UNDERTAKING J12.2

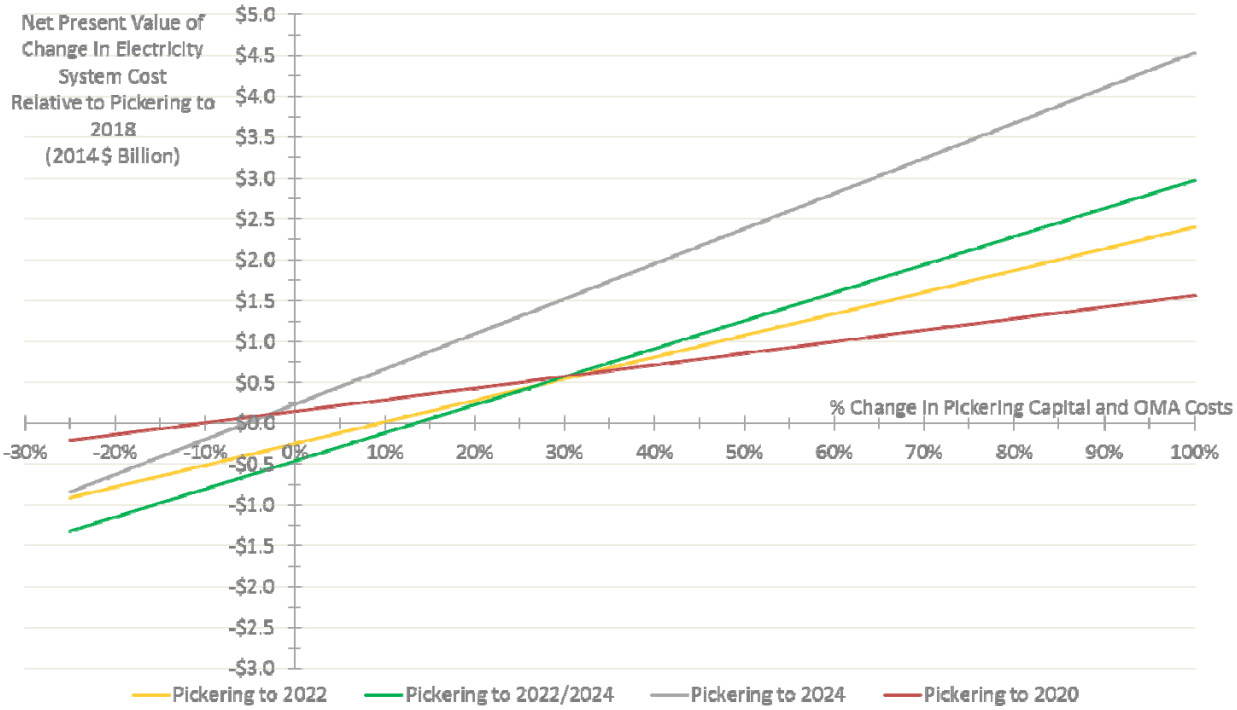
Undertaking

Compare Pickering 2022 to 2018 base cases, what is the tipping point at which project becomes uneconomic relative to that base case (See chart on page 62 of Ex F2-2-3, Attachment 1).

Response

If Pickering to 2018 was used as a base case instead of Pickering to 2020, the cost/benefit sensitivity to a change in Pickering capital and OMA costs would appear as shown in the figure below. The figure shows that Pickering life extension to 2022/2024 would not be economic if Pickering costs increased by more than 13.4 percent.

Figure 1



UNDERTAKING J12.3

Undertaking

To provide breakdown of -$1.4B NPV of Change in Electricity System Cost Components Relative to Pickering to 2020 between domestic generation (i.e. gas fired) and imports. Import types to be provided on best efforts basis (See chart in Ex. F2-2-3, pg. 6).

Response

The -$1.4B NPV (Case with +62 TWh of Pickering Production) due to Change in Electricity System Cost Components Relative to Pickering to 2020 is comprised of the following NPV changes in electricity production costs:

Fuel Type	NPV Savings ($2015M)
Natural Gas	-675
Imports	-740

The net change in imports by jurisdiction is as follows:

Jurisdiction	Total change in Imports between 2015 and 2024 (TWh)
New York	-8.7
Quebec	-4.3
Michigan	-4.9
Manitoba	-1.9
Minnesota	-0.4

*negative figures indicate a reduction relative to the Pickering to 2020 case.

In any given hour, imports and exports among neighbouring jurisdictions reflect an interplay of real-time electricity prices, electricity demands, bidding practices, carbon costs, resource and transmission availability and other factors. Long-term annual projections of electricity trade are accordingly interpreted as indicative in light of the uncertainties in projecting any of these factors across a wide range of control areas. In practice, imports into Ontario could be lower or higher, as could the output of flexible resources in the province such as natural gas-fired generators. Imports and Ontario-based natural gas-fired generators often work in tandem as swing resources – projections of their combined annual volumes are likely more indicative than if considered individually.

UNDERTAKING J12.4

Undertaking

To assess whether the $148M in savings on GEC compendium page 35 would increase with a decrease in Pickering production from 73 to 62 MWh.

Response

The increase in Pickering production (62, 65 or 73 TWh) is relative to the base case of all Pickering units being retired at the end of 2020. In the case where all Pickering units are retired at the end of 2018, total Pickering production decreases by 41 TWh relative to 2020 Base Case. All costs and savings for the Pickering to 2018 case are calculated relative to the 2020 Base Case.

The $148M in cost savings associated with the Pickering to 2018 case are unrelated to the Pickering extension scenarios, in which Pickering production is increased. Changing the amount of Pickering production in the Pickering extension scenarios will change the cost/benefit analysis for those cases; however, those changes have no impact on the Pickering to 2018 case.

For further reference, this question was discussed in EB-2016-0152 Transcript Volume 12 at pages 69 through 72 (March 24, 2017).

UNDERTAKING J12.5

Undertaking

To confirm NERC numbers on page 27 of GEC compendium are on consistent basis with IESO numbers used in analysis. If not, adjust numbers to be on consistent basis.

Response

The annual peak demand values contained in the 2016 NERC LTRA Narrative Guide on page 27 of the GEC compendium (K12.1) are not on an entirely consistent basis with the peak demand values used in IESO's analysis of Pickering Extended Operations (at F2-2-3 Att.1).

The NERC LTRA focuses on "grid demand" and therefore reflects the IESO's forecast of electricity demand on the IESO-Controlled Grid. Grid demand represents the need for electricity to be delivered to distributors and directly-connected wholesale customers through the bulk electricity system.

In contrast, demand values used in IESO's analysis of Pickering scenarios reflects so-called "net demand", which is the grid demand plus the generation that occurs on the distribution system (i.e. grid demand is a subset of net demand). A net demand representation will be higher than a grid demand representation because it includes demands served by embedded resources that are explicitly modelled as supply resources in long-term planning analyses.

The table below shows the 2016 NERC LTRA demand forecast, adjusted to the Net Demand Forecast level.

2018	2019	2020	2021	2022	2023	2024	2025	2026
24,073	24,030	23,946	24,094	24,131	24,189	24,186	24,243	24,212

UNDERTAKING J12.6

Undertaking

To produce annual Pickering production by year that was used by IESO for purposes of the study (Fall 2015 assessment).

Response

The following table summarizes annual Pickering production as simulated by the IESO in its October 2015 assessment of Pickering Extended Operations. The Table is extracted from the IESO's response to an Interrogatory at Exhibit L, Tab. 6.5, Schedule 7, ED-028, page 3 of 5.

Table 1: Annual Pickering Generation Across Various Scenarios Assessed by the IESO in its October 2015 Analysis of Pickering Extended Operations (MWh)

	Case with +65 TWh of Pickering Production, Pickering to 2020	Case with +65 TWh of Pickering Production, Pickering to 2022/2024	Case with +62 TWh of Pickering Production, Pickering to 2020	Case with +62 TWh of Pickering Production, Pickering to 2022/2024
2015	23,887,836	23,887,836	23,887,836	23,887,836
2016	21,269,076	21,269,076	21,269,076	21,269,076
2017	20,130,936	19,240,032	20,130,936	19,240,032
2018	20,585,928	19,300,818	20,585,928	19,424,418
2019	21,442,720	19,593,600	20,651,680	19,049,760
2020	24,289,248	20,884,154	23,930,808	19,902,158
2021	-	19,730,040	-	18,963,000
2022	-	21,301,800	-	20,312,064
2023	-	14,836,032	-	13,956,768
2024	-	16,716,336	-	16,295,280

The values contained in far right column in the table above (i.e. the 62 TWh Extended Operations scenario) have been entered into the spreadsheet which accompanies this response at Attachment 1. Attachment 1 was originally produced by Board Staff as part of Board Staff's Compendium for Panel 3A at Ex. K12.3, p. 2. Values entered into Attachment 1 by the IESO are highlighted in yellow.

Line No.s	COMPARISON OF PRODUCTION FORECAST ESTIMATES USED IN PCO ANALYSIS, PEO ANALYSIS AND OPG'S CURRENT APPLICATION												TOTAL (TWH) 2016-2021
1			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
2	OPG PCO Production Forecast (TWH)									N/A	N/A	N/A	N/A	
3	IESO PEO Assumptions Production Forecast (TWH)	Source - L-6.5-1-STAFF 125			21.3	19.2	19.3	19.6	20.9	19.7	21.3	14.8	16.7	120.0
4	**OEB Staff Estimate (based on Staff IR 125 and 126)**	Source - OEB STAFF ESTIMATE			**21.3**	**19.2**	**19.3**	**19.8**	**20.5**	**18.963**				**119.063**
5	IESO Analysis PEO Production Forecast (TWH)	Source - L-6.5-1-STAFF 126	N/A	23.89	21.27	19.24	19.42	19.05	19.90	18.96	20.31	13.96	16.30	117.8
6	OPG Current Application - Production Forecast (TWH)	Source - E2-T1-S1-TABLE 1	20.1	21.2	20.8	19.1	19.2	19.4	19.6	18.8	N/A	N/A	N/A	116.9
7														
8														

9 Notes:
10 N/A - Not applicable
11 PCO - Pickering Continued Operations
12 PEO - Pickering Extended Operations
13 OEB Staff Estimate is calculated using production estimates in Staff IR 125 and adjusted for revisions noted in Chart 2 of Staff IR 126.

Source: Exhibit L/ Tab 6.5/ Schedule 7/ED-028 Page 3 of 5

UNDERTAKING J12.7

Undertaking

Please provide in table format OPG's Production Forecast and the Actual Production for the years 2014, 2015 and 2016. Please provide this information separately for PNGS and DNGS and by unit.

Response

OPG's production forecast (as opposed to Board approved) and actual production for 2014, 2015 and 2016 by station and unit:

Operating Unit	2014 Budget	2014 Actual	2015 Budget	2015 Actual	2016 Budget	2016 Actual
Darlington Unit 1						
TWh	5.8	5.8	6.5	5.5	7.5	7.6
Darlington Unit 2						
TWh	7.5	7.4	6.4	6.4	5.9	5.7
Darlington Unit 3						
TWh	7.5	7.5	5.5	5.0	7.1	6.7
Darlington Unit 4						
TWh	7.5	7.3	6.4	6.5	5.6	5.7
Total Darlington	28.1	28.0	24.8	23.3	26.0	25.7
Pickering Unit 1						
TWh	3.6	3.9	2.9	2.6	3.8	4.2
Pickering Unit 4						
TWh	2.9	2.8	3.8	4.3	2.9	2.4
Pickering Unit 5						
TWh	4.0	4.3	3.0	2.9	4.3	4.4
Pickering Unit 6						
TWh	4.3	4.0	3.1	3.0	4.3	4.0
Pickering Unit 7						
TWh	2.9	2.8	4.3	4.2	2.9	2.8
Pickering Unit 8						
TWh	3.3	2.4	4.3	4.3	2.6	2.2
Subtotal Pickering [Note 1]	20.9	20.1	21.4	21.2	20.8	19.9
Less Adjustment [Note 1]	0.5	0	0	0	0	0
Total Pickering	20.4	20.1	21.4	21.2	20.8	19.9

Note 1: excludes a decrease of 0.5 TWH to the forecast for Pickering in 2014 that was not allocated to specific units (EB-2013-0321 Ex N2-1-1).
Amounts may not add up due to rounding

UNDERTAKING J12.9

Undertaking

Please expand VECC IR19 (EX L-TAB 5.1-SCHEDULE 20 VECC 19, ATTACHMENT 1) to include the years 2008 to 2016 and year 2021. Please provide actuals for 2016.

Response

An update to Ex L-Tab 5.1-Schedule 20 VECC 19, Attachment 1 to include the years 2008 to 2016 and year 2021 has been provided in Attachment 1.

Actual/ Planned Forecast By Operating Unit 2008-2021

Operating Unit	2008 Actual	2009 Actual	2010 Actual	2011 Actual	2012 Actual	2013 Actual	2014 Actual	2015 Actual	2016 Actual	2017 Plan	2018 Plan	2019 Plan	2020 Plan	2021 Plan
Darlington Unit 1														
TWh	6.1	6.9	7.2	6.2	7.3	7.5	5.8	5.5	7.6	5.2	7.1	7.0	5.2	3.3
Unit Capability Factor (%)	80.8	91.0	95.7	82.8	95.6	98.5	75.7	72.4	99.7	69.6	93.6	92.9	69.7	99.0
PO Days (excludes Refurb)	69.1	30.1	0.0	60.3	0.0	0.0	77.4	72.0	0.0	108.4	20.0	22.5	108.2	0.0
Refurb PO Days	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	200.0
FEPO Days	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0
FLR (%)	0.1	0.6	4.3	0.4	4.4	1.3	2.2	8.3	0.2	1.0	1.0	1.0	1.0	1.0
FLR Days Equivalent	0.2	2.0	15.6	1.1	15.9	4.6	6.1	23.9	0.7	2.6	3.4	3.4	2.6	1.7
Darlington Unit 2														
TWh	7.6	6.7	6.2	7.5	7.2	5.1	7.4	6.4	5.7	-0.2	-0.2	-0.2	4.7	6.4
Unit Capability Factor (%)	98.8	88.4	82.5	99.0	94.2	67.6	96.9	84.3	96.5	0.0	0.0	0.0	72.2	85.3
PO Days (excludes Refurb)	0.0	32.0	61.7	0.0	6.8	77.9	2.8	50.3	0.0	0.0	0.0	0.0	57.5	33.7
Refurb PO Days				0.0	0.0	0.0	0.0	0.0	78.0	365.0	365.0	365.0	45.0	0.0
FEPO Days	0.0	3.2	0.0	0.0	0.0	19.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FLR (%)	1.2	2.0	0.7	1.0	3.7	7.1	2.2	2.0	3.0	0.0	0.0	0.0	12.0	6.0
FLR Days Equivalent	4.2	6.6	2.0	3.6	13.1	18.8	8.0	6.4	10.8	0.0	0.0	0.0	31.6	19.9
Darlington Unit 3														
TWh	7.7	5.6	7.5	7.6	6.4	7.3	7.5	5.0	6.7	7.0	5.3	7.4	0.8	-0.2
Unit Capability Factor (%)	99.9	74.6	98.5	99.2	84.0	96.6	98.8	65.7	87.7	92.9	71.0	98.3	99.0	0.0
PO Days (excludes Refurb)	0.0	79.5	4.9	0.0	56.8	0.0	0.0	95.8	22.4	22.5	103.3	2.5	0.0	0.0
Refurb PO Days	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	321.0	365.0
FEPO Days	0.0	7.7	0.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0
FLR (%)	0.1	1.9	0.1	0.7	0.1	3.4	1.2	8.6	5.9	1.0	1.0	1.0	1.0	0.0
FLR Days Equivalent	0.2	5.2	0.2	2.7	0.2	12.2	4.2	22.4	20.0	3.4	2.6	3.6	0.5	0.0
Darlington Unit 4														
TWh	7.5	6.8	5.6	7.6	7.6	5.2	7.3	6.5	5.7	7.0	7.1	5.4	7.0	7.0
Unit Capability Factor (%)	98.5	89.8	73.8	99.8	99.0	69.0	96.0	85.2	75.5	92.9	93.6	72.1	92.9	92.9
PO Days (excludes Refurb)	0	28.7	56.5	0	0	66.5	11.8	48.8	87.7	22.5	20.0	99.1	22.5	22.5
Refurb PO Days				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEPO Days	0.0	1.0	13.9	0.0	0.0	20.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FLR (%)	1.5	2.1	8.5	0.2	0.9	9.3	0.6	1.5	0.2	1.0	1.0	1.0	1.0	1.0
FLR Days Equivalent	5.3	7.0	25.0	0.8	3.1	25.9	2.1	4.7	0.6	3.4	3.4	2.7	3.4	3.4
Pickering Unit 1														
TWh	2.8	4.1	2.3	3.7	2.9	2.0	3.9	2.6	4.2	1.8	3.7	2.7	3.8	2.5
Unit Capability Factor (%)	62.3	91.7	53.2	82.0	65.2	47.1	87.6	58.0	94.5	41.7	83.8	61.6	83.8	55.8
PO Days	0.0	0.0	98.0	0.0	106.3	0.0	0.0	128.4	0.0	204.9	43.0	128.5	43.0	150.5
FEPO Days	1.1	0.0	12.3	0.0	9.9	109.7	0.0	17.3	0.0	0.0	0.0	0.0	0.0	0.0
FLR (%)	37.2	8.3	22.2	18.0	4.0	32.2	12.4	2.5	5.0	5.0	5.0	5.0	5.0	5.0
FLR Days Equivalent	135.0	30.2	55.5	65.9	9.9	81.6	45.1	5.5	18.4	8.0	16.1	11.8	16.2	10.7
Pickering Unit 4														
TWh	3.7	1.6	3.2	2.4	3.3	3.9	2.8	4.3	2.4	3.7	2.6	3.7	2.3	3.9
Unit Capability Factor (%)	81.3	36.7	71.6	53.8	73.8	86.7	63.6	95.3	55.1	83.8	57.5	83.8	52.3	87.2
PO Days	0.0	74.0	46.5	80.9	18.0	20.0	85.3	0.0	107.8	43.0	144.1	43.0	164.5	30.0
FEPO Days	0.0	32.5	0.0	6.8	7.4	4.5	34.3	0.0	31.9	0.0	0.0	0.0	0.0	0.0
FLR (%)	18.6	47.8	17.6	29.2	20.5	6.9	5.3	4.7	10.1	5.0	5.0	5.0	5.0	5.0
FLR Days Equivalent	68.1	122.5	55.9	81.0	69.8	23.5	12.9	17.3	22.7	16.1	11.0	16.1	10.1	16.8
Pickering Unit 5														
TWh	4.0	3.1	3.8	1.9	4.4	2.6	4.3	2.9	4.4	2.3	4.2	2.3	4.3	2.1
Unit Capability Factor (%)	90.3	70.7	84.6	45.1	98.5	58.7	95.8	66.1	98.9	53.2	95.0	51.9	95.0	48.2
PO Days	1.7	57.3	41.9	113.0	0.0	87.8	0.0	105.9	0.0	160.7	0.0	165.6	0.0	179.7
FEPO Days	5.3	27.7	0.0	63.9	0.0	53.4	0.0	14.7	0.0	0.0	0.0	0.0	0.0	0.0
FLR (%)	7.2	7.1	3.8	10.4	1.4	1.8	4.1	0.5	1.0	5.0	5.0	5.0	5.0	5.0
FLR Days Equivalent	25.5	19.8	12.1	19.1	5.2	3.8	14.9	1.1	3.6	10.2	18.3	10.0	18.3	9.3
Pickering Unit 6														
TWh	4.3	3.5	3.9	3.2	4.3	3.0	4.0	3.0	4.0	2.7	4.2	2.1	4.3	2.6
Unit Capability Factor (%)	96.0	78.2	86.3	71.5	97.2	67.6	88.7	68.0	91.7	60.4	95.0	48.1	95.0	57.9
PO Days	0.0	68.2	39.4	101.1	0.0	113.0	0.0	102.4	1.4	133.0	0.0	180.1	0.0	142.6
FEPO Days	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2	0.0	0.0	0.0	0.0	0.0
FLR (%)	4.1	3.1	3.0	0.5	2.8	0.1	11.3	5.3	2.6	5.0	5.0	5.0	5.0	5.0
FLR Days Equivalent	14.8	9.2	9.7	1.3	10.2	0.3	41.3	13.8	8.9	11.6	18.3	9.2	18.3	11.1
Pickering Unit 7														
TWh	1.5	4.2	2.9	4.3	2.9	4.3	2.8	4.2	2.8	4.2	2.0	4.2	3.0	3.9
Unit Capability Factor (%)	34.1	94.8	65.4	97.1	66.5	95.4	62.2	93.3	62.5	95.0	44.6	95.0	68.4	87.2
PO Days	0.0	0.0	117.2	0.0	104.4	0.0	113.9	0.0	117.5	0.0	193.5	0.0	102.5	30.0
FEPO Days	0.0	0.0	2.2	0.0	0.0	0.0	7.5	8.5	3.9	0.0	0.0	0.0	0.0	0.0
FLR (%)	65.9	5.2	1.4	2.9	6.5	4.6	6.6	3.3	6.4	5.0	5.0	5.0	5.0	5.0
FLR Days Equivalent	241.3	18.9	3.3	10.7	16.9	16.7	16.2	11.7	15.7	18.3	8.6	18.3	13.2	16.8
Pickering Unit 8														
TWh	2.9	4.1	3.1	4.1	2.9	3.9	2.4	4.3	2.2	4.2	2.5	4.2	2.0	3.9
Unit Capability Factor (%)	65.3	92.3	69.2	91.0	65.7	86.8	53.8	95.5	48.7	95.0	55.9	95.0	46.0	87.2
PO Days	60.4	0.0	76.4	0.0	97.4	0.0	85.7	13.4	142.6	0.0	150.2	0.0	188.9	30.0
FEPO Days	13.2	0.0	7.0	0.0	8.9	0.0	13.6	0.0	41.4	0.0	0.0	0.0	0.0	0.0
FLR (%)	17.8	7.7	8.9	8.9	6.5	13.2	25.6	0.7	0.6	5.0	5.0	5.0	5.0	5.0
FLR Days Equivalent	51.6	28.0	24.7	32.5	16.8	48.0	67.7	2.3	1.1	18.3	10.7	18.3	8.9	16.8