Gross Minimum Procurement Volume Input and Methodology Review

November 2018

Background

The procurement volumes released for consultation on August 31, 2018[1] were derived based on the AESO's application of a resource adequacy modelling methodology developed in consultation with: (1) members of the Adequacy and Demand Curve Work Group in 2017; and (2) members of the Demand Curve Working Group in 2018 during the Straw Alberta Market and Comprehensive Market Design processes.

Between the final Demand Curve Working Group session on August 16, 2018 and the release of the Set 3 Rules on August 31, 2018, the AESO updated the resource adequacy model using the most recent load forecast information. This information took into account the updated historic load data and the most recent Conference Board of Canada economic forecast data. The update increased the gross minimum procurement volume from 18,378 MW to 18,516 MW for the 2021/2022 obligation period.

During the AESO's consultation process, stakeholders commented that the proposed procurement volumes would result in the over-procurement of capacity and requested additional transparency with respect to the AESO's modelling approach.[2] These stakeholder comments along with AESO's own internal analysis prompted the AESO to further assess the inputs and assumptions underpinning the proposed procurement volumes.

In order to better evaluate the resource adequacy model and the resulting procurement volumes, the AESO performed a 2018 calibration assessment. The calibration used the methodologies applied in developing the procurement volumes against the 2018 existing generation fleet. This included creating a set of 2018 load profiles to account for expected variation in 2018 demand, taking into account weather years and economic scenarios.[3] The calibration also applied the methodologies consistent with those used in developing the procurement volumes for modeling correlated wind, solar and hydro profiles, planned and forced outage rates, cogeneration and intertie availability.

As a result of this calibration run, the AESO determined that the initial 2018 calibration results were higher than anticipated which indicated that further evaluation of the resource adequacy model and results was warranted. The AESO assessed model inputs and determined that the following assumptions merited refinement:

- Biomass unit planned and forced outages;

[1] https://www.aeso.ca/assets/Uploads/Section-207.1-Gross-Minimum-Procurement-Volume-final-for-consultation-2018-08-31.pdf

[2] https://www.aeso.ca/rules-standards-and-tariff/consultation/stakeholder-sessions-notice-of-consultation-on-iso-rules-for-the-implementation-of-the-capacity-market/

[3] The 2018 calibration deviates from the procurement volume load forecast methodology by accounting for observed price responsive load impacts to expected unserved energy in 2018. This is considered appropriate for the calibration as it captures observed behavior today, whereas for the 2021/22 and 2022/2023 the obligations and behavior of price responsive load are unknown at this time.

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- Capacity to maintain regulating reserves; and
- Intertie distribution.

A summary of the review and refinements is provided below.

Summary of the AESO's Resource Adequacy Model Review

Input/Methodology	Evaluation completed/conclusion reached.
Load Profiles	2018 actual loads fall in-line with the forecasted load profiles modelled. No refinement warranted.
Conventional Generation Availability	Comparison of simulated availability and actual availability show inputs are representative. A minor update was recommended for biomass units.
Cogeneration Availability	Comparison of simulated availability and actual availability show inputs are representative. No refinement warranted.
Hydro Production	Comparing 2018 actual hydro output with the simulated hydro dispatch shows no systematic disconnects. No refinement warranted.
Wind Production	No systematic differences between simulated wind and actual wind output. No refinement warranted.
Intertie Capability Distribution	The intertie availability showed a disconnect between 2018 import capability and the modelled intertie distribution. As a result, a refinement was recommended.
Capacity to maintain Regulating Reserve	Reviewed historical regulating reserve usage data during tight supply hours. It was determined the initial assumption of holding out the full regulating reserve requirement is conservative. A refinement is recommended.

Resource Adequacy Model Refinements

The AESO revised the following inputs:

- Biomass Unit Planned and Forced Outages

  The AESO reviewed available capability (AC) data for biomass units and adjusted the planned and forced outage rates to more specifically reflect each unit's availability. The planned outage rate increased slightly from 2% to 2.3%, and the forced outage rate decreased from 5.3% to 2.4%. The previous iteration of the model used net AC for certain units.

- Capacity to Maintain Regulating Reserves:

  The Resource Adequacy Model (RAM) begins measuring simulated firm load shedding once estimated contingency reserves are depleted. In the estimation of unserved energy, regulating reserves are maintained during load shed events, consistent with AESO system controller procedures.

  Regulating reserves in the model are estimated as a percent of Alberta gross load. Historical regulating reserve data was analyzed and it was determined that during historical tight supply hours the regulating reserve maintained on average was 0.72% of Alberta internal load (AIL). The AESO has adjusted the modelled value of regulating reserve to maintain during load shed events within the model, from 1.5% of the Alberta gross load to 0.72%.

- Intertie Distribution

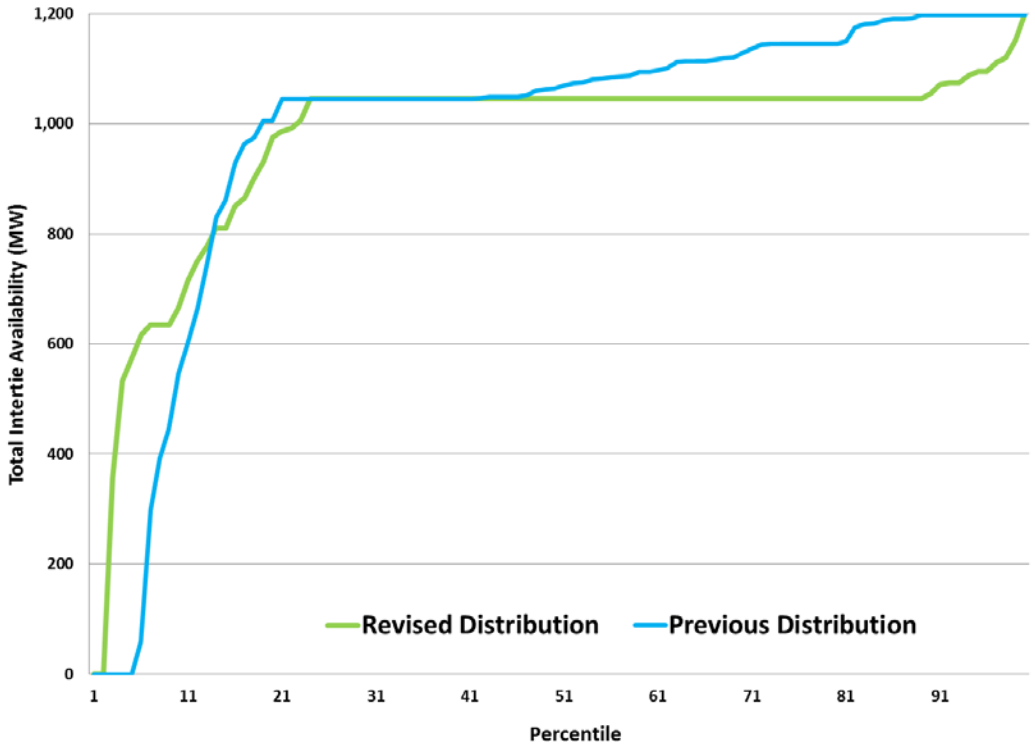
  A review of 2018 intertie availability indicated that, during tight supply hours, average imports and availability were higher in 2018 than what was being simulated within the model suggesting the intertie distribution used assumes less availability than reality.

  The model performs random draws of import availability from a defined intertie distribution. The distribution had approximately 5% of all draws at 0 MW import availability into Alberta from all ties.

  The AESO reviewed the historic available transfer capability data and identified the system intertie distribution should be adjusted to better capture the excepted effects of intertie constraints and unexpected outages.

  - The range of historical data informing the distribution has been extended to include 2018 (Jan 1st, 2015 – Oct 31st, 2018).
  - The distribution is now defined with coincident system intertie availability, rather than defining and ranking each individual tie line.
  - Identified full outages lasting more than seven days as a planned outage and have excluded these events from the distribution.

Figure 1 – Revised Intertie Distribution


1,200
1,000
800
600
400
200
0
Total Intertie Availability (MW)
1
11
21
31
41
51
61
71
81
91
Percentile
Revised Distribution
Previous Distribution

Conclusion

As a result of the refinements described above:

- The gross minimum procurement volume for the base auction for the 2021/2022 obligation period has been revised from 18,516 MW to 18,305 MW of maximum capability, which is 57 MW less than the modelled existing fleet.
- The gross procurement volume for the base auction for the 2022/2023 obligation period has been revised from 18,597 MW to 18,400 MW of maximum capability, which indicates the need for an additional 38 MW above the modelled existing fleet.

Further information on the procurement volume and calibration results are provided in Figure 1 and Tables 1 to 3 below.

Figure 2 – Unserved Energy by Gross Volume (2021/2022)

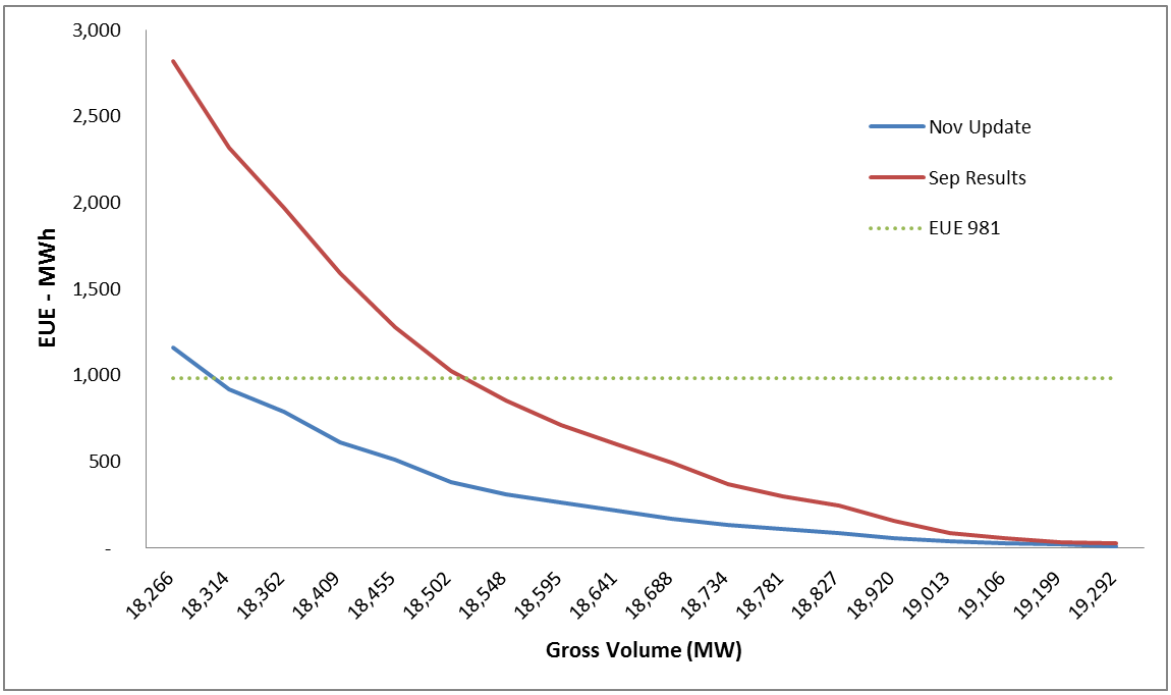


Table 1 – Unserved Energy by Gross Volume

Base (addition/subtraction)	Procurement Volume	%NEUE	EUE (MWh)	LOLE Capacity (Events per Year)	LOLH Capacity (Hours)
Base(-144)	18,218	0.001609%	1,435	2.81	5.33
Base (-96)	18,266	0.001317%	1,174	2.35	4.31
Min Procurement Volume (-57)	18,305	0.001100%	981	2.03	3.67
Base (-48)	18,314	0.001049%	935	1.92	3.43
Base	18,362	0.000858%	765	1.69	2.97
Base (+46.5)	18,409	0.000684%	610	1.38	2.34
Base (+93)	18,455	0.000547%	488	1.16	1.94
Base (+139.5)	18,502	0.000443%	395	0.93	1.51
Base (+186)	18,548	0.000359%	320	0.79	1.24
Base (+232.5)	18,595	0.000289%	257	0.67	1.04
Base (+279)	18,641	0.000232%	207	0.53	0.84
Base (+325.5)	18,688	0.000187%	167	0.45	0.67
Base (+372)	18,734	0.000150%	134	0.38	0.56
Base (+418.5)	18,781	0.000121%	108	0.30	0.44
Base (+465)	18,827	0.000097%	87	0.25	0.37
Base (+558)	18,920	0.000063%	56	0.17	0.24
Base (+651)	19,013	0.000043%	39	0.11	0.15
Base (+744)	19,106	0.000027%	24	0.07	0.10
Base (+837)	19,199	0.000017%	15	0.05	0.08

Table 2 – Revised 2017 Calibration Results

2017 Calibration	Min	Average	Max	Actual
EUE (MWh)	0	3	650	0
LOLH (Hours)	0	0.02	2	0
EEA Event (Hours Spanned)	0	0.2	7	5 (2 events)

Table 3 – Revised 2018 Calibration Results

2018 Calibration	Min	Average	Max	Actual (Jan - Nov)
EUE (MWh)	0	370	13,700	0
LOLH (Hours)	0	1.5	43	0
EEA Event (Hours Spanned)	0	12	191	5 (2 events)

Appendix 1

Table 4 – Load forecast 2021/2022

2021/2022	Min	Low	Ref	High	Max
Max Values (MW)	12,301	12,378	12,454	12,549	12,633
Average* Values (MW)	10,045	10,106	10,171	10,249	10,322
Average* Total Annual Energy (TWh)	88,010	88,552	89,122	89,800	90,442

* Table values are average values of all weather years

Table 5 – Load Forecast 2022/2023

2022/2023	Min	Low	Ref	High	Max
Max Values (MW)	12,424	12,508	12,588	12,686	12,779
Average* Values (MW)	10,151	10,216	10,283	10,363	10,442
Average* Total Annual Energy (TWh)	88,919	89,495	90,077	90,784	91,468

* Table values are average values of all weather years