

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 document¹ 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 provide market participants with AESO information referenced in Section 304.3.

2 Exemption List

As referenced by subsection 1(2) of Section 304.3, the following facilities are included in the exemption list:

- Bull Creek #1 (“BUL1”); and
- Bull Creek #2 (“BUL2”).

3 Alberta System Wind and Solar Power Limit

3.1 Methodology

The AESO’s Alberta system wind and solar power limit methodology referenced in subsection 6(1) of Section 304.3 is set out below.

To determine the system wind and solar power limit, the AESO continuously monitors the state of the Alberta Interconnected Electric System (AIES) for reliability concerns related to the wind and solar real power output. The monitored system variables include, but are not limited to, the following:

- Area Control Error (ACE)
- System Frequency
- Amount of downward Regulating Reserve
- Ramp rate of the total real power output from all applicable wind and solar aggregated facilities
- Total potential real power output from all applicable wind and solar aggregated facilities

If there are no reliability concerns (normal system state), the system wind and solar power limit is the sum of the energy dispatches of all applicable wind and solar aggregated facilities.

If there are reliability concerns caused by wind and solar real power output increase (abnormal system state), AESO will reduce the system wind and solar power limit to manage the wind and solar real power output ramp.

The AESO’s calculation of the system wind and solar power limit can be summarized as follows:

$$\text{WSPL} = \text{EN_TOTAL (for normal system state), OR}$$
$$\text{RPO_TOTAL} + \text{WSRL (for abnormal system state)}$$

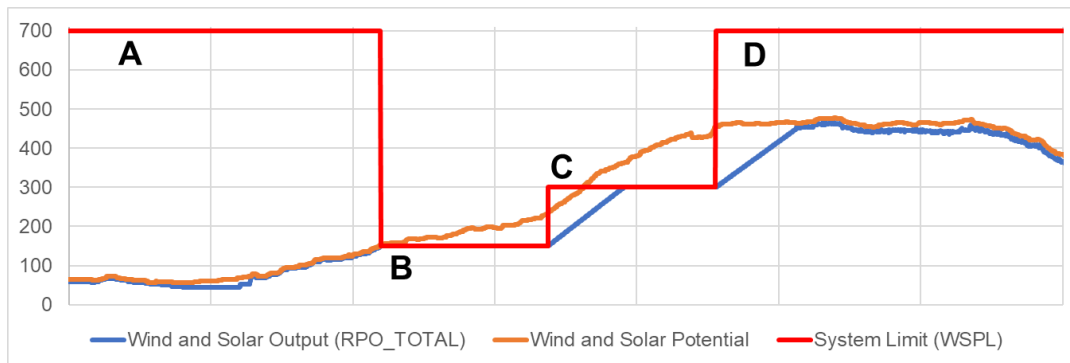
¹ “Authoritative documents” is the general name given by the AESO to categories of documents made by the AESO under the authority of the *Electric Utilities Act* and associated regulations, and that contain binding legal requirements for either market participants or the AESO, or both. AESO authoritative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

where:

WSPL	is the Alberta system wind and solar power limit;
EN_TOTAL	is the Alberta energy dispatch total for all applicable wind and solar aggregated facilities;
RPO_TOTAL	is the total Alberta real power output from all applicable wind and solar aggregated facilities;
WSRL	is the Alberta system wind and solar ramp limit as calculated by the AESO for abnormal system state.

If wind and solar real power output increase results in the AIES being in an unreliable state, WSRL will be set to 0. The AESO will continue to monitor the system variables listed above and increase WSRL as system conditions allow. The AESO will determine a pro rata share of WSRL for each applicable wind and solar aggregated facility based on the methodology described in Section 4.1 below.

The following diagram illustrates how the system wind and solar power limit gets updated to manage a wind and solar real power output ramp event.



- A – System normal state (WSPL = EN_TOTAL).
- B – System abnormal state (WSPL = RPO_TOTAL + WSRL, and WSRL = 0).
- C – System abnormal state (WSPL = RPO_TOTAL + WSRL, and WSRL = 150) .
- D – System returns to normal state (WSPL = EN_TOTAL).

4 Wind and Solar Aggregated Facilities Power Limit Pro Rata Share

4.1 Methodology

The AESO's wind and solar aggregated facilities power limit pro rata share methodology referenced in subsection 6(1) of Section 304.3 is set out below.

(a) Pro Rata Share

The AESO calculates the pro rata share for each applicable wind or solar aggregated facility at the beginning of a power ramp monitoring interval.

$$\text{Pro Rata Share (MW)} = (\text{MWP} + \text{LR}) \times (\text{WSPL} - \text{RPO_TOTAL})$$

where:

MWP is the net potential MW weighting of each facility calculated.

$$\text{MWP} = 50\% * \frac{\text{MWP_F}}{\text{MWP_TOTAL}}$$

where:

MWP_F is the net potential MW capability of the facility defined as the difference of the potential and actual real power output of the facility; and

MWP_TOTAL is the total net potential MW of all applicable wind and solar aggregated facilities participating in the pro rata calculation.

LR is the last ramp weighting of each facility calculated as follows:

$$LR = 50\% * \frac{LR_F}{LR_TOTAL}$$

where:

LR_F is the last ramp of the facility based on the difference of the potential real power output from start to finish of the look back interval period as determined by the AESO; and

LR_TOTAL is the total last ramp for all applicable wind and solar aggregated facilities participating in the pro rata calculation;

WSPL is the Alberta system wind and solar power limit; and

RPO_TOTAL is the total real power output from all applicable wind and solar aggregated facilities.

(b) Pro Rata Limit

The AESO calculates the pro rata limit for each facility as follows:

Pro Rata Limit (MW) = Pro Rata Share + Real Power Output

4.2 Example Calculation

For clarity, an example is provided below to illustrate the AESO's pro rata share and limit calculations with 2 facilities based on the following assumptions.

RPO_TOTAL = 158 MW

WSRL = 65 MW

WSPL = 158 + 65 = 223 MW

MWP_TOTAL = 20 MW

LR_TOTAL = 35 MW

For Facility 1: MWP_F = 11 MW, LR_F = 15 MW, Real Power Output = 93 MW

For Facility 2: MWP_F = 9 MW, LR_F = 20 MW, Real Power Output = 65 MW

The pro rata shares for Facility 1 and 2 are calculated as follows:

For Facility 1:

$$\text{Facility 1 Pro Rata Share} = \left(50\% * \left(\frac{11}{20} \right) + 50\% * \left(\frac{15}{35} \right) \right) * (223 - 158) = 32 \text{ MW}$$

For Facility 2:

$$\text{Facility 2 Pro Rata Share} = \left(50\% * \left(\frac{9}{20} \right) + 50\% * \left(\frac{20}{35} \right) \right) * (223 - 158) = 33 \text{ MW}$$

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The AESO calculates pro rata limits for each facility by adding its real power output to its pro rata share as follows:

Facility 1 Pro Rata Limit (MW) = 32 MW + 93 MW = 125 MW

Facility 2 Pro Rata Limit (MW) = 33 MW + 65 MW = 98 MW

Revision History

Posting Date	Description of Changes
2024-04-05	Administrative amendments to align with Energy Storage ISO Rule amendments and new definitions.
2023-08-28	Update for Alberta System Wind and Solar Power Limit methodology Update for the weighting factors in the Limit Pro Rata Share Calculation
2021-03-22	Administrative amendments to align with AESO drafting principles, fixed typographical errors, remove and consolidate some sections to improve clarity, reduce repetition, and reduce overall requirements.
2020-04-07	Addition of new section 2 Applicability and renumbering of ID sections
2018-09-04	Initial release