UNDERTAKING J8.4

Undertaking

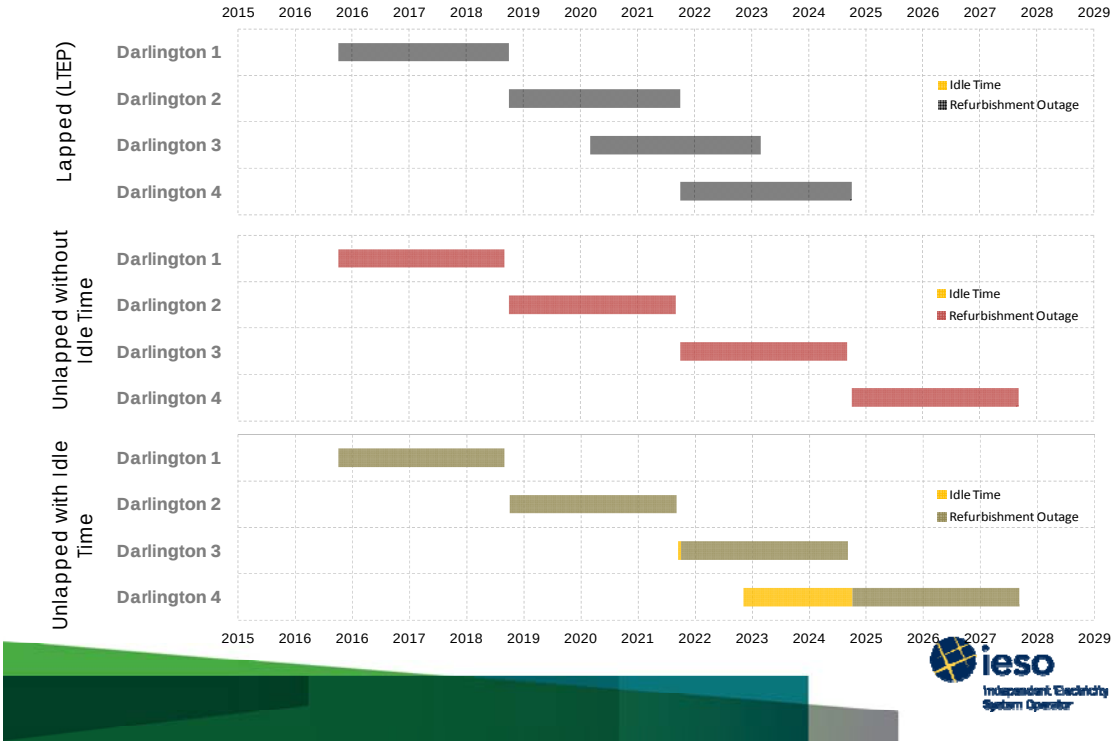
To advise whether the change in the DRP schedule, whereby Units 2 and 3 have been unlapped, has been accounted for in the IESO's analysis.

Response

The March 2015 study considered Darlington refurbishment schedules that were unlapped (refurbishment outages not overlapping) and lapped (refurbishment outages overlapping) (Figure 1). The October 2015 study considered the lapped refurbishment schedule.

Figure 1: Darlington Refurbishment Schedules March 2015 study.

Pickering extension options were assessed against three Darlington refurbishment sequences. One sequence features some overlap among Darlington refurbishments. Two sequences feature no overlap - in sequences without overlap, one relies on idle time at Darlington units 3 and 4 to attain the required service life.



UNDERTAKING J8.5

Undertaking

To confirm that the Nymex future prices (see also Ex. K8.1, p.2, footnote 3), and the IESO Price Premium numbers in the chart found at Ex. K8.1, p.2 are accurate.

Response

Ex. K8.1, p.2 presented the following table:

	2017	2018	2019	2020	2021	2022	2023	2024
IESO Forecast (2015 real U.S. $/MMBTU)	5.45	5.45	5.44	5.44	5.43	5.43	5.43	5.43
IESO Forecast (nominal U.S. $/MMBTU)	5.67	5.78	5.89	6.01	6.12	6.24	6.36	6.49
NYMEX Future Prices ($/MMBtu)	3.35	3.05	2.99	3.02	3.01	3.03	3.08	3.16
IESO Price Premium	69%	90%	97%	99%	103%	106%	106%	105%

[1] Ex. L, Tab 6.5, Sch. 7 ED-028, Page 5
[2] Conversion from 2015 real $ based on assumed 2% annual inflation rate.
[3] As of March 6, 2017: http:www.cmegroup.com/trading/energy/natural-gas/natural-gas.html

The specific NYMEX Future Prices presented in the table above cannot be confirmed as those instantaneous quotes no longer exist on the website cited. However, a comparison of the futures prices available on the website as of March 13, 2017 to those in the table above indicates there has not been a significant deviation in gas futures prices over the previous seven days (see table below).

NYMEX Future Prices ($USD/MMbtu)	2017	2018	2019	2020	2021	2022	2023	2024
March 6, 2017 (Tab 2)	3.35	3.05	2.99	3.02	3.01	3.03	3.08	3.16
March 13, 2017	3.37	3.07	2.99	2.99	3.00	3.01	3.04	3.11

The percentage by which the IESO nominal forecast exceeds the NYMEX future price illustrated in the table at Ex. K8.1, p.2 appears to be calculated correctly using the March 6, 2017 NYMEX future prices.

UNDERTAKING J8.6

Undertaking

To advise on the differential that was assumed in the analysis between Henry Hub and Dawn amounts.

Response

The following table summarizes the price differential between Dawn Hub and Henry Hub assumed in the analysis, consistent with the publicly available natural gas forecast used. Note that the basis differential used is positive, indicating that the Dawn price is more expensive than Henry Hub.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2016	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2017	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2018	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2019	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2020	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2021	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2022	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2023	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2024	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2025	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2026	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2027	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2028	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2029	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2030	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2031	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27
2032	0.27	0.27	0.27	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.26	0.27

Source: Sproule.

UNDERTAKING J8.7

Undertaking

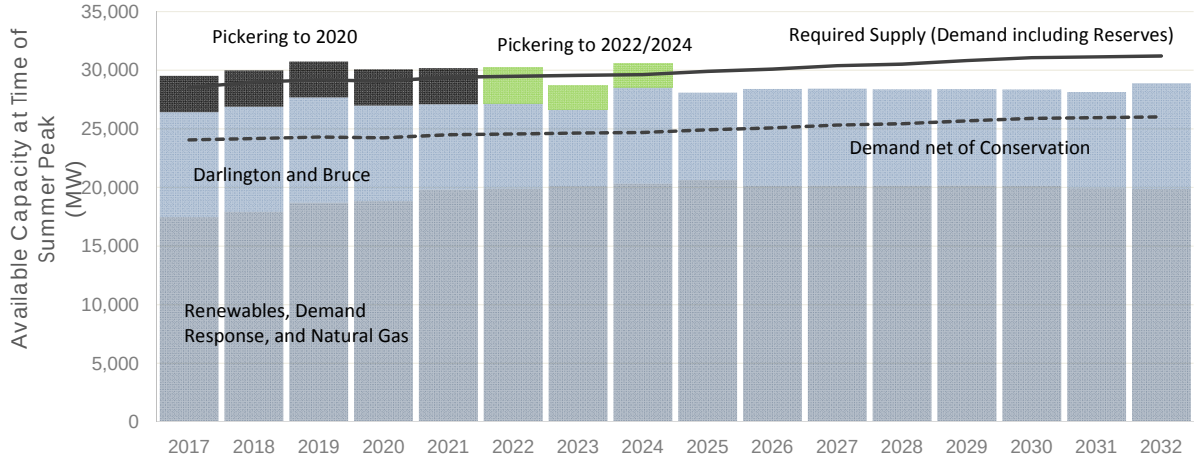
Reference: Ex. F2-2-3, Att. 1, p. 5

To provide a table comparing the resource requirement line found at Ex. F2-2-3, Att. 1, p. 5 with the latest version of the resource requirement line.

Response

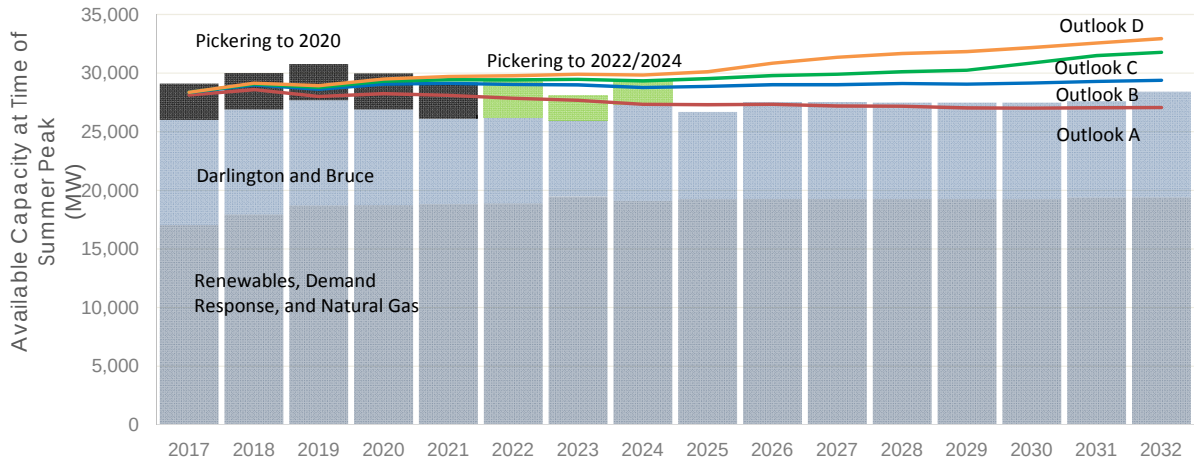
The available resources at time of summer peak and the required supply are shown in Figures 1 and 2, for the October 2015 Pickering Assessment and an indicative March 2017 outlook respectively. Note the IESO is currently in the midst of updating its planning outlook and an indicative outlook based on current information is illustrated herein.

Figure 1: Available Resources at Time of Peak – October 2015 Pickering Assessment[1]



[1] Demand outlooks are consistent with the Ontario Planning Outlook (2016). http://www.ieso.ca/sector-participants/planning-and-forecasting/ontario-planning-outlook

Figure 2: Available Resources at Time of Peak – March 2017 Outlook*



The resource above requirement for the October 2015 Pickering Assessment and the updated March 2017 outlook is shown in Tables 1 and 2. The resource above requirement is the difference between the available resources and required supply. While the March 2017 Outlook is still a work in progress, it is considered indicative.

Table 1: Summer Resource Above Requirement – October 2015 Pickering Assessment

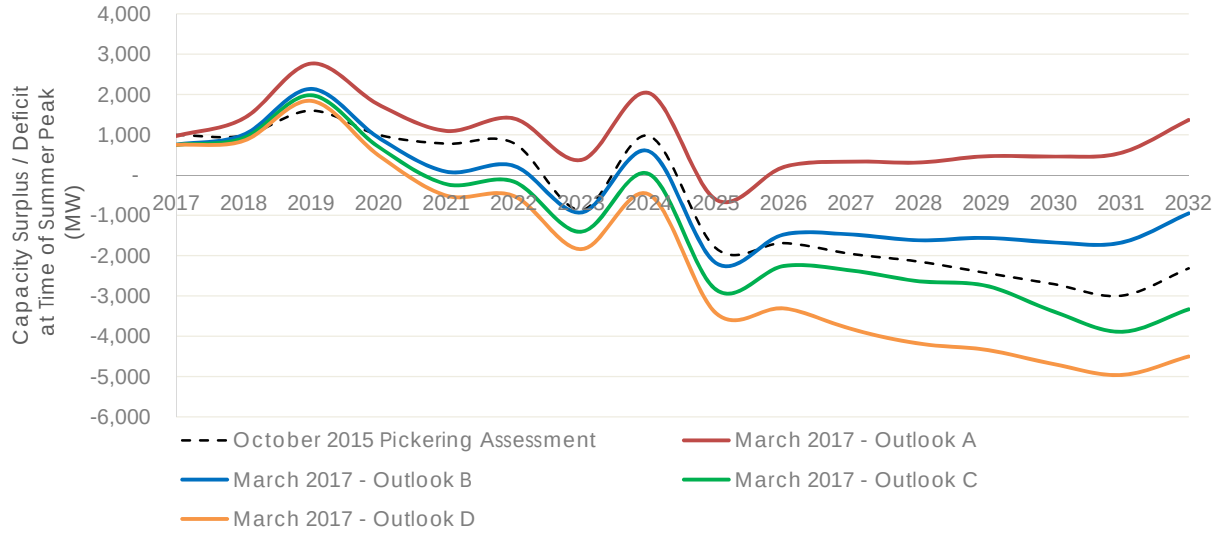
MW	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Available Resources	29,519	29,971	30,760	30,073	30,177	30,266	28,696	30,592
Required Supply	28,521	28,990	29,161	29,076	29,398	29,473	29,563	29,619
Resource Above Requirement	998	981	1,599	997	778	793	-867	974
	2025	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Available Resources	28,073	28,402	28,422	28,364	28,384	28,357	28,141	28,897
Required Supply	29,895	30,091	30,378	30,511	30,813	31,063	31,134	31,213
Resource Above Requirement	-1,822	-1,688	-1,956	-2,146	-2,429	-2,706	-2,994	-2,315

Table 2: Summer Resource Above Requirement – March 2017 Outlook

	2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Available Resources	29,099	29,992	30,759	29,983	29,196	29,255	28,053	29,362
Required Supply								
Outlook A	28,128	28,583	27,990	28,236	28,100	27,848	27,678	27,325
Outlook B	28,343	28,988	28,620	29,058	29,111	29,024	28,981	28,768
Outlook C	28,350	29,069	28,777	29,288	29,422	29,416	29,459	29,332
Outlook D	28,350	29,139	28,917	29,498	29,705	29,773	29,891	29,838
Resource Above Requirement								
Outlook A	971	1,408	2,769	1,747	1,097	1,407	375	2,037
Outlook B	756	1,004	2,139	925	85	231	-929	595
Outlook C	749	922	1,982	695	-225	-161	-1,407	30
Outlook D	749	852	1,842	485	-509	-519	-1,839	-476
	2025	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Available Resources	26,677	27,527	27,526	27,481	27,485	27,472	27,596	28,429
Required Supply								
Outlook A	27,291	27,326	27,192	27,169	27,016	27,011	27,044	27,060
Outlook B	28,863	29,001	29,001	29,100	29,044	29,142	29,273	29,377
Outlook C	29,525	29,783	29,894	30,114	30,233	30,858	31,485	31,758
Outlook D	30,109	30,835	31,347	31,664	31,822	32,163	32,558	32,930
Resource Above Requirement								
Outlook A	-615	201	334	312	470	462	552	1,369
Outlook B	-2,187	-1,475	-1,475	-1,619	-1,559	-1,670	-1,677	-948
Outlook C	-2,848	-2,257	-2,368	-2,634	-2,748	-3,386	-3,890	-3,329
Outlook D	-3,433	-3,308	-3,821	-4,184	-4,336	-4,690	-4,963	-4,501

Figure 3 illustrates the summer resources above requirement (capacity surplus/deficit) for the two outlooks (Pickering to 2022/2024).

Figure 3: Comparison of Resource Above Requirement – October 2015 Pickering Assessment and March 2017 Outlook (Pickering to 2022/2024)



Although resource requirements illustrated above are at the time of summer peak, note that in Outlooks C and D Ontario transitions to a winter peaking system over the planning horizon.

UNDERTAKING J8.8

Undertaking

To advise on the expiry date of the three NUG contracts representing about 270 MW of capacity, in particular, if any of these contracts expire in 2021, 2022, or 2023.

Response

The NUG contracts representing the 270 MW of installed capacity and their contract expiry dates are as follows:

- Iroquois Falls - 126 MW (January 1, 2022)
- Nipigon – 40 MW (December 31, 2022)
- Kirkland Lake (base load) – 103 MW (August 23, 2031)

UNDERTAKING J8.9

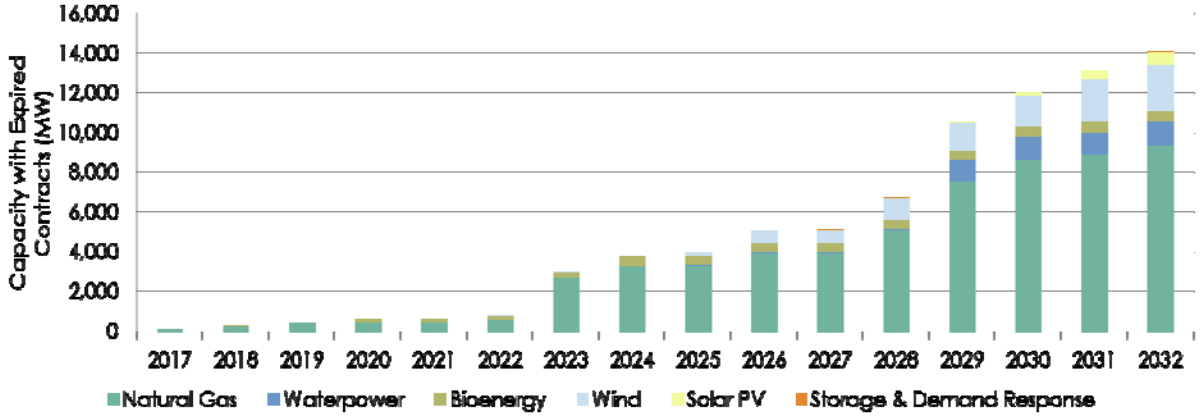
Undertaking

To confirm the number of NUG contracts assumed to be renewed in the analysis.

Response

The analysis considered that some of the capacity currently under contract would remain in-service following contract expiry. The amount of capacity expiring over the planning period of the Pickering study is illustrated in Figure 1.

Figure 1: Capacity with Expired Contracts



Approximately 4,000 MW of capacity currently under contract reaches the end of its contract term by 2024. In the analysis, most of this capacity was assumed to continue to remain in operation.

Regarding NUG capacity in particular, 397 MW of NUG capacity was estimated to reach the end of contract term by 2024. Approximately 269 MW of this capacity was assumed to remain in service, while 128 MW was not assumed to remain in-service.

UNDERTAKING J8.10

Undertaking

Reference: Ex. K8.1, Tab 10, p. 21

To break down the capacity requirement assumptions between summer and winter.

Response

For the case with Pickering to 2020, the figures below illustrate the summer and winter capacity requirements in the October 2015 Pickering assessment and an indicative March 2017 outlook. Note the IESO is currently in the midst of updating its planning outlook and an indicative outlook based on current information is illustrated herein.

Figure 1: Comparison of Summer Capacity Requirements – October 2015 Pickering Assessment and March 2017 Outlook (Pickering to 2020)[1]

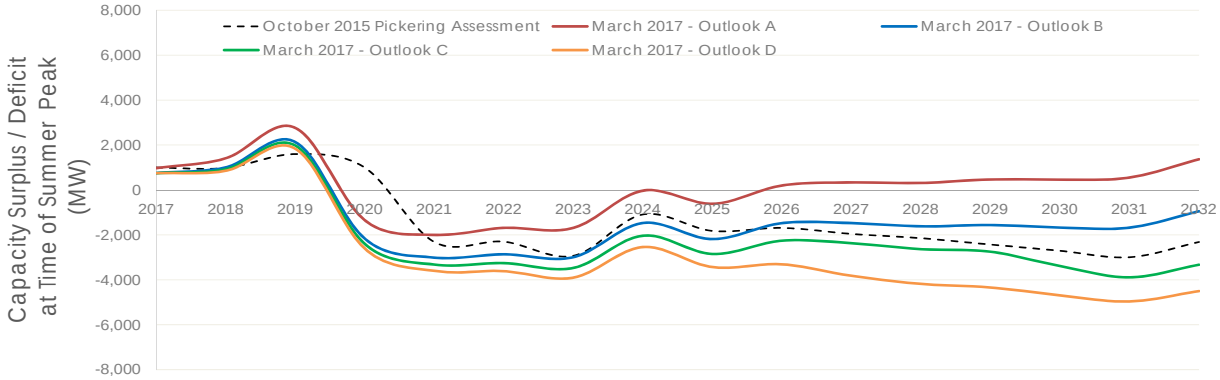
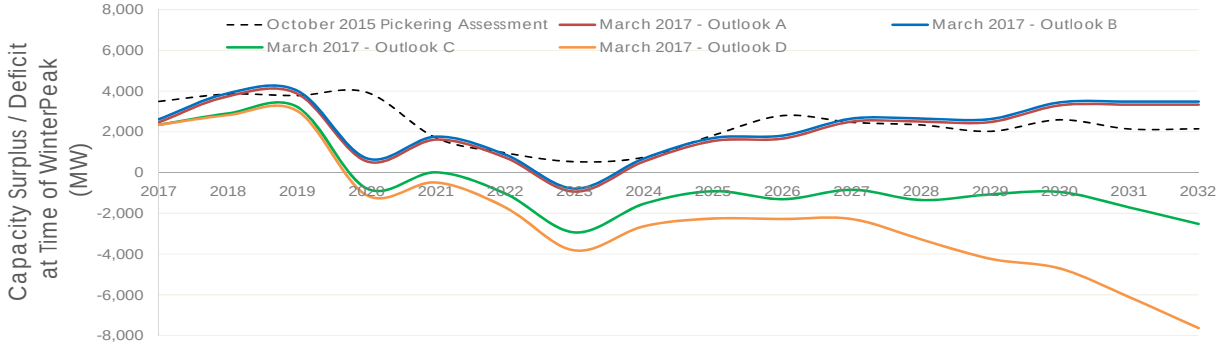


Figure 2: Comparison of Winter Capacity Requirements – October 2015 Pickering Assessment and March 2017 Outlook (Pickering to 2020)



[1] Note that demand outlooks are consistent with the Ontario Planning Outlook (2016). http://www.ieso.ca/sector-participants/planning-and-forecasting/ontario-planning-outlook

Table 1: Comparison of Summer Capacity Requirements – October 2015 Pickering Assessment and March 2017 Outlook (Pickering to 2020)

Resource Above Requirement	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
October 2015 Pickering Study	998	981	1,599	997	-2,316	-2,301	-2,931	-1,090
March 2017, Outlook A	971	1,408	2,769	-1,347	-1,997	-1,687	-1,689	-27
March 2017, Outlook B	756	1,004	2,139	-2,169	-3,009	-2,863	-2,993	-1,469
March 2017, Outlook C	749	922	1,982	-2,399	-3,319	-3,255	-3,471	-2,034
March 2017, Outlook D	749	852	1,842	-2,609	-3,603	-3,613	-3,903	-2,540
Resource Above Requirement	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
October 2015 Pickering Study	-1,822	-1,688	-1,956	-2,146	-2,429	-2,706	-2,994	-2,315
March 2017, Outlook A	-615	201	334	312	470	462	552	1,369
March 2017, Outlook B	-2,187	-1,475	-1,475	-1,619	-1,559	-1,670	-1,677	-948
March 2017, Outlook C	-2,848	-2,257	-2,368	-2,634	-2,748	-3,386	-3,890	-3,329
March 2017, Outlook D	-3,433	-3,308	-3,821	-4,184	-4,336	-4,690	-4,963	-4,501