Information Document
Wind and Solar Power Ramp up Management
ID #2018-013

Information documents are not authoritative. Information documents are for information purposes only and are intended to provide guidance. In the event of any discrepancy between an information document and any authoritative document[1] in effect, the authoritative document governs.

1 Purpose

This information document relates to the following authoritative document:

- Section 304.3 of the ISO rules, *Wind and Solar Power Ramp up Management* ("Section 304.3")

The purpose of this information document is to describe the methodology used to calculate the Alberta system wind and solar aggregated generating facilities power limit and how the pro rata share is distributed.

2 Applicability

Section 304.3 is applicable to those parties and facilities listed in subsection 1 under Applicability. To be clear, the reference to facilities with gross real power capability equal to or greater than 5 MW, applies to all the different types of facilities referenced in subsections (1)(a) and (b) not just to electric systems within the service area of the City of Medicine Hat.

3 Methodology Used to Calculate System Wind and Solar Power Limit

Pursuant to subsection 7(1) of section 304.3, the AESO is required to post "the methodology used to calculate the Alberta system wind and solar aggregated generating facilities power limit". The wind and solar power limit in MW for all non-exempt wind and solar aggregated generating facilities for a power ramp monitoring interval, with the interval not to exceed 20 minutes and the initial interval set at 10 minutes, will be the greater of (A) and (B), calculated as follows:

(A) (i) the total Alberta real power output from all non-exempt wind and solar aggregated generating facilities;

plus

(ii) the AESO estimates, in MW, of:

(a) the ramp rate-down capability, in MW per minute, of all pool assets in the energy market merit order for the power ramp monitoring interval;

plus

(b) any increases or decreases in the Alberta internal load for the power ramp monitoring interval;

plus

(c) any increases or decreases in any interchange schedule quantities for the power ramp monitoring interval; and

(B) (i) the total Alberta real power output from all non-exempt wind and solar aggregated generating facilities;

plus

(ii) 6.5 MW per minute for the power ramp monitoring interval.

The table below shows an example to illustrate the calculation of system wind and solar power limit.

[1] "Authoritative documents" is the general name given by the AESO to categories of documents made by the AESO under the authority of the *Electric Utilities Act* and associated regulations, and that contain binding legal requirements for either market participants or the AESO, or both. AESO authoritative documents include: the ISO rules, the Alberta reliability standards, and the ISO tariff.

A	B
A(i) = 250 MW	B(i) = 250 MW
A(ii) = 50 MW	B(ii) = 6.5 MW/min x 10 min monitoring interval = 65 MW
A = A(i) + A(ii) = **300 MW**	B = B(i) + B(ii) = **315 MW**

In the example above, since B is greater than A, the Alberta system wind and solar power limit is **315 MW**.

4 Methodology Used to Calculate the Pro Rata Share of the System Wind and Solar Power Limit

Pursuant to subsection 7(1) of section 304.3, the AESO is required to post "the methodology used to calculate the pro rata share of the Alberta system wind and solar aggregated generating facilities power limit to the AESO". The AESO calculates the pro rata share for each of the non-exempt wind or solar aggregated generating facilities at the beginning of a power ramp monitoring interval, and may re-calculate the pro-rata share as frequently as every 1 minute until the next monitoring interval. The pro rata share calculation is not applicable to the aggregated generating facilities that are already limited by any curtailment directive or dispatch, other than a power ramp management directive. The AESO calculates the pro rata share using configurable weighting factors for potential MW, maximum capability and last ramp using the following equation:

$$Pro\ Rata\ Share = (A + B + C) * (D - E)$$

Where

A = the potential real power capability weighting of the non-exempt wind or solar aggregated generating facility as provided to the AESO under Appendix 2 of section 502.8 of the ISO rules, *SCADA Technical Requirements*. A is calculated as follows.

$$A = A1 * \frac{A2}{A3}$$

Where

A1 = the weighting percentage for the potential real power capability. This is currently 0%.

A2 = the wind or solar aggregated generating facility's potential real power capability.

A3 = the sum of all potential real power capability for non-exempt wind and solar aggregated generating facilities participating in the pro rata calculation.

B = the max capability weighting of the non-exempt wind or solar aggregated generating facility. B is calculated as follows.

$$B = B1 * \frac{B2}{B3}$$

Where

B1 = the weighting percentage for the maximum capability. This is currently 20%.

B2 = the wind or solar aggregated generating facility's maximum capability.

B3 = the sum of all maximum capabilities for non-exempt wind and solar aggregated generating facilities participating in the pro rata calculation.

C = the last ramp interval weighting of the non-exempt wind or solar aggregated generating facility as calculated based on the difference from start to finish of the look back interval period). C is calculated as follows.

$$C = C1 * \frac{C2}{C3}$$

Where

C1 = the weighting percentage for the last ramp value. This is currently 80%.

C2 = the wind or solar's last ramp value.

C3 = the sum of last ramp values for all non-exempt wind and solar aggregated generating facilities participating in the pro rata calculation.

D = the Alberta system wind and solar power limit.

E = the total real power output from all non-exempt wind and solar aggregated generating facilities.

Below is an example to illustrate the pro rata calculation with 2 non-exempt wind and solar aggregated generating facilities. For this example, the Alberta system wind and solar power limit is **223 MW**. As mentioned above, the pro rata calculation weighting factor is 0% for potential MW, 20% for maximum capability, and 80% for last ramp value.

Wind/Solar Facility	Maximum Capability (MW)	Actual Output (MW)	Potential Output (MW)	Last Ramp
Facility 1	250	93	95	15
Facility 2	100	65	66	20
Total	**350**	**158**	**161**	**35**

The pro rata share for Facilities 1 and 2 are calculated as follows.

$$Facility\ 1\ Pro\ Rata\ Share = (\ 0 + 20\% * \left(\frac{250}{350}\right) + 80\% * \left(\frac{15}{35}\right)) * (223 - 158) = 32\ MW$$

$$Facility\ 2\ Pro\ Rata\ Share = (\ 0 + 20\% * \left(\frac{100}{350}\right) + 80\% * \left(\frac{20}{35}\right)) * (223 - 158) = 33\ MW$$

The resulting pro rata limits for Facility 1 and 2 are shown below.

Wind/Solar Facility	Maximum Capability (MW)	Actual Output (MW)	Pro Rata Share (MW)	Pro Rata Limit (MW)
Facility 1	250	93	32	93+32 = 125
Facility 2	100	65	33	65+33 = 98
Total	**350**	**158**	**65**	**223**

Revision History

Posting Date	Description of Changes
2020-04-07	Addition of new section 2 Applicability and renumbering of ID sections
2018-09-04	Initial release