discussion on Monday, please find attached the first draft of OPG's information on Pickering Continued Operations in order to commence the OPA's assessment.

Please consider this information preliminary. OPG continues to refine its assessment of the incremental costs of operating the Pickering units over the next decade and the potential cost impacts if Pickering Continued Operations were not achieved, and may, therefore, issue a revised version of this information for your assessment in the next few weeks. In particular, as we discussed, the data set we are providing does not explicitly show the severance costs OPG would incur under the two different scenarios and also does not show the impact on the decommissioning liability for the two different scenarios. As discussed, these two impacts relate to the timing of cost flows and therefore impacts the Net Present Value difference between the alternatives. OPG quantifies both of these impacts and factors in the impact of severance cost timing differences into its NPV analysis, but does not factor in the impact of the decommissioning cost timing differences. These two impacts will be provided separately.

As well, OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back of various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-Life date projections for each of the Pickering units without P7 life management and without Continued Operations. Note that OPG no longer considers this to be the reference case for No Continued Operations and has not developed costs for this case.

Tab 2: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and the Continued Operations Case (with later P7 life management) **assuming the final units S/D in mid-2020** (i.e. achieve 240,000 Effective Full Power Hours). This tab also shows the differences in costs and performance between the two cases.

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (with later P7 life management) **assuming the final units S/D at the end of 2020** (i.e. achieve 247,000 Effective Full Power Hours (EFPH), but last 4 units operate only to end 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: A schematic of the No Continued Operations Case (with early P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 5: A schematic of the first Continued Operations Case (240,000 EFPH, with later P7 life management), showing the timing of the planned outages and unit shutdowns for that case.

Tab 6: A schematic of the second Continued Operations Case (247,000 EFPH, with later P7 life management) showing the timing of the planned outages and unit shutdowns for that case

As you have also requested, OPG will be providing, via separate e-mail, the detailed performance forecast for each of the Pickering units. OPG's information is currently aggregated at the level of Pickering Units 1 & 4 and Pickering Units 5-8.

I have also enclosed a marked up version of the document "System Impact of Continued Operations" which you had sent in your e-mail. OPG is suggesting that additional sensitivity scenarios be analysed, beyond the ones originally listed.

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers

Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

From: Bob Gibbons [<mailto:Bob.Gibbons@powerauthority.on.ca>]

Sent: Tuesday, December 06, 2011 4:37 PM

To: BURKE Paul J -PLANNG&ANALY

Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; ROGERS Stephen -CRPINVASTPLN; Nancy Marconi; Bashir Bhana; Steve Chui; Bonnie Chan

Subject: RE: Response to OPA/OPG meeting on OEB Support

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Hi Paul,

We would like to get our evaluation of Pickering continued operation underway as soon as possible.

Section 17

. We intend to use a similar approach as last year except that we will use IPSP2 assumptions in our evaluation of avoided supply costs. Other assumptions are summarized in the second attachment.

It would be helpful if you could provide us with the following information as soon as possible:

1. EOSL dates for Pickering units with continued operation with P7 life management
2. EOSL dates for Pickering units without continued operation without P7 life management
3. Annual values for the following with continued operation and with P7 life management:
 - Total Pickering OM&A dollars (excluding allocated corporate overheads)

- Unit Fuel cost
- Unit Energy production
- Unit PO days
- Unit ACF %
- Unit FLR %

4. As in 3. above without continued operation and without P7 life management

If it would be helpful, we would be glad to meet with you to discuss further. Just let me know.

Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: BARRETT Andrew P -REGAFFCRPSTY [<mailto:andrew.barrett@opg.com>]
Sent: December 2, 2011 5:55 PM
To: Michael Lyle; George Pessione; Nancy Marconi; Bob Gibbons
Cc: KOHN Ethan -REGAFFCRPSTY; POWER Donald J -CRPINVASTPLN; BURKE Paul J -PLANNG&ANALY;
ROGERS Stephen -CRPINVASTPLN; JANOSSY Eva -PLANNG&ANALY
Subject: Response to our meeting on OEB Support

Folks,

Sorry for the delay in getting back to you - it has and is taking us a little time to get ourselves organized on this.

In terms of points of contact, I can advise that [REDACTED] *Not Responsive* and Eva Janossy will be our point of contact on the PGS project.

In addition, Paul Burke and Stephen Rogers will be contacting you (prob via Bob) to get some additional information on how you proposed to undertake the Pickering Continued Operations analysis that was discussed at our meeting.

Andrew

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From: Bashir Bhana
Sent: January-12-12 11:58 AM
To: Bob Gibbons; Bonnie Chan; Victor Stein
Subject: FW: Pickering Study

FYI

From: Jim Lee
Sent: January 12, 2012 11:50 AM
To: Bashir Bhana
Cc: Joe Toneguzzo
Subject: RE: Pickering Study

Please use 3 year cash flow, evenly spread out. Please assume asset life for a TS to be 40 years.

From: Jim Lee
Sent: January 12, 2012 11:47 AM
To: Bashir Bhana
Cc: Joe Toneguzzo
Subject: RE: Pickering Study

Bashir,
Please use \$260 million in-service dollar for 2015.
Thank you,
Jim

From: Bashir Bhana
Sent: January 11, 2012 11:27 AM
To: Joe Toneguzzo; Jim Lee
Subject: Pickering Study

Joe/Jim,

For the Pickering continued operations study, could you please provide updated costs for Oshawa Area TS. Specifically, the total capital expenditure associated with the TS.

Happy to discuss further.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: January-23-12 4:03 PM
To: Bob Gibbons; Victor Stein
Subject: RE: Simple Pickering Model
Attachments: Simplified Pickering Study Model 01-23-2012 (BB) v2.xlsx

An updated version of the model is attached based on a detailed discussion and review with Victor.

Victor – as a compromise, I've included both versions of the calculation – NPV'd and not. But as we both saw, both yield more or less the same result.

Bob – I'd be happy to walk you through this model when you have a few moments. I also propose bringing this to the OPG meeting Thursday to illustrate our analysis at a high level.

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

From: Bashir Bhana
Sent: January 23, 2012 3:04 PM
To: Bob Gibbons; Victor Stein
Subject: Simple Pickering Model

Attached is a simple spreadsheet model for calculating the value of Pickering CO.

You can play around with the PSE and fuel costs and see how that affects the net benefit.

The default values are more or less consistent with the current detailed study.

Bashir

Bashir Bhana
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E: Bashir.Bhana@powerauthority.on.ca

Simplified Pickering Continued Operations Study Model

NPV Basis

Parameter	Value
Increase in Pickering Energy Production (Between 2016-2020)	75
% of Energy Increase that is PSE	47%
Gas Energy Production Displaced	40
Pickering Fuel Cost	\$6
Pickering Fixed Costs	\$52
Gas Fuel Cost	\$60
<i>Natural Gas Price</i>	\$6.35
<i>Heat Rate</i>	9,500
Capacity Credit	\$0.70
Cost of Increased Pickering Energy Production	\$4.39
Savings in Displaced Gas Energy Production	\$3.10
Net System Benefit	-\$1.29

Note:

Units/Notes
TWh (Source: OPG)
TWh
/MWh (Source: OPG)
/MWh (Source: OPG)
/MWh
/MMBtu (\$6/MMBtu is the reference case forecast + Gas Basis)
Btu/kWh (the average heat rate of Ontario gas fleet between 2016-2020)
Billion (real dollars)
Billion (real dollars) => Nuclear energy times fuel cost plus fixed cost
Billion (real dollars) => Gas energy times fuel cost plus fixed cost
Billion (real dollars)

"+" denote net savings

"-" denote net cost

Simplified Pickering Continued Operations Study Model**Not NPV Basis**

Parameter	Value
Increase in Pickering Energy Production (Between 2016-2020)	92
% of Energy Increase that is PSE	44%
Gas Energy Production Displaced	52
Pickering Fuel Cost	\$6
Pickering Fixed Costs	\$50
Gas Fuel Cost	\$60
<i>Natural Gas Price</i>	\$6.35
<i>Heat Rate</i>	<i>9,500</i>
Capacity Credit	\$0.75
Cost of Increased Pickering Energy Production	\$5.15
Savings in Displaced Gas Energy Production	\$3.86
Net System Benefit	-\$1.30

Note:

Units/Notes
TWh (Source: OPG)
TWh
/MWh (Source: OPG)
/MWh (Source: OPG)
/MWh
/MMBtu (\$6/MMBtu is the reference case forecast + Gas Basis)
Btu/kWh (the average heat rate of Ontario gas fleet between 2016-2020)
Billion (real dollars)
Billion (real dollars) => Nuclear energy times fuel cost plus fixed cost
Billion (real dollars) => Gas energy times fuel cost plus fixed cost
Billion (real dollars)

"+" denote net savings

"-" denote net cost

From: Bob Gibbons
Sent: January-24-12 11:09 AM
To: Nancy Marconi
Cc: Victor Stein; Bonnie Chan; Bashir Bhana; Bob Gibbons
Subject: RE: Mtg with OPG on Thursday

Nancy,

Here are a few questions we would like to have OPG address at our next meeting.

1. What is OPG asking OPA to assess?
2. Why are the OM&A and Capital costs in 2015 and 2016 (1.2 B\$) not relevant? How are these costs different from those in 2013 and 2014 (160 M\$)?
3. Why is it appropriate to only simulate the period from 2017 – 2020 when continued operation occurs after March 2016?
4. Why is it appropriate to assume that all Pickering energy displaces gas even during SBG periods?

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

From: Nancy Marconi
Sent: January 23, 2012 4:11 PM
To: Bob Gibbons; Victor Stein; Bonnie Chan; Bashir Bhana
Subject: Mtg with OPG on Thursday

Hi everyone,

Hope you had a nice weekend. Although I believe that most of our meeting with OPG this week will be discussing the technical assumptions in our study, I did just want to check in with you folks and see whether there was anything in particular that you wanted me to ask OPG to be prepared to speak to, or bring along in terms of information. I spoke with Ethan today, and he said that he would see if they couldn't come with some preliminary ideas as to where they might make changes to the information they previously provided us, but please let me know if there is anything else in your view.

Thanks!

Nancy Marconi | PEng, MBA
Manager, Regulatory Proceedings
Legal, Aboriginal and Regulatory Affairs
Ontario Power Authority
(416) 969-6046

From: Beverly Nollert
Sent: February-16-12 2:26 PM
To: Beverly Nollert; Bashir Bhana
Cc: Bonnie Chan; George Pessione; Victor Stein; Bob Gibbons
Subject: Pickering Report - Carbon Cost Text
Attachments: Brief Background on Carbon Prices-Pickering.docx

Hi Bashir,

Attached please find the proposed paragraphs to describe the carbon costs in the Pickering Continued Operations benefit-cost evidence.  *Not Responsive*

Please let me know if you have any questions or comments.

Thank you,

Bev

Beverly Nollert P.Eng, MBA
Planner, Resource Integration
Power System Planning
Ontario Power Authority
T: 416.969.6283
E-mail: Beverly.Nollert@powerauthority.on.ca
Web: www.powerauthority.on.ca



Not Responsive

Not Responsive

Beverly Nollert P.Eng, MBA
Planner, Resource Integration
Power System Planning

Not Responsive

Paragraph for background on carbon prices in the Benefit-Cost of Pickering NGS Continued Operations

At the time of writing, no economy-wide carbon policy resulting in a cost of carbon exists in Ontario or Canada, and uncertainty with respect to future policy is high. Similarly, carbon policy development in other Canadian provinces is generally slow-going. This current environment supports the use of \$0 carbon costs in the reference case of this work.

Because the future landscape is uncertain, it is prudent to consider a potential cost of carbon in a sensitivity case, to assess the value of Pickering continued operation in light of different future outcomes. It is difficult to ascertain future carbon prices with a high degree of precision; however, they can be estimated by surveying recent studies and analysis published by credible, publically available sources as well as data from established carbon markets. The carbon prices extracted from these sources create a range of possible outcomes, which was used to inform the selection of a medium level trajectory, with a carbon price starting in 2015.

The starting year of 2015 was selected using judgement. The second phase of the Western Climate Initiative program (to which Ontario is a member) is slated to begin in 2015 and it is assumed that this is the earliest year in which Ontario would have implemented policy in order to participate in the program.

From: ROGERS Stephen -CRPINVASTPLN <stephen.rogers@opg.com>
Sent: February-23-12 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J - PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John - PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops_Feb 23 2012_Final Draft.xlsx

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Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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PNGS No Continued Operations with Early P7 Life Management

February 23, 2012

Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	<div>Section 17</div>																																			
P4																																				
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P6																																				
P7																																				
P8																																				

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PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17											
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PB Outage	PA Outage	Off the Grid
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Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

	2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management								
Total OM&A & Capital	Section 17							
Fuel & Fuel Related Costs								
Difference: Continued Operations - No Continued Operations								
Total OM&A & Capital	56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital	18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project	38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs	8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF
LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

23-Feb-12

TIGATION

TIGATION

From: Bashir Bhana
Sent: February-24-12 8:53 AM
To: Victor Stein; Steve Chui; Bonnie Chan
Cc: Bob Gibbons
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 23 2012_Final Draft.xlsx

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [<mailto:stephen.rogers@opg.com>]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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PNGS No Continued Operations with Early P7 Life Management

February 23, 2012

Section 17Section 17

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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
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PB Outage	PA Outage	Off the Grid
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PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

February 23, 2012

Nios Continued Operations With Pickering Units 9-8 Operating to 247K EFPH to Year End 2020 and Later P7 Life Management																																	February 23, 2014							
Year	2012																2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec				
P1																																								
P4																																								
P5																																								
P6	Section 17																																							
P7																																								
P8																																								

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

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Section 17

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

			2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
Difference: Continued Operations - No Continued Operations										
Total OM&A & Capital			56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital			18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project			38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs			8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	<i>Section 17</i>							
P5 - P8								
	Planned Outage & Life Management Days							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	<i>Section 17</i>							
P4								
P5								
P6								
P7								
P8								

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LITIGATION

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LI

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	
Pickering A	
Pickering A +B Total	

Section 17

Pickering B Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.

Pickering A Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)

Pickering A + B Total Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	

Section 17

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LI

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23-Feb-12

TIGATION

TIGATION

From: Bob Gibbons
Sent: February-24-12 10:57 AM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bashir Bhana; Steve Chui; Bonnie Chan; BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR; Nancy Marconi
Subject: RE: Response to OPA/OPG meeting on OEB Support

Stephen,

Thank-you for providing updated information regarding Pickering Continued Operation.

As we have agreed, our target date for producing a first draft of both the Pickering and Not Responsive assessment reports is mid-March and our target date for producing final reports is the end of March. You will appreciate that any further substantial changes in information at this point may jeopardize our ability to meet these dates.

Regards,

Bob Gibbons
Director, Resource Integration
Ontario Power Authority

Phone: (416) 969-6043
Fax: (416) 967-1947
E-mail: bob.gibbons@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more

benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFPH, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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From: Bashir Bhana
Sent: February-28-12 12:06 PM
To: Victor Stein
Subject: FW: Response to OPA/OPG meeting on OEB Support
Attachments: OPA Data PB Cont Ops _Feb 27 2012_Draft.xlsx

fyi

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 28, 2012 11:58 AM
To: Bashir Bhana
Cc: Bob Gibbons; Steve Chui; Bonnie Chan
Subject: RE: Response to OPA/OPG meeting on OEB Support

Bashir,

Thanks for reviewing the file in detail. The minor discrepancies that you have detected have been corrected in the updated file attached, dated Feb 27. These changes are as follows:

1. Tab 1 (210k EFPH case): [REDACTED] *Section 17*

2. Tab 2a (247k case): [REDACTED] *Section 17*

Please note that the schematics in Tabs 1 and 2 are cannot be used to mimic the exact timing of the planned outages, as the resolution is only to the nearest one-half of a month. This is why we have provided the corresponding outage start and end dates in Tabs 1a and 2a for your use. The schematics are intended as a visual aid to see how all of the outages align.

Also, to expedite the analysis, if there are minor any further discrepancies between the schematics, the outage dates and the data provided in Tabs 3 and 4 in the attached file, please consider the data in Tabs 3 & 4 as over-riding any other data.

Please call if there are further questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

From: Bashir Bhana [mailto:Bashir.Bhana@powerauthority.on.ca]
Sent: Monday, February 27, 2012 2:54 PM
To: ROGERS Stephen -CRPINVASTPLN
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen - I just left a message on your machine. Just spotted a similar issue with the LM dates between tab 1 and 1a (the 210K case). Could you please confirm. Thanks.

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 27, 2012 2:23 PM
To: Bashir Bhana
Cc: Bob Gibbons; Steve Chui; Bonnie Chan
Subject: FW: Response to OPA/OPG meeting on OEB Support

Bashir,

Thanks for catching the typo in Tab 2a. The schematic in Tab 2 was correct for the 2016 P7 LM outage. The dates in Tab 2a were typed in incorrectly and have been corrected in this version (cells G25, H25) and shaded in orange. I apologize for the inconvenience.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

-----Original Message-----

From: Bashir Bhana [mailto:Bashir.Bhana@powerauthority.on.ca]

Sent: Monday, February 27, 2012 1:52 PM
To: ROGERS Stephen -CRPINVASTPLN
Cc: Bob Gibbons; Bonnie Chan; Steve Chui
Subject: RE: Response to OPA/OPG meeting on OEB Support

Hi Stephen,

Could you please confirm the P7 LM outage dates for the 247K case? There appears to be inconsistencies between the schedules presented in Tabs 2 and 2a.

Thanks,
Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca

-----Original Message-----

From: ROGERS Stephen -CRPINVASTPLN [mailto:stephen.rogers@opg.com]
Sent: February 23, 2012 5:13 PM
To: Bob Gibbons; Bashir Bhana
Cc: BARRETT Andrew P -REGAFFCRPSTY; KOHN Ethan -REGAFFCRPSTY; BURKE Paul J -PLANNG&ANALY; POWER Donald J -CRPINVASTPLN; Victor Stein; BLAZANIN John -PICKERING; PASQUET Paul -NUCLEAR
Subject: Response to OPA/OPG meeting on OEB Support

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

Bob & Bashir,

Please find attached OPG's current scenario for Pickering Continued Operations to be used in the OPA's assessment of this undertaking.

Please consider this information "near-final". OPG continues to refine its assessment of the Pickering Continued Operations option and the potential cost impacts if Pickering Continued Operations were not achieved, and will advise if a revised version of this information is developed. OPG is also working on alternative scenarios which may be of more benefit to the electricity system (i.e. involve life management of additional units to make more Pickering generation available in the 2017 - 2020 period) and will be forwarding those for review and assessment within the next few weeks.

OPG would like to stress that, because OPG's planning scenario is based on achieving Continued Operations, a detailed assessment of some of the additional costs which might be incurred if the No Continued Operations case were to occur has not been undertaken. These include potential costs associated with the potential need to cancel or scale back various procurement contracts (including fuel) and engineering services contracts. Without a quantitative assessment of these additional potential costs, the Net Present Value benefit of achieving Continued Operations would likely be understated in the results you will obtain using the data we are providing.

As discussed, your analysis will begin in 2013, so any data we are providing on 2012 (e.g. on outage schematics) is for information only.

In the attached workbook you will find:

Tab 1: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the No Continued Operations case (with early P7 life management).

Tab 1a: Outage Dates and Durations corresponding to the schematic in Tab 1 (No Continued Operations case)

Tab 2: A schematic showing the timing and duration of planned outages and the end-of-life date projections for each of the Pickering units for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016).

Tab 2a: Outage Dates and Durations corresponding to the schematic in Tab 2 (Continued Operations case)

Tab 3: Costs and performance forecasts for the Pickering units for the No Continued Operations case (with early P7 life management) and for the Continued Operations Case (247,000 EFP, with P7 life management in 2015 and 2016, assuming the final units S/D at the end of 2020). This tab also shows the differences in costs and performance between the two cases.

Tab 4: Unit Performance data for the No Continued Operations Case and the Continued Operations Case, showing the forecast Forced Loss Rates, Planned Outage Days & Life Management Days, Capability Factors, and Energy Generation.

Tab 5: The Present Value Differences OPG has assessed for the Decommissioning liability and the likely Severance costs for the No Continued Operations vs. the Continued Operations Case (assessed at a 4% real discount rate)

We look forward to receiving the results of your analysis as early as possible.

Please do not hesitate to call if there are any questions.

Regards,

Stephen Rogers
Director, Asset Planning & Integration
Corporate Investment & Asset Planning
Ontario Power Generation Inc.
Ph: (416) 592-3993

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the intended recipient(s), any dissemination, distribution or copying of this e-mail message or any files transmitted with it is strictly prohibited.

If you have received this message in error, or are not the named recipient(s), please notify the sender immediately and delete this e-mail message.

PNGS No Continued Operations with Early P7 Life Management

February 27, 2012

Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1																																				
P4																																				
P5																																				
P6	Section 17																																			
P7																																				
P8																																				

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PNGS No Continued Operations with Early P7 Life Management

	Scenario Dates											
	2012				2013				2014			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												

	2015				2016				2017			
	Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												

Unit End of Life	Section 17
------------------	------------

PB Outage	PA Outage	Off the Grid
-----------	-----------	--------------

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Year	2012												2013												2014											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2015												2016												2017											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				
Year	2018												2019												2020											
Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
P1	Section 17																																			
P4																																				
P5																																				
P6																																				
P7																																				
P8																																				

PNGS Continued Operations with Pickering Units 5-8 Operating to 247k EFPH to Year End 2020 and Later P7 Life Management

Scenario Dates												
2012				2013				2014				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Min. Outg												
2015				2016				2017				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
2018				2019				2020				
Outage	Start	End	# of Days	Outage	Start	End	# of Days	Outage	Start	End	# of Days	
P1	Section 17											
P4												
P5												
P6												
P7												
P8												
LM**												
Unit End of Life	Section 17											
PB Outage	PA Outage	Off the Grid										

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PICKERING CONTINUED OPERATIONS Assessment Data

(P5-8 Unit Operation of 247k EFPH to year-end 2020 and later P7 Life Management)

Section 1 - Operating Costs (M2012\$)

			2013	2014	2015	2016	2017	2018	2019	2020
PNGS No Continued Operations with early P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
PNGS Continued Operations (247k EFPH to YE 2020) with P7 Life Management										
Total OM&A & Capital			Section 17							
Fuel & Fuel Related Costs										
Difference: Continued Operations - No Continued Operations										
Total OM&A & Capital			56	98	282	764	878	889	821	575
Effect of on-going operation on Total OM&A & Capital			18	52	282	764	878	889	821	575
OM&A Costs to enable Cont. Ops including FCLM project			38	47	0	0	0	0	0	0
Fuel & Fuel Related Costs			8	28	27	94	135	114	110	93

Notes

1. Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs.
2. These costs do not include the severance costs associated with each scenario. Estimated severance is provided separately.
3. EFPH: Effective Full Power Hours
4. Costs are in constant 2012\$.

Section 2 - Production Related Data
Forced Loss Rate (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Capability Factor Including Impact of Life Mgmt Days (%)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								

Planned Outage & Life Management Days

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0	0	0	78	87	85	76	0
Diff P5-8 Cont. Ops - P5-8 Orig. Life	-114	-157	337	297	146	196	73	0

Energy (TWh)

	2013	2014	2015	2016	2017	2018	2019	2020
P1&4 No Continued Operations	Section 17							
P5-8 Originally Assumed Life								
P1&4 Life to Match Continued Ops	Section 17							
P5-8 Continued Ops (247k)								
Diff P1&4 Cont'd - P1&4 No Cont'd	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Diff P5-8 Cont. Ops - P5-8 Orig. Life	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1

Notes

1. Difference in Planned Outage & Life Management Days in 2013-2014 assumes early P7 Life Management in the P5-8 Originally Assumed Life case.

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PICKERING CONTINUED OPERATIONS Assessment Data
Pickering Unit Level Performance
1. No Continued Operations with Early P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

2. Continued Operations of 247k EFPH Presure Tube Life to Year End 2020 with Later P7 Life Management

	2013	2014	2015	2016	2017	2018	2019	2020
	Forced Loss Rate (%)							
P1 & P4	Section 17							
P5 - P8								
	Planned Outage & Life Management Days							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Energy (TWh)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								
	Capability Factor Including Impact of Life Mgmt Days (%)							
P1	Section 17							
P4								
P5								
P6								
P7								
P8								

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LITIGATION

PRIVILEGED AND CONFIDENTIAL - PREPARED IN CONTEMPLATION OF LITIGATION

1. Approximate Impact on Decommissioning Liability of Pickering Continued Ops

Cost Estimates Latest update of ONFA (2012)

Escalation rates: ONFA escalation rates

Note: -ve numbers means that the assessed decommissioning liability is **decreased**

Note: Suggest rounding these results to the nearest \$5M

	2012 PV M\$
Real Discount Rate	4%
Pickering B	Section 17
Pickering A	
Pickering A +B Total	

Pickering B	Pickering B - shows reduction in PV of decommissioning liability caused by Continued Ops, i.e. change in unit end of life dates from the 2014 - 2016 period to the 2018 to 2020 period.
Pickering A	Pickering A - shows reduction in PV of decommissioning liability if the Pickering 1 & 4 units had been forced to shutdown when the last two Pickering B units would have shutdown (i.e. mid 2016 compared to shutting down in 2020 (4+ year deferral of decommissioning)
Pickering A + B Total	Shows combined decrease in PV of decommissioning liability resulting from of Continued Ops at Pickering

2. Approximate Impact on Severance Costs of Pickering Continued Ops

Cost Estimates Latest Forecast Incremental Costs for Pickering Continued Oeprations

Note: -ve numbers means that the assessed severance liability is **decreased**

	2012 PV M\$
Real Discount Rate	4%
Pickering A+B Total	Section 17

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From: Nancy Marconi
Sent: March-26-12 9:41 PM
To: Bob Gibbons; Bashir Bhana; Victor Stein; Bonnie Chan; Michael Lyle; Kristin Jenkins; Amir Shalaby; Andrew Pietrewicz
Cc: Wajiha Shoaib; Joe Toneguzzo; Jim Lee

Subject:
Attachments:

Not Responsive

Not Responsive



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

October 3, 2011

Mr. Carmine Marcello
Executive Vice President, Strategy
Hydro One Networks Inc.
483 Bay Street
Toronto, ON
M5G 2C9

Dear Carmine:

Not Responsive

Not Responsive

Background

Pickering GS, with two A units and four B units connected to the 230 kV system, provides critical local generation for reliable supply of the east GTA. System studies indicate that either a minimum of two Pickering units are required in service or additional autotransformer capacity in the east GTA is needed to maintain reliable supply for the area.

There are scenarios where Pickering GS is shut down as early as by the spring 2015. Since such scenarios have material impact to the reliable supply to east GTA, the OPA considers it prudent for Hydro One to begin work that will provide the 500 - 230 kV autotransformer capacity within the east GTA, to meet the spring 2015 need date.

Current information indicates that Pickering GS is not expected to operate beyond 2020 under the extended operation scenarios. Thus, the new autotransformer capacity is expected to be required by 2020 in any case.

The OPA will keep Hydro One apprised of the status of decisions related to the operating schedule of generating units at the Pickering GS which could have impact on the 2015 need date for additional 500-230 kV transformation capacity in the area.

Not Responsive

Not Responsive



120 Adelaide Street West
Suite 1600
Toronto, Ontario M5H 1T1
T 416-967-7474
F 416-967-1947
www.powerauthority.on.ca

January 11, 2012

Mr. Carmine Marcello
Executive Vice President, Strategy
Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario, M5G 2C9

Dear Carmine:

Not Responsive

the following is a summary of the status of key factors related to the subject project:

- Pickering GS has a license that allows it to operate only until March 2015. The current outlook for the number of in-service units at Pickering is 6 currently, 5 after May 2014, 4 after November 2014 and none after March 2015. Thus, if this outlook holds, by spring of 2015, additional 500-230 kV auto-transformation capacity would be required. There is work underway that explores the possibility that the plant can continue to operate until mid 2019, and there are significant technical, economic and regulatory issues yet to be concluded before this can be counted on. This letter is to prepare the system for a March 2015 end of life in case that becomes the outcome.
- An assessment has been made to “manage” the life of the last 4 units at Pickering GS for an additional 14 months beyond the end of life date. Although economic assessments conducted by the OPA show this to be economically viable if the life were continued to 2019, at this point they do not support this option for a 2015 end of life date. The OPA assessment results for the 2015 end of life date hold true even with the potential deferral of the additional 500-230 kV auto-transformer capacity required in the area, taken into account.
- OPA continues to work with OPG to pursue a number of proposals around Pickering. The merits of the options depend on a large number of factors that are subject to change. This work is done in a broader context of integrated planning.

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

Not Responsive

From: Bashir Bhana
Sent: March-27-12 11:10 AM
To: Victor Stein; Bob Gibbons
Cc: Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: RE: Pickering CO Draft Report

Yes Victor. Gas Price of \$8/mmbtu for the Pickering high case.

Initially we had it at \$12/mmbtu to be consistent with the EWT report which looks out 50 years . Looking that far out perhaps warrants looking at a high of \$12. It should still be 12 for darlington which also looks quite far out into the future. Pickering looking out to 2020 warrants looking at a more tighter range of gas prices.

Bashir

From: Victor Stein
Sent: March-27-12 10:19 AM
To: Bob Gibbons; Bashir Bhana
Cc: Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: RE: Pickering CO Draft Report

Gas price upper bound at \$8/MMBtu?

I thought we decided a wk ago that it would be \$12, in both short term and longterm.

Does this mean that the Darl. Refurb report has to be changed from \$12 to \$8 in short term (while retaining the existing \$12 in longterm)?

Best Regards,
Victor Stein
Senior Planner,
Power System Planning.
Ontario Power Authority
Toronto, Canada
Tel. 416.969.6409
Cell 416.786.8391
Fax 416.969.6369

From: Bob Gibbons
Sent: March 27, 2012 10:09 AM
To: Bashir Bhana
Cc: Victor Stein; Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: RE: Pickering CO Draft Report

Bashir – I have suggested some edits in the attached version (also found here<[file:///\\pafilesrv\PSP\\$\Resource%20Integration\Projects\Pickering\2012%20Pickering%20Continued%20Operations%20Study\Documentation%20and%20Reports\Draft%20Evidence](file:///\\pafilesrv\PSP$\Resource%20Integration\Projects\Pickering\2012%20Pickering%20Continued%20Operations%20Study\Documentation%20and%20Reports\Draft%20Evidence)>), particularly with respect to export revenues.

Bob G

From: Bashir Bhana
Sent: March 26, 2012 4:16 PM
To: Bob Gibbons
Cc: Victor Stein; Bonnie Chan; Steve Chui; Andrew Pietrewicz
Subject: Pickering CO Draft Report

Bob – I've updated the report based on our discussion as well as Amir's comments (verbally provided this morning).

I would like to wait for OPG's comments before updating the gas price for the high gas scenario but estimate the net benefit to be \$1.3B with gas price at \$8/MMBtu. I've included comments in that regard.

Please see tracked version for specific edits, clean version for a smoother read.

Also found

here<[file:///\\pafilesrv\PSP\\$\Resource%20Integration\Projects\Pickering\2012%20Pickering%20Continued%20Operations%20Study\Documentation%20and%20Reports\Draft%20Evidence](file:///\\pafilesrv\PSP$\Resource%20Integration\Projects\Pickering\2012%20Pickering%20Continued%20Operations%20Study\Documentation%20and%20Reports\Draft%20Evidence)>.

Bashir

Bashir Bhana
Planner, Resource Integration
Power System Planning
Ontario Power Authority
120 Adelaide Street West, Suite 1600
Toronto, Ontario, M5H 1T1
T: 416-969-6263
E: Bashir.Bhana@powerauthority.on.ca<<mailto:Bashir.Bhana@powerauthority.on.ca>>

From: Victor Stein
Sent: March-27-12 1:08 PM
To: Bashir Bhana
Cc: Victor Stein
Subject: RE: Cost of Alternatives to Pickering CO

Bashir,
Thx.

You've covered all the bases.

My comments are

- P3, combine "fixed cost" with "NRR" and call it fixed cost (incl capital, fixed O&M, etc). "Net Revenue Requirement" is not accurate since it is a commercial term, but your assumed cost is a societal cost.
- P4, why no express also as a levelized \$/MWh, using the CO (relative to no CO) energy as the base?

V.

-----Original Message-----

From: Bashir Bhana
Sent: March 27, 2012 11:50 AM
To: Victor Stein
Subject: FW: Cost of Alternatives to Pickering CO

Only version so far. Would like to work with you to refine this when time permits.

Bashir

From: Bashir Bhana
Sent: March-23-12 4:41 PM
To: Bob Gibbons; Andrew Pietrewicz
Cc: Victor Stein; Bonnie Chan; Steve Chui
Subject: Cost of Alternatives to Pickering CO

I've done some analysis to look at the cost of alternative resource options to Pickering continued operation (attached).

In sum, Pickering looks cheaper than 1) firm imports, 2) a combination of NUG renewal and firm imports, 3) coal conversion, and 4) new SCGT.

Data can be found

here<file:///\\pafilesrv\PSP\$\Resource%20Integration\Projects\Pickering\2012%20Pickering%20Continued%20Operations%20Study\Analysis_March_2012\Cost%20of%20Resource%20Options>.

Bashir

Bashir Bhana
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E: Bashir.Bhana@powerauthority.on.ca<mailto:Bashir.Bhana@powerauthority.on.ca>

From: Andrew Pietrewicz
Sent: August-24-12 3:02 PM
To: Bashir Bhana; Victor Stein
Subject: Signed letter for your records.
Attachments: OPA Support for Pickering and Not Responsive_August 15 2012__Signed.docx.pdf



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August 15, 2012

Mr. Pankaj Sardana
Vice President, Regulatory Affairs
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Dear Pankaj,

Re: Pickering NGS Continued Operation and *Not Responsive*

The Ontario Power Authority supports Ontario Power Generation's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and refurbishment of Darlington NGS.

The Ontario Power Authority ("OPA") has evaluated the merit of these options and will continue to evaluate them as circumstances evolve.

Pickering NGS Continued Operation

In absence of continued operation, the six generating units (3,094 MW) that are currently in operation at Pickering NGS are expected to cease operation beginning around 2015. The feasibility of continued operation is expected to be confirmed by the end of 2012. If feasible, it would provide the option to continue to operate the units at Pickering NGS through to approximately 2020.

From 2013 to 2014, it will be necessary for OPG to incur up to \$85 million at Pickering NGS to preserve the option of continued operation through additional inspection and maintenance work. It will be necessary for OPG to increase the number of generating unit planned outage hours at Pickering NGS during the 2013 to 2014 period to perform this work.

OPG has provided the OPA with updated information regarding their proposal for the continued operation of Pickering NGS (Appendix 1). The OPA has evaluated the effects of Pickering NGS continued operation on various aspects of the integrated power system, including capacity and energy requirements, system costs, Ontario CO₂ emissions, and transmission implications.

The OPA's analysis to date identifies a number of potential merits to preserving the option of continued operation at Pickering NGS. These include:

- Reduced need for replacement capacity and energy during part of the nuclear refurbishment period. Without continued operation and if all currently directed resources proceed as planned, between nearly 1,000 MW and 3,000 MW of capacity replacement would be required between 2016 and 2020.

- An approximately 11 megatonne reduction in Ontario CO₂ emissions between 2015 and 2020.
- Potential for deferral of some investments in transmission enhancements needed to maintain reliable load supply to customers in the east GTA upon retirement of Pickering NGS. This is further described in OPA's evidence to Hydro One regarding the need and rationale for "Oshawa Area" TS (EB-2012-0031, Exhibit D1-3-3 Appendix B).
- A hedge against mid-term uncertainties that could result in additional replacement requirements.

The OPA's assessment illustrates that cost implications of Pickering continued operation could vary across a wide range of potential circumstances. Key factors in this context include electricity demand, price of natural gas; price of carbon; length of the continued operation period; magnitude of capital and fixed operating costs and quantity of production from Pickering NGS during the continued operation period.

On balance, the OPA's assessment of system cost impacts suggests an expected cost advantage to Pickering continued operation (in the order of approximately \$100 Million). This advantage predominantly reflects expected costs savings from reduced natural gas-fired energy production and lower replacement capacity requirements. Based on evaluation to date of the broader uncertainties, the OPA estimates a range of up to approximately \$1.3 billion in potential net-benefit from Pickering continued operation to \$0.76 billion in potential net-cost (dis-benefit). These estimates represent illustrative bookends and explore combinations of factors that together would increase or decrease the cost impacts of Pickering continued operation. Some of the factors outlined are out of OPG's control, while others, such as station operational performance and cost, are within OPG's control. Opportunities for enhancing value through further coordination of other nuclear plans with plans for continued operations at Pickering have not yet been considered in the OPA's assessment. The OPA expects to explore such opportunities over the coming year.

An additional consideration that was not quantitatively reflected in its cost assessment of Pickering continued operation, but which informs the OPA's perspective on the option is the hedge that Pickering continued operation could provide against mid-term uncertainties. Continued operations at Pickering would see approximately 3,000 MW of nuclear supply remain available during a period of significant transition in the Ontario power system. This mid-term period, roughly spanning the years 2015 to 2020, immediately follows the shutdown of coal-fired generation in Ontario and features the following:

- Multiple concurrent refurbishment outages and restarts among Ontario's nuclear stations (the plans for which remain in development in some instances)
- Potential unit retirements at several currently existing natural gas-fired generators
- Sizeable expected contributions from conservation programs over and above already significant levels of anticipated natural efficiency gains in the Ontario economy
- Expected implementation of a substantial number of supply resources that are presently contractually committed or directed, and
- Uncertainty related to the pace of economic recovery in the province.

In short, the mid-term period involves significant transition and many moving pieces, some of which remain to be resolved and each of which present some degree of risk. Continued operation at Pickering is seen by the OPA as a timely and potentially helpful source of insurance within this dynamic context.

Not Responsive

In closing, the OPA supports OPG's proposals for expenditures in 2013 and 2014 to maintain the options of continued operation at Pickering NGS and [REDACTED] *Not Responsive*. The OPA has evaluated the options and will continue to evaluate them as circumstances evolve. Please feel free to contact us should you require additional information.

Regards,

A handwritten signature in black ink, appearing to read 'A. Shalaby'.

Amir Shalaby
Vice-President, Power System Planning
Ontario Power Authority

CC
Ethan Kohn
Joel Sheinfield
Colin Andersen
Michael Lyle
Andrew Pietrewicz

Appendix 1 - Information Received from OPG Regarding Pickering NGS Continued Operation

Incremental Generation in 2013 to 2020 Due to Continued Operation (TWh)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A (TWh)	0.0	0.0	0.0	5.2	7.3	7.3	7.3	8.2
Pickering B (TWh)	1.3	4.7	4.6	11.4	15.3	14.7	13.0	9.1
Total	1.3	4.7	4.6	16.6	22.6	21.9	20.3	17.2

Incremental Costs in 2013 to 2020 Due to Continued Operation (2012 \$ M) (1)								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Capital and OM&A For Plant Operation	\$18	\$52	\$282	\$764	\$878	\$889	\$821	\$575
Costs to Enable Continued Operation in 2013-2014	\$38	\$47	\$0	\$0	\$0	\$0	\$0	\$0
Fuel & Fuel Related Costs	\$8	\$28	\$27	\$94	\$135	\$114	\$110	\$93
Total Continued Operation Cost	\$64	\$126	\$310	\$858	\$1,013	\$1,003	\$931	\$668

(1) Total OM&A & Capital includes station OM&A (base, outage, projects) and sustaining capital projects and the station's share of incremental allocated nuclear and corporate support costs. These costs do not include the severance costs associated with each scenario.

Incremental Planned Outage Days in 2013 to 2020 Due to Continued Operation								
Year	2013	2014	2015	2016	2017	2018	2019	2020
Pickering A Incremental Planned Outage Days	0	0	0	78	87	85	76	0
Pickering B Incremental Planned Outage Days	-114	-157	337	297	146	196	73	0

Not Responsive

From: Bonnie Chan
Sent: September-13-12 10:34 AM
To: Victor Stein
Subject: 2012 - 2060 Supply Outlook: Illustrative View
Attachments: 2012-2060 Illustrative View 2012-07-31 (BC).pptx

Hi Victor,

Here is the deck that I put together that illustrates the supply outlook to 2060.

Bonnie Chan | Planner, Power System Planning
Ontario Power Authority, 120 Adelaide St. West, Ste. 1600, Toronto, Ontario, M5H 1T1
T: 416-969-6273 | F: 416-967-1947 | E: bonnie.chan@powerauthority.on.ca

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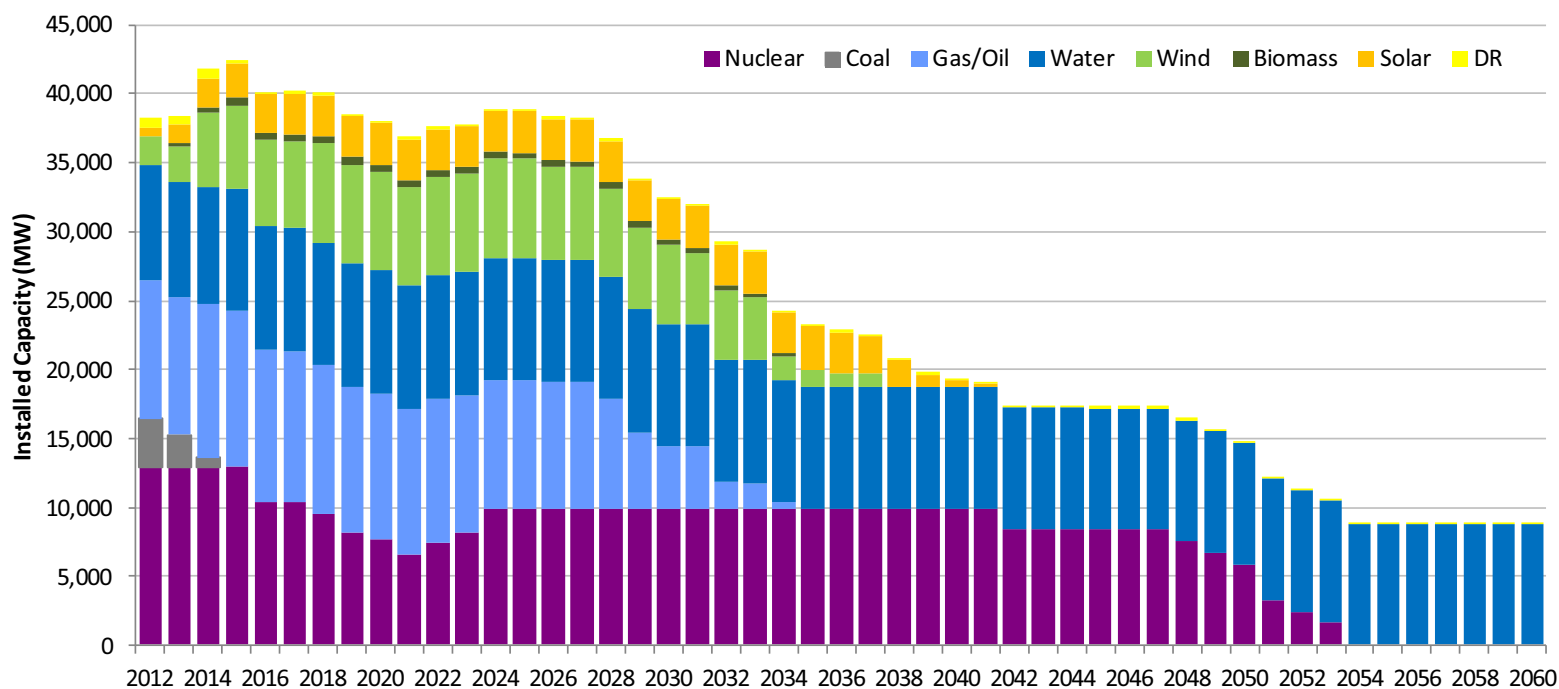
Illustrative Supply Outlook: 2012 - 2060

August 03, 2012

Outlook

- Provide insight on longer term planning considerations
- This deck illustrates the supply and demand balance beyond our current 20-year view, and takes a look out to to 2060 under current plans/assumptions
 - No new generation assumed beyond what is already planned

Illustrative Supply Outlook: 2012 - 2060



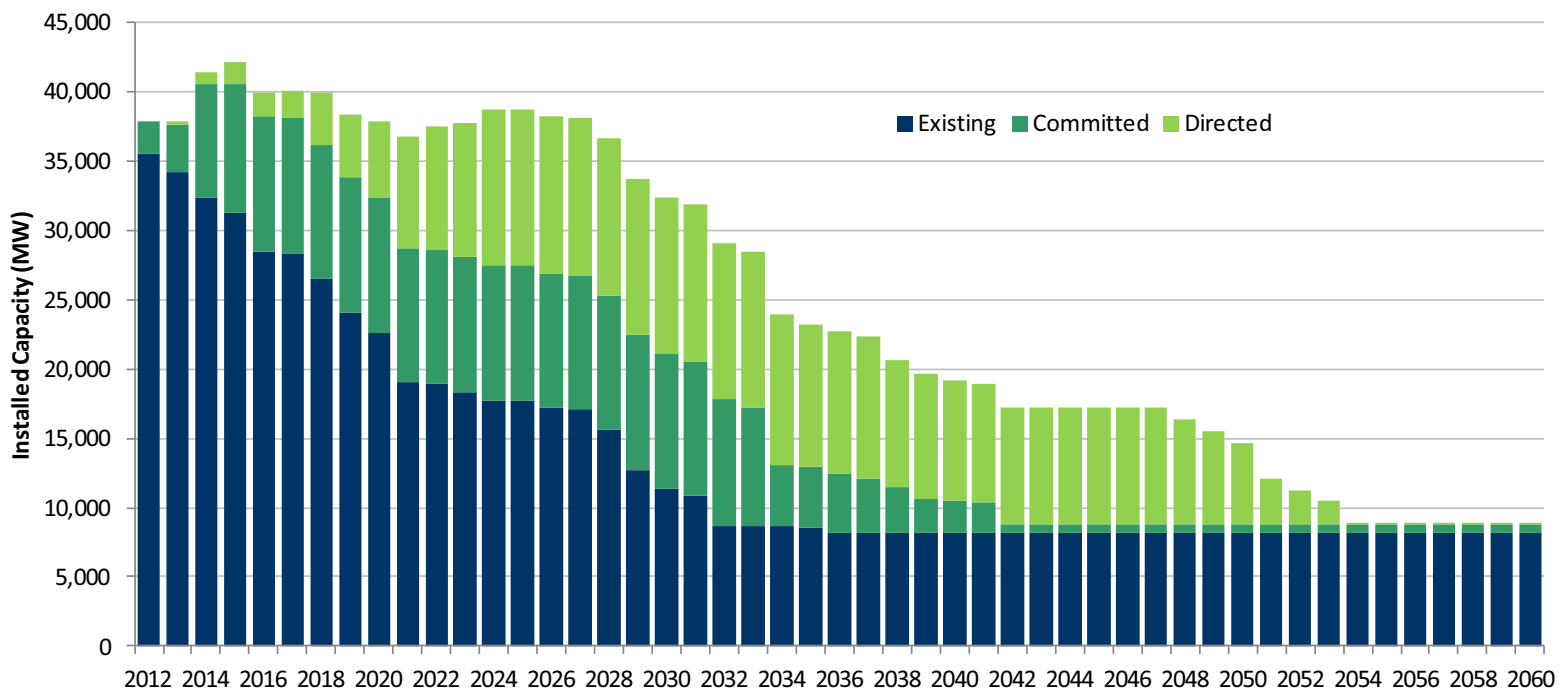
Assumptions on physical life differ by fuel source

- Nuclear 30 yrs, Gas 20 yrs, Hydro 100 yrs, Wind 20 yrs, Biomass 20 yrs, Solar 25 yrs

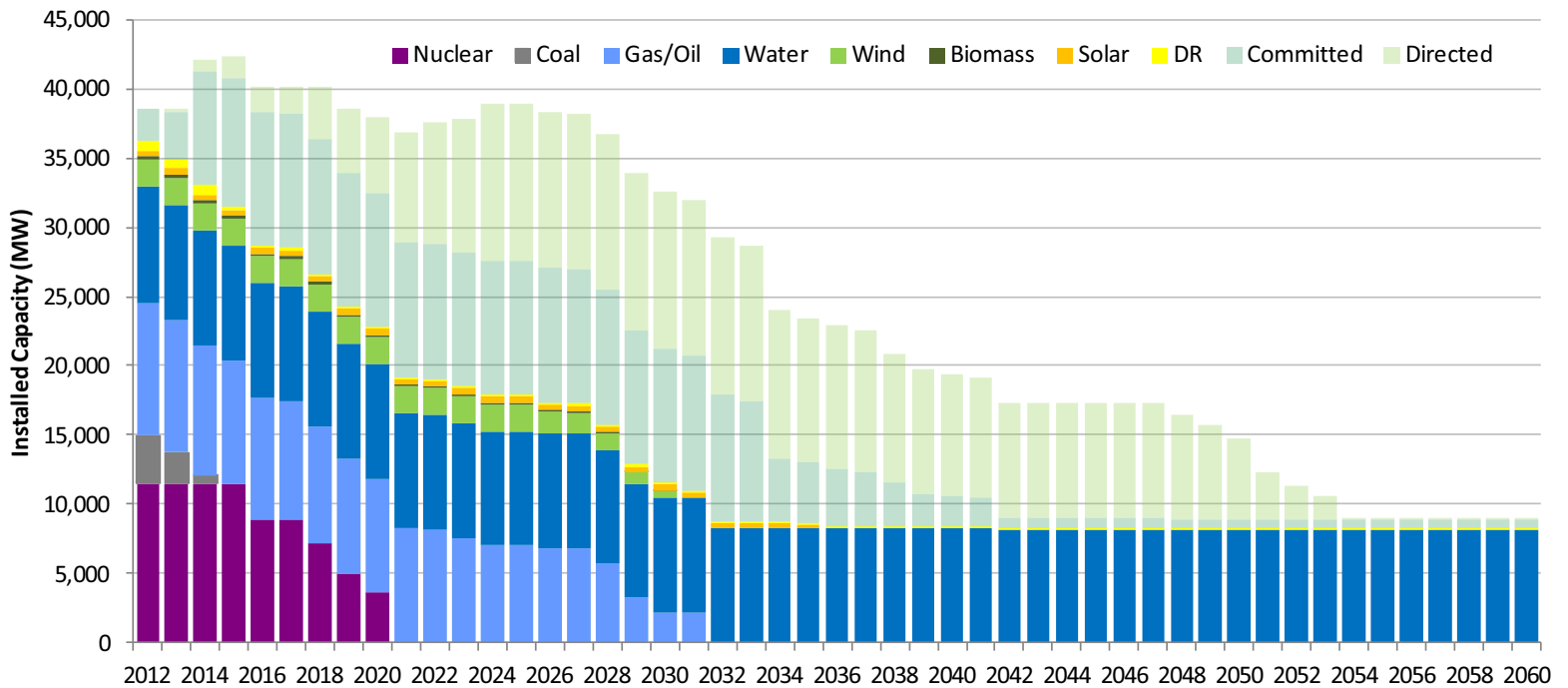
Supply outlook assumes Pickering Continued Operation

Not Responsive

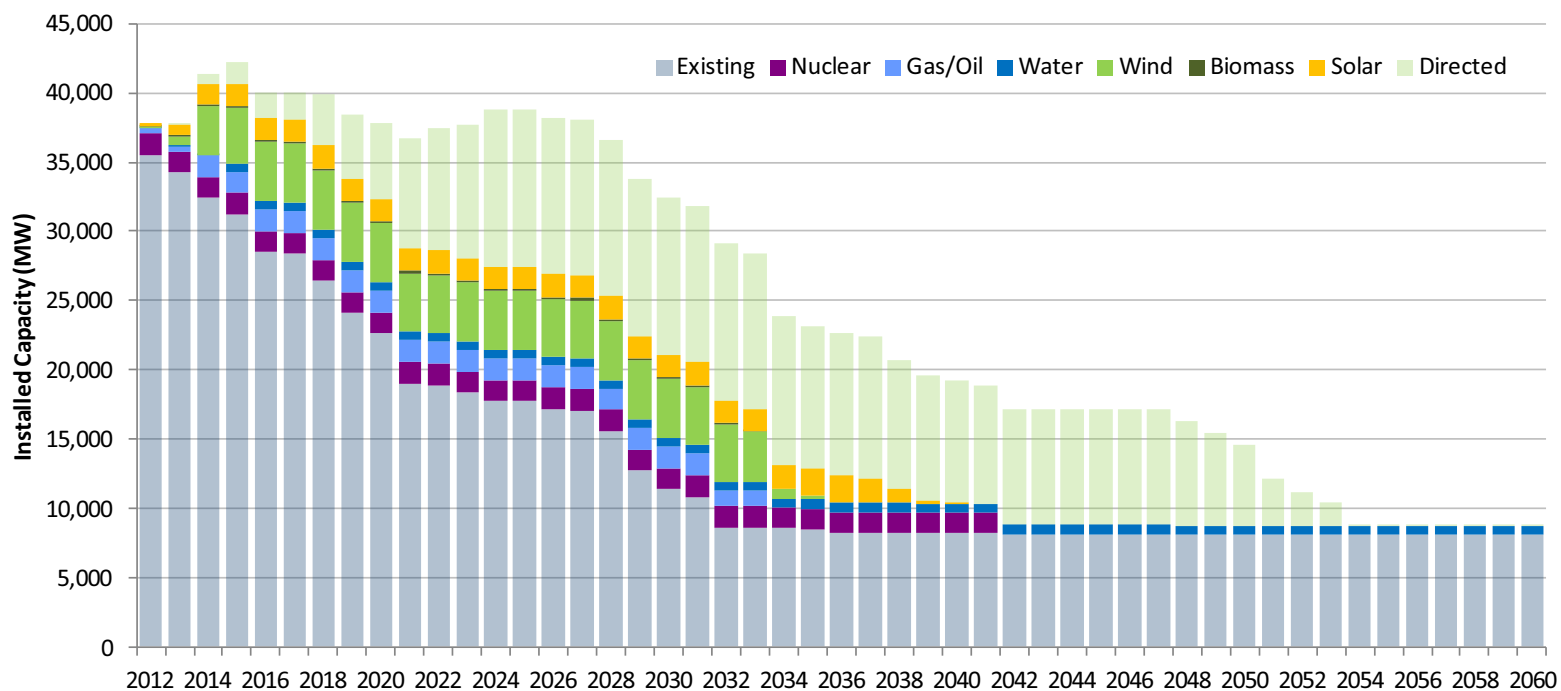
Illustrative Supply Outlook: 2012 - 2060



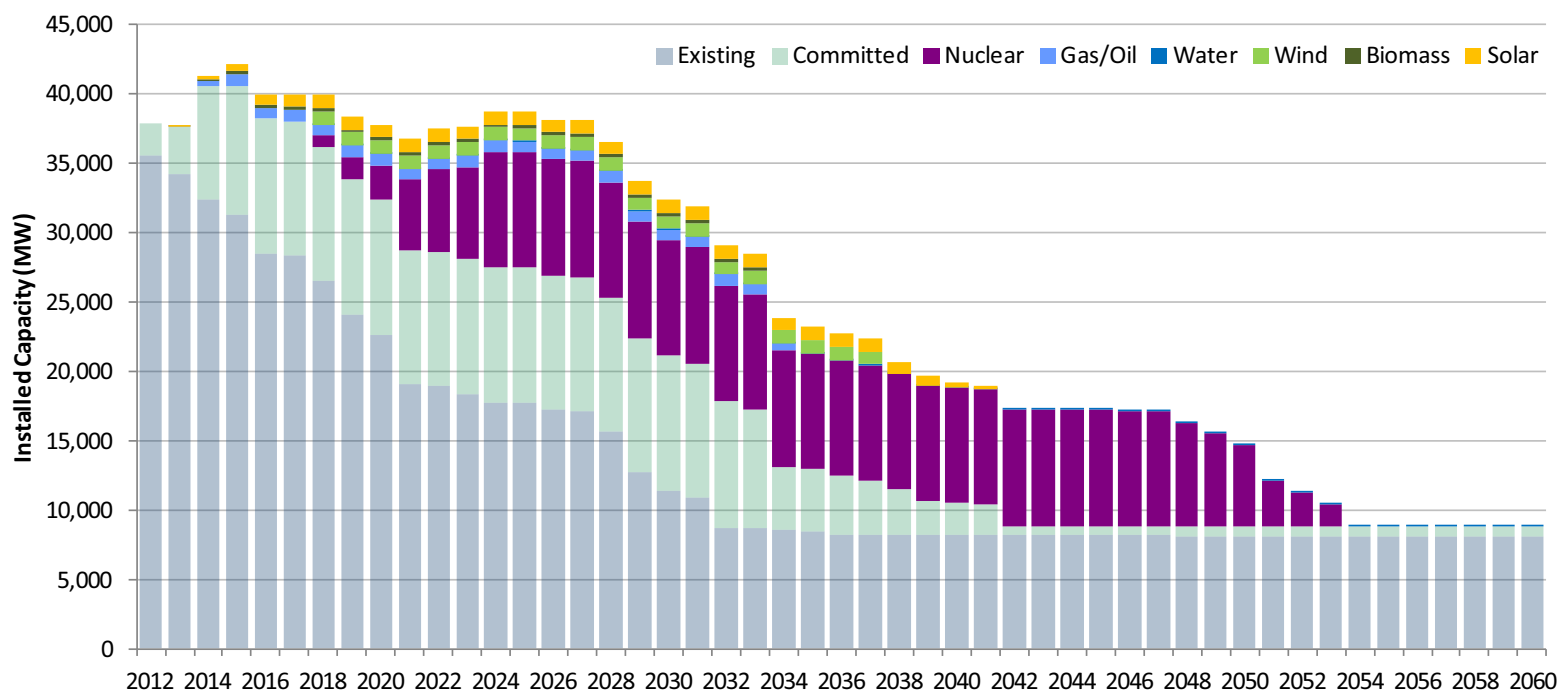
Details on Existing Supply



Details on Committed Supply



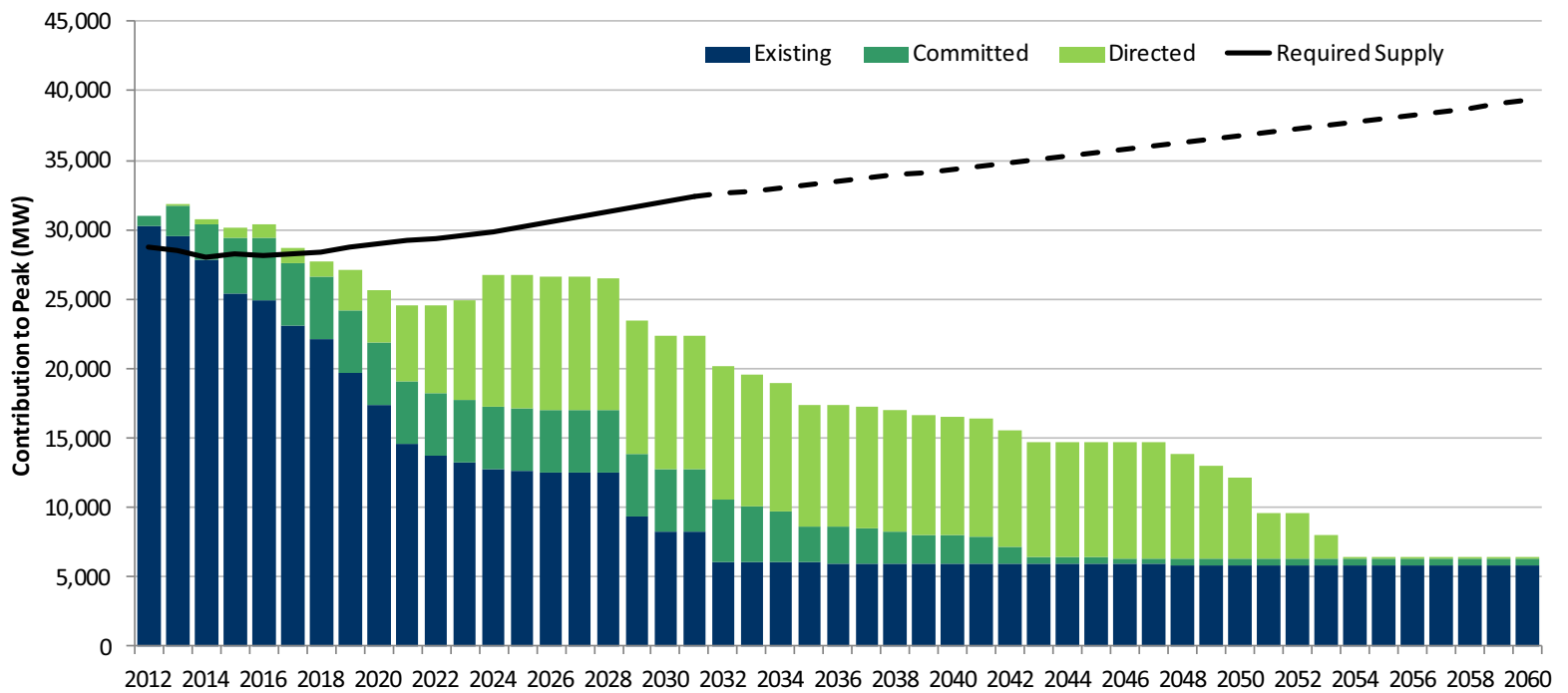
Details on Directed Supply



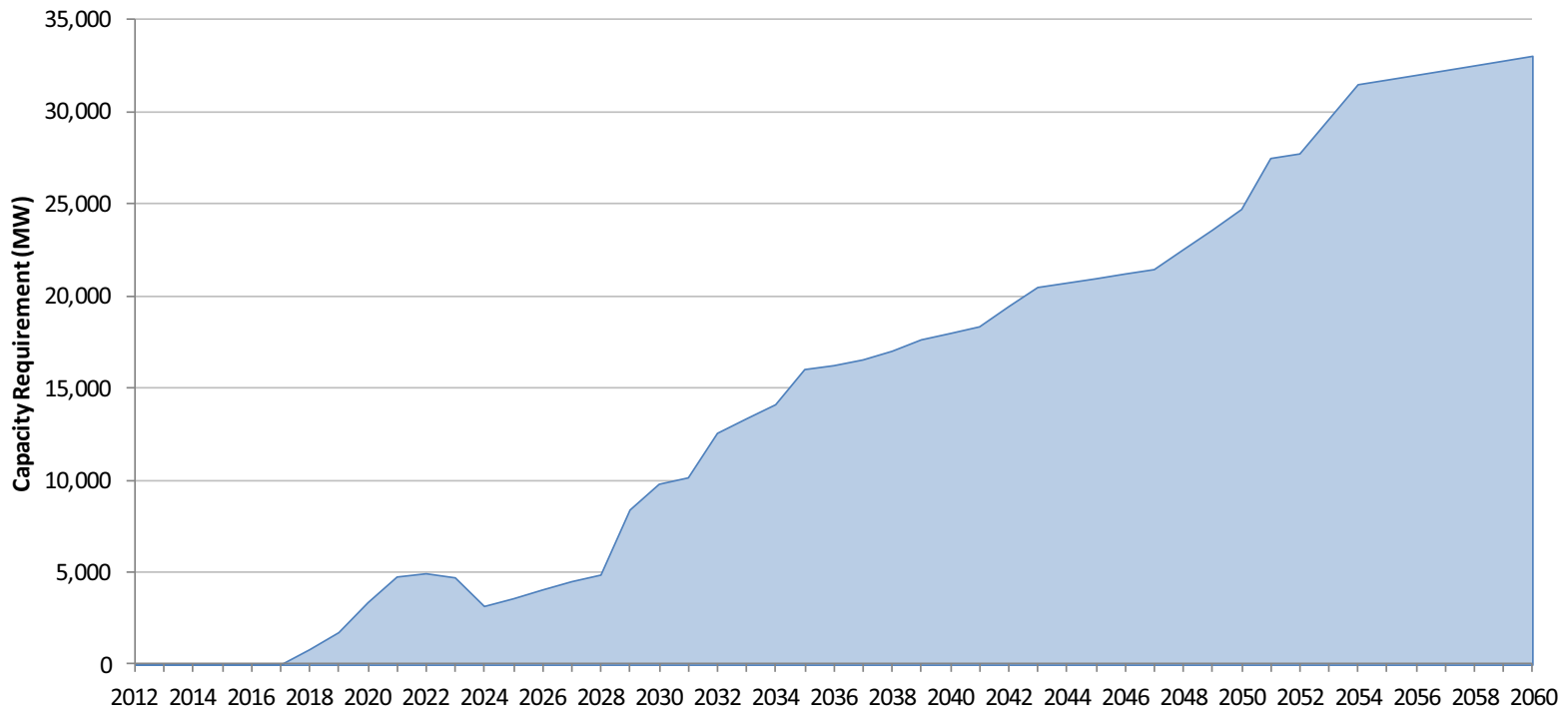
Outlook on Nuclear

Section 17

Contribution to Peak



Capacity Requirement



Year to Year Additions & Retirements

Section 17

From: Bashir Bhana
Sent: December-11-12 4:42 PM
To: Andrew Pietrewicz
Cc: Bonnie Chan; Steve Chui; Alan Leung; Victor Stein; Bashir Bhana
Subject: Nuclear Capacity Scenarios
Attachments: Nuclear Capacity Scenarios 12-11-2012 (BB).ppt

Andrew – as discussed, please see attached.

Thanks,
Bashir

Bashir Bhana, P.Eng.
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Nuclear Capacity Scenarios - For Discussion -

December 11, 2012

Illustrative Case Summary – Multiple Scenarios Exist

Case	Pickering	
DN	No PCO, 2015 Retirement	<i>Not Responsive</i>
1	No PCO, 2015 Retirement	
2	No PCO, 2015 Retirement	
3	No PCO, 2015 Retirement	
4	No PCO, 2015 Retirement	
5	With PCO, 2020 Retirement	
6	With PCO, 2020 Retirement	
7	With PCO, 2020 Retirement	
8	With PCO, 2020 Retirement	

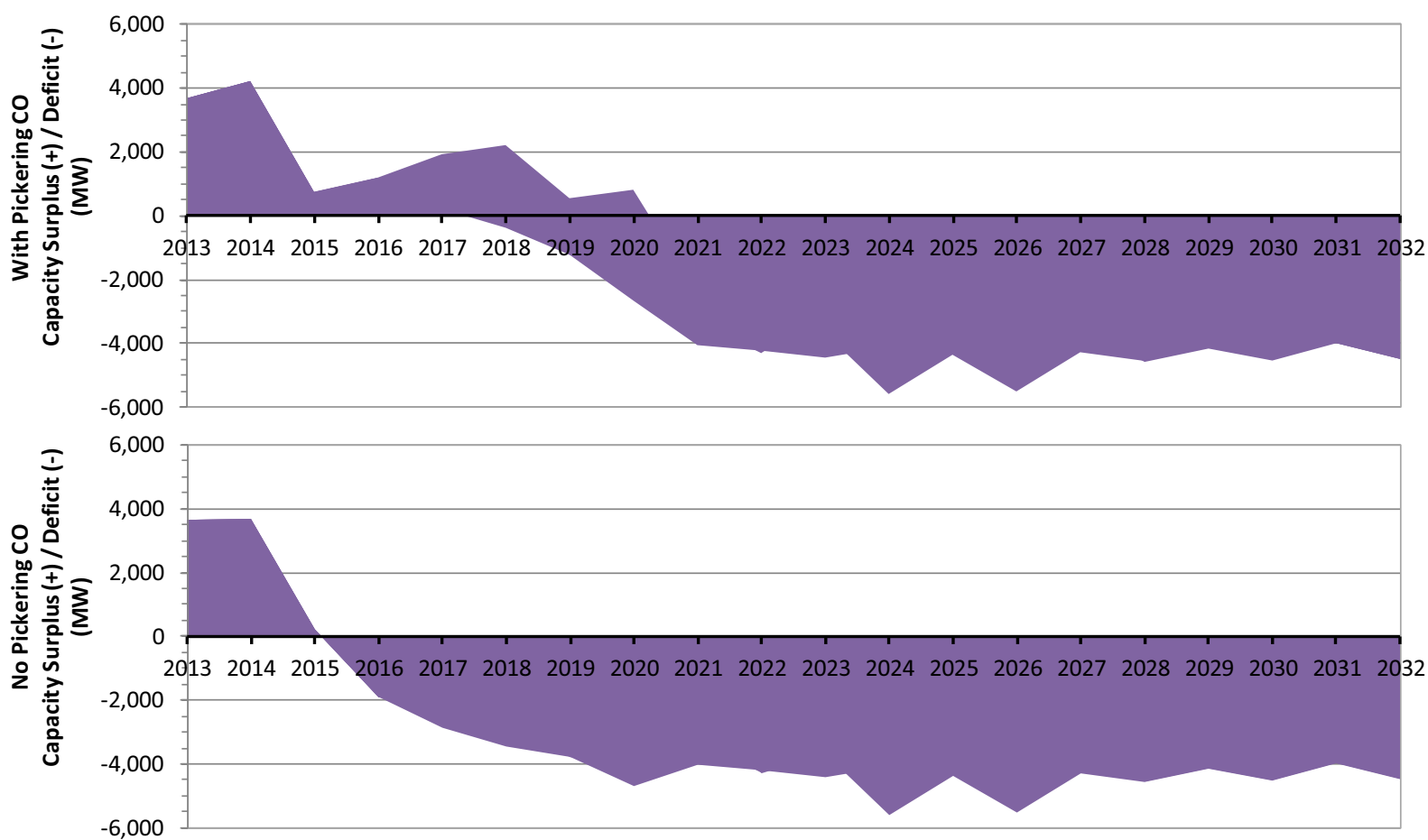
Range of Available Nuclear Capacity

Section 17

System Capacity Surplus/Deficit

Section 17

Range of Capacity Surplus/Deficit: Pickering provides insurance



Capacity Gap

Section 17

POWER RANKING

Observations

- [REDACTED] *Not Responsive*, Pickering hedges against capacity shortfalls – delaying it by at least 2-3 years
 - [REDACTED] *Not Responsive*, there would still be a sizeable capacity gap that could be adequately met with Pickering continued operations

Not Responsive