

ISO Rules

Part 300 System Reliability and Operations

Division 304 Routine Operations

Section 304.3 Wind and Solar Power Ramp Up Management



External Consultation Draft April 7, 2017

Applicability

1—Section 304.3 (1) Subject to subsections 1(2) and 1(3), section 304.3 applies to:

- (a) the legal owner of any wind aggregated generating facilities; and
- (b)(a) the legal owner of a wind or solar aggregated generating facility connected to the interconnected electric system or an electric system within the service area of the City of Medicine Hat, including a wind or solar aggregated generating facility situated within an industrial complex that is directly connected to the interconnected electric system or to an electric system within the service area of the City of Medicine Hat and that has a gross real power capability equal to or greater than 5 MW;
- (b) the operator of a wind or solar aggregated generating facility connected to the interconnected electric system or an electric system within the service area of the City of Medicine Hat, including a wind or solar aggregated generating facility situated within an industrial complex that is directly connected to the interconnected electric system or to an electric system within the service area of the City of Medicine Hat and that has a gross real power capability equal to or greater than 5 MW; and
- (c) the ISO.

(2) Except as otherwise specified herein, this

2—This section 304.3 does not apply to the following exempt wind or solar aggregated generating facilities, as represented by their pool asset descriptions: Castle River, #1 (CR1), Cowley Ridge, (CRE3), Kettles Hill, (KHW1), Suncor Magrath, (SCR2), McBride Lake, and Windfarm (AKE1), Summerview 1 (IEW1), Bull Creek #1 (BUL1) and Bull Creek #2 (BUL2) (collectively referred to herein as the “exempt facilities”).

(3) Notwithstanding subsection 1(1), the legal owner of an aggregated generating facility that was connected in accordance with any previous ramp up management requirements, whether in an ISO rule or otherwise, prior to April 7, 2017 must operate its aggregated generating facility in compliance with the previously effective ramp up management requirements.

(4) Notwithstanding subsection 1(2) or 1(3), if any of the aggregated generating facilities described in subsections 1(2) or 1(3) undergoes one or more:

- (a) facility additions after April 7, 2017 resulting in an increase in the cumulative gross real power capability of the aggregated generating facility by an amount equal to or greater than 5 MW; or
- (b) equipment replacements after April 7, 2017 where the equipment replaced has a gross real power capability equal to or greater than 5 MW irrespective of whether the cumulative gross real power capability of the aggregated generating facility is increased;

then the entire aggregated generating facility will be subject to and must comply with the provisions of this section 304.3.

(5) Notwithstanding subsections 1(2), (3) and (4), the ISO may require the legal owner of a wind or solar aggregated generating facility, transmission facility to comply with any specific provision or all of the provisions of this section 304.3, if the ISO determines that such compliance is necessary for the

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safe and reliable operation of the **interconnected electric system**.

Requirements

Exemption for Certain Wind Aggregated Generating Facilities Functional Specification

2(1) The **ISO** may issue a written functional specification containing details, work requirements and specifications for the design, construction and operation of a wind or solar **aggregated generating facility** and associated **transmission facility** connection facilities.

(2) The functional specification referred to in subsection 2(1) must be generally consistent with the provisions of this section 304.3, but may contain material variances approved of by the **ISO** based upon its discrete analysis of any one or more of the technical, economic, safety, operational and **reliability** requirements of the **interconnected electric system** related to the specific facility project.

Real Power and Ramp Rate Limitations

3(1) The **legal owner** of a wind or solar **aggregated generation facility** must ensure that the facility has the control capability to limit the **real power** output at the **point of connection**, or the connection to the **electric distribution system**, in accordance with any limits or instructions contained in any **directive** and must ensure that the **real power** output does not exceed the tolerances described in this subsection 3.

(2) The **legal owner** of a wind or solar **aggregated generating facility** must ensure that the **real power** control limit referred to in subsection 3(1) is adjustable from the minimum operating output to the **gross real power** capacity at an average resolution of 1 MW.

(3) Subject to subsection 3(4), the **legal owner** of a wind or solar **aggregated generating facility** must, when a **real power** control limit is in effect in accordance with a **directive** and ambient conditions at the wind or solar **aggregated generation facility** result in increasing **real power** output, ensure that the **real power** control limit of the wind and solar **aggregated generating facility** is capable of keeping the one (1) minute average **real power** output from exceeding the **real power** control limit specified in the **directive**, within 2% of the **gross real power** capability.

(4) The **legal owner** of a wind or solar **aggregated generating facility** must ensure that, if changing ambient conditions result in the **real power** control limit set out in the **directive** referred to in subsection 3(3) being instantaneously exceeded, the **real power** output of the wind or solar **aggregated generating facility** at the **point of connection**, or the connection to the **electric distribution system**, must not exceed the **real power** control limit by more than 5% of the **gross real power** capability.

(5) The **legal owner** of a wind or solar **aggregated generating facility** must ensure that the facility is equipped with **ramp rate** limiting controls.

(6) The **legal owner** of a wind or solar **aggregated generating facility** must ensure that the **ramp rate** limiting controls referred to in subsection 3(5) are capable of limiting the ramp up of the **real power** of the wind or solar **aggregated generating facility**, and that they are adjustable such that the **ramp rate** does not exceed, in MW per minute, a range equal to 5% of the **gross real power** capability to 20% of the **gross real power** capability.

(7) The **legal owner** of a wind or solar **aggregated generating facility** must ensure that the default setting for the **ramp rate** limiting controls referred to in subsection 3(5) is set at 10% of the **gross real power** capability, unless otherwise approved by the **ISO** in writing.

(8) The **legal owner** of a wind or solar **aggregated generating facility** must ensure that any difference between the **real power** at:

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(a) the point of connection or the connection to the electric distribution system of the wind or solar aggregated generating facility, and

(b) any collector busses of the wind or solar aggregated generating facility,

is compensated for in the real power limiting and ramp rate limiting controls.

Use of the Energy Market Merit Order

~~34(1) Prior~~ The ISO must, prior to issuing any directive under subsection 5(2) curtailing real power output from any of the non-exempt wind or solar aggregated generating facilities under subsection 4(3), the ISO must first facility, implement the energy market merit order provisions of the ISO rules for energy balance to manage the ramp up of the total real power output from all exempt and non-exempt wind or solar aggregated generating facilities, including the exempt facilities.

(2) ~~If~~ The ISO must, if the energy market merit order provisions of the ISO rules referred to in subsection 4(1) are insufficient to manage the ramp up of the total real power output from all exempt wind and non-exempt wind solar aggregated generating facilities, ~~then including the ISO must exempt facilities,~~ limit that total Alberta real power output, and specify a wind and solar aggregated generating facilities power limit pro rata share for each of the non-exempt wind and solar aggregated generating facilities, excluding the exempt facilities.

Calculation of Alberta System Wind and Solar Aggregated Generating Facilities Power Limit

~~45(1)~~ The ISO must calculate, at a minimum wind monitoring interval of every twenty (20) minutes, an Alberta system wind and solar aggregated generating facilities power limit.

(2) ~~The Alberta system wind power limit in MW for all non-exempt wind aggregated generating facilities for a wind ISO must issue, at the start of each monitoring interval will be the greater of (a) and (b), calculated as follows:~~

(a) ~~(i) the total Alberta real power output from all non-exempt wind aggregated generating facilities;~~

~~plus~~

~~(ii) the ISO 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 wind monitoring interval;~~

~~plus~~

~~(B) any increases or decreases in the Alberta internal load for the wind monitoring interval;~~

~~plus~~

~~(C) any increases or decreases in any interchange schedule quantities at the ME 01 to ME 10 10 minute clock period for the wind monitoring interval;~~

(b) ~~(i) the total Alberta real power output from all non-exempt wind aggregated generating facilities;~~

~~plus~~

~~(ii) six point five (6.5) MW per minute for the wind monitoring interval.~~

~~(3) If during a wind monitoring interval the ISO determines that the total Alberta real power output from~~

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~~all non-exempt wind aggregated generating facilities is either at:~~

- ~~(a) ninety (90) percent or more of the Alberta system wind power limit; or~~
- ~~(b) the Alberta system wind power limit minus an amount up to, but not in excess of, sixty five (65) MW;~~

~~and if the ISO further determines that within the wind monitoring interval the total real power output will exceed the Alberta system wind power limit, then the ISO must issue directives by means of Supervisory Control and Data Acquisition signals to each the operator of each of the non-exempt wind or solar aggregated generating facility, specifying its wind and solar aggregated generating facilities, which directives will set the wind power limit pro rata share for each of the non-exempt wind aggregated generating facilities as calculated in subsection 6(1).~~

Calculation and implementation of Wind and Solar Aggregated Generating Facilities Power Limit Pro Rata Share

~~56(1)~~ The wind and solar aggregated generating facilities power limit pro rata share for each wind or solar aggregated generating facility for each of the non-exempt wind aggregated generating facilities as may be required for a wind monitoring interval is equal to:

- (a) the potential real power capability of the wind or solar aggregated generating facility as provided to the ISO under Appendix 2 of section 502.8 of the ISO rules, *SCADA Technical and Operating Requirements*;

divided by

- (b) the sum of all potential real power capabilities provided to the ISO under ~~that subsection 24(b)~~ Appendix 2 of section 502.8 of the ISO rules, *SCADA Technical and Operating Requirements* for all non-exempt wind and solar aggregated generating facilities, but excluding those capabilities which are already limited by any curtailment directive or dispatch other than a wind and solar aggregated generating facilities power management limit pro rata share directive under subsection 5(2);

multiplied by

- (c) the difference ~~for in~~ the wind monitoring interval between:
 - (i) the Alberta system wind and solar aggregated generating facilities power limit calculated under subsection ~~4;5(1)~~; and
 - (ii) the total real power output from all non-exempt wind and solar aggregated generating facilities.

~~(2) If the wind power limit pro rata share for any of the non-exempt wind aggregated generating facilities causes The ISO must, if the wind and solar aggregated generating facilities power limit pro rata share for a wind or solar aggregated generating facility causes the wind or solar aggregated generating facility to exceed its maximum capability, then the ISO must reallocate the excess difference in MW on a pro rata basis to all other non-exempt wind and solar aggregated generating facilities.~~

~~(3) If~~ The operator of a non-exempt wind or solar aggregated generating facility that receives:

- (a) a pro rata share Supervisory Control and Data Acquisition directive signal under subsection ~~45(32)~~; and
- (b) a curtailment directive for any other reason;

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~~then the operator~~ must comply with the subsection ~~56~~(3)(b) curtailment ~~directive and the ISO must~~.

(4) The **ISO** must, where the **operator** of a wind or solar **aggregated generating facility** receives both of the **directives** described in subsection 6(3), reallocate any ~~excess~~ difference in MW between the pro rata share **directive** and the ~~subsection 5(3) (b)~~ curtailment **directive** to all other ~~non-exempt~~ wind and solar aggregated generating facilities.

~~(4)~~—Subject to the tolerances set out in subsection 18 of section 502.1 of the **ISO rules**, *Wind Aggregated Generating Facilities Technical Requirements*, a non-exempt wind **aggregated generating facility** must, by means of a Supervisory Control and Data Acquisition signal sent to the **ISO**, comply with a wind power limit pro rata share **directive** signal no later than ten (10) minutes after the **ISO** has sent the signal.

~~(5)~~—The **ISO** must cancel, by means of Supervisory Control and Data Acquisition signals, the wind power limit pro rata share **directives** when they no longer are required under the conditions set out in subsection 4(3).

~~(6)~~—If the **ISO** issues a **directive** to the **operator** of any wind **aggregated generating facility** which results in a net increase in the **real power** input, then the **ramp rate**, in MWs per minute, must not exceed ten percent (10%) of the **maximum authorized real power**.

Revision History

Date	Description
<u>xxxx-xx-xx</u>	<u>Revised the applicability section to include solar aggregated generating facilities and to apply to an aggregated generating facility that has a gross real power capability equal to or greater than 5 MW; added real power and ramp rate limitations requirements; revised the requirement to issue a power limit pro rata share from when a predetermined criterion is met to at the start of each monitoring interval; and removed the formula used to calculate the Alberta system wind power limit.</u>
2015-04-01	Rule references have been updated in subsection 5(1)(a)
2015-04-01	The words “or dispatch” were added in subsection 5(1)(b).
2013-01-08	Previously defined terms have been un-defined and the words have been un-bolded.
2011-12-01	Initial release.