Energy Storage Consolidated Version 2.0 to Version 3.0 Blacklines and Commentary– Blackline

Issued for Stakeholder Consultation:

March 15, 2023

ISO Rules
CONTENTS

ISO Rules
CONTENTS

ISO Rules
Part 200 Markets
Division 202 Dispatching the Markets
Section 202.2 Short-Term Adequacy and Supply Shortfall

Applicability

1 Section 202.2 applies to:

(a) a **pool participant**;

(b) the **legal owner** of an **electric distribution system**; and

(b) the **ISO**.

Requirements

Short Term Adequacy Determinations and Supply Shortfall

2 If t~~T~~he **ISO** ~~must if it~~ forecasts that the interconnected electric system will experience a state of supply shortfall, as evidenced by the **firm load** and minimum **regulating reserves** requirement exceeding the available supply and curtailable demand, and determined in accordance with the ~~short term~~real-time **adequacy** assessment conducted pursuant to ~~subsection 3 of~~ S~~s~~ection 202.6 of the **ISO rules**, *Adequacy of Supply*, then the **ISO** must manage the state of supply shortfall in accordance with the provisions set out in subsections 3, 4 and 5 below.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #6

Managing Supply Shortfall

3(1) The **ISO** must, if it forecasts a state of supply shortfall, issue a message to **pool participants** warning of an upcoming state of supply shortfall.

(2) The **ISO** must, if a state of supply shortfall persists after issuing the message in subsection 3(1), attempt to manage the state of supply shortfall by issuing **directives** which may include **directives**:

(a) instructing available **source assets**, including **long lead time assets** but excluding import assets, to deliver energy;

(b) curtailing **demand opportunity service**; and

(c) maximizing the import capability of the **interties**.

(3) The **ISO** must not issue a **directive** instructing a **long lead time asset** to start if the required start-up time of the **long lead time asset** is greater than the time the supply shortfall condition is expected to last.

(4) The **ISO** must, once the short term adequacy assessment referred to in subsection 2 indicates there is an adequate supply of energy or curtailable demand to meet **firm load** and minimum **regulating reserves** in subsequent **settlement intervals**, cancel **directives** that instructed **long lead time assets** to start.

Operating Exceptions During Supply Shortfall

4(1) The **ISO** may, during a state of supply shortfall, issue a **directive** to a **pool participant** instructing it to provide energy in excess of the **maximum capability** of the **source asset**.

(2) The **ISO** must cancel a **directive** issued under subsection 4(1) when the energy provided above **maximum capability** is no longer required.

(3) The ISO may, notwithstanding any other provision of the **ISO rules** or **reliability standards**, , if required to manage a state of supply shortfall, approve valid **e-tags** submitted for the current or next **settlement interval** for import energy that do not have a corresponding **offer**, up to the posted **available transfer capability** limit.

Firm Load Shed

5(1) The **ISO** may, if:

(a) a state of supply shortfall persists; and

(b) **firm load** and minimum **regulating reserve** cannot be met after completing the procedures in subsection 3(2)

issue **directives** to some or all **legal owners** of an **electric distribution system** instructing them to shed **firm load**.

(2) The **ISO** must allocate the shedding of **firm load** among the **legal owners** of **electric distribution systems** on a pro rata basis.

(3) The **legal owner** of an **electric distribution system** must develop and maintain a plan for shedding **firm load**.

(4) The **legal owner** of an **electric distribution system** must ensure that its plan for shedding **firm load** takes into account the following:

(a) shedding of industrial and large commercial loads before residential loads;

(b) **system operating limit** violations;

(c) the need to maintain the integrity of **remedial action schemes** and the **under frequency load shedding** scheme;

(d) public safety and environmental impact; and

(e) **ISO** discretion to adjust curtailments as required to account for unforeseen circumstances.

Revision History

Effective	Description
2023-xx-xx	
2013-12-20	Updated to reflect the move of the “short term adequacy assessment” from subsection 2(2) to section 202.6 of the ISO rules.
2013-09-24	Updated to clarify priority of industrial and commercial loads in load shedding
2013-01-08	Initial Release

ISO Rules
Part 200 Markets
Division 202 Dispatching the Markets
Section 202.3 Issuing Dispatches for Equal Prices

Applicability

1 Section 202.3 applies to:

(a) the **ISO**

when operating the energy market and managing **dispatch down service**.

Requirements

Equally-Priced Operating Blocks

~~**2(1)** The **ISO** must, if the price of an **operating block** in an **offer** for a **pool asset** is identical to the price of one or more **operating blocks** in an **offer** for another **pool asset** during the same **settlement interval**, issue **dispatches** on a pro rata basis amongst the **flexible blocks** within the **settlement interval**.~~

~~**(2)** The **ISO** must, if the price of an **operating block** in a **bid** for a **pool asset** is identical to the price of one or more **operating blocks** in a **bid** for another **pool asset** during the same **settlement interval**, issue **dispatches** on a pro rata basis amongst the **flexible blocks** within the **settlement interval**.~~

~~**(3)** The **ISO** must, if the price of **operating block** in an **offer** for a **pool asset** is identicial to the price of one or more **operating blocks** in a **bid** for another **pool asset** during the same **settlement interval**, issue a **dispatch** for the **offer** first.~~

2(1) The **ISO** must, if the price of one or more **operating blocks** in an **offer** for a **pool asset** and the price of one or more **operating blocks** in a **bid** for a **pool asset** are identical during the same **settlement interval**, issue **dispatches** for all of the equally-priced **offers** first, followed by **dispatches** for all of the equally-priced **bids**.

(2) The **ISO** must, when **dispatching** equally-priced **operating blocks** from 2 or more **offers** during the same settlement **interval**, issue **dispatches** for the **operating blocks** on a pro rata basis.

(3) The **ISO** must, when **dispatching** equally-priced **operating blocks** from 2 or more **bids**, issue **dispatches** for the **operating blocks** on a pro rata basis.

Commented [AESO1]: V2 to V3 change. See AESO Written Replies #9 & 10

(4) The **ISO** must, notwithstanding subsections 2(1), 2(2) and 2(3), if one or more of the equally-priced **operating blocks** is an **inflexible block**, attempt to accommodate the **inflexible blocks** and minimize the issuing of **dispatches** for **operating blocks** higher in the energy market **merit order**.

~~**3(1)(5)** The **ISO** must, notwithstanding subsection 2 2(1)~~:

(a) determine **dispatch** volumes for a **pool asset** that is an import asset or an export asset in accordance with the procedures set out in Section 203.6 of the ISO rules, *Available Transfer Capability and Transfer Path Management*; and

(b) issue **dispatches** for equally priced $0 **offers** in accordance with section 202.5 of the **ISO rules**, *Supply Surplus*.

Revision History

Effective	Description
2023-XX-XX	
2013-01-08	Initial release

ISO Rules
Part 200 Markets
Division 202 Dispatching the Markets
Section 202.5 Supply Surplus

Applicability

1 Section 202.5 applies to:

(a) a **pool participant**; and

(b) the **ISO**.

Requirements

State of Supply Surplus and Multiple $0 Offers

2(1) The **ISO** may curtail next hour import **interchange transactions** to balance system supply and **system load**, if during a current hour the **ISO** forecasts that the **interconnected electric system** will experience a state of supply surplus in the next hour, as evidenced by the **in merit** electricity supply consisting of only multiple $0 **offers** ~~and the supply of electricity available from these **offers** exceeds the **system load**.~~.

(2) The **ISO** must, subject to subsection 2(3), ~~if during a current hour the **ISO**~~if it determines that a state of supply surplus is imminent in the current hour or already exists, ~~comply with the following procedures as may be required, in the following sequence, to~~ balance system supply and **system load** using following procedures, as required, and in the following sequence:

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #12

(a) initiate curtailment of import **interchange transactions**;

(b) allow **pool participants** to submit **bids** to increase export **interchange transactions** within 2 hours of the start of a **settlement interval**;

(c) allow **pool participants** to submit **offers** to decrease import **interchange transactions** within 2 hours of the start of a **settlement interval**;

(d) allow **pool participants** to submit restatements reducing **generating unit**, **aggregated facility**, and **energy storage resource**, output within 2 hours of the start of a **settlement interval**;

(e) issue, on a pro rata basis **dispatches** to **generating units**, **aggregated facilities**, and **energy storage resources**, for partial volumes of **flexible blocks** of the $0 **offers**;

(f) if there are **generating units**, **aggregated facilities**, and **energy storage resources**, with $0 **offers** for **inflexible blocks** stating volumes greater than their declared **minimum stable generation**, then issue **directives** to curtail those **generating units**, **aggregated facilities**, and **energy storage resources,** to their declared **minimum stable generation**, starting with the **generating units**, **aggregated facilities**, and **energy storage resources** having the greatest difference in MW between the then current **dispatch** level and **minimum stable generation** and continuing in descending order until all those **generating units**, **aggregated facilities**, and **energy storage resources** have received **directives**; and

(g) issue **directives** for any other necessary actions, including shutting down **generating units**, **aggregated facilities**, and **energy storage resources,** to ensure system **reliability**.

(3) The **ISO** may, as part of the effective execution of the procedures set out in subsection 2(2), if it determines that a **generating unit**, **aggregated facility**, or **energy storage resource** is running at an output level higher than its **minimum stable generation** in order to provide **regulating reserve**, issue a **dispatch**:

(a) to curtail delivery of **regulating reserve** from that **generating unit**, **aggregated facility**, or **energy storage resource**; and

(b) for **regulating reserve** to another **generating unit**, **aggregated facility**, or **energy storage resource** which can provide **regulating reserve** while operating at a lower output level at or above **minimum stable generation**.

(4) The **ISO** may alter the procedural sequence set out in subsections 2(2) and 3, if during a current hour, ~~the present, real time operating conditions change such that~~ the **ISO** determines ~~that following~~ that real-~~-~~time operating conditions are such that procedural sequence would put the **ISO** in contravention of a ~~any~~ **reliability standard** ~~requirement by failing to achieve compliance within the operating limits or required response time specified in that **reliability standard**~~.

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #12

(5) The **ISO** must, if it alters the procedural sequence as set out in subsection 2(4), recommence the procedural sequence set out in subsections 2(2) and 3 once it is assured that the **interconnected electric system** is operating in a safe and reliable mode.

Transitioning Out of a State of Supply Surplus

3 The **ISO** must, when it determines that the **interconnected electric system** is transitioning out of a state of supply surplus, reverse any actions taken under subsection 2(2), in reverse order, to balance system supply and **system load**.

Revision History

Effective	Description
2023-XX-XX	
2018-09-01	Revised “source asset” to “generating unit or aggregated generating facility”; clarified subsections 2 and 3; and administrative revisions.
2012-03-28	Initial release

ISO Rules
Part 200 Markets
Division 202 Dispatching the Markets
Section 202.6 Adequacy of Supply

Applicability

1 Section 202.6 applies to:

(a) the **ISO**.

Requirements

Supply Adequacy Forecast

2 The **ISO** must forecast supply **adequacy** in accordance with a prescribed methodology.

Real-time Adequacy Assessments

3 The **ISO** must assess and report on the short-term **adequacy** of supply by, at a minimum, completing a real-time **adequacy** assessment.

Long Term Adequacy Metrics and Reporting

4 The **ISO** must report on the following **long term adequacy** metrics on a quarterly basis:

(a) a metric listing Alberta electrical generation projects and retirements;

(b) a 5-year forecast reserve margin metric;

(c) a supply cushion metric which provides a 2-year forecast of available daily generation capacity and peak demand; and

(d) a 2-year probability of supply **adequacy** shortfall metric.

Publications and Provision of Notice

5(1) The **ISO** must publish:

(a) the forecasts and reports set out in subsections 2, 3, and 4; and

(b) details of the calculations and methodologies underlying the forecasts and reports referenced in subsection 5(1)(a).

(2) The **ISO** must:

(a) give 60 **days**' notice of any proposed changes to the calculations and methodologies referenced in subsection 5(1)(b); and

(b) provide an opportunity for **market participants** to provide feedback on the proposed changes.

Long Term Adequacy Threshold Determination and Use

6(1) The **ISO** must, for the 2-year probability of supply **adequacy** shortfall metric model set out in subsection 4(d), use a **long term adequacy** threshold which:

(a) represents the equivalent impact of the probability of having a system supply shortfall occur once every 10 years; and

(b) is calculated as the 1 hour average **Alberta internal load** for a year divided by 5;

being the level which, if exceeded, would indicate a need for the **ISO** to consider taking preventative action.

(2) The **ISO** must, using the 2-year probability of supply **adequacy** shortfall metric, estimate on a quarterly basis the expected total system MWh not served in a subsequent 2-year period.

(3) The **ISO** must, if the estimated total system MWh not served exceeds the **long term adequacy** threshold established at the time, undertake further studies to verify the likely cause, magnitude, and timing of the potential **adequacy** issue.

Long Term Adequacy Threshold Actions

7(1) The **ISO** may, if the **long term adequacy** threshold is exceeded and the **ISO** deems that a potential **adequacy** issue requires preventative action, procure services to address the potential **adequacy** issue, including:

(a) load shed;

(b) self-supply, back-up generation, and back-up energy storage that would not otherwise be available to participate in the energy market; or

(c) emergency portable generation or emergency portable energy storage.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #13

(2) The **ISO** must, prior to procuring services in accordance with subsection 7(1), publish a report on the potential **adequacy** issues requiring preventative action.

Revision History

Date	Description
2023-xx-xx	
2023-01-01	Revised subsection 2 by adding a reference to a prescribed methodology; subsection 3 by removing the detailed calculations for short-term adequacy assessments; added requirements in subsection 5 to publish forecasts, assessments, and associated calculations and methodologies, and to provide notice of potential changes and opportunity for feedback; added a requirement in subsection 7 to publish a report on potential adequacy issues requiring preventative action; and other minor administrative amendments, including amendments to align with the AESOs drafting principles
2018-09-01	Revised references to “wind aggregated generating facilities” to “aggregated generating facilities”; replaced “wind” with “wind and solar generation”; administrative revisions.
2014-10-01	Amendment to the short term adequacy assessments calculation to include the ISO’s spinning reserve requirement.
2013-12-20	Initial release

ISO Rules
Part 200 Markets
Division 203 Energy Market
Section 203.1 Offers and Bids for Energy

Applicability

1 Section 203.1 applies to:

(a) a **pool participant**; and

(b) the **ISO**,

when participating in the energy market.

Requirements

Submission Method and Timing

2(1) A **pool participant** may only submit an **offer** or a **bid** to the **power pool** in respect to an active **pool asset** listed opposite their name in the **ISO** list of **pool assets**.

(2) A **pool participant** submitting an **offer** or **bid** must submit such **offer** or **bid**:

(a) before 12:00 hours on the **day** before the **day** that the **offer** or **bid** is effective, subject to any extension of time granted pursuant to subsection 3 of section 201.4 of the **ISO rules**, *Submission Methods and Coordination of Submissions*; and

(b) no earlier than 00:00, 7 **days** prior to the **day** that the **offer** or **bid** is effective.

Obligation to Offer and Offer Content

3(1) A **pool participant** must, for each **settlement interval**, submit an **offer** for each of its **source assets** with a **maximum capability** of greater than or equal to 5 MW ~~or greater~~.

(2) A **pool participant** must not, notwithstanding subsection 3(1), submit an **offer** for capacity that is committed under a contract for long term adequacy.

(3) A **pool participant** must include in each **operating block** in an **offer**;

(a) a price in $/MWh to the nearest cent per MWh which:

(i) in the case of **source asset** that is not an import asset, is greater than or equal to $0 per MWh and less than $1000 per MWh; and

(ii) in the case of an import, is ~~-~~ $0;

(b) a quantity in MW; and

(c) an indication of whether the **operating block** is a **flexible block** or an **inflexible block**; and

must also include in the **offer** the **minimum stable generation** for **the source asset**.

(4) A **pool participant** that submits an **offer** must ensure that:

(a) the cumulative total MW, as entered for the highest priced **operating block** in the **offer** for the **settlement interval**, equals the **maximum capability** of the **source asset**; and

(b) the **minimum stable generation** submitted for the **source asset** does not exceed the MW of the **operating block** with the lowest **offer** price for the **source asset** and a quantity greater than zero, including when submitted as part of a restatement under subsection 5(2) of section 203.4, *Energy Restatements*.

Offers During Commissioning and Testing

4 A **pool participant** that submits an **offer** for a **source asset**, excluding an import asset, which is undergoing **commissioning** and testing under section 505.3 of the **ISO rules**, *Coordinating Synchronization, Commissioning, WECC Testing and Ancillary Services Testing* must, notwithstanding subsection 3(3)(a)(i) and until the **ISO** otherwise authorizes in writing, submit a price for the **offer** of $0.

Available Capability

5 A **pool participant** that submits an **offer** must also submit the **available capability**, in MW, for each **source asset** which such **available capability** must equal the **maximum capability** of the **source asset** unless the **pool participant** has submitted an **acceptable operational reason** with the **offer**.

Operating Constraints for Offers and Bids

6(1) A **pool participant** that submits an **offer** or **bid** must also submit the following operating constraints:

(a) **ramp rate**; and

(b) the initial start-up time.

(2) A **pool participant** must submit to the **ISO** any changes to the operating constraints of a **pool asset** as soon as ~~reasonably~~ practicable.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #15

Option to Bid and Bid Content

7(1) A **pool participant** may, for a **settlement interval**, submit a **bid** for any of its **sink assets**.

(2) A **pool participant** must include in each **operating block** in a **bid**:

(a) a price in $/MWh to the nearest cent per MWh which:

(i) in the case of a **sink asset** that is not an export asset, is greater than or equal to $0 per MWh and less than $1000 per MWh; and

(ii) in the case of an export asset, is ~~-~~ $999.99; and

(b) a quantity in MW.

(3) A **pool participant** that submits a **bid** must ensure that the total MW in the **bid** do not exceed the **maximum capability** of the **sink asset**.

Standing Submission

8(1) A **pool participant** may create a standing submission, being an **offer** or **bid** that remains in place until the **pool participant** changes it.

(2) The **ISO** must use the data contained in the standing submission for the **pool asset** for the **day** following the **forecast scheduling period**.

Validation

9 The **ISO** must, as soon as reasonably practicable following the receipt of an **offer** or **bid**, send to the **pool participant** who submitted the **offer** or **bid**:

(a) acknowledgment of receipt of the **offer** or **bid**;

(b) notification that the **offer** or **bid** is either valid or invalid with respect to this section 203.1 of the **ISO rules**; and

(c) if an **offer** or **bid** is invalid, an explanation as to why the **offer** or **bid** is not accepted.

Revision History

~~Effective~~Date	Description
2023-xx-xx	
2013-12-20	Updated subsections 3(1) and 3(2) to clarify offers in the context of capacity that is committed under a contract for long term adequacy.
2013-01-08	Initial Release

ISO Rules
Part 200 Markets
Division 203 Energy Market
Section 203.4 Delivery Requirements for Energy

Applicability

1 Section 203.4 applies to:

(a) a **pool participant** with a **source asset,** excluding an import asset**,**that has an associated current **offer** when participating in the energy market; and

(b) the **ISO**.

Requirements

Compliance Responsibilities

2(1) A **pool participant** may only deliver energy to the **interconnected electric system** pursuant to a **dispatch** or a **directive** the **ISO** issues.

(2) A **pool participant** must:

(a) operate its **source asset** or cause it to be operated; and

(b) respond to **dispatches** from the **ISO**,

using **good electric industry practice**, including the design, implementation and use of reasonable **dispatch** protocols, together with personnel and software systems designed to detect and address errors or omissions in a timely fashion.

Generating Asset Steady State Compliance

3(1) A **pool participant** must not, during **generating asset steady state**, vary the average MW it delivers from a **source asset** in any **10 minute clock period** outside the **allowable dispatch variance**.

(2) A **pool participant** that is supplying **regulating reserve** from a **source asset** must ensure that the average MW delivered in any **10 minute clock period** is not outside the **allowable dispatch variance** plus the **regulating reserve**.

Ramping Compliance

4(1) A **pool participant** must move the output of a **source asset**, which is the subject of a **dispatch**, ~~(a) the subject of a **dispatch**; and~~

~~(b) **ramping**~~

towards the MW level indicated in that **dispatch** within 10 minutes of, but not prior to, the time specified in the **dispatch** ~~but not prior to the time specified in the **dispatch**~~.

(2) A **pool participant** must ensure that each **source asset** reaches **generating asset steady state** in:

(a) no longer than the period of time calculated as follows:

(i) divide the change in **dispatch** MW by the **ramp rate** the **pool participant** submits;

(ii) add 40% of the time calculated in subsection 4(2)(a)(i) or 5 minutes, whichever is greater; and

(iii) add the 10 minutes referred to in subsection 4(1);

and

(b) no sooner than the period of time calculated as follows:

(i) divide the change in **dispatch** MW by the **ramp rate** the **pool participant** submits; and

(ii) subtract 40% of the time calculated in subsection 4(2)(b)(i) or 5 minutes, whichever is greater.

Operational Deviation

5(1) A **pool participant** must, if a **source asset** experiences an **operational deviation**, verbally inform the **ISO** as soon as practicable of the occurrence of the **operational deviation** and provide a description of the cause if known.

(2) A **pool participant** must inform the **ISO** of the information required under subsection 5(1) on a telephone line the **ISO** designates, which must contain a voice recording system.

(3) A **pool participant** must, if an **operational deviation** extends for 20 minutes or longer, submit an **available capability** restatement or MW restatement for the **source asset** that represents the operational capability of the **source asset** and must do so no later than 20 minutes after the commencement of the **operational deviation**.

Exceptions to Non-Compliance

6(1) Notwithstanding the provisions set out in subsections 3, 4 and 5, the **ISO** must not determine that a **pool participant** is non-compliant with a **dispatch** for a **source asset** if the **pool participant** has met its responsibilities as set out in subsection 2 and one or more of the following circumstances occur:

(a) the **source asset** is ramping into position to provide **operating reserve** in response to a **dispatch** in the 15 minutes before the time indicated in that **dispatch**;

(b) the **source asset** is operating below the **minimum stable generation** level indicated in the Energy Trading System, but only if that **source asset** is:

(i) synchronizing and its **available capability** the **pool participant** submitted is equal to its **minimum stable generation** and it has received a **dispatch** for that quantity, in MW;

(ii) going off line and its **available capability** the **pool participant** submitted is equal to 0 MW and it has received a **dispatch** for that quantity, in MW;

(iii) unable to follow the **ramp rate** the **pool participant** submitted when its output is being increased to its **minimum stable generation** and the **pool participant** has submitted a verbal plan to the **ISO** indicating a proposal for ramping to **minimum stable generation**, which verbal plan must provide an estimate of the time required to achieve the **ramp rate** and be updated for deviations of greater than 30 minutes or 50 MW; or

(iv) stopped at an output level not identified in the verbal plan referenced in subsection 6(1)(b)(iii) above, but which is below **minimum stable generation** for more than 30 minutes for an operational reason and the **pool participant** has submitted a restatement of the **available capability** accordingly;

(c) the **source asset** is responding to abnormal frequency through automatic **governor** or **governor system** action;

(d) an **operational deviation** has occurred and the **pool participant** has complied with subsection 5; and

(e) energy is being delivered to the **interconnected electric system** from a **source asset** while it is being tested or commissioned or both, in accordance with applicable provisions of the **ISO rules**.

Concurrent Energy and Operating Reserve Requirements

7(1) The **ISO** must, when assessing a **pool participant**'s compliance with subsections 4(3) through 4(6) of Section 205.2 of the **ISO rules**, *Issuing Dispatches and Directives for Operating Reserve* in a situation

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #17

Commented [AESO2]: Note: unbolded. Proposing to remove definition.

Commented [AESO3]: Note: unbolded. Proposing to remove definition.

where there are concurrent energy and **spinning reserve** requirements or energy and **supplemental reserve** requirements, consider the time of the energy **dispatch** to be:

(a) 15 minutes after the **directive** for **spinning reserve** or **supplemental reserve** in the case of subsection 4(3); and

(b) the time the **pool asset** is providing the amount of **real power** described in subsection 10(1) of Section 205.5 of the **ISO rules**, *Spinning Reserve Technical Requirements and Performance Standards,* or subsection 6(1) of Section 205.6 of the **ISO rules**, *Supplemental Reserve Technical Requirements and Performance Standards*, in the case of subsection 4(4);

(c) the later of 15 minutes after the **directive** for **spinning reserve** or **supplemental reserve** or the time of the **dispatch** in the case of subsection 4(5); and

(d) the time the **pool asset** is providing the amount of **real power** described in subsection 10(1) of Section 205.5 of the **ISO rules**, *Spinning Reserve Technical Requirements and Performance Standards,* or subsection 6(1) of Section 205.6 of the **ISO rules**, *Supplemental Reserve Technical Requirements and Performance Standards*, in the case of subsection 4(6).

(2) The **ISO** must, when assessing a **pool participant**'s compliance with subsections 4(3) through 4(6) of Section 205.2 of the **ISO rules**, *Issuing Dispatches and Directives for Operating Reserve* in a situation where there are concurrent energy and **spinning reserve** requirements or energy and **supplemental reserve** requirements, consider the MW quantity to be the energy **dispatch** quantity plus the **spinning reserve** or **supplemental reserve** quantity while the **directive** remains in effect.

Revision History

Date	Description
2023-XX-XX	
2020-09-16	Amended Section 3(1) and 3(2) to clarify generating asset steady state compliance. Administrative amendments.
2014-12-23	Added subsection 7 to address requirements in section 205.2 of the ISO rules related to concurrent energy and operating reserve.
2013-01-08	Initial release

ISO Rules
Part 200 – Markets
Division 203 Energy Market
Section 203.5 Consumption Requirements for Bids

Applicability

1 Section 203.5 applies to:

(a) a **pool participant** with a **sink asset**, excluding an export asset, that has an associated current **bid** in the energy market; and

(b) the **ISO**.

Requirements

Compliance Responsibilities

2(1) A **pool participant** who submits **bids** may only consume the **bid** energy from the **interconnected electric system** pursuant to a **dispatch** the **ISO** issues.

(2) A **pool participant** must, using **good electric industry practice**:

(a) operate its **sink assets**, or cause them to be operated; and

(b) respond to **dispatches** from the **ISO**.

~~Ramping~~ Dispatch Compliance

3(1) A **pool participant** must reduce the consumption of a **sink asset**, which is the subject of a **dispatch**, towards the MW level indicated in the **dispatch** within 10 minutes of, but not prior to, the time specified in the **dispatch**. ~~:~~

~~(a) the subject of a **dispatch**; and~~

~~(b) **ramping**towards the MW level indicated in that **dispatch** within 10 minutes of the time specified in the **dispatch** but not prior to the time specified in the **dispatch**.~~

(2) A **pool participant** that modifies energy consumption associated with a **bid** that is subject to a **dispatch** must reach the MW level indicated in the **dispatch** in a time that is:

(a) not longer than the ~~period of~~ time calculated as follows:

(i) divide the change in **dispatch** MW by the **ramp rate** the **pool participant** submits;

(ii) add 40% of the time calculated in subsection 3(2)(a)(i) or 5 minutes, whichever is greater; and

(b) not ~~sooner~~ shorter than the ~~period of~~ time calculated as follows:

(i) divide the change in **dispatch** MW by the **ramp rate** the **pool participant** submits; and

(ii) subtract 40% of the time calculated in subsection 3(2)(b)(i) or 5 minutes, whichever is greater.

(3) A **pool participant** must, when reducing the consumption of a **sink asset** that is **controllable** in accordance with subsection 3(1), maintain the following **dispatch** variance as measured from the **dispatch** quantity:

(a) plus or minus five (5) MW for a **sink asset** with a **maximum capability** of two hundred (200) MW or less; or

(b) plus or minus ten (10) MW for a **sink asset** with a **maximum capability** of greater than two hundred (200) MW.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #18.

Commented [AESO2]: V2 to V3 change. See AESO Written Reply – ES Definitions #30.

Exceptions to Non-Compliance

4 The **ISO** must, notwithstanding subsection 3, not determine that a **pool participant** is non-compliant with a **dispatch** for a **sink asset** if the pool participant has met its responsibilities as set out in subsection 2 and one or more of the following circumstances occur:

(a) the **bid** energy is being consumed from the **interconnected electric system** from a **sink asset** while undergoing **commissioning** or testing in accordance with applicable **ISO rules**;

(b) the **sink asset** is ~~**ramping**~~ moving into position to provide **operating reserve** in response to a **dispatch** in the 15 minutes before the time indicated in that **dispatch**; or

(c) the **sink asset** is responding to abnormal frequency through automatic **governor** or **governor system** action.

Commented [AESO3]: V2 to V3 change. See AESO Written Reply – ES Definitions #30.

Revision History

Date	Description
	Initial release

ISO Rules
Part 200 Markets
Division 205 Ancillary Services
Section 205.4 Regulating Reserve Technical Requirements and Performance Standard

Applicability

1 Section 205.4 applies to:

(a) a **pool participant**; and

(b) the **ISO**.

Requirements

Application for Qualification to Provide Regulating Reserve

2(1) A **pool asset** must be qualified by the **ISO** in order to provide **regulating reserve**.

(2) A **pool participant** seeking to have the **ISO** qualify a **pool asset** to provide **regulating reserve** must provide the **ISO** with:

(a) a completed application form, available on the AESO website; and

(b) the data and records that the **ISO** specifies in the application form.

Eligibility to Provide Regulating Reserve

3(1) A **pool participant** seeking to have the **ISO** qualify its **pool asset** to provide **regulating reserve** must ensure that its **pool asset** has at least one **regulating reserve resource** that is:

(a) at a minimum, capable of providing:

(i) 15 MW of **regulating reserve**;

(ii) the amount of **real power** applied for, at either the high limit or the low limit of the **regulating reserve** range, for a period of up to 1 hour;

(iii) without manual intervention, **real power** movement in the direction of the latest **automatic generation control** signal within no more than:

A. 28 seconds of receiving an **automatic generation control** signal; and

B. 40 seconds of receiving an **automatic generation control** signal reversal; and

(b) equipped with a **governor** or **governor system** that:

(i) is responsive to both over frequency and under frequency events;

(ii) has a total deadband of equal to or less than 0.036 Hz;

(iii) has a droop setting greater than or equal to ~~equal to or greater than~~ 3% but less than or equal to 5% based on the maximum operating range of the **regulating reserve resource**, as specified by the **ISO**;

(iv) has no time delays, ramp characteristics or other control settings that prevent the **regulating reserve resource** from providing an immediate, automatic and sustained response to frequency deviations;

(v) has a sample rate of at least 20 samples per second;

(vi) has a resolution of at least 0.004 Hz;

(vii) is not acting as a **governor** or **governor system** for more than one **regulating reserve resource**; and

(viii) continues to be responsive to **automatic generation control** signals during frequency deviations between 58.9 Hz and 61 Hz.

(2) The requirements set out in subsections 3(1)(b)(v) and (vi) do not apply to a **pool asset** that provides **regulating reserve** from a **generating unit** that is equipped with an analog **governor**, as of December 23, 2014, until such time as the **governor** is replaced.

Qualification of a Pool Asset to Provide Regulating Reserve

4(1) The **ISO** may qualify a **pool asset** to provide **regulating reserve** if one or more **regulating reserve resources** of the **pool asset** meet the eligibility criteria set out in subsection 3.

(2) The **ISO** must, after qualifying a **pool asset** under subsection 4(1), determine the **real power** quantity in MW that each **regulating reserve resource** of the **pool asset** is capable of providing, with consideration given to the following:

(a) whether the **regulating reserve resource** is capable of a minimum **ramp rate** in MW per minute equal to 10% of the **real power** applied for under subsection 2(2);

(b) whether the **regulating reserve resource** participates in a **remedial action scheme**;

(c) the total **operating reserve** that could be lost during a single **contingency**;

(d) the maximum **real power** capability and minimum **real power** capability of each **regulating reserve resource** of the **pool asset**; and

(e) any other factors that the **ISO** considers relevant.

(3) The **ISO** must advise a **pool participant** whether its **pool asset** is qualified to provide **regulating reserve** within 60 **days** of the **ISO** receiving a completed application under subsection 2(2).

Performance Requirements when under Dispatch to Provide Regulating Reserve

5(1) A **pool participant** must ensure that, following the receipt of a **dispatch** to provide **regulating reserve**, one or more **regulating reserve resources** of the **pool asset** are positioned for the **regulating reserve** range indicated in the **dispatch**.

(2) A **pool participant** must ensure that each **regulating reserve resource** being used to provide **regulating reserve** meets the requirements set out in subsection 5(1) beginning at:

(a) the time stated in the **dispatch**, for a **dispatch** with a time more than 15 minutes from the time the **pool participant** receives the **dispatch**; or

(b) the time stated in the **dispatch** or as soon as possible thereafter, but in any event, not more than 15 minutes after receiving the **dispatch**, for a **dispatch** with a time (15 minutes or less from the time the **pool participant** receives the **dispatch**.

(3) A **pool participant** must ensure that, after positioning each **regulating reserve resource** being used to provide **regulating reserve** in accordance with subsection 5(1), the **regulating reserve** control status is sent to the **ISO**:

(a) indicating that the **regulating reserve resource** is enabled to provide **regulating reserve**;

and

(b) identifying the high and low limits of the **regulating reserve** range.

(4) The **ISO** may issue an **automatic generation control** signal to a **pool asset** or a **regulating reserve resource** any time after the **regulating reserve resource** being used to provide **regulating reserve** has met the requirements set out in subsection 5(3).

(5) A **pool participant** must ensure that the **automatic generation control** signal the **ISO** issues in accordance with subsection 5(4) can move each **regulating reserve resource** being used to provide **regulating reserve** within the **regulating reserve** range.

(6) A **pool participant** must ensure that each **regulating reserve resource** being used to provide **regulating reserve** responds to an **automatic generation control** signal change:

(a) with a minimum **ramp rate** in MW per minute of 10% of the **real power** quantity qualified for under subsection 4(2); and

(b) in accordance with time delays set out in subsection 3(1)(a)(iii).

(7) A **pool participant** must ensure that the **regulating reserve resources** being used to provide **regulating reserve** maintain a output level equal to the latest **automatic generation control** signal within a total tolerance of plus or minus:

(a) 1 MW of the **regulating reserve** range for a **regulating reserve** range less than or equal to 20 MW; or

(b) 5% of the **regulating reserve** range for a **regulating reserve** range greater than 20 MW.

(8) A **pool participant** will not be paid for **regulating reserve** unless the **pool participant** ensures that the **regulating reserve resources** being used to provide **regulating reserve** meet the requirements set out in subsections 5(1), 5(2), 5(3), 5(5), 5(6) and 5(7) for as long as the **dispatch** is in effect.

Frequency Response Requirements when under Dispatch to Provide Regulating Reserve

6(1) A **pool participant** must ensure that, while its **pool asset** is under **dispatch** to provide **regulating reserve**, the **governor** or **governor system** of each **regulating reserve resource** providing **regulating reserve** is operating such that:

(a) it is in service at all times;

(b) it is operating without load limiters or other control systems including outer control loops that would prevent the **governor** or **governor system** from achieving the maximum frequency response; and

(c) the response of the **governor** or **governor system** and the **automatic generation control** signal of the **regulating reserve resource** is coordinated to provide both primary frequency control and response to the **automatic generation control** signal.

(2) A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **regulating reserve**, the change in **real power** output of each **regulating reserve resource** being used to provide **regulating reserve** is:

(a) continuously proportional to the measured frequency;

(b) in accordance with the droop setting set out in subsection 3(1)(b)(iii); and

(c) limited to the maximum **real power** capability of the **regulating reserve resource** that is available at the time of the frequency event

for any change in frequency where the frequency goes outside the deadband set out in subsection 3(1)(b)(ii).

(3) A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **regulating reserve**, each **regulating reserve resource** being used to provide **regulating reserve** sustains the change in **real power** set out in subsection 6(2) for any change in frequency where the frequency is outside of the deadband set out in subsection 3(1)(b)(ii).

(4) A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **regulating reserve**, for any change in frequency where the frequency is outside the deadband set out in subsection 3(1)(b)(ii), other resources within the **pool asset** do not change their **real power** load level as a result of the change in **real power** of the **regulating reserve resource**, unless such a change does not negatively impact frequency response of the **pool asset**.

(5) A **pool participant** must ensure that, for the applicable minimum time period set out in Appendix 1, each **regulating reserve resource** being used to provide **regulating reserve** will not trip as a result of under frequency or over frequency deviations while the **pool asset** is under a **dispatch** to provide **regulating reserve**.

Maintaining Connection when under Dispatch to Provide Regulating Reserve

7 A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **regulating reserve**, the **regulating reserve resource** remains connected to the **interconnected electric system** and remains frequency responsive in accordance with the requirements set out in subsection 6.

Measuring Frequency Response when under Dispatch to Provide Regulating Reserve

8 For the purpose of subsection 6, frequency response performance is measured at:

(a) the stator winding terminals of a **generating unit** or synchronous **energy storage resource**;

(b) the circuit breaker or disconnection device that is electrically closest to each load;

(c) the alternating current terminal closest to each inverter based ~~technology~~resource;

(d) the **collector bus** for **aggregated facilities**; or

(e) a point the **ISO** designates.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #20

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #21

Other Facility Arrangements

9 The **ISO** may, for the purposes of evaluating frequency response performance, consider other facility arrangements if the combined change in **real power** demonstrates in aggregate that they meet the performance requirements set out in subsection 6 for a single **regulating reserve resource**.

Test Requirements

10 The **ISO** may request a **pool participant** to test a **regulating reserve resource**:

(a) prior to allowing the **regulating reserve resource** to provide **regulating reserve**;

(b) if the **ISO** provides evidence that the **regulating reserve resource** exhibits behaviour that is inconsistent with the requirements of this Section 205.4; or

(c) if the **ISO** otherwise determines that such testing is necessary.

Maintaining Eligibility to Provide Regulating Reserve

11(1) The **ISO** may issue a notice suspending the ability of a **pool participant** to provide **regulating reserve** if the **pool participant** does not comply with:

(a) a testing request pursuant to subsection 10;

(b) any other provision of this Section 205.4; or

(c) other **ISO rules** that affect the provision of **regulating reserve**.

(2) A **pool participant** that has received a suspension notice issued pursuant to subsection 11(1) must not submit an **offer** for **regulating reserve** until the **ISO** confirms that the **pool participant** is compliant with this Section 205.4 and all other **ISO rules** that affect the provision of **regulating reserve**.

Appendices

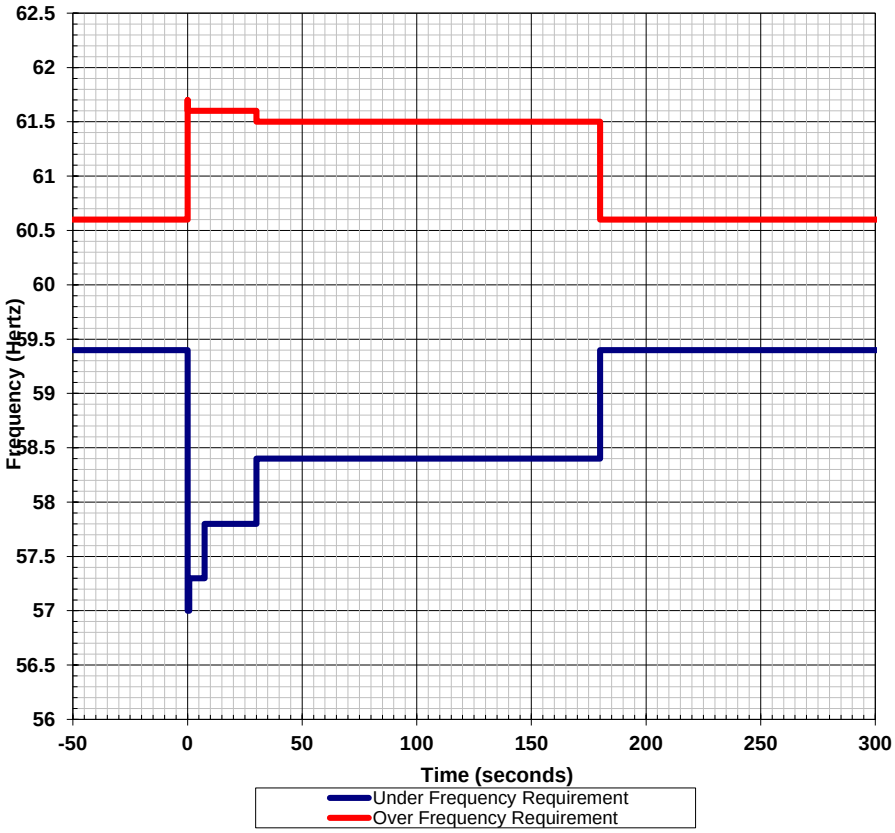
Appendix 1 – *Frequency Ranges*

Revision History

Date	Description
2023-xx-xx	
2018-02-01	Revised requirements to be technology agnostic, added new requirements to define clarify proper frequency response, removed prohibition against assets located outside the ISO's balancing authority providing regulating reserve.
2014-12-23	Initial Release

Appendix 1
Frequency Ranges

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	**Time (seconds)**	**Frequency (Hz)**	**Time (seconds)**
≥ 61.7	Instantaneous trip	≤57.0	Instantaneous trip
≥61.6	30	≤57.3	0.75
≥60.6	180	≤ 57.8	7.5
<60.6	Continuous operation	≤ 58.4	30
		≤ 59.4	180
		> 59.4	Continuous operation


62.5
62
61.5
61
60.5
60
59.5
59
58.5
58
57.5
57
56.5
56
Frequency (Hertz)
-50
0
50
100
150
200
250
300
Time (seconds)
Under Frequency Requirement
Over Frequency Requirement

ISO Rules
Part 200 Markets
Division 205 Ancillary Services
Section 205.5 Spinning Reserve Technical Requirements and Performance Standards

Applicability

1 Section 205.5 applies to:

(a) a **pool participant**; and

(b) the **ISO**.

Requirements

Application for Qualification to Provide Spinning Reserve

2(1) A **pool asset** must be qualified by the **ISO** in order to provide **spinning reserve**.

(2) A **pool participant** seeking to have the **ISO** qualify a **pool asset** to provide **spinning reserve** must provide the **ISO** with:

(a) a completed application form, available on the AESO website; and

(b) the data and records that the **ISO** specifies in the application form.

Eligibility to Provide Spinning Reserve

3(1) A **pool participant** seeking to have the **ISO** qualify its **pool asset** qualified to provide **spinning reserve** must ensure that its **pool asset** has at least one **spinning reserve resource** that is:

(a) at a minimum, capable of providing:

(i) 10 MW of **spinning reserve**; and

(ii) the amount of **real power** applied for under subsection 2(2) for a period of 1 hour.

(b) equipped with a **governor** or **governor system** that:

(i) is responsive to both over frequency and under frequency events;

(ii) has a total deadband of ~~equal to or~~ less than or equal to 0.036 Hz;

(iii) has a droop setting ~~equal to or~~ greater than or equal to 3% but less than or equal to 5% based on the maximum operating range of the **spinning reserve resource**, as specified by the **ISO**;

(iv) has no time delays, ramp characteristics or other control settings that prevent the **spinning reserve resource** from providing an immediate, automatic and sustained response to frequency deviations;

(v) has a sample rate of at least 20 samples per second;

(vi) has a resolution of at least 0.004 Hz; and

(vii) is not acting as a **governor** or **governor system** for more than one **spinning reserve resource**.

(2) The requirements set out in subsections 3(1)(b)(v) and (vi) do not apply to a **pool asset** that provides **spinning reserve** from a **generating unit** that is equipped with an analog **governor**, as of December 23, 2014, until such time as the **governor** is replaced.

Qualification of a Pool Asset to Provide Spinning Reserve

4(1) The **ISO** may qualify a **pool asset** to provide **spinning reserve** if one or more **spinning reserve resources** of the **pool asset** meet the eligibility criteria set out in subsection 3.

(2) The **ISO** must, after qualifying a **pool asset** under subsection 4(1), determine the **real power** quantity in MW that each **spinning reserve resource** of the **pool asset** is capable of providing, with consideration given to the following:

(a) whether the **spinning reserve resource** participates in a **remedial action scheme**;

(b) the total **operating reserve** that could be lost during a single **contingency**;

(c) the maximum **real power** capability and minimum **real power** capability of each **spinning reserve resource** of the **pool asset**; and

(d) any other factors that the **ISO** considers relevant.

(3) The **ISO** must advise a **pool participant** whether its **pool asset** is qualified to provide **spinning reserve** within 60 **days** of the **ISO** receiving a completed application under subsection 2(2).

Performance Requirements when under Dispatch to Provide Spinning Reserve

5(1) A **pool participant** must ensure that, following the receipt of a **dispatch** to provide **spinning reserve**, one or more **spinning reserve resources** of the **pool asset** are positioned to provide the **real power** set out in the **dispatch** within a total tolerance of minus:

(a) 1 MW for a **dispatch** of less than or equal to 20 MW; or

(b) 5% of the **dispatch** quantity for a **dispatch** greater than 20 MW.

(2) A **pool participant** must ensure that each **spinning reserve resource** being used to provide **spinning reserve** meets the requirements set out in subsection 5(1) beginning at:

(a) the time stated in the **dispatch** for a **dispatch** with a time more than 15 minutes from the time the **pool participant** receives the **dispatch**; or

(b) the time stated in the **dispatch**, or as soon as possible thereafter but not more than 15 minutes after receiving the **dispatch**, for a **dispatch** with a time 15 minutes or less from the time the **pool participant** receives the **dispatch**.

(3) A **pool participant** will not be paid for **spinning reserve** unless the **pool participant** ensures that the **spinning reserve resources** being used to provide **spinning reserve** meet the requirements set out in subsections 5(1) and 5(2).

Frequency Response Requirements when under Dispatch to Provide Spinning Reserve

6(1) A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **spinning reserve**, the **governor** or **governor system** of each **spinning reserve resource** providing **spinning reserve** is operating such that it is:

(a) in service at all times; and

(b) operating without load limiters or other control systems including outer control loops that would prevent the **governor** or **governor system** from achieving the maximum frequency response.

(2) A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **spinning reserve**, the change in **real power** of each **spinning reserve resource** being used to provide **spinning reserve** is:

(a) continuously proportional to the measured frequency;

(b) in accordance with the droop setting set out in subsection 3(1)(b)(iii); and

(c) limited to the maximum **real power** capability of the **spinning reserve resource** that is available at the time of the frequency event

for any change in frequency where the frequency goes outside the deadband set out in subsection 3(1)(b)(ii).

(3) A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **spinning reserve**, each **spinning reserve resource** being used to provide **spinning reserve** sustains the change in **real power** set out in subsection 6(2) for any change in frequency where the frequency is outside the deadband set out in subsection 3(1)(b)(ii).

(4) A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **spinning reserve**, for any change in frequency where the frequency is outside the deadband set out in subsection 3(1)(b)(ii), other resources within the **pool asset** do not change their **real power** load level as a result of the change in **real power** of the **spinning reserve resource**, unless such a change does not negatively impact frequency response of the **pool asset**.

(5) A **pool participant** must ensure that, for the applicable minimum time period set out in Appendix 1, each **spinning reserve resource** being used to provide **spinning reserve** will not trip as a result of under frequency or over frequency deviations while the **pool asset** is under a **dispatch** to provide **spinning reserve**.

Maintaining Connection when under Dispatch to Provide Spinning Reserve

7 A **pool participant** must ensure that, while its **pool asset** is under a **dispatch** to provide **spinning reserve**, the **spinning reserve resource** remains connected to the **interconnected electric system** and remains frequency responsive in accordance with the requirements set out in subsection 6.

Measuring Frequency Response when under Dispatch to Provide Spinning Reserve

8 For the purpose of subsection 6, frequency response performance is measured at:

(a) the stator winding terminals of the **generating unit** or synchronous **energy storage resource**;

(b) the circuit breaker or disconnection device that is electrically closest to each load;

(c) the alternating current terminal closest to each inverter based resource~~technology~~;

(d) the **collector bus** for **aggregated facilities**; or

(e) a point the **ISO** designates.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #24

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #26

Other Facility Arrangements

9 The **ISO** may, for the purposes of evaluating frequency response performance, consider other facility arrangements if the combined change in **real power** demonstrates in aggregate that they meet the technical requirements set out in subsection 6 for a single **spinning reserve resource**.

Performance Requirements when Responding to a Directive to Provide Spinning Reserve

10(1) A **pool participant** must, within 10 minutes following receipt of a **directive** to provide **spinning reserve**, ensure that its **pool asset** is providing a quantity of **real power** equal to the instantaneous amount of **real power** of the **pool asset** at the time of the **directive** and the amount of **real power** set out in the **directive**

(2) A **pool participant** must ensure that, from the first time its **pool asset** achieves the response set out in subsection 10(1) to the time 15 minutes following receipt of the **directive**, the **pool asset** is providing an average response equal to or greater than the amount of **real power** set out in the **directive**.

(3) A **pool participant** must ensure that, for each consecutive 10 minute interval beginning 15 minutes following receipt of a **directive**, the average response from the **pool asset** equals the amount of **real power** set out in the **directive**, within a tolerance of plus or minus:

(a) 5 MW for a **pool asset** with a **maximum capability** of 200 MW or less; or

(b) 10 MW for a **pool asset** with a **maximum capability** of greater than 200 MW.

(4) Where a **pool asset** does not have a **maximum capability**, the tolerances set out in subsection 10(3) will be measured against the maximum qualified facility capacity the **ISO** prescribes for the **pool asset**.

(5) A **pool participant** must ensure that its **pool asset** continues to meet the requirements set out in subsection 10(3) for as long as the **directive** to provide **spinning reserve** is in effect.

(6) A **pool participant** must ensure that its **pool asset** is in the position set out in subsection 5(1) as soon as possible but not more than 15 minutes after receiving cancellation of the **directive** for **spinning reserve**.

~~**(7)** A **pool participant** must not use the amount of **real power** set out in the **directive** for **spinning reserve** to simultaneously provide **real power** in response to a **directive** for **ancillary services** under any other section of the **ISO rules** or under any contract.~~

Commented [AESO3]: V2 to V3. Should have been eliminated as part of removal of FFR amendments.

Measuring Response to a Directive

11 A **pool participant** must ensure that each **pool asset** complies with the requirements set out in subsection 10 as measured at:

(a) the stator winding terminals of each **generating unit** or synchronous **energy storage resource**;

Commented [AESO4]: V2 to V3 change. See AESO Written Reply #24

(b) the circuit breaker or disconnection device that is electrically closest to each load;

(c) the alternating current terminal closest to each inverter based resource~~technology~~;

Commented [AESO5]: V2 to V3 change. See AESO Written Reply #26

(d) the **collector bus** for **aggregated facilities**; or

(e) a point the **ISO** designates.

Test Requirements

12 The **ISO** may request a **pool participant** to test a **spinning reserve resource**:

(a) prior to allowing the **spinning reserve resource** to provide **spinning reserve**;

(b) if the **ISO** provides evidence that the **spinning reserve resource** exhibits behaviour that is inconsistent with the requirements of this Section 205.5; or

(c) if the **ISO** otherwise determines that such testing is necessary.

Maintaining Eligibility to Provide Spinning Reserve

13(1) The **ISO** may issue a notice suspending the ability of a **pool participant** to provide **spinning reserve** if the **pool participant** does not comply with:

(a) a testing request pursuant to subsection 12;

(b) any other provision of this Section 205.5; or

(c) other **ISO rules** that affect the provision of **spinning reserve**.

(2) A **pool participant** that has received a suspension notice issued pursuant to subsection 13(1) must not submit an **offer** for **spinning reserve** until the **ISO** confirms that the **pool participant** is compliant with this Section 205.5 and all other **ISO rules** that affect the provision of **spinning reserve**.

Appendices

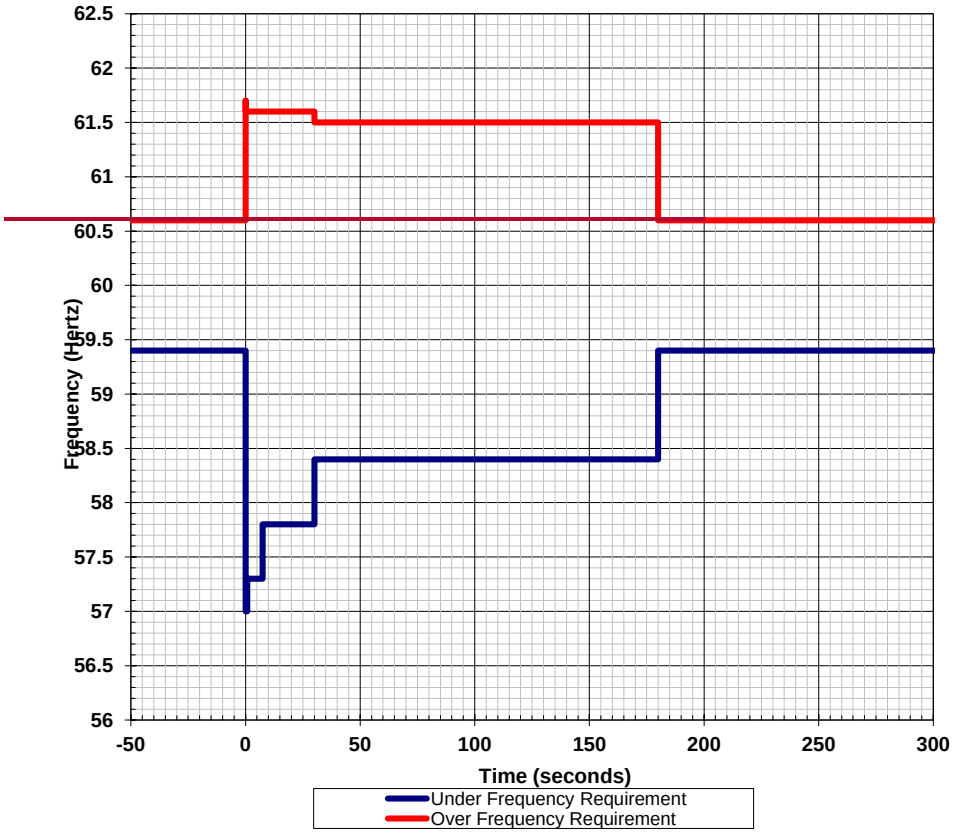
Appendix 1 – *Frequency Ranges*

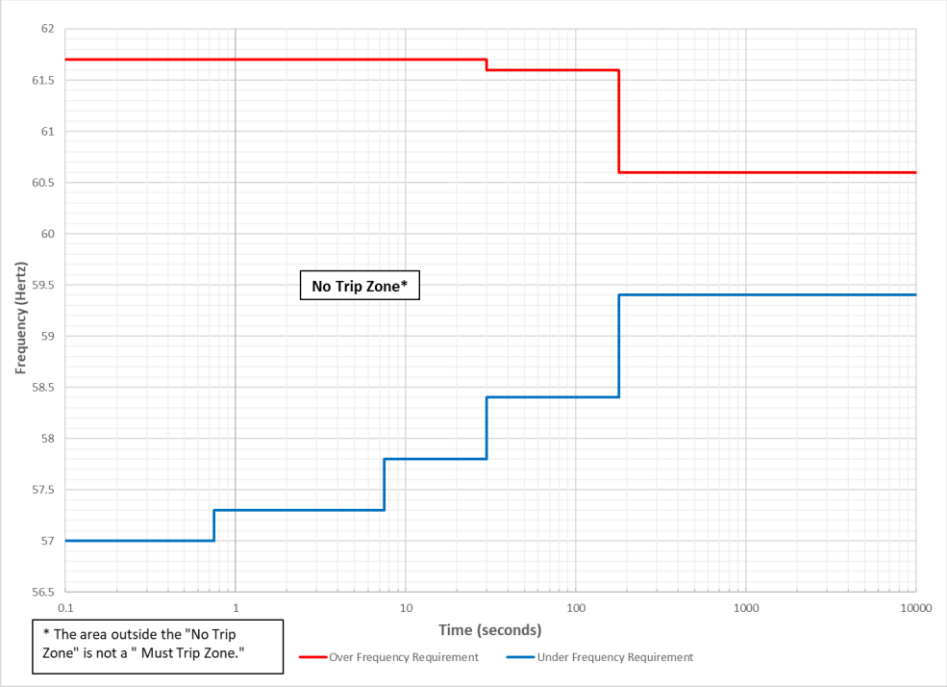
Revision History

Date	Description
2023-xx-xx	
2018-02-01	Revised requirements to be technology agnostic, added new clarified requirements to define for proper frequency response.
2015-03-27	Replaced “effective date” within the initial release date in section 3(5); and replaced the word “Effective” in the Revision History to “Date”.
2014-12-23	Initial release

Appendix 1
Frequency Ranges

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	**Time (seconds)**	**Frequency (Hz)**	**Time (seconds)**
≥ 61.7	Instantaneous trip	≤57.0	Instantaneous trip
≥61.6	30	≤57.3	0.75
≥60.6	180	≤ 57.8	7.5
<60.6	Continuous operation	≤ 58.4	30
		≤ 59.4	180
		> 59.4	Continuous operation


62.5
62
61.5
61
60.5
60
59.5
59
58.5
58
57.5
57
56.5
56
Frequency (Hertz)
-50
0
50
100
150
200
250
300
Time (seconds)
Under Frequency Requirement
Over Frequency Requirement


62
61.5
61
60.5
60
59.5
59
58.5
58
57.5
57
56.5
Frequency (Hertz)
No Trip Zone*
0.1
1
10
100
1000
10000
Time (seconds)
* The area outside the "No Trip Zone" is not a " Must Trip Zone."
Over Frequency Requirement
Under Frequency Requirement

ISO Rules
Part 200 Markets
Division 205 Ancillary Services
Section 205.6 Supplemental Reserve Technical Requirements and Performance Standards

Applicability

1 Section 205.6 applies to:

(a) a **pool participant**; and

(b) the **ISO**.

Requirements

Application for Qualification to Provide Supplemental Reserve

2(1) A **pool asset** must be qualified by the **ISO** in order to provide **supplemental reserve**.

(2) A **pool participant** seeking to have the **ISO** qualify a **pool asset** to provide **supplemental reserve** must provide the **ISO** with:

(a) a completed application form, available on the AESO website; and

(b) the data and records that the **ISO** specifies in the application form.

Eligibility to Provide Supplemental Reserve

3 A **pool participant** seeking to have the **ISO** qualify a **pool asset** to provide **supplemental reserve** must ensure that its **pool asset** has at least one **supplemental reserve resource** that is at a minimum, capable of providing:

(a) 5 MW of **supplemental reserve**; and

(b) the amount of **real power** applied for under subsection 2(2) for a period of 1 hour.

Qualification of a Pool Asset to Provide Supplemental Reserve

4(1) The **ISO** may qualify a **pool asset** to provide **supplemental reserve** if one or more **supplemental reserve resources** of the **pool asset** meet the eligibility criteria set out in subsection 3.

(2) The **ISO** must, after qualifying a **pool asset** under subsection 4(1), determine the **real power** quantity in MW that each **supplemental reserve resource** of the **pool asset** is capable of providing, with consideration given to the following:

(a) whether the **supplemental reserve resource** participates in a **remedial action scheme**;

(b) the total **operating reserve** that could be lost during a single **contingency**;

(c) the maximum **real power** capability and minimum **real power** capability of each **supplemental reserve resource** of the **pool asset**; and

(d) any other factor that the **ISO** considers relevant.

(3) The **ISO** must advise a **pool participant** whether its **pool asset** is qualified to provide **supplemental reserve** within 60 **days** of the **ISO** receiving a completed application under subsection 2(2).

Performance Requirements when under Dispatch to Provide Supplemental Reserve

5(1) A **pool participant** must ensure that, following the receipt of a **dispatch** to provide **supplemental reserve**, one or more **supplemental reserve resources** of the **pool asset** are positioned to provide the **real power** set out in the **dispatch** within a total tolerance of minus:

(a) 1 MW for a **dispatch** of less than or equal to 20 MW; or

(b) 5% of the **dispatch** quantity for a **dispatch** greater than 20 MW.

(2) A **pool participant** must ensure that each **supplemental reserve resource** being used to provide **supplemental reserve** meets the requirements set out in subsection 5(1) beginning at:

(a) the time stated in the **dispatch** for a **dispatch** with a time more than 15 minutes from the time the **pool participant** receives the **dispatch**; or

(b) the time stated in the **dispatch**, or as soon as possible thereafter but not more than 15 minutes after receiving the **dispatch**, for a **dispatch** with a time 15 minutes or less from the time the **pool participant** receives the **dispatch**.

(3) A **pool participant** will not be paid for **supplemental reserve** unless the **pool participant** ensures that the **supplemental reserve resources** being used to provide **supplemental reserve** meet the requirements set out in subsections 5(1) and 5(2).

Performance Requirements when Responding to a Directive to Provide Supplemental Reserve

6(1) A **pool participant** must, within 10 minutes following receipt of a **directive** to provide **supplemental reserve**, ensure that its **pool asset** is providing a quantity of **real power** equal to the instantaneous amount of **real power** of the **pool asset** at the time of the **directive** and the amount of **real power** set out in the **directive**.

(2) A **pool participant** must ensure that, from the first time its **pool asset** achieves the response set out in subsection 6(1) to the time 15 minutes following receipt of the **directive**, the **pool asset** is providing an average response greater than or equal to~~equal to or greater than~~ the amount of **real power** set out in the **directive**.

(3) A **pool participant** must ensure that, for each consecutive 10 minute interval beginning 15 minutes following the receipt of a **directive**, the average response from the **pool asset** equals the amount of **real power** set out in the **directive**, within a tolerance of plus or minus:

(a) 5 MW for a **pool asset** with a **maximum capability** of 200 MW or less; or

(b) 10 MW for a **pool asset** with a **maximum capability** of greater than 200 MW.

(4) Where a **pool asset** does not have a **maximum capability**, the tolerances set out in subsection 6(3) will be measured against the maximum qualified facility capacity the **ISO** prescribes for the **pool asset**.

(5) A **pool participant** must ensure that its **pool asset** continues to meet the requirements set out in subsection 6(3) for as long as the **directive** to provide **supplemental reserve** is in effect.

(6) A **pool participant** must ensure that its **pool asset** is in the position set out in subsection 5(1) as soon as possible but not more than 15 minutes after receiving a cancellation of the **directive** for **supplemental reserve**.

~~**(7)** A **pool participant** must not use the amount of **real power** set out in the **directive** for **supplemental reserve** to simultaneously provide **real power** in response to **directive** for **ancillary services** under any other section of the **ISO rules** or under any contract.~~

Commented [AESO1]: V2 to V3. Should have been eliminated as part of removal of FFR amendments.

Measuring Response to a Directive

7 A **pool participant** must ensure that each **pool asset** complies with the requirements set out in subsection 6 as measured at:

(a) the stator winding terminals of the **generating unit** or synchronous **energy storage resource**;

(b) the circuit breaker or disconnection device that is electrically closest to each load;

(c) the alternating current terminal closest to each inverter based resource~~technology~~;

(d) the **collector bus** for **aggregated facilities**; or

(e) a point the **ISO** designates.

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #28

Commented [AESO3]: V2 to V3 change. See AESO Written Reply #30

Test Requirements

8 The **ISO** may request a **pool participant** to test a **supplemental reserve resource**:

(a) prior to allowing the **supplemental reserve resource** to provide **supplemental reserve**;

(b) if the **ISO** provides evidence that the **supplemental reserve resource** exhibits behaviour that is inconsistent with the requirements of this Section 205.6; or

(c) if the **ISO** otherwise determines that such testing is necessary.

Maintaining Eligibility to Provide Supplemental Reserve

9(1) The **ISO** may issue a notice suspending the ability of a **pool participant** to provide **supplemental reserve** if the **pool participant** does not comply with:

(a) a testing request pursuant to subsection 8;

(b) any other provision of this Section 205.6; or

(c) other **ISO rules** that affect the provision of **supplemental reserve**.

(2) A **pool participant** that has received a suspension notice pursuant to subsection 9(1) must not submit an **offer** for **supplemental reserve** until the **ISO** confirms the **pool participant** is compliant with this Section 205.6 and all other **ISO rules** that affect the provision of **supplemental reserve**.

Revision History

Date	Description
2023-xx-xx	
2018-02-01	Revised requirements to be technology agnostic.
2014-12-23	Initial release

ISO Rules
Part 300 System Reliability and Operations
Division 304 Routine Operations
Section 304.7 Event Reporting

Applicability

1 Section 304.7 applies to:

(a) the **operator** of a **transmission facility**;

(b) the **operator** of a **generating unit** or **energy storage resource** that:

(i) is not part of an **aggregated facility**;

(ii) has a **maximum authorized real power** rating greater than 4.5 MW; and

(iii) is directly connected to the **transmission system**;

(c) the **operator** of an **aggregated facility** that:

(i) is directly connected to the **transmission system**; and

(ii) has a **maximum authorized real power** rating greater than 4.5 MW;

(collectively referred to as the "Responsible Entities")

and

(d) the **ISO**.

Requirements

Events Reportable by the Operator of a Transmission Facility

2 The **operator** of a **transmission facility** must submit a report to the **ISO** for each of the events identified in Appendix 1:

(a) in writing, in the form the **ISO** specifies; and

(b) as soon as practicable and no later than 5 **business days** ~~of~~ after the **operator** of a **transmission facility** becoming aware of the event.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #33

3 The **operator** of a **transmission facility** must notify PSIO, the RCMP and, where applicable, the local police, for each of the events identified in Appendix 1 as being reportable to these entities, as soon as practicable.

Events Reportable by the Operator of a Generating Unit, Aggregated Facility, or Energy Storage Resource

4 The **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** must, for each of the events identified in Appendix 2, submit a report to the **ISO**:

(a) in writing, in the form the **ISO** specifies; and

(b) as soon as practicable and no later than 5 **business days** ~~of~~ after the **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** becoming aware of the event.

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #33

Events Reportable by a Responsible Entity

5 A Responsible Entity must submit a report to the **ISO** for each of the events identified in Appendix 3:

(a) in writing, in the form the **ISO** specifies; and

(b) as soon as practicable and no later than 5 **business days** ~~of~~ after the Responsible Entity becoming aware of the event.

Commented [AESO3]: V2 to V3 change. See AESO Written Reply #33

6 A Responsible Entity must notify PSIO, the RCMP and, where applicable, the local police, for each of the events identified in Appendix 3 as soon as practicable.

7 A Responsible Entity is not, notwithstanding any other provision of this Section 304.7, required to report a theft to the **ISO**, PSIO, the RCMP or, where applicable, the local police in accordance with the provisions of this Section 304.7, unless the Responsible Entity reasonably determines that the theft degrades normal operation of:

(a) a **transmission facility** operated at a nominal voltage of 100 kV or higher, excluding a **radial circuit** only connected to load; or
(b) a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher.

Events Reportable to NERC

8 The **ISO** must forward a report received from a Responsible Entity in accordance with subsections 2 or 5 to the **NERC** within 5 **business days** of receiving such a report, but only for those events identified in Appendix 4.

Revision History

Date	Description
2023-xx-xx	
2016-08-30	Initial release

Appendix 1: Events Reportable by the Operator of a Transmission Facility

Event	Entity to Submit Report to
1. Damage to or destruction of a **transmission facility** that results in an unexpected sustained outage of any combination of 3 or more of the following: (a) transmission lines energized at greater than 25 kV; or (b) transformers with at least 2 terminals energized at greater than 25 kV.	**ISO**
2. Unexpected loss, contrary to design, of any combination of 3 or more of the following: (a) transmission lines energized at greater than 25 kV; or (b) transformers with at least 2 terminals energized at greater than 25 kV caused by a common **disturbance** (excluding successful automatic reclosing).	**ISO**
3. A physical threat to a **control centre** for the **bulk electric system**, excluding a weather or natural disaster related threat, which has the potential to degrade the normal operation of the **control centre**.	**ISO**, PSIO, RCMP and, where applicable, local police
4. A suspicious device or activity at a **control centre** for the **bulk electric system**.	**ISO**, PSIO, RCMP and, where applicable, local police
5. Automatic **firm load** shedding (via an automatic undervoltage or underfrequency load shedding scheme, or a **remedial action scheme**) that occurs as part of the **ISO**'s **under voltage load shed** program or **underfrequency load shedding** program.	**ISO**
6. The failure or **misoperation** of a **remedial action scheme** or **protection system** on the **transmission system** that impacts the **transmission system**, except where a **misoperation** incident report is provided in accordance with PRC-004-WECC-AB, *Protection System and Remedial Action Scheme Misoperation*.	**ISO**
7. A loss of monitoring or control that significantly affects the ability of the **operator** of a **transmission facility** to make operating decisions for 30 continuous minutes or more, including: (a) loss of the ability to remotely monitor or control **system elements** of the **bulk electric system**	**ISO**

Event	Entity to Submit Report to
~~that is directly connected to the **transmission system** energized at 100kv or higher~~; (b) loss of communications from supervisory control and data acquisition remote terminal units; (c) unavailability of "inter control centre protocol" links reducing **bulk electric system** visibility; or (d) loss of the ability to remotely monitor or control **generating units** providing **regulating reserves**.	
8. A complete loss, for 30 continuous minutes or more, of voice communication systems for a **control centre** of a **transmission facility** that are required for the purpose of communicating with the **ISO** and the **operators** of adjacent **transmission facilities**.	**ISO**
9. An unplanned evacuation of a **control centre** of a **transmission facility** for 30 continuous minutes or more.	**ISO**

Commented [AESO4]: V2 to V3 change. See AESO Written Reply #33

Appendix 2: Events Reportable by the Operator of a Generating Unit, Energy Storage Resource or Aggregated Facility

Commented [AESO5]: V2 to V3 change. See AESO Written Reply #32

Event	Entity to Submit Report to
1. An unexpected outage impacting 2 or more **generating units**, **aggregated facilities**, or **energy storage resources**, with an aggregate gross generation exceeding 500 MW at the time of the outage, which is caused by a common **disturbance** and contrary to the design of **generating units**, **aggregated facilities**, or **energy storage resources**.	**ISO**
2. A loss of monitoring or control that significantly affects the ability of the **operator** of a **generating unit, aggregated facility**, or **energy storage resource** to make operating decisions for 30 continuous minutes or more, including: (a) loss of the ability to remotely monitor or control a generating unit or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher; (b) loss of communications from supervisory control and data acquisition remote terminal units; (c) unavailability of "inter control centre protocol" links reducing visibility of a **generating unit** or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher ; or (d) loss of the ability to remotely monitor or control **generating units** providing **regulating reserves**.	**ISO**
3. A complete loss, for 30 continuous minutes or more, of voice communication systems for a **control centre** of a **generating unit, aggregated facility**, or **energy storage resource**~~,~~ that are required for the purpose of communicating with the **ISO** and the **operators** of adjacent **transmission facilities**.	**ISO**
4. An unplanned evacuation of a **control centre** of a **generating unit**, **aggregated facility**, or **energy storage resource,** for 30 continuous minutes or more.	**ISO**

Commented [AESO6]: V2 to V3 change. See AESO Written Reply #33

Appendix 3: Events Reportable by a Responsible Entity

Event	Entity to Submit Report to
1. Damage to or destruction of a **transmission facility**, **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher that results from human action, which is known or suspected to be intentional.	**ISO**, PSIO, RCMP and, where applicable, local police
2. A physical threat to a **transmission facility**, **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher, excluding weather or natural disaster related threats, which has the potential to degrade the normal operation of the **transmission facility**, **generating unit**, **aggregated facility,** or **energy storage resource**.	**ISO**, PSIO, RCMP and, where applicable, local police
3. A suspicious device or activity at a **transmission facility**, **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher.	**ISO**, PSIO, RCMP and, where applicable, local police

Appendix 4: Events Reportable by the ISO

Event	Entity to Forward Report to
1. Damage to or destruction of a **transmission facility** that results in an unexpected sustained outage of any combination of 3 or more of the following: (i) transmission lines energized at greater than 25 kV; or (ii) transformers with at least 2 terminals energized at greater than 25 kV.	**NERC**
2. Unexpected loss, contrary to design, of any combination of 3 or more of the following: (a) transmission lines energized at greater than 25 kV; or (b) transformers with at least 2 terminals energized at greater than 25 kV caused by a common **disturbance** (excluding successful automatic reclosing).	**NERC**
3. Damage to or destruction of a **transmission facility**, **generating unit**, **aggregated facility,** or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher that results from actual or suspected intentional human action.	**NERC**
4. A physical threat to a **control centre** for the **bulk electric system**, excluding a weather or natural disaster related threat, which has the potential to degrade the normal operation of the **control centre**.	**NERC**
5. A physical threat to a **transmission facility**, **generating unit**, **aggregated facility,** or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher, excluding weather or natural disaster related threats, which has the potential to degrade the normal operation of the **transmission facility**, **generating unit**, **aggregated facility**, or **energy storage resource**.	**NERC**
6. A suspicious device or activity at a **control centre** for the **bulk electric system**.	**NERC**
7. A suspicious device or activity at a **transmission facility**, **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** energized at 100 kV or higher.	**NERC**

Event	Entity to Forward Report to
8. Automatic **firm load** shedding of greater than or equal to 100 MW (via an automatic undervoltage or underfrequency load shedding scheme, or a **remedial action scheme**) that occurs as part of the **ISO**'s **under voltage load shed** program or **underfrequency load shedding** program.	**NERC**
9. A loss of monitoring or control that significantly affects the ability of the **operator** of a **transmission facility** to make operating decisions for 30 continuous minutes or more, including: (i) loss of the ability to remotely monitor or control **system elements** of the **bulk electric system**; (ii) loss of communications from supervisory control and data acquisition remote terminal units; (iii) unavailability of "inter control centre protocol" links reducing **bulk electric system** visibility; or (iv) loss of the ability to remotely monitor and control **generating units** providing **regulating reserves**.	**NERC**
10. A complete loss, for 30 continuous minutes or more, of voice communication systems for a **control centre** of a **transmission facility** that are required for the purpose of communicating with the **ISO** and the **operators** of adjacent **transmission facilities**.	**NERC**
11. An unplanned evacuation of a **control centre** of a **transmission facility** for 30 continuous minutes or more.	**NERC**

ISO Rules
Part 300 System Reliability and Operations
Division 304 Routine Operations
Section 304.9 Wind and Solar Aggregated Facility Forecasting

The amendments in this draft reflect changes to incorporate storage into the existing version of Section 304.9. A proposed new version of Section 304.9 was posted with ISO Rules Red Tape Administrative Amendments on Jan 17, 2023. These changes will be filed in March 2023. The AESO will reconcile proposed amendments across the two versions based on the outcome of the Commission's process.

Applicability

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #36 for all changes in this rule.

1 Section 304.9 applies to:

(a) the **legal owner** of an **aggregated facility** containing wind or solar resources that is connected to:

(i) the **interconnected electric system**;

(ii) an electric system within the **service area** of the City of Medicine Hat, including an **aggregated facility** situated within an industrial complex that is directly connected to the **interconnected electric system**; or

(iii) an electric system within the **service area** of the City of Medicine Hat and that has a **gross real power** capability greater than or equal to~~equal to or greater than 5~~ MW; and

(b) the **ISO**.

Requirements

Functional Specification

2 The **ISO** must, in accordance and generally consistent with this Section 304.9, approve a written functional specification containing details, work requirements, and specifications for the design, construction, and operation of an **aggregated facility** containing wind or solar resources and any associated **transmission facility** connection facilities.

Successor to Prior Requirements and Compliance Timeframe

3~~**(1)**~~ The provisions of this Section 304.9 succeed all previous forecasting requirements for **aggregated facilities** containing wind or solar resources, whether in an **ISO rule** or other document, and those requirements will no longer be in force and effect as of September 1, 2018.

~~**(2)** The **legal owner** of an **aggregated facility** containing wind or solar resources connected in accordance with any previous forecasting requirements must bring its **aggregated facility** into compliance with this Section 304.9 by no later than twelve (12) months after September 1, 2018 and, until such time as the **aggregated facility** is brought into compliance with this Section 304.9, the **legal owner** of must operate its **aggregated facility** in compliance with the previously effective forecasting requirements in accordance with which it was being operated prior to September 1, 2018.~~

Meteorological Data Collection Equipment and Availability Requirements

4(1) The **legal owner** of an **aggregated facility** containing wind or solar resources must ensure that the facility is equipped with meteorological data collection equipment and related devices that are installed and maintained in accordance with the provisions of subsections 4 and 5.

(2) The **legal owner** of an **aggregated facility** containing wind ~~or solar~~ resources must ensure that it is equipped with 2 sets of instruments for each meteorological parameter in accordance with the requirements in Table 1.

(3) The **legal owner** of an **aggregated facility** containing ~~wind or~~ solar resources must ensure that the facility is equipped with meteorological data collection equipment and related devices in accordance with the following:

(a) one set of instruments for each meteorological parameter in accordance with the requirements in Table 1 per 49 square kilometers of surface area within the facility;

(b) each set of instruments, if required by subsection 4(3)(a), must be less than 8 kilometers apart; and

(c) measurements must be taken at not less than 2 meters and not greater than 10 meters above ground, except where otherwise noted in Table 1.

(4) The **legal owner** of an **aggregated facility** containing wind or solar resources must ensure that the meteorological data collection equipment and related devices described in subsections 4(2) and 4(3) take measurements of instantaneous values at intervals of 15 **seconds** or less.

(5) The **legal owner** of an **aggregated facility** containing wind or solar resources must measure, collect and submit to the **ISO** the meteorological data in Table 1.

(6) The **legal owner** of an **aggregated facility** containing wind or solar resources must determine, at 30 minute intervals, and submit to the **ISO**, the **gross real power** capability with a precision to the nearest 2.0 MW.

(7) The **legal owner** of an **aggregated facility** containing wind or solar resources must determine and submit to the **ISO**, the following data:

(a) any **real power** limits in MW, with a precision for instantaneous measurements to the nearest 0.1 MW; and

(b) actual net to grid **real power** production in MW, with a precision for instantaneous measurements to the nearest 0.1 MW.

Data Transfer Technical Specification

5(1) The **legal owner** of an **aggregated facility** containing wind or solar resources must submit to the **ISO** the data specified in subsection 4(5) using one **minute** average data.

(2) The **legal owner** of an **aggregated facility** containing wind or solar resources must submit to the **ISO** the data specified in subsection 4 in the method and format the **ISO** specifies.

(3) The **legal owner** of an **aggregated facility** containing wind or solar resources must ensure that its meteorological data collection equipment and related devices including its data transfer equipment is designed and maintained with an availability of 98.0% in accordance with Table 1 and a mean time to repair of 48 hours or less.

(4) The **legal owner** of an **aggregated facility~~ies~~** containing wind or solar resources must keep 7 **days** of back up data for any data that has been submitted in accordance with this subsection 5 and must provide it to the **ISO** upon request within 30 **days**.

Notification of Unavailability, Suspected Failure or Data Error

6(1) The **legal owner** of an **aggregated facility** containing wind or solar resources must, if any component in the meteorological data collection equipment and related devices, including data transfer equipment, becomes unavailable due to an unplanned event, is suspected to have failed, or is suspected to be providing erroneous data, notify the **ISO** as soon as practicable, in writing, after identifying the unavailability, suspected failure, or data error.

(2) The **legal owner** of an **aggregated facility** containing wind or solar resources must provide the **ISO** as soon as practicable, in writing:

(a) a description of the cause of any unavailability, suspected failure, or data error reported pursuant to subsection 6(1); and

(b) in the event of an equipment failure:

(i) a plan acceptable to the **ISO** to repair the failed equipment, including testing; and

(ii) the expected date when the equipment will be repaired and the required measurements will be restored.

(3) The **legal owner** of an **aggregated facility** containing wind or solar resources must, if an equipment failure described in subsection 6(2) is not repaired and required measurements are not restored by the expected date, notify the **ISO** as soon as practicable, in writing, of the revised date and the reason the component in the equipment was not repaired by the expected date.

(4) The **legal owner** of an ~~wind or solar resources~~ **aggregated facility** containing wind or solar resources must notify the **ISO** as soon as practicable, in writing, after an equipment failure described in subsection 6(2) is repaired and the required measurements are restored.

Exceptions

7 The **legal owner** of an **aggregated facility** containing wind or solar resources is, notwithstanding~~,~~ subsections 4 and 5, not required to comply with the requirements of this Section 304.9 relating to meteorological data collection equipment and related devices including data transfer equipment when:

(a) such equipment is being repaired or replaced in accordance with a plan acceptable to the **ISO** under subsection 6; and

(b) the **legal owner** is using reasonable efforts to complete such repair or replacement in accordance with that plan.

Pre-Commissioning Facility Data and Records Requirements

8(1) The **legal owner** of an ~~wind~~ **aggregated facility** containing wind ~~or solar~~ resources must provide to the **ISO** the pre-**commissioning** data and records referred to in this subsection 8 in a method and format the **ISO** specifies.

(2) The **legal owner** of an ~~solar~~ **aggregated facility** containing ~~wind or~~solar resources must provide to the **ISO,** in a method and format the **ISO** specifies, either:

(a) the pre-**commissioning** data and records referred to in this subsection 8; or

(b) an industry standard model that is approved by the **ISO**.

(3) The **legal owner** of an **aggregated facility** containing wind or solar resources must, subject to the provisions of this subsection 8, retain and provide, within 60 **days** of the **ISO**'s written request, the following averaged meteorological data and records at 10-minute intervals or less, covering the 2 calendar years prior to the **commissioning** of the **aggregated facility**:

(a) details on the height of the measurements;

(b) wind speed;

(c) wind direction;

(d) temperature;

(e) barometric pressure; and

(f) for **aggregated facilities** containing solar resources only, global horizontal irradiance.

(4) The **legal owner** of an ~~wind~~ **aggregated facility** containing wind ~~or solar~~ resources must, in response to a request by the **ISO** under subsection 8(3), provide the following facility data:

(a) meteorological tower data collection height in m, with a precision for instantaneous measurements to the nearest 1 m;

(b) turbine model name;

(c) turbine model capacity in MW, with a precision to the nearest 0.1 MW;

(d) turbine wind speed cut-in in ~~meters per~~ m/s, with a precision to the nearest 0.1 m/s;

(e) turbine wind speed cut-out in ~~meters per (~~m/s with a precision to the nearest 0.1 m/s;

(f) turbine temperature cut-out lower in degrees Celsius (°C), with a precision for instantaneous measurements to the nearest 1 °C ~~and~~ with an indicator ~~is required~~ to confirm that the numbers are ambient temperature within the rotor or air temperature;

(g) turbine temperature cut-out upper in degrees Celsius (°C), with a precision for instantaneous measurements to the nearest 1 °C ~~and~~ with an indicator ~~is required~~ to confirm that the numbers are ambient temperature within the rotor or air temperature;

(h) site latitude and longitude in degrees; and

(i) turbine power curves.

(5) The **legal owner** of an ~~solar~~ **aggregated facility** containing ~~wind or~~ solar resources must, in response to a request by the **ISO** under subsection 8(3), provide the following solar array data and records, including:

(a) site latitude and longitude in degrees;

(b) direct current **real power** rating;

(c) alternating current **real power** rating;

(d) inverter manufacturer and model;

(e) mounting height from ground in meters (m);

(f) tilt angle or range of tilt angles to horizontal plane in degrees;

(g) azimuth angle in degrees;

(h) alternating current **real power** capacity per **solar array** in MW;

(i) mounting type, tracking (fixed, single or dual axis); and

(j) module type (crystalline, thin-film etc.).

Revision History

Date	Description
2019-12-11	"Removed duplication with new Section 103.14, Waivers and Variances; standardized functional specifications language; capitalized references to "Section"."

ISO Rules
Part 300 System Reliability and Operations
Division 304 Routine Operations
Section 304.9 Wind and Solar Aggregated Facility Forecasting

2018-09-01	Initial release.

Table 1
Meteorological Data Requirements for Aggregated Facility Containing Wind or Solar Resources

Meteorological Data Requirements for Aggregated Facility containing Wind Resources						
Measurement Type	**Units**	**Precision**	**Range**	**Accuracy**	**Height of Instrument**	
					Set-1	**Set-2**
Wind Speed	Meters/Second (m/s)	0.1 m/s	0 to 50	±1m/s	At Hub Height	At 35 Meters
Wind Direction	Degrees from True North	1 degree	0 to ~~360~~359	±5°	At Hub Height	At 35 Meters
Barometric Pressure	HectoPascals (~~HPa~~hPa)	1 hPa	800 to 1000	±1.0 hPa at -20 to 50°C; and ±1.5 hPa at below -20°C	At Convenient location	At Convenient location
Ambient Temperature	Degree~~s~~ Celsius (°C)	0.1° C	-50 to +50	±0.2°C	At Hub Height	At 35 Meters
Dewpoint	Degrees Celsius (°C)	0.1° C	-50 to +50	±0.2°C	At Convenient location	At Convenient location
Relative Humidity	Percentage (%)	1~~.00~~%	0 to 100 %	±2%	At Convenient location	At Convenient location
Ice-up Parameter Measured with an Icing Sensor	Scale 0.0 to1.0	0.1	0 to 1	n/a	At Convenient location	At Convenient location
Precipitation	Millimeters/minute (mm/min)	0.1	0 to11	2% up to 0.417 mm/m~~i~~in 3% over 0.417 mm/min	At Convenient location	At Convenient location
Meteorological Data Requirements for Aggregated Facility containing Solar Resources						
Measurement Type	**Units**	**Precision**	**Range**	**Accuracy**	**Height of Instrument**	
					Set-1 per 49 km^2	**Set-2 for each subsequent 49 km^2**
Wind Speed	Meters/Second (m/s)	0.1 m/s	0 to 50	±1m/s	Between 2-10 meters	Between 2-10 meters
Wind Direction	Degrees from True North	1 degree	0 to 360	±5°	Between 2-10 meters	Between 2-10 meters
Barometric Pressure	HectoPascals (hPa)	1 hPa	800 to 1000	±1.0 hPa at -20 to 50°C; and ±1.5 hPa at below -20°C	Between 2-10 meters	Between 2-10 meters
Ambient Temperature	Degree Celsius (°C)	0.1° C	-50 to +50	±0.2°C	Between 2-10 meters	Between 2-10 meters

Dewpoint	Degrees Celsius (°C)	0.1° C	-50 to +50	±0.2°C	Between 2-10 meters	Between 2-10 meters
Relative Humidity	Percentage (%)	1.00%	0 to 100 %	±2%	Between 2-10 meters	Between 2-10 meters
Precipitation	Millimeters/minute (mm/min)	0.1	0 to11	2% up to 0.417 mm/mon 3% over 0.417 mm/min	Between 2-10 meters	Between 2-10 meters
Back panel Temperature	Degree Celsius (°C)	0.1° C	-50 to +50	±0.15°C at -27 to +50°C; and ±0.2°C at below -27°C	Between 2-10 meters	Between 2-10 meters
Global Horizontal Irradiance	Watts/Square Meter (W/m^2)	0.1	0 to 4000	±3%	Between 2-10 meters	Between 2-10 meters
Diffused Horizontal Irradiance	Watts/Square Meter (W/m^2)	0.1	0 to 4000	±3%	Between 2-10 meters	Between 2-10 meters
Direct Normal Irradiance[1]	Watts/Square Meter (W/m^2)	0.1	0 to 2000	±3%	Between 2-10 meters	Between 2-10 meters

[1] The requirement to provide this parameter will be determined by the AESO based on solar technology used in the project.

ISO Rules
Part 300 System Reliability and Operations
Division 306 Outages and Disturbances
Section 306.5 Source Asset Outage Reporting and Coordination

Applicability

1 Section 306.5 applies to:

(a) a **pool participant** with a **source asset,** excluding an import asset, with a **maximum capability** of greater than or equal to 5 MW~~5 MW or higher~~;

(b) a **legal owner** of a **source asset** described in subsection 1(a); and

(c) the **ISO**.

Requirements

General

2(1) A **pool participant** must, for any outage that results or will result in a change in **available capability** of greater than or equal to 5 MW~~5 MW or greater~~, comply with the notification requirements set forth in subsections 3, 4 or 5, as applicable.

(2) A **pool participant** must provide to the **ISO**, in writing and in conjunction with its first **planned outage** notification, a list of contact **persons** who must be involved in the planning of outages and be in a position of authority to resolve with the **ISO** any issues or concerns regarding outages.

(3) A **pool participant** must submit information required to be provided to the **ISO** pursuant to this Section 306.5 via the Energy Trading System.

Planned Outage Notification Requirements

3(1) A **pool participant** must, in respect of any **planned outage**, submit to the **ISO**:

(a) the dates, times, durations and impact to MW capability for the **planned outage**;

(b) the specific nature of the **planned outage** work to be done; and

(c) a designation of the **planned outage** as “Derate-Planned” or **“**Outage-Planned”.

(2) A **pool participant** must, by the first **day** of every **month** after the date of energization, submit the information set out in subsection 3(1) to the **ISO** related to **planned outages** that, as of the time of the submission, are planned to occur at any time within the next 24 **months**.

(3) A **pool participant** must, with respect to:

(a) any revisions to the information submitted to the **ISO** under subsection 3(1); or

(b) a **planned outage** that is not included in the submission set out in subsection 3(2);

submit such information or **planned outage** as soon as reasonably practicable.

(4) A **pool participant** must, if information submitted under subsection 3(3) is submitted later than 3 **months** prior to the **day** the **planned outage** is to start, include a statement in its submission setting out the reasons that the information varies from the original subsection 3(1) submission or was not included in the submission set out in subsection 3(2).

Delayed Forced Outage Notification Requirements

4(1) A **pool participant** must, as soon as reasonably practicable, in respect of a **delayed forced outage**, submit to the **ISO**:

(a) the dates, times, durations and impact to MW capability for the **delayed forced outage**;

(b) the specific nature of the **delayed forced outage** work to be done; and

(c) a designation of the **delayed forced outage** as “Derate-Forced” or “Outage-Forced”.

(2) A **pool participant** must also, as soon as reasonably practicable, in respect of a **delayed forced outage** for which the **pool participant** has less than 24 hours between the time of discovering the circumstances requiring the **delayed forced outage** and the time of commencing the **delayed forced outage**, contact the **ISO** by telephone, on a telephone number that the **ISO** designates, which must contain a voice recording system.

Automatic Forced Outage Notification Requirements

5 A **pool participant** must, as soon as reasonably practicable, submit **automatic forced outage** information as follows:

(a) through contacting the **ISO** by telephone, on a telephone number that the **ISO** designates, which must contain a voice recording system; and

(b) submit a designation of the **automatic forced outage** as “Derate-Forced” or “Outage-Forced”.

Authority to Issue an Outage Cancellation Directive

6(1) The **ISO** may, if after:

(a) completing the assessments and procedures set out in subsections 7(2) through 7(6) the **ISO** determines that there remains:

(i) an immediate need on a short term basis for services provided by certain **source assets** to maintain the necessary level of **reliability** or **adequacy**, as the case may be; and

(ii) a high probability that the situation will not be alleviated in a voluntary manner:

(A) by any **pool participants** amending or revising outage plans; or

(B) through the ordinary course operation of the market; and

(b) taking into account the factors set out in subsection 7(7) below,

issue a **directive** to cancel any one or more of a **planned outage** or a **delayed forced outage**.

(2) The **ISO** must not issue a **directive** canceling an outage without the authorization of the Chief Executive Officer of the **ISO** or their designee.

Outage Cancellation Procedure

7(1) The **ISO** must, prior to issuing a **directive** canceling an outage, comply with the procedures set out in subsection 7(2) through 7(8) in sequence.

(2) The **ISO** must consider and analyze the results of the **adequacy** forecast undertaken in accordance with subsection 2 of Section 202.6 of the **ISO rules**, *Adequacy of Supply*, and perform a further assessment of the status of all **source assets** based on all **planned outage** plans **pool participants** submit under subsection 3.

(3) The **ISO** must:

(a) after completing the assessments and taking into account the total amount of all **source assets**,which are planned for outages; and

(b) if the **ISO** anticipates a high probability of a supply **adequacy** shortfall or **reliability** concern

notify **market participants** on the AESO website of its determination.

(4) The **ISO** must continue to conduct further situational analysis to seek to alleviate the potential supply **adequacy** shortfall or **reliability** concern and avoid the cancellation of any outages.

(5) The **ISO** must post the determination referred to in subsection 7(3) above for a minimum period of 1 calendar week, and in anticipation that certain **pool participants** may have flexibility to voluntarily amend plans for outages to assist in the alleviation of the supply **adequacy** shortfall or **reliability** situation.

(6) The **ISO** must, if the **ISO** posting referred to in subsection 7(5) and any resulting voluntary actions do not result in a reduction in the total amount of **source asset** capacity planned for outages such that the forecast supply **adequacy** shortfall or **reliability** remains unresolved, contact the individual **pool participants** to request that they further review outage plans.

(7) The **ISO** must consider all of the following factors in its determination as to whether or not to issue a **directive** canceling an outage as contemplated in this subsection 7:

(a) the economic and operational consequences for the **legal owner** of the **source asset** and for any designated **pool participant** of the **source asset**, if a different **person**;

(b) the operational and functional impact on the **source asset** if the outage is cancelled;

(c) the effectiveness of canceling the outage in alleviating the supply **adequacy** shortfall or **reliability** concern;

(d) the historical frequency that a given **source asset** has been the subject of outage cancellations relative to other **source assets**;

(e) the length of time of, and reasons for, any outage the **pool participant** has previously submitted to the **ISO** under the reporting requirements set out in subsections 3(1) and 4(1) of this Section 306.5;

(f) the extent to which the outage will begin or end during the period of the forecast supply **adequacy** shortfall or **reliability** concern;

(g) any requirements or material implications under or related to any applicable municipal, provincial or federal legislation or regulations if the **ISO** proceeds to issue a **directive** to cancel an outage; and

(h) the practicality and effectiveness of market-based solutions to alleviate the supply **adequacy** shortfall or **reliability** concern, including a consideration of load curtailment options.

(8) The **ISO** must not issue a **directive** canceling an outage more than 90 **days** in advance of the first **day** of the period which the **ISO** has determined to be the commencement of the **reliability** or **adequacy** shortfall.

Outage Planned Costs and Work Submission

8(1) A **pool participant** who has received a **directive** for the cancellation of an outage must use all reasonable efforts to submit to the **ISO** in advance of the period when the outage would have occurred:

(a) a detailed description and estimation of the work, which was to have been carried out during the outage, including an itemization of the specific plant, machinery and equipment which are the subject of the work during the that period; and

(b) an estimate of any known or anticipated **incremental generation costs** that may be the basis for a claim for compensation under these **ISO rules**.

(2) The submissions set out in subsection 8(1) do not limit compensation claims for other reasonable demonstrable costs.

Time Constrained Outage Cancellation

9 The **ISO** may, notwithstanding subsection 7, dispense with any or all of the procedures set out in that subsection 7 and proceed to issue a **directive** to cancel an outage if, in the **ISO**'s opinion, it is evident that immediate **reliability** or **adequacy** circumstances do not allow sufficient time to permit the **ISO** to comply with such procedures.

Outage Cancellation Report

10 The **ISO** must, if it issues a **directive** under subsection 6 to cancel an outage, prepare a report and post it on the AESO website, which report must contain:

(a) an explanation of the circumstances, background and chronological events that caused and are related to the issuance of the **directive** cancelling the outage;

(b) the particulars of the outage that was cancelled, including date of cancellation, duration and MW affected;

(c) any material market impacts known to the **ISO**;

(d) whether the cancellation was a time and procedurally constrained one under subsection 9, and if so, the reasons for a decision to depart from any prescribed procedures set out in subsection 7; and

(e) any other matters that, in the **ISO**'s opinion, are necessary in order to provide a full and complete explanation to **market participants** of the decision.

Payment Eligibility for Incremental Generation Costs and Claim Limitations

11(1) A **pool participant** or **legal owner** of a **source asset**, or both of them if different **persons**, that has complied with a **directive** to cancel an outage issued pursuant to subsection 6, is eligible to receive payment for **incremental generation costs** from the **ISO,** subject to this subsection 11, subsection 5(1) of Section 103.4 of the **ISO rules**, *Power Pool Financial Settlement* and the definition of **incremental generation costs**.

(2) A **pool participant** or a **legal owner** that is a claimant under this subsection 11 must, within 40 **days** after the end of the **settlement period** related to the period during which the **directive** was effective, provide the **ISO** with a written statement which contains:

(a) the detailed information of the claim and calculation of **incremental generation costs** as incurred and caused by the cancellation, to the extent those details and calculations are known or estimable as of the date of delivery of the statement to the **ISO**; or

(b) if any detailed information or calculations are not known or estimable as of the date of delivery of the statement, an estimate of the date by which any of the outstanding information or calculations required under subsection 11(2)(a) will be finally determined and delivered to the **ISO**.

(3) A **pool participant** or a **legal owner** that is a claimant under this subsection 11 must provide the **ISO** with a supplementary written statement setting out all outstanding information or calculations as soon

as reasonably practicable after the delivery of the original statement but not later than one year after the end of the **settlement period** related to the period during which the cancellation **directive** was effective.

(4) A **pool participant** or a **legal owner** that is a claimant under this subsection 11 must provide to the **ISO**:

(a) any and all of its own and third party supporting data, records, invoices, formulas, calculations, third party contract claims and related terms and conditions;

(b) any other information or materials used to calculate or determine the amounts claimed in the statement or any supplementary statement; and

(c) any other detail and information the **ISO** may reasonably request

in order to verify the **incremental generation costs**, claims, calculations, and particulars.

(5) The **ISO** must approve the compensation and settlement in respect of any **incremental generation costs** on or before the 40th **day** following the **day** the **ISO** receives the last of the initial statement, supplementary statement, or deficiency materials.

(6) The **ISO** must reject the portion of a claim for **incremental generation costs** related to any of the following:

(a) costs or claims related to a cancellation for which the claimant is eligible for compensation pursuant to the provisions of a **transmission must-run** contract with the **ISO**;

(b) costs or claims associated with or related to the claimant's market or hedging portfolio, other than those allowed under subsection (iv)(d)(B) of the definition of **incremental generation costs** which limits such costs and claims to the **source asset** which is the subject of the **directive**;

(c) lost opportunity costs, or other form of loss of profits, revenue, earnings, or revenue not specifically provided for in the definition of **incremental generation costs**;

(d) raw material, fuel, processing, production, manufacturing, or industrial costs of any nature which are not directly related to the **source asset**'s participation in the energy market;

(e) fixed costs; or

(f) costs or claims that the claimant could otherwise have mitigated through all reasonable efforts.

Cost Recovery

12 The **ISO** must treat the **incremental generation costs** paid to a claimant for an approved claim under subsection 11(6) as an **ancillary services** cost.

Timely Information from Legal Owner

13 A **legal owner** of a **source asset** must, if it is not the **pool participant** for that **source asset**, provide such timely and complete information to the **pool participant** for such **source asset** to enable the **pool participant** to comply with its obligations under subsections 3, 4, and 5.

Revision History

Date	Description
2023-xx-xx	

2020-09-16	Addition of timing requirement for submission of delay forced outages in subsection 4. Revised subsection 4 title to Delayed Forced Outage Notification Requirements. Revised subsection 5 title to Automatic Forced Outage Notification Requirements. Administrative changes.
2015-04-01	The words “excluding a wind facility” were deleted from subsection 1(a).
2014-07-02	Initial release

ISO Rules
Part 300 System Reliability and Operations
Division 306 Outages and Disturbances
Section 306.7 Mothball Outage Reporting

The amendments in this draft reflect changes to incorporate storage into the existing version of Section 306.7. A proposed new version of Section 306.7 was filed with the Commission on March 8, 2023. The AESO will reconcile proposed amendments across the two versions based on the outcome of the Commission's process.

Applicability

1 Section 306.7 applies to:

(a) a **pool participant** with a **source asset**, excluding an import asset, with a **maximum capability** of greater than or equal to 5 MW or ~~higher~~;

(b) the **legal owner** of a **source asset** described in subsection 1(a); and

(c) the **ISO.**

Requirements

General

2 A **pool participant** must, for any **mothball outage** that results or will result in a change in **available capability** of greater than or equal to 5 MW ~~or greater~~:

(a) comply with the notification requirements in subsection 3; and

(b) comply with the attestation requirements in subsection 4.

Mothball Outage Notification Requirements

3(1) A **pool participant** must, in respect of any **mothball outage**, submit to the **ISO**:

(a) the dates, times, durations and impact to MW capability for the **mothball outage**;

(b) a designation of the **mothball outage** as "Derate-Planned" or "Outage-Planned";

(c) the minimum time, which must be no more than 6 **months**, that is required for the **source asset** to return to full capability if the **ISO** issues a **directive** in accordance with subsection 6(1); and

(d) a list of contact **persons** who are in a position of authority to resolve with the **ISO** any issues or concerns regarding the **mothball outage**.

(2) A **pool participant** must, by the first **day** of every **month** after the date of **energization**, submit the information set out in subsection 3(1) to the **ISO** related to **mothball outages** that, as of the time of the submission, are planned to occur at any time within the next 24 **months**.

(3) A **pool participant** must, with respect to:

(a) any revisions to the information submitted to the **ISO** under subsection 3(1); or

(b) a **mothball outage** that is not included in the submission set out in subsection 3(2);

submit such information or **mothball outage** as soon as practicable but no later than 3 **months** prior to the **day** the revision takes effect or the **mothball outage** is to start, unless the **ISO** otherwise agrees in writing.

(4) A **pool participant** must submit information required to be provided to the **ISO** pursuant to this

subsection 3 through the Energy Trading System, except that the information required to be provided in accordance with subsection 3(1)(c) and (d) is to be provided directly to the **ISO**, in writing.

Attestation

4(1) A **pool participant** must, if it provides a notification to the **ISO** pursuant to subsections 3(1) or 3(3)(a) where such notification results in an extension to the duration or increase in MW of the **mothball outage** originally submitted pursuant to subsection 3(1), provide an attestation to the **ISO** from a corporate officer of the **pool participant** of the **source asset** that:

(a) based on its reasonable assessment of forecast market prices and market conditions at the time the attestation is provided, such forecast market prices and market conditions are insufficient to recover avoidable costs for the **source asset** for the duration of the **mothball outage**; and

(b) the **mothball outage** will be cancelled if, based on its reasonable assessment of forecast market prices and market conditions, such forecast market prices and market conditions become sufficient to recover avoidable costs for the **source asset** for the remaining duration of the **mothball outage**.

4(2) A **pool participant** must provide an attestation in accordance with subsection 4(1):

(a) on the **day** that it provides a notification to the **ISO** pursuant to subsections 3(1) or 3(3)(a), if such notification is received after May 28, 2018; and

(b) on the last **business day** that is 3 **months** prior to the **day** the **mothball outage** is planned to start when it provides a notification to the **ISO** pursuant to subsections 3(1) or 3(3)(a), if notification is provided more than 3 **months** prior to the **day** the **mothball outage** is planned to start.

4(3) A **pool participant** must, if it is not the **legal owner** of the **source asset**, provide to the **ISO** on the **day** that the **pool participant** submits an attestation in accordance with subsection 4(2), an attestation from the **legal owner** of a **source asset** that the avoidable costs provided to the **pool participant** in accordance with subsection 8(a) are accurate.

Cancellation of Mothball Outage

5(1) A **pool participant** must provide the **ISO** with a minimum of 3 **months**' written notice prior to cancelling a **mothball outage**.

(2) A **pool participant** must cancel a **mothball outage** no later than 24 months after the date of commencement of the **mothball outage**, unless the **ISO** otherwise agrees, in writing.

(3) A **pool participant** must take one of the following actions upon cancelling a **mothball outage**:

(a) return the **source asset** to service; or

(b) terminate the **supply transmission service** contract for the **source asset**.

(4) A **pool participant** must not:

(a) schedule a **planned outage** immediately after a **mothball outage**; or

(b) schedule a **mothball outage** less than 3 **months** after a previous **mothball outage**.

Authority to Issue an Outage Cancellation Directive

6(1) The **ISO** may, if after:

(a) completing the procedures set out in subsections 7(2) through 7(5) the **ISO** determines that there remains:

(i) an immediate need on a short-term basis for services provided by certain **source assets** to maintain the necessary level of **reliability** or **adequacy**, as the case may be; and

(ii) a high probability that the situation will not be alleviated in a voluntary manner:

(A) by any **pool participants** amending or revising outage plans; or

(B) through the ordinary course operation of the market; and

(b) taking into account the factors described in subsection 7(4) below,

issue a **directive** to cancel a **mothball outage**.

(2) The **ISO** must not issue a **directive** canceling a **mothball outage** without the authorization of the Chief Executive Officer of the **ISO** or their designee.

Mothball Outage Cancellation Procedure

7(1) The **ISO** must, in order to assist in determining whether to issue a **directive** canceling a **mothball outage**, forecast the **adequacy** of supply as described in subsection 2 of Section 202.6 of the **ISO Rules**, *Adequacy of Supply*.

(2) The **ISO** must, prior to issuing a **directive** canceling a **mothball outage**, comply with the outage cancellation procedures described in subsection 7 of Section 306.5 of the **ISO rules**, *Source Asset Outage Reporting and Coordination*.

(3) The **ISO** must, in performing the assessments described in Section 306.5, take into account all **mothball outage** plans submitted to the **ISO** under subsection 3 of this Section 306.7.

(4) The **ISO** must, in addition to the factors set out in subsection 7(7) of Section 306.5, consider the length of time of any outage the **pool participant** has previously submitted to the **ISO** under the reporting requirements set out in this Section 306.7 in its determination as to whether or not to issue a **directive** cancelling a **mothball outage**.

(5) The **ISO** may, notwithstanding subsection 7(8) of Section 306.5, issue a **directive** cancelling a **mothball outage** at any time by providing notice equivalent to or greater than the minimum time that is required for the **source asset** to return to service provided under subsection 3(1)(c).

Timely Information from Legal Owner

8 A **legal owner** of a **source asset** must, if it is not the **pool participant** for that **source asset**:

(a) provide such timely and complete information to the **pool participant** for such **source asset** to enable the **pool participant** to comply with its obligations under subsection 3, 4, and 5; and

(b) provide an attestation to the **pool participant** from a corporate officer of the **legal owner** of such **source asset** to enable the **pool participant** to comply with its obligations under subsection 4(3).

Revision History

Date	Description
2018-05-28	Addition of subsection 4 Amendment to subsection 8 Administrative amendments
2016-06-07	Initial release.

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.1 Functional Specification & Legacy Treatment

Applicability

1 Section 503.1 applies to:

(a) a **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system**, or to **transmission facilities** within the City of Medicine Hat; and

(b) a **legal owner** of a **bulk transmission line**;

(c) the **ISO**.

Commented [AESO1]: V2 to V3 change. See AESO Replies to #38 and #39.

Requirements

Functional Specification

2(1) The **ISO** must, ~~in accordance and generally consistent with Division 503 of the **ISO rules**,~~ approve a functional specification containing details, work requirements, and specifications for the design, construction, and operation of a project and any associated **transmission system** connection facilities.

(2) The functional specification referred to in subsection 2(1) must be generally consistent with the provisions of Division 503 of the **ISO rules**, as applicable, but may contain material variance the **ISO** approves based upon its 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.

Legacy Treatment

3 A **legal owner** must, unless otherwise specifically stated in an **ISO rule** within Division 503 of the **ISO rules**, remain compliant with the applicable predecessor document to an **ISO rule** within Division 503 if the **legal owner**'s facility received either of the following ~~facility application approval~~ prior to the effective date of an **ISO rule** within Division 503:

(a) a first version of the final functional specification issued by the **ISO**; or

(b) approval for the construction and operation of the facility from the relevant regulatory authority with jurisdiction.

Modifications to ~~Facilities~~Generating Units, Aggregated Facilities and Energy Storage Resources

4(1) A **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must, notwithstanding subsection 3 ~~and subject to subsection 4(2)~~, comply with the applicable requirements of Division 503 of the **ISO rules** if the **legal owner**'s facility or resource, or any supporting systems, undergoes an addition ~~, replacement,~~ or upgrade.

(2) Subsection 4(1) does not apply to identical or similar replacements, or maintenance-related activities.

Modifications to Transmission Facilities

5 A **legal owner** of an existing **bulk transmission line** that is extending, tapping, or adding to the **bulk transmission line**:

(a) must, if the project circuit length will be greater than or equal to 1,500 meters, comply with the applicable requirements of Division 503 of the **ISO rules**; or

(b) must, if the project circuit length will be less than 1,500 meters, comply with the:

(i) applicable technical specification and design requirements for the **bulk transmission line** in effect as of the original date of the commencement of the design of the bulk transmission line; and

(ii) specifications set out in the most recently published edition of the *Alberta Electrical Utility Code.*

Authority to Require Compliance

6~~5~~ The **ISO** may, notwithstanding subsection 3, require a **legal owner** to comply with any provision of Division 503 if the **ISO** determines that such compliance is necessary for the safe and reliable operation of the **interconnected electric system**.

Revision History

Date	Description
20XX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.2 Maximum Authorized Real Power and Maximum Authorized Charging Power

Applicability

1 Section 503.2 applies to:

(a) the **legal owner** and **operator** of a **generating unit, aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit, aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**;

and

(b) the **ISO**.

Requirements

Maximum Authorized Real Power

2(1) The **legal owner** must, upon receiving a request from the **ISO**, determine the **maximum authorized real power** for the **generating unit**, **aggregated facility**, or **energy storage resource** and provide this value to the **ISO.**

(2) The **legal owner** of an **aggregated facility** must ~~exclude~~ ignore any auxiliary power used in the operation of the facility in determining the **maximum authorized real power**.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #41.

(3) The **legal owner** must consider the capability and limitations of the **generating unit**, **aggregated facility**, or **energy storage resource** under optimal conditions when determining **maximum authorized real power**.

Maximum Authorized Charging Power

3(1) The **legal owner** of an **energy storage resource** or **aggregated facility** containing an **energy storage resource** must, upon receiving a request from the **ISO**, determine the **maximum authorized charging power** for the **energy storage resource** or **aggregated facility** and provide this value to the **ISO**.

(2) The **legal owner** of an **aggregated facility** containing an **energy storage resource** must ~~exclude~~ ignore any auxiliary power used in the operation of the facility in determining the **maximum authorized charging power**.

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #41.

(3) The **legal owner** of an **energy storage resource** or **aggregated facility** containing an **energy storage resource** must~~,~~ consider the capability and limitations of the **energy storage resource** or **aggregated facility** under optimal conditions when determining **maximum authorized charging power**.

Operation at Maximum Authorized Real Power

4(1) The **operator** must not operate the **generating unit**, **aggregated facility**, or **energy storage resource** above the **maximum authorized real power**.

(2) The **ISO** may, notwithstanding subsection 4(1), request that the **operator** operate above the **maximum authorized real power** of the **generating unit**, **aggregated facility**, or **energy storage resource** during supply shortfall events.

(3) The **ISO** must, when the additional **real power** referred to in subsection 4(2) is no longer required, notify the **operator** to return the **generating unit**, **aggregated facility**, or **energy storage resource** to a value at or below the **maximum authorized real power**.

Operation at Maximum Authorized Charging Power

5 The **operator** of an **energy storage resource** or **aggregated facility** containing an **energy storage resource** must not operate the **energy storage resource** or **aggregated facility** below the **maximum authorized charging power**.

Revision History

Date	Description
20XX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.3 Reactive Power

Applicability

1 Section 503.3 applies to:

(a) the **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**;

(b) the **legal owner** of a load facility, where for purposes of this Section 503.3:

(i) "legal owner" refers to:

(A) the **legal owner** of an **electric distribution system**;

(B) a **person** who has entered into an arrangement directly with the **ISO** for the provision of **system access service** under subsection 101(2) of the **Act**;

and

(ii) "load facility" refers to a facility connecting industrial load or distribution load to the **transmission system**;

(c) the **legal owner** of a **transmission facility** to which a load facility is connected ~~to~~;

and

(d) the **ISO**.

Requirements

Reactive Power

2(1) The **legal owner** must, for the purposes of determining the **reactive power** requirements of this Section 503.3, determine the root mean square phase-to-phase voltage at:

(a) the stator winding terminal, for a **generating unit** or synchronous **energy storage resource**; or

(b) the **collector bus**, for an **aggregated facility**;

to be used as the 1.00 per unit voltage value.

(2) The **legal owner** of **generating unit**, **aggregated facility**, or **energy storage resource** must ensure that the **generating unit**, **aggregated facility**, or **energy storage resource**, as well as any external **reactive power** resource approved under subsection 2(9), have the capability to operate in accordance with the requirements of this subsection 2 by both:

(a) manual control of the set point of the **automatic voltage regulator** or **voltage regulating system** of the **generating unit**, **aggregated facility**, or **energy storage resource**; and

(b) automated action of the **automatic voltage regulator** or **voltage regulating system** of the **generating unit**, **aggregated facility**, or **energy storage resource**.

(3) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must~~, subject to subsection 2(7),~~ ensure that **reactive power** capability complies with the following minimum requirements:

(a) 0.9 **power factor**, supplying dynamic **reactive power**; and

(b) 0.95 **power factor**, absorbing dynamic **reactive power**.

Commented [AESO1]: V2 to V3 change. See AESO Written Replies #43 and #2.

(4) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must ensure that the **reactive power** capability set out in subsection 2(3) is based on:

(a) for a **generating unit**, or **aggregated facility** not containing an **energy storage resource**, the **maximum authorized real power** of the **generating unit** or **aggregated facility** over the entire **real power** operating range, down to the applicable minimum **gross real power**; or

(b) for an **energy storage resource**, or **aggregated facility** containing an **energy storage resource**, the **maximum authorized real power** and **maximum authorized charging power** of the **energy storage resource** or **aggregated facility** over the entire **real power** operating range.

(5) Notwithstanding subsection 2(4), when a **generating unit**, ~~n **energy storage resource**, or an~~ **aggregated facility**, or ~~containing an~~ **energy storage resource**, shares~~has~~ a common **point of connection** ~~with a **generating unit**~~, the **reactive power** resources may be shared to meet the **reactive power** capability set out in subsection 2(3) if:

(a) the **reactive power** resources are designed to be in service at all times for any operating combination of the **generating unit**, **aggregated facility**, or~~and~~ **energy storage resource** ~~or **aggregated facility**~~; and

(b) the shared **reactive power** resources are sufficient to meet the total of the individual requirements of subsection 2(3) for each **generating unit**, **aggregated facility** or **energy storage resource** sharing the common **point of connection**. ~~based on the greater of~~:

~~(i) the **maximum authorized real power** of the **generating unit**;~~

~~(ii) the **maximum authorized charging power** of the **energy storage resource** or **aggregated facility**;~~

~~(iii) the **maximum authorized real power** of the **energy storage resource** or **aggregated facility**; or~~

~~(iv) for a facility designed to be operated concurrently, the sum of the **maximum authorized real power** of the **generating unit** and the **maximum authorized charging power** of the **energy storage resource** or **aggregated facility**.~~

(6) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must ~~, subject to subsection 2(7),~~ ensure that the limiters are not set to reduce the **reactive power** capability set out in subsection 2(3).

~~**(7)** The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that has the capability to meet the **reactive power** requirements of this subsection 2 but has stability concerns must submit in writing to the **ISO**:~~

~~(a) a request for variance allowing for a reduction in the dynamic **reactive power** capability requirement set out in subsection 2(3)(b) due to **generating unit**, **aggregated facility**, or **energy storage resource** stability concerns; and~~

~~(b) a detailed study in support of the request, specific to the location of the **generating unit**, **aggregated facility**, or **energy storage resource** and completed by a qualified professional engineer, demonstrating that compliance with the dynamic **reactive power** capability set out in subsection 2(3)(b) will cause the **generating unit**, **aggregated facility**, or **energy storage resource** to become unstable and therefore should be reduced by a limiter.~~

~~**(8)** The **ISO** must make a decision on its approval and notify the **legal owner** in writing of the decision no later than 90 **days** after the date of receiving the submission set out in subsection 2(7).~~

(7~~9~~) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #44.

Commented [AESO3]: V2 to V3 change. See AESO Written Reply #45

Commented [AESO4]: V2 to V3 change. See AESO Written Reply #45.

does not have the capability to meet the dynamic **reactive power** capability set out in subsection 2(3) must submit to the **ISO** a request in writing for approval of the use of an external dynamic **reactive power** resource to compensate for the lack of capability, such that the combined capability of the **generating unit**, **aggregated facility**, or **energy storage resource** and the external dynamic **reactive power** resource meets the requirements of subsection 2(3).

Load Facility Power Factor

3(1) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must design the load facility with **reactive power** resources to result in a **power factor** of above 0.9 lagging.

(2) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must ensure the **power factor** requirement in subsection 3(1) is based on expected normal operating conditions up to the **contract capacity**, and measured at the **point of common coupling**.

Revision History

Date	Description
20XX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.4 Voltage Regulation

Applicability

1 Section 503.4 applies to:

(a) the **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**; and

(b) the **ISO**.

Requirements

Voltage Regulation

2(1) The **legal owner** must ensure that the **generating unit**, **aggregated facility**, or **energy storage resource** has a continuously variable, continuously acting, closed loop, centralized **automatic voltage regulator** or **voltage regulating system** that:

(a) compares a measured voltage to a set point;

(b) controls any dynamic **reactive power** resources needed to meet the requirements of this Section 503.4;

(c) is designed to be continuously in service and controlling while the **generating unit**, **aggregated facility**, or **energy storage resource** is electrically connected to the **transmission system**;

(d) is capable of operating in a voltage set point control mode, to the exclusion of any other modes;

(e) is capable of manual set point adjustments to a value between 0.95 per unit and 1.05 per unit of the nominal voltage at the following point of control:

(i) the stator winding terminal, for a **generating unit** or synchronous **energy storage resource**; or

(ii) the **collector bus**, for an **aggregated facility**; or

(iii) at an alternative point of control for a facility that implements reactive current compensation in accordance in subsection 3(1);

and

(f) is able to achieve, under non-**disturbance** conditions, a steady state voltage regulation of plus or minus 0.5% of the voltage set point at the point of control.

(2) The **legal owner** must design a **generating unit**, **aggregated facility**, or **energy storage resource** such that the point of control for the **automatic voltage regulator** is not at the high voltage side of the **transmission system** step-up transformer.

(3) The **legal owner** of a **generating unit** or synchronous **energy storage resource** must not use stator current limiters for the **generating unit** or **energy storage resource**.

(4) The **legal owner** of an **aggregated facility** or **energy storage resource** must ensure that the **aggregated facility** or **energy storage resource** is calibrated such that a change in **reactive power** will achieve 95% of its final value no sooner than 0.1 seconds and no later than one second following a step change in voltage.

(5) The **legal owner** of an **aggregated facility** must ensure the **aggregated facility** is able to regulate voltage at the **voltage regulation system** or **automatic voltage regulator** point of control under both

Commented [AESO1]: V2 to V3 change. See AESO Written Replies #46 and #2

Commented [AESO2]: V2 to V3 change. See AESO Written Replies #46, #44 and #2

non-disturbance and disturbance conditions.

(6) The **legal owner** of an **aggregated facility** must ensure the **voltage regulating system** for the **aggregated facility** measures voltage that represents the overall voltage response of the **aggregated facility**.

(7) The **legal owner** of an **aggregated facility** must ensure that the **aggregated facility** is designed such that, when the **voltage regulation system** requires the switching of a shunt reactive device, the switching operation is delayed by 10 seconds.

Reactive Current Compensation Setting

3(1) The **legal owner** must, if 2 or more **automatic voltage regulators** or **voltage regulating systems** have:

(a) a common point of measurement; or

(b) separate points of measurement connected by a low impedance bus,

implement reactive current compensation in each **automatic voltage regulator** or **voltage regulating system**.

(2) The **legal owner** must ensure that the **voltage regulating system** of an **aggregated facility** is capable of:

(a) adjustable gain, or reactive droop compensation adjustable from 0% to 10%; and

(b) reactive current compensation.

(3) The **ISO** must specify in the functional specification for the **aggregated facility** whether the reactive current compensation in the **voltage regulating system** or **automatic voltage regulator** must be implemented.

Variance to Reactive Current Compensation

4(1) The **legal owner** must submit a request in writing to the **ISO** for approval to use a reactive current compensation feature in the **automatic voltage regulator** or **voltage regulating system** that has a point of control not listed in subsection 2(1)(e).

(2) The **ISO** must make a decision on its approval and notify the **legal owner** in writing of the decision no later than 90 **days** after the date of receiving the submission set out in subsection 4(1).

ISO Notice to Change Reactive Current Compensation Setting

5(1) The **ISO** must provide a **legal owner** with 180 **days**' written notice that a change to the reactive current compensation settings is required.

(2) The **legal owner** must, upon receiving the notice from the **ISO**:

(a) make a change to the reactive current compensation settings on or before the date specified in the notice; and

(b) provide written confirmation to the **ISO** that the change has been implemented.

(3) The **legal owner** of an **aggregated facility** that is not equipped with reactive current compensation must, notwithstanding subsection 5(2), advise the **ISO** in writing that it is not equipped with such settings on or before the date specified by the **ISO**.

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.4 Voltage Regulation

Revision History

Date	Description
20XX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.5 Voltage Ride-Through

Applicability

1 Section 503.5 applies to:

(a) the **legal owner** of a~~n~~ **generating unit** that:

(i) has:

(A) a **maximum authorized real power** greater than 9.0 MW; or:

(B) is a part of a complex with another **generating unit**, **aggregated facility**, or **energy storage resource** with an aggregate **maximum authorized real power** amount greater than 9.0 MW;

and

(ii) is directly connected to the **transmission system**, or to a **transmission facility** within the service area of the City of Medicine Hat, including a **generating unit** situated within an industrial complex that is directly connected to the **transmission system**;

(b) the **legal owner** of an **aggregated facility** that:

(i) does not contain an **energy storage resource**; and

(ii) is directly connected to the **transmission system**, or to a **transmission facility** within the service area of the City of Medicine Hat, including an **aggregated facility** situated within an industrial complex that is directly connected to the **transmission system**; ~~and~~

and

(c) the **legal owner** of an **energy storage resource**, or **aggregated facility** containing an **energy storage resource**, that:

(i) has a range greater than 5 MW between its **maximum authorized charging power** and **maximum authorized real power**; and

(ii) is directly connected to the **transmission system** or **to transmission facilities** within the City of Medicine Hat, including an **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #48

Requirements

Voltage Ride-Through

2(1) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must, for purposes of determining the voltage ride-through requirements of this Section 503.5, determine the root mean square phase-to-phase voltage value at the high-voltage side of the **transmission system** step-up transformer, to be used as the 1.0 per unit voltage value.

(2) The **legal owner** must ensure that the **generating unit**, **aggregated facility**, or **energy storage resource** is designed to meet the following voltage ride-through requirements:

(a) continuous operation between greater than or equal to 0.90 and less than 1.10 per unit of the voltage value determined under subsection 2(1);

(b) not tripping or going off-line during, or as a result of, a voltage dip or post-transient voltage deviation resulting from a **disturbance** on the **transmission system**, on any phase or combination of phases at or beyond the **point of connection**, in accordance with the applicable timing requirements of Appendix 1; and

(c) the amount of time that the voltage of the **generating unit**, **aggregated facility**, or **energy**

storage resource remains at 0.0 per unit must be at least the **normal clearing** time for a 3-phase fault at the specific location where the **generating unit**, **aggregated facility**, or **energy storage resource** is electrically connected.

(3) A **generating unit**, **aggregated facility**, or **energy storage resource** is not required, notwithstanding any other provision of this Section 503.5, to ride-through a fault that:

(a) causes a forced outage of a radial transmission line connecting the **generating unit**, **aggregated facility**, or **energy storage resource** to the **transmission system**;

(b) occurs on the **generating unit**, **aggregated facility**, or **energy storage resource** side of the **point of connection**, including the low-voltage network and the substation; or

(c) results in the activation of a transfer trip or anti-islanding protection scheme at the **generating unit**, **aggregated facility**, or **energy storage resource** that causes the **generating unit**, **aggregated facility**, or **energy storage resource** to be disconnected from the **transmission system**.

Appendices

Appendix 1 – Voltage Ride-Through Requirements

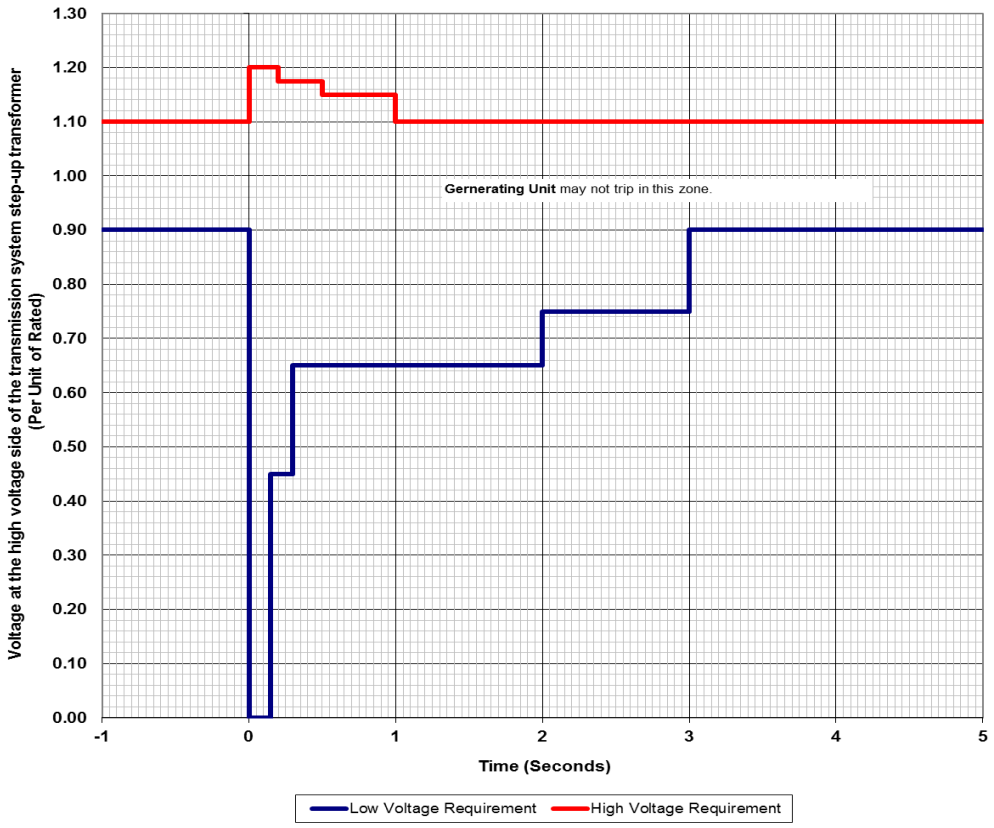
Revision History

Date	Description
20XX-XX-XX	

Appendices

Appendix 1 – Voltage Ride-Through Requirements

High Voltage Ride-Through Duration		Low Voltage Ride-Through Duration	
Voltage (per unit)	**Time**	**Voltage (per unit)**	**Time**
≥ 1.200	Instantaneous trip	< 0.45	4 to 9 cycles
≥ 1.175	0.20 seconds	< 0.65	0.30 seconds
≥ 1.15	0.50 seconds	< 0.75	2.00 seconds
≥ 1.10	1.00 seconds	< 0.90	3.00 seconds
< 1.10	Continuous operation	≥ 0.90	Continuous operation


1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Voltage at the high voltage side of the transmission system step-up transformer (Per Unit of Rated)
Gernerating Unit may not trip in this zone.
-1
0
1
2
3
4
5
Time (Seconds)
Low Voltage Requirement
High Voltage Requirement

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.6 Frequency & Speed Governing

Applicability

1 Section 503.6 applies to:

(a) the **legal owner** and **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**.

Commented [AESO1]: V2 to V3 change. See AESO Written Replies #50, 51 and 52 for all changes to this rule.

Requirements

Frequency and Speed Governing Requirements for Generating Units and Synchronous Energy Storage Resources

2(1) The **legal owner** of a **generating unit** or synchronous **energy storage resource** with **maximum authorized real power** equal to or greater than 10 MW must ensure that the **generating unit** or **energy storage resource** has a continuously acting **governor system** that is designed:

(a) to be continuously in service, free to respond to frequency changes and controlling the response to frequency changes while the **generating unit** or **energy storage resource** is:

(i) electrically connected to the **transmission system**; and

(ii) ~~is~~ producing or consuming, as applicable, any **real power** as measured at the ~~synchronous machine~~ stator winding terminals;

(b) with a droop setting equal to or greater than 3% but less than or equal to 5% based on **maximum authorized real power**;

(c) with a deadband, intentional plus unintentional, not exceeding plus or minus 0.036 Hz; and

(d) with the capability of manual setpoint adjustments within a range of 59.4 Hz and 60.6 Hz.

Frequency and Speed Governing Requirements for Aggregated Facilities ~~and Energy Storage Resources~~

3(1) The **legal owner** of an **aggregated facility** ~~or energy storage resource~~ must ensure the **aggregated facility** ~~or energy storage resource~~ has a continuously acting **governor system** that is designed:

(a) to be continuously in service, free to respond to frequency changes and controlling the response to frequency changes while the **aggregated facility** ~~or energy storage resource~~ is:

(i) connected to the **transmission system** or a **transmission facility** within the service area of the City of Medicine Hat; and

(ii) ~~is~~ producing or consuming any **real power** as measured at the **collector bus**;

(b) with a droop setting equal to or greater than 3% but less than or equal to 5%, where droop setting is based on:

(i) **maximum authorized real power**, for an **aggregated facility** that does not contain an **energy storage resource**; or

(ii) the ~~difference between~~ greater of the **maximum authorized charging power** ~~and~~ or **maximum authorized real power**, for an ~~energy storage resource or~~ **aggregated facility** ~~that contains~~containing an **energy storage resource**.

(c) with a deadband, intentional plus unintentional, not exceeding plus or minus 0.036 Hz;

(d) not to have an intentional time delay added to the control system;

(e) with the capability of manual setpoint adjustments within a range of 59.4 Hz and 60.6 Hz;

(f) to continuously monitor frequency at a sample rate of at least 20 samples per second;

(g) with a resolution of at least 0.004 Hz; and

(h) to operate at a frequency response rate, measured in MW/s, that is less than or equal to 5% of the difference between the **maximum authorized real power** and the **maximum authorized charging power**, as applicable.

(2) The **legal owner** of an **aggregated facility** ~~or **energy storage resource**~~ must ensure that the **governor system** overrides any **real power** limits in effect at the time of the frequency excursion, but only while the frequency remains outside of the deadband.

Ramp Rate Limitations

4~~**(1)**~~ The **legal owner** must install controls that are capable of limiting the **ramp rate**.

Frequency Ride-Through

5(1) The **legal owner** must, subject to subsection 5(2), design a **generating unit**, **aggregated facility**, or **energy storage resource** to not trip for under-frequency and over-frequency deviations for the minimum time frames as set out in Appendix 1.

(2) The **legal owner** must, in the event that subsection 5(1) is not achievable, have binding and firm arrangements to automatically and simultaneously trip off an amount of load in MW on the **interconnected electric system** equal to the anticipated generation loss in MW at comparable frequency levels.

Operation of a Governor System

6 The **operator** must, subject to Section 503.19 of the **ISO rules**, *Operation and Maintenance of Facilities*, operate the **generating unit**, **aggregated facility**, or **energy storage resource** with the **governor system** in service, in droop mode, and free to respond to frequency changes while:

(a) supplying **active power** to the **interconnected electric system**; or

(b) providing an **ancillary service** that requires a response to frequency changes.

Appendices

Appendix 1 - Trip Settings for Off-Nominal Frequency Protective Relays

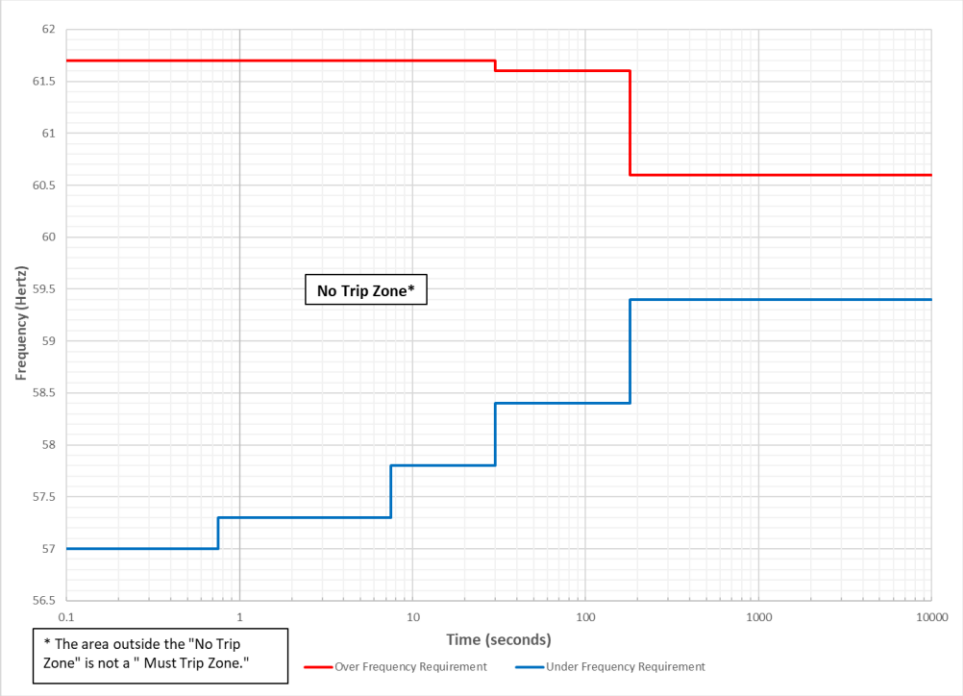
Revision History

Date	Description
20XX-XX-XX	

Appendices

Appendix 1 – Trip Settings for Off-Nominal Frequency Protective Relays

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	**Time (seconds)**	**Frequency (Hz)**	**Time (seconds)**
≥ 61.7	Instantaneous trip	≤57.0	Instantaneous trip
≥61.6	30	≤57.3	0.75
≥60.6	180	≤ 57.8	7.5
<60.6	Continuous operation	≤ 58.4	30
		≤ 59.4	180
		> 59.4	Continuous operation



ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.10 Isolating and Interrupting Devices

Applicability

1 Section 503.10 applies to:

(a) the **legal owner** and **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**;

(b) the **legal owner** of a load facility, where for purposes of this Section 503.10:

(i) "**legal owner**" refers to

(A) the **legal owner** of an **electric distribution system**; or

(B) a **person** who has entered into an arrangement directly with the **ISO** for the provision of **system access service** under subsection 101(2) of the **Act**;

and

(ii) "load facility" refers to a facility connecting industrial load or distribution load to the transmission system;

(c) the **legal owner** of a **transmission facility** to which a **generating unit**, **aggregated facility**, **energy storage resource**, or load facility is connected ~~to~~;

and

(d) the **ISO**.

Fault Interrupting Devices

2(1) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must design the **generating unit**, **aggregated facility**, or **energy storage resource** fault interrupting devices to:

(a) account for the fault contributions from both the **transmission facilities** and **generating unit**, **aggregated facility**, or **energy storage resource**; and

(b) have fault interrupting and momentary withstand ratings that are adequate to meet the maximum expected fault levels, with a margin for future anticipated fault levels as the **ISO** approves in the functional specification for the **generating unit**, **aggregated facility**, or **energy storage resource**.

(2) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected to must ensure that there is at least one fault interrupting device that will electrically disconnect the load facility from the **transmission system** ~~at~~ near the **point of connection**.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #60

(3) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected to must ensure the fault interrupting device required by subsection 2(2) is designed and operated to account for the present and ultimate fault current contributions from both the load facility and the **transmission system**.

(4) The **legal owner** of:

(a) a **generating unit**, **aggregated facility**, **energy storage resource**, or load facility; and

(b) the **transmission facility** to which the **generating unit**, **aggregated facility**, **energy storage resource**, or load facility is connected to,

must not use high voltage fuses at 60 kV or higher.

Disconnection

3(1) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must have systems, controls, and related procedures to electrically disconnect the **generating unit**, **aggregated facility**, or **energy storage resource** at either one or both of:

(a) the **point of connection**; and

(b) the **collector bus** feeder breakers;

as documented in the functional specification, after consultation between the **legal owner** of the **generating unit**, **aggregated facility**, or **energy storage resource** and the **legal owner** of the applicable **transmission facility**.

(2) A **generating unit**, **aggregated facility**, or **energy storage resource** connecting to a **transmission facility** must provide the functionality and remote control capabilities to enable the **operator** of the **transmission facility** to open or trip any connecting circuit breaker either at the **point of connection** or any **collector bus** feeder breakers, as applicable.

Isolation Devices

4(1) The **legal owner** of:

(a) a **generating unit**, **aggregated facility**, **energy storage resource**, or load facility; and

(b) the **transmission facility** to which the **generating unit**, **aggregated facility**, **energy storage resource**, or load facility is connected,

must ensure that the **generating unit**, **aggregated facility**, **energy storage resource** or load facility has a minimum of one isolation device with manual operating capability at all points of isolation**.**

(2) The **legal owners** must, unless otherwise specified in the functional specification, ensure that the isolation devices referenced in subsection 4(1):

(a) permit visual verification of electrical isolation and must be capable of being locked open with 2 or more locks;

(b) are under the control of a single control authority as confirmed by a joint operating agreement between the **legal owner** of the **generating unit**, **aggregated facility**, **energy storage resource**, or load facility, and the **legal owner** of the **transmission facility**; and

(c) permit the installation of temporary safety grounding so that either side of the isolation device can be safely maintained when the other side is energized.

Notification to Reconnect

5 The **operator** of the **aggregated facility** must not, once a connecting breaker of the **aggregated facility** has been opened or tripped, electrically reconnect to the **transmission facility** unless it has received approval from the **ISO**.

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.10 Isolating and Interrupting Devices

Revision History

Date	Description
XXXX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.12 Grounding and Surge Protection

Applicability

1 Section 503.12 applies to:

(a) the **legal owner** and **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**;

(b) the **legal owner** of a load facility, where for purposes of this Section 503.12:

(i) "**legal owner**" refers to:

(A) the **legal owner** of an **electric distribution system**;

(B) a **person** who has entered into an arrangement directly with the **ISO** for the provision of **system access service** under subsection 101(2) of the **Act**;

and

(ii) "load facility" refers to a facility connecting industrial load or distribution load to the **transmission system**;

and

(c) the **legal owner** of a **transmission facility**.

Requirements

Grounding

2(1) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must design the **generating unit**, **aggregated facility**, or **energy storage resource** to operate within a **transmission system** that operates as an effectively grounded system.

(2) The **legal owner** of a load facility, or the **legal owner** of a **transmission facility** to which the load facility is connected to, must design the load facility and the **transmission facility** to operate within a **transmission system** that operates as an effectively grounded system.

Lightning and Other Surge Protection

3(1) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must equip any associated substation equipment with surge protection that operates under the following conditions:

(a) lightning, including the average ground flash density level, for the **generating unit**, **aggregated facility**, or **energy storage resource** location;

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #64

(b) switching surges;

(c) neutral shifts;

(d) **electrical islands**; and

(e) temporary over-voltages.

(2) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must coordinate insulation levels with the **legal owner** of the **transmission facility** to which the **generating**

unit, **aggregated facility**, or **energy storage resource** is connected, taking into account the surge protection referred to in 3(1).

(3) The **legal owner** of a load facility must coordinate insulation levels with the **legal owner** of the **transmission facility** to which the load facility is connected to, taking into account the average lightning ground-flash density level for the site location of the load facility and compatibility with the connecting **transmission facility**.

Revision History

Date	Description
20XX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.13 Synchrophasor Measurement System

Applicability

1 Section 503.13 applies to:

~~(a) the **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**; and~~

(a) the **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource**:

(i) that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**; and

(ii) implementing a synchrophasor measurement;

(b) the **legal owner** of a **transmission facility** implementing a synchrophasor measurement unit;

and

(c) the **ISO**.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #67.

Requirements

Verification

2 The **legal owner** must verify to the **ISO** that the facility meets the requirements of this Section 503.13 during **commissioning** and energization of the new facility.

Synchrophasor Measurement Locations

3(1) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must equip the **generating unit**, **aggregated facility**, or **energy storage resource** with a synchrophasor measurement system.

~~**(2)** The **legal owner** must design the synchrophasor measurement system referenced in subsection 3(1) to record at the following locations:~~

~~(a) at the stator winding terminal of the **generating unit**, or synchronous **energy storage resource** for all 3 phase-to-ground voltages and all 3 phase currents; and~~

~~(b) at the low side of the **transmission system** step-up transformer of the **aggregated facility** or **energy storage resource** for all 3 phase-to-ground voltages and all 3 phase currents; and~~

~~(c) at the high side of the **transmission system** step-up transformer of the **generating unit**, **aggregated facility**, or **energy storage resource** for all 3 phase-to-ground voltages and all 3 phase currents.~~

(2) The **legal owner** of a **generating unit** or synchronous **energy storage resource** must design the synchrophasor measurement system referenced in subsection 3(1) to record at the following locations:

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #65.

(a) at the stator winding terminal of the **generating unit** or synchronous **energy storage resource** for all 3 phase-to-ground voltages and all 3 phase currents; and

(b) at the high side of the **transmission system** step-up transformer of the **generating unit** or synchronous **energy storage resource** for all 3 phase-to-ground voltages and all 3 phase currents.

(3) The **legal owner** of an **aggregated facility** must design the synchrophasor measurement system referenced in subsection 3(1) to record at the following locations:

(a) at the low side of the **transmission system** step-up transformer of the **aggregated facility** all 3 phase-to-ground voltages and all 3 phase currents; and

(b) at the high side of the **transmission system** step-up transformer of the **aggregated facility**, for all 3 phase-to-ground voltages and all 3 phase currents.

(43) Each applicable **legal owner** must, if a **generating unit** or **aggregated facility** has a common **point of connection** with an **energy storage resource**, ensure that the synchrophasor measurement system has dedicated voltage and current channels for the feeder to the **energy storage resource** at the low side of the **transmission system** step-up transformer; and

(54) Each applicable **legal owner** may, if the **generating unit** or **aggregated facility** has a common **point of connection** with an **energy storage resource**, use ~~a~~ common voltage and current channels at the high side of the **transmission system** step-up transformer for the synchrophasor measurement system.

Synchrophasor Measurement Unit Functionality

4 The **legal owner** must meet the functionality requirements, data requirements, data format requirements and communication requirements set out in the Institute of Electrical and Electronics Engineers *C37.118.1a–2014 – IEEE Standard for Synchrophasor Measurements for Power Systems* and *IEEE Standard ~~C37.118.2-2011~~ C37.118.2-2011 – IEEE Standard for Synchrophasors Data Transfer for Power Systems* specific to a synchrophasor measurement unit.

Synchrophasor Measurement Unit Signal Names

5 The **ISO** must provide a **legal owner** with the Institute of Electrical and Electronics Engineers *C37.118.2-2011 – IEEE Standard for Synchrophasors Data Transfer for Power Systems* compliant synchrophasor measurement unit signal names and the appropriate data format, including the company identifier, device identifier and the necessary formatting.

Data Storage and Streaming

6(1) The **legal owner** must collect and continuously store the synchrophasor measurement unit data for 1 year from the date the synchrophasor measurement unit data was collected, unless the data is being streamed to the **ISO** pursuant to subsection 6(2).

(2) The **legal owner** must, as determined by the **ISO**, stream the data to the **ISO**.

(3) The **legal owner** may, within 1 year of streaming the data to the **ISO**, obtain the data from the **ISO** upon written request.

(4) The **ISO** must, if it receives a request as set out in subsection 6(3), provide the data to the **legal owner** within 10 **business days**.

(5) The **ISO** must store any data streamed pursuant to subsection 6(2) for one year.

Suspected Failure or Malfunction of a Synchrophasor Measurement Unit

7(1) A **legal owner** must, if it identifies or suspects a failure or malfunction of a synchrophasor measurement unit or any of its components, notify the **ISO** as soon as practicable but not later than one **business day** after identifying the suspected malfunction or failure.

(2) The **ISO** must, if it identifies or suspects a failure or malfunction of a synchrophasor measurement unit or any of its components, notify the applicable **legal owner** as soon as practicable, but not later than one **business day**, after identifying the suspected failure.

(3) The applicable **legal owner** must provide the **ISO** with the date it expects to investigate the suspected failure or malfunction of the synchrophasor measurement unit or any of its components which, in the case of an investigation in response to a notification under subsection 7(2), must be within 2 **business days** of receiving the **ISO**'s notification.

(4) The **legal owner** must, if it is unable to test the synchrophasor measurement unit or any of its components on the expected date provided under subsection 7(3), provide the **ISO** with the revised date.

(5) The **legal owner** must, after testing the synchrophasor measurement unit or any of its components, confirm if there is a failure or malfunction with the synchrophasor measurement unit or not and notify the **ISO** with the results of the test.

(6) The **legal owner** must, if the results of the test indicated that the synchrophasor measurement unit or any of its components have failed, provide the **ISO** with the date that the **legal owner** expects to repair or replace the synchrophasor measurement unit.

(7) The **legal owner** must, if the synchrophasor measurement unit or any of its components are not repaired or replaced by the date provided under subsection 7(6), provide the **ISO** with a revised date.

(8) The **legal owner** must notify the **ISO** when the synchrophasor measurement unit or any of its components have been repaired or replaced.

As-Built Drawing

8 A **legal owner** must provide the **ISO** with an as-built engineering stamped 3 line drawing or a record representing the as-built installation, indicating:

(a) the voltage transformer and current transformer connections through to the synchrophasor measurement unit; and

(b) the voltage transformer and current transformer accuracy class.

Revision History

Date	Description
XXXX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.15 Interconnected Electric System Protection

Applicability

1 Section 503.15 applies to:

(a) the **legal owner** of a **generating unit** directly connected to the **transmission system**, with a **maximum authorized real power** rating greater than or equal to ~~greater than~~ 18 MW;

(b) the **legal owner** of an **aggregated facility** directly connected to the **transmission system**, with a **maximum authorized real power** rating greater than or equal to ~~greater than~~ 67.5 MW;

(c) the **legal owner** of an **energy storage resource** directly connected to the **transmission system**, with a **maximum authorized real power** rating greater than or equal to ~~greater than~~ 18 MW;

(e) the **legal owner** of a **transmission facility** with a rated voltage greater than or equal to ~~equal to or greater than~~ 100 kV; and

(f) the **ISO**.

Protection System General Requirements

Basic Requirements

2 The **legal owner** must design, engineer and construct all **protection systems** to:

(a) successfully detect all phase-to-ground with ground impedance less than 5 ohms, phase-to-phase-to-ground with ground impedance less than 5 ohms, phase-to-phase, and 3 phase faults on the protected equipment within the zone of protection;

(b) initiate isolation of the faulted equipment from all sources;

(c) coordinate with any adjacent **protection systems** and remain stable for faults external to the zone of protection; and

(d) ensure cascade tripping does not occur.

Requirement for 2 Protection Systems

3(1) Except as otherwise specified in this Section 503.15, all facilities of the applicable entities listed in subsection 1 must be equipped with no less than 2 independently operating **protection systems**.

(2) Each of the 2 **protection systems** must:

(a) meet the operate time requirements set out in subsection 4;

(b) include~~,~~ an independent secondary potential transformer winding, independent current transformer core, independent communication channel, independent interconnecting cables, independently protected direct current power supply and independent trip circuit, including breaker trip coil; and

(c) operate independently of and without interference from the other **protection system**.

(3) The relay for one of the **protection systems** must be from a different manufacturer than the relay for the other **protection system**, or must operate on a different protection principle from the other **protection system**.

Protection Relay Operate Times

4(1) For bus protection relays, the primary protection relay operate times for phase-to-phase or 3 phase bus faults must be:

(a) specified to not exceed; or

(b) tested to confirm they do not exceed,

the maximum operate times, expressed in cycles, in the following Table 1:

Table 1

Bus Protection Maximum Operate Times

Voltage	Operate Time
500 kV	1.50 cycles
240 kV	1.50 cycles
138 kV	2.00 cycles

(2) For line distance relays, the primary protection relay operate times for phase-to-phase or 3 phase faults for near end faults on **bulk transmission lines** with 2 terminals and 2 sources that are long enough to have an effective zone 1 distance protection must be:

(a) specified to not exceed; or

(b) tested to confirm they do not exceed,

the maximum operate times, expressed in cycles, in the following Table 2:

Table 2

Line Distance Protection

Voltage	Operate Time
500 kV	1.00 cycles
240 kV	1.00 cycles
138 kV	2.00 cycles

(3) For line differential relays, the primary protection relay operate times for phase-to-phase or 3 phase faults on **bulk transmission lines** with ~~two~~ 2 terminals and ~~two~~ 2 sources must be:

(a) specified to not exceed; or

(b) tested to confirm they do not exceed,

the maximum operate times, expressed in cycles, in the following Table 3:

Table 3

Line Differential Protection

Voltage	Operate Time
500 kV	2.00 cycles
240 kV	2.00 cycles
138 kV	2.00 cycles

(4) The primary protection relay operate times for phase-to-phase or 3 phase faults:

(a) within the zone of protection of equipment, including transformers, capacitor banks, reactors, and static VAR compensators; and

(b) close to the equipment's high voltage bushings that are connected to the **interconnected electric system**;

must be:

(c) specified to not exceed; or

(d) tested to confirm they do not exceed,

the maximum operate times, expressed in cycles, in the following Table 4:

Table 4

Equipment Protection

Voltage	Operate Time
500 kV	1.50 cycles
240 kV	1.50 cycles
138 kV	2.00 cycles

Instrument Transformers

5(1) The **legal owner** must ensure the facility uses protection class voltage and current transformers.

(2) Each **protection system** must have separate current cores and utilize separate secondary voltage transformer windings.

Voltage Transformers

6(1) Voltage transformers for a facility must be wire wound, capacitive or optical voltage transformers, and any other form of transformer is prohibited.

(2) For 240 kV or higher voltage facilities, **protection system** devices that require voltage transformer inputs to provide protection functions must be connected to voltage transformers that are directly connected to the protected **system element**.

(3) For 144 kV or lower voltage facilities that utilize simple bus design, the use of common bus voltage transformers is acceptable.

Fuse Failure Alarm for Voltage Transformers

7 A voltage transformer used for protective purposes, including synchronism checking, must have a loss of potential alarm.

Current Transformers

8(1) A current transformer used in a **protection system** must be either magnetic or optical, and must not be the limiting element in the **transmission facility's** rating.

(2) The maximum available current transformer ratio must be sized for the ultimate fault level of the facility as set out in the functional specification.

(3) A current transformer used in a **protection system** must meet the 2.5 L low internal secondary impedance accuracy requirement as set out in *CAN/CSA-C60044-1:07, Instrument transformer – Part 1: Current transformers, Table 1B*, or an equivalent accuracy requirement at its maximum possible ratio, regardless of the ratio actually being utilized.

Protection System Power Supply

9(1) The direct current supply for each of the 2 **protection systems** for a facility must be protected such that a direct current fault within one of the **protection systems** is isolated and will not affect the operation of the other **protection system**.

(2) A **protection system** must be such that it may be isolated from its direct current supply without affecting the operation of any other **protection system**.

Event Capture

10(1) For each zone of protection, there must be a **protection system** with no less than one relay or digital style fault event recorder to capture wave form event records.

(2) Faults within the zone of protection must trigger an event capture.

(3) The event recorder must be able to time stamp an event to an accuracy level within 1.0 milliseconds of Universal Time Constant.

(4) All event records must be retrievable within 24 hours of request.

Bulk Transmission Line

Ground Fault Resistance Coverage

11 If a **bulk transmission line** experiences a fault of the following type, then each of the 2 **protection systems** for the **bulk transmission line** must initiate isolation of the fault:

(a) single line-to-ground, with a minimum impedance of 5 ohms; or

(b) phase-to-phase-to-ground with a minimum impedance of 5 ohms.

Auto-Reclosing

12(1) The **ISO** must, for 240 kV or higher voltage **bulk transmission lines**, specify the type of auto-

reclosing in the functional specification.

(2) When single pole trip and reclose is specified in the functional specification for a 240 kV or higher voltage **bulk transmission line**, the following must be met:

(a) auto-reclose single pole upon a single phase fault and not reclose for any multiphase fault, unless 3 pole auto-reclosing operation or no reclosing is specifically requested in the functional specification;

(b) not allow for more than one attempt at each end of the **bulk transmission line** to auto-reclose the **bulk transmission line**; and

(c) have adequate dead time to ensure the secondary arc is extinguished.

(3) A 144 kV or lower voltage **bulk transmission line** must:

(a) trip and auto-reclose 3 pole once for all fault types unless no reclosing is specified in the project functional specification and

(b) have adequate dead time to ensure any secondary arc is extinguished

Auto–Reclosing Prohibition

13(1) If a **bulk transmission line** is a dedicated single line connecting from any **generating unit**, **aggregated facility**, or **energy storage resource** to the **interconnected electric system**, then the installation of auto-reclosing equipment is prohibited, unless specifically provided for in the functional specification.

(2) Auto-reclosing on cables is not permitted.

Switch onto Fault

14 Instantaneous tripping must occur for the entire length of the **bulk transmission line** if upon an auto-reclose the fault re-establishes.

Synchronism Check Relaying

15 For all 240 kV and higher voltage **bulk transmission line** breakers, a synchronism check relay must be used for all 3 pole closing but those breakers that switch only a load transformer, a capacitor, or a reactor, and have no power source of their own, do not require a synchronism check relay.

Distance or Impedance Protection Systems

16 A **protection system** for a **bulk transmission line** utilizing distance or impedance protection as a primary manner of protecting a 2 terminal, 2 source **bulk transmission line** must have:

(a) no instantaneous distance element, such as zone 1, reach past the remote bus; and

(b) at least 1 distance element, such as zone 2, overreach the remote bus.

Differential Protection Systems

17(1) On **bulk transmission lines**, the use of differential protection is acceptable.

(2) Upon communication failure:

(a) the **protection system** must still be capable of fault detection and tripping; and

(b) protection relay operate times slower than those specified in subsection 4(3) are acceptable.

Stub Protection

18 Any stubs created by opening line motorized disconnects must be protected by 2 **protection systems**.

Protection System Communications

19 Each communication system utilized in a **protection system** must be designed to have an overall availability of not less than 99.99% unless specified otherwise in the functional specification.

3 Terminal Lines

20(1) For a new 3 terminal **bulk transmission line**, regardless of source or load locations, communications between all 3 terminals is required.

(2) Notwithstanding subsections 2(c) and 20(1), if a protection study is undertaken identifying the level of mis-coordination and associated risks, the **ISO** may choose to grant an exemption in the functional specification.

(3) Clearing times for faults on the 3 terminal line must comply with the requirements the **ISO** specifies in the functional specification for the facility.

Bulk Transmission Line Connected Reactors

21(1) The line reactor for a 240 kV or higher voltage **bulk transmission line** must be equipped with 2 **protection systems**.

(2) The reactor **protection systems** must be in compliance with the following requirements:

(a) a phase reactor must be equipped with 2 differential **protection systems**;

(b) a phase reactor must be equipped with a phase and residual over-current **protection system**, which may be included in 1 of the differential **protection systems**;

(c) an oil-filled reactor must have non-electrical **protection systems** with the same requirement as an oil-filled transformer; and

(d) a neutral reactor must be either included in an overall zero sequence differential zone or equipped with a single phase differential **protection system** and must also be equipped with a second differential protection or over-current protection as backup.

Switch Onto Fault Protection – Manual Close

22(1) A **bulk transmission line** terminal must be equipped with switch onto fault protection as identified in subsection 14 for **operator**-initiated breaker close.

(2) For a manual switch onto fault event, auto-reclose must be blocked.

Positive, Negative, Zero, and Mutual Impedances

23 For the protection of a **bulk transmission line**, the **protection system** equipment and settings must take into account the zero sequence mutual coupling during fault conditions, and the under-reach or over-reach of the distance element must be either mitigated or the zone reaches adjusted accordingly.

500 kV Protection System Setting Verification

24 A 500 kV line **protection system** utilizing distance or impedance protection as its primary protection must have settings verified utilizing real-time digital simulation.

Substations

Transformers

25(1) All transformers with a base rating less than 25 MVA must have:

(a) one independent overcurrent **protection system** installed on the high voltage side;

(b) one independent differential **protection system**;

(c) an oil level alarm;

(d) a minimum of gas accumulation alarming and gas surge protection tripping; and

(e) 2 levels for thermal alarm and the time between the first alarm and the second alarm must allow time to take action to unload the transformer.

(2) A transformer with a base rating of 25 MVA or larger must have:

(a) one overcurrent **protection system** which may be combined with a differential protection **system**;

(b) 2 independent differential **protection systems**;

(c) an oil level alarm;

(d) a minimum of gas accumulation alarming and gas surge protection tripping; and

(e) 2 levels for thermal alarm and the time between the first alarm and the second alarm must allow time to take action to unload the transformer.

(3) All transformers with tertiary windings that are used for loads, such as station service, must have the tertiary windings included in the transformer differential protection zone.

240 kV and Higher Voltage Substation Bus Protection

26(1) All 240 kV and higher voltage substation buses must have 2 bus **protection systems**.

(2) All 240 kV and higher voltage substation bus **protection systems** must trip all associated breakers to isolate the fault.

144 kV and Lower Voltage Substation Bus Protection

27(1) All 144 kV and lower voltage substation buses must have 2 bus **protection systems.**

(2) If protection studies show that the remote line **protection systems** can clear a bus fault in 0.6 seconds, then the remote line **protection systems** can be considered to be one of the 2 **protection systems** required in subsection 27(1).

(3) All 144 kV and lower voltage substation bus **protection systems** must trip all associated breakers to isolate the fault.

Ring Bus Protection

28 Notwithstanding subsections 26 and 27, ring bus configured substations that have 2 overlapping

protection systems that are capable of stub protection as identified in subsection 18 do not require additional bus protection.

Substation Shunt Capacitor Banks

29(1) Auto-restoration of a faulted capacitor bank is prohibited.

(2) 2 over-current **protection systems** must be applied to shunt capacitor banks to detect major faults such as a phase-to-phase fault or phase-to-ground fault.

(3) For wye or wye-wye shunt capacitor banks, at least one **protection system** must be applied which provides both an alarm and a trip level to detect capacitor bank unit or capacitor bank element failure.

Substation Shunt Reactor Banks

30 The **protection systems** for shunt reactor banks must comply with the following:

(a) 144 kV and lower voltage reactors must be equipped with a minimum of 1 independent phase differential and one independent over-current **protection systems**;

(b) 240 kV and higher voltage reactors must be equipped with 2 differential **protection systems** and overcurrent protection which may be included in one of the differential **protection systems**; and

(c) an oil filled reactor, in addition, must have a minimum of gas accumulation alarming and gas surge protection tripping.

Breaker Failure Protection

31(1) All breakers must have a minimum of one breaker failure **protection system** and all protection trips excluding **remedial action scheme** trips must initiate a current or contact supervised breaker failure **protection system**.

(2) The **ISO** must identify the need for **remedial action schemes** to initiate breaker fail in the functional specifications on a project basis.

(3) For 240 kV and higher voltage breakers, the breaker failure **protection system** must utilize direct tripping of all remote breakers utilizing communications.

(4) For 144 kV and lower voltage breakers, a breaker failure **protection system** must be installed which trips all:

(a) local breakers; and

(b) remote breakers:

(i) by a communication system which, notwithstanding subsection 19, must be designed to have an availability of at least 99.5%; or

(ii) within a definite time period the **legal owner** of a **generating unit**, **aggregated facility**, **energy storage resource**, or **transmission facility**, as applicable, defines, and without thermally damaging additional facilities beyond the faulted facility.

(5) The maximum time delay for breaker fail operate time measured from the primary **protection system**'s trip output contact closing to the last local breaker receiving the open signal for solid single line-to-ground or 3 phase faults that generate high fault currents must not be longer than:

(a) 6 cycles, being 0.100 seconds, for 500 kV breakers;

(b) 7 cycles, being 0.117 seconds, for 240 kV breakers; and

(c) 12 cycles, being 0.200 seconds, for 138 kV and 144 kV breakers.

(6) For applications where free standing current transformers are used with live-tank breakers it is acceptable to have a breaker fail operation for faults located between the breaker and the current transformer.

Substation Transformer Ended Lines

32 For 144 kV and lower voltage transformer ended **transmission lines** without a breaker, the substation must be equipped with 2 independent direct transfer trip communication channels to trip any remote end breakers.

Generating Unit, Aggregated Facility, and Energy Storage Resource Protection

Inadvertent Energization

33 No facility may be designed, engineered or constructed such that there may be inadvertent energization of any **generating unit**, **aggregated facility**, or **energy storage resource**, including through the station service bus.

Protection from Interconnected Electric System Faults

34 ~~Each~~ The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** must each ensure that their facilities have appropriate **protection systems** to protect the facilities from the effects of faults on the **interconnected electric system**.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #70

Tripping

35(1) If a **generating unit**, **aggregated facility**, or **energy storage resource** fault occurs, the **protection system** at a minimum must isolate the fault from the **interconnected electric system** by opening the appropriate breakers and initiating breaker failure protection.

(2) If it is possible to energize or back-feed the **generating unit**, **aggregated facility**, or **energy storage resource** through the station service, then the **protection system** must also trip the low voltage station service breakers, including those with high-speed bus transfer schemes.

Auto-Reclosing

36 Auto-reclosing of generator breakers after a **generating unit**, **aggregated facility**, or **energy storage resource** fault is prohibited.

Synchronizing

37 A synchronous **generating unit**, **aggregated facility** or **energy storage resource** must be equipped with full synchronizing equipment, capable of assuming full control of the **governor system** and **automatic voltage regulator** during the synchronizing process.

60 Hz Synchronous Generating Units and Energy Storage Resources (other than Aggregated Facilities) Electrical Protection

38 A 60 Hz synchronous **generating unit** or **energy storage resource**, excluding any **aggregated facility**, must meet the following protection requirements:

(a) 2 **generating unit** differential **protection systems**;

(b) 2 **generating unit** and facility step up transformers **protection systems**;

(c) 2 high voltage bus **protection systems**; and

(d) **generating unit** excitation transformers must have 2 **protection systems**.

Out of Step Condition

39 For any 60 Hz synchronous **generating unit** or **energy storage resource**, excluding an **aggregated facility**, impedance protection at the **generating unit** or **energy storage resource** step-up transformer terminals must be applied to mitigate any out-of-step condition when an electric energy swing traverses the **generating unit**, **energy storage resource**, **generating unit** step-up transformer, or **energy storage resource** step-up transformer.

Aggregated Facilities and Energy Storage Resources (Excluding 60 Hz Synchronous Energy Storage Resources)

40 An **aggregated facility** or **energy storage resource**, excluding any 60 Hz synchronous **energy storage resources**, must meet the following protection requirements:

(a) 2 **aggregated facility** step-up transformer **protection systems**; and

(b) 2 high voltage bus **protection systems**.

Reverse Electric Energy Condition

41 Two **protection systems** must be capable of detecting reverse power flowing into the **generating unit** and the **generating unit** must be removed from service if either of the **protection systems** detects reverse power flow.

Revision History

Date	Description
20xx-xx-xx	
2019-12-11	Removed duplication with new Section 103.14, Waivers and Variances; standardized functional specifications language; capitalized references to “Section”.
2018-09-01	Revised references to “wind aggregated generating facilities” to “aggregated generating facilities”; revised applicability section; and administrative revisions.
2016-08-30	Inclusion of the defined term **system element**.
2015-03-27	Replaced “effective date” with the initial release date in sections 2, 3 and 5; and replaced the word “Effective” in the Revision History to “Date”.
2012-12-31	Initial release

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.16 SCADA

Applicability

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #71, for all changes in this rule

1~~(1)~~ Section 503.16 applies to:

(a) the **legal owner** of a **generating unit** or **energy storage resource** that has a **gross real power** capability greater than or equal to 5 MW and is:

(i) connected to the **interconnected electric system** or an electric system in the **service area** of the City of Medicine Hat, including by way of connection to an **electric distribution system**;

(ii) part of an industrial complex connected to the **transmission system**; or

(iii) providing, or part of a facility providing, **ancillary services**;

(b) the **legal owner** of an **aggregated facility** that has a **gross real power** capability greater than or equal to 5 MW and is:

(i) connected to the **interconnected electric system** or an electric system in the **service area** of the City of Medicine Hat, including by way of connection to an **electric distribution system**;

(ii) part of an industrial complex connected to the **transmission system**; or

(iii) providing, or part of a facility providing, **ancillary services**;

(c) the **legal owner** of a **transmission facility** connected to the **transmission system** or **transmission facilities** in the service area of the City of Medicine Hat;

(d) the **legal owner** of a load facility, where for the purposes of this Section 503.16, "load facility" means a facility that is:

(i) connected to the **transmission system**;

(ii) connected to **transmission facilities** in the service area of the City of Medicine Hat;

(iii) part of an industrial complex connected to the **transmission system**; or

(iv) providing **ancillary services**;

and

(e) the **ISO**.

Requirements

Supervisory Control and Data Acquisition Data

2(1) The **legal owner** of a synchronous **generating unit** must ~~provide~~ meet the supervisory control and data acquisition data requirements set out in Appendix 1.

(2) The **legal owner** of an **aggregated facility** containing a wind or solar resource must meet the supervisory control and data acquisition data requirements set out in Appendix 2.

(3) The **legal owner** of a **generating unit** or **energy storage resource** that is part of an industrial complex and the **legal owner** of a load facility must meet the supervisory control and data acquisition data requirements set out in Appendix 3.

(4) The **legal owner** of a **transmission facility** must meet the supervisory control and data acquisition data requirements set out in Appendix 4, if at least one of the following criteria is met:

(a) the substation contains 2 or more buses operated at nominal voltage greater than 60 kV;

(b) the substation contains one or more buses operated at a nominal voltage greater than 200 kV;

(c) the substation contains a capacitor bank, reactor, static VAr compensator or synchronous condenser rated greater than or equal to 5 MVAr;

(d) the substation connects 3 or more transmission lines operated at a nominal voltage greater than 60 kV;

(e) the substation supplies local site load~~, with~~ having normally energized site load equipment rated ~~greater than or equal to 5~~ at 5 MVA or more that are offered for **ancillary services** or are included in **remedial action schemes**;

(f) the substation supplies local site load with normally energized ~~site load~~ equipment rated ~~greater than or equal to~~at 10 MVA or more;

(g) the substation supplies **supplemental reserve** load greater than or equal to 5 MVA; or

(h) the substation supplies **system load** that is part of a **remedial action scheme**.

(5) The **legal owner** of a **generating unit**, **energy storage resource**, **aggregated facility**, or load facility must, if the facility provides **ancillary services**, meet the supervisory control and data acquisition data requirements for **ancillary services** set out in Appendix 5.

(6) The **ISO** must meet the supervisory control and data acquisition data requirements set out in Appendix 2 and Appendix 5.

(7) The **legal owner** of an **energy storage resource**, or an **aggregated facility** containing an **energy storage resource**, must meet the supervisory control and data acquisition data requirements set out in Appendix 6.

Separate Meters

3 The **legal owner** must gather supervisory control and data acquisition data using a device that is independent from a **revenue meter**.

Supervisory Control and Data Acquisition Data General Requirements

4(1) The **ISO** must initiate all supervisory control and data acquisition communications with a **legal owner**'s equipment directly connected to the **ISO**'s equipment to acquire supervisory control and data acquisition data from a **legal owner**.

(2) The **ISO** must configure the **ISO**'s communications device to be the "master" device.

(3) The **legal owner** must configure its communication device to be the "subordinate" device using the ~~appropriate~~ addressing the **ISO** assigns.

(4) The **legal owner** must configure the supervisory control and data acquisition data so that each ~~data~~ datum falls within the allowable deadbands for the measurement types specified in Table 1 when using report-by-exception polls with the **ISO**.

Table 1
Allowable Deadband Requirement by Measurement Type

Measurement Type	Equipment Normal Rating Range	Allowable Deadband
Real power	0 to 200 MW	0.5 MW
	Greater than 200 MW	1.0 MW
Reactive power	0 to 200 MVAr	0.5 MVAr
	Greater than 200 MVAr	1.0 MVAr
Voltage	0 to 20 kV	0.1 kV
	Greater than 20 kV	0.5 kV

(5) A **legal owner** must, if it is providing analog values to the **ISO**, provide those values with the following minimum accuracy and resolution as specified in Table 2.

Table 2
Accuracy and Resolution Requirements by Measurement Type

Measurement Type	Units	Accuracy	Resolution
All facilities			
All analog measurements not otherwise specified below		~~+/-~~±2% of full scale	0.1
Frequency (between 55 Hz and 65 Hz only)	Hz	~~+/-~~± 0.012 Hz	0.001 Hz
Transformer tap position	Position	Integer Value	1
Renewable **aggregated facilities**			
Ambient temperature (for solar facilities)	°C	~~+/-~~±1 °C	1°C
Barometric pressure	hPa	6 hPa	1 hPa
Global horizontal irradiance (for solar facilities)	W/m^2	~~+/-~~±25 W/m^2	1 W/m^2
Potential **real power** capability	MW	~~+/-~~±10% of full scale	0.1
Wind direction from true north	Degrees	~~+/-~~±5°	1°
Regulating reserve			
Regulating reserve measurements	MW	0.25% of Full Scale	0.25% of measurement

(6) The **legal owner** must ensure that the transducer is scaled such that the maximum, full scale, Table 2 values returned are between 120% and 200% of the **normal rating** of the equipment.

(7) The **legal owner** of a **generating unit** that uses a mode of operation of either a synchronous condenser or motor, must ensure that the minimum, full scale, Table 2 values are between 120% and 200% of the lowest operating condition.

(8) The **legal owner** must report supervisory control and data acquisition data relating to power flows with the sign convention of positive power flow being out from a bus, except in situations where source measurements are positive polarity.

(9) The **legal owner** must, notwithstanding subsection 4(8), report:

(a) **real power** and **reactive power** measurements from a **collector bus** as positive polarity;

(b) **reactive power** measurements from a capacitor as positive polarity; and.

(c) **reactive power** measurements from a reactor as negative polarity.

(10) The **legal owner** must, if installing a global positioning system clock as required in a functional specification, use the coordinated universal time as the base time where the base time is the universal time code minus 7 hours.

(11) The **legal owner** must ensure that its global positioning system clock functionality provides for a time stamped event accuracy of 1 millisecond and ~~can~~ automatically adjust<u>s</u> for seasonal changes to daylight saving~~s~~ time.

Supervisory Control and Data Acquisition Communications

5(1) A **legal owner** must implement the communication methods for supervisory control and data acquisition data between its facility and the **ISO** in accordance with Table 3.

Table 3
Communication Requirements by Maximum Authorized Real Power for Generating Units, Aggregated Facilities, Energy Storage Resources, and Load Facilities

Maximum Authorized Real Power	Communication Method Options	Data Latency	Data Availability	Mean Time to Repair
less than 50 MW	Internet or Dedicated	30 seconds	98.0%	48 hours
greater than or equal to 50 MW, and less than 300 MW	Dedicated	15 seconds	98.0%	48 hours
greater than or equal to 300 MW	Dedicated	4 seconds	99.8%	48 hours

(2) The **legal owner** providing **ancillary services** must implement the communication methods for supervisory control and data acquisition data between its facility and the **ISO** in accordance with Table 4 or Table 3 as applicable.

Table 4
Communication Requirements by Ancillary Service Type Provided

Ancillary Service Type	Communication Method Options	Data Latency	Data Availability	Mean Time to Repair
Regulating Reserve	Dedicated	2 seconds	99.8%	4 hours
Regulating reserve for high/low limits	Dedicated	10 seconds	99.8%	4 hours
Spinning reserve	Dedicated	10 seconds	99.8%	4 hours

(3) The **legal owner** of a **transmission facility** must implement the communication methods for supervisory control and data acquisition data between its facility and the **ISO** in accordance with Table 5.

Table 5
Communication Requirements for Transmission Facilities by Bus Operating Voltage

Bus Operating Voltage	Communication Method Options	Data Latency	Data Availability	Mean Time to Repair
Greater than or equal to 60 kV, and less than 200 kV	Dedicated	30 seconds	98.0%	48 hours
greater than or equal to 200 kV	Dedicated	15 seconds	98.0%	48 hours

(4) The **legal owner** that has been directed by the **ISO** to participate in a **remedial action scheme** must implement the communication methods for supervisory control and data acquisition data between the **legal owner**'s facility that participates in the **remedial action scheme** and the **ISO** in accordance with Table 6 below.

Table 6
Communication Requirements for Remedial Action Scheme Facilities by Bus Operating Voltage

Bus Operating Voltage	Communication Method Options	Data Latency	Data Availability	Mean Time to Repair
greater than or equal to 60 kV, and less than 200 kV	Dedicated	30 seconds	99.8%	4 hours
greater than or equal to 200 kV	Dedicated	15 seconds	99.8%	4 hours

(5) The **legal owner** with a **reactive power** resource must implement the communication methods for its **reactive power** resource between its facility and the **ISO** in accordance with Table 7.

Table 7
Communication Requirements for Reactive Power Resources by Type

Reactive Resource Type	Communication Method Options	Data Latency	Data Availability	Mean Time to Repair
Capacitor bank/reactor	Dedicated	30 seconds	98.0%	48 hours
Static VAr compensator, synchronous condenser, or other similar device	Dedicated	15 seconds	98.0%	48 hours

(6) The **legal owner** must provide and maintain a connectivity point and data communication to both the **ISO**'s primary system **control centre** and the **ISO**'s backup **control centre**.

(7) The **ISO** must provide and maintain a connectivity point to the **legal owner**'s facility at both the **ISO**'s primary **control centre** and the **ISO**'s backup **control centre**.

(8) The **legal owner** of a **generating unit**, **energy storage resource**, **aggregated facility**, or load facility must, if it owns a facility with the capability of combined load and generation greater than 1000 MW, provide 2 communication circuits that must connect each of the **ISO**'s primary **control centre** and the **ISO**'s backup **control centre** to each of the **legal owner**'s primary and backup **control centre**s.

(9) A **legal owner** of a **generating unit**, **energy storage resource**, **aggregated facility**, or ~~a~~ load facility must, when providing **ancillary services**, send supervisory control and data acquisition data to each of the **ISO**'s primary **control centre** and the **ISO**'s backup **control centre**.

(10) A **legal owner** must, based on the **ISO**'s generic communication block diagrams and prior to connecting facilities to the **interconnected electric system** or an electric system in the **service area** of the City of Medicine Hat, indicate to the **ISO** the generic communication block diagram that depicts the communication protocols between the **legal owner**'s facility and the **ISO**'s system **control centre**, with any variations, as appropriate.

(11) A **legal owner** must, if it changes the communication protocols used between itself and the **ISO**, communicate these changes to the **ISO** in writing 90 **business days** prior to changing the protocols.

Notification of Actual or Suspected Data Unavailability or Data Error

6(1) A **legal owner** must, if supervisory control and data acquisition data becomes, or is suspected of being unavailable or erroneous, notify the **ISO** as soon as practicable after becoming aware of this data unavailability or data error.

(2) The **ISO** may, following receipt of the notification pursuant to subsection 6(1), require the **legal owner** to discontinue the provision of **ancillary services**.

(3) "A **legal owner** must provide the **ISO**, in writing and as soon as practicable following, or as part of the notification pursuant to subsection 6(1), with the following: ~~A **legal owner** must, following or as part of the notification pursuant to subsection 6(1), provide the **ISO** with, as soon as practicable, in writing~~:

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #71.

(a) the cause of any supervisory control and data acquisition data unavailability or data error;

(b) if there is an equipment failure that relates to subsection 6(3)(a), a plan that is acceptable to the **ISO** to repair the failed equipment;

(c) the expected date when the supervisory control and data acquisition data will be restored or

repaired; and

(d) if the **legal owner** determines that there was no supervisory control and data acquisition data unavailability or data error, a notification to this effect~~if, following the notification pursuant to subsection 6(1), the **legal owner** determines that there was no actual supervisory control and data acquisition data unavailability or data error, then the **legal owner** must notify the **ISO** of this determination.~~

(4) The **legal owner** must notify the **ISO**, as soon as practicable and in writing, of ~~The **legal owner** must notify the **ISO**, as soon as practicable, in writing of~~ any revisions necessary to the plan and the rationale for the revisions to the plan.

(5) The **legal owner** must notify the **ISO** once the supervisory control and data acquisition data is restored or repaired.

Exceptions

7 A **legal owner** is not required to comply with the specific supervisory control and data acquisition data submission requirements of this Section 503.16 applicable to a particular device:

(a) that is being repaired or replaced in accordance with a plan accepted by the **ISO** pursuant to subsection 6; and

(b) where the **legal owner** is using reasonable efforts to complete such repair or replacement in accordance with that plan.

Appendices

Appendix 1 – *Supervisory Control and Data Acquisition Data Requirements for Synchronous Generating Units*

Appendix 2 – *Supervisory Control and Data Acquisition Data Requirements for Aggregated Facilities Containing Wind or Solar Resources*

Appendix 3 – *Supervisory Control and Data Acquisition Data Requirements for Industrial Complexes and Load Facilities*

Appendix 4 – *Supervisory Control and Data Acquisition Data Requirements for Transmission Facilities*

Appendix 5 – *Supervisory Control and Data Acquisition Data Requirements for Ancillary Services*

Appendix 6 – *Supervisory Control and Data Acquisition Data Requirements for Energy Storage Resources and Aggregated Facilities Containing Energy Storage Resources*

Revision History

Date	Description
XXXX-XX-XX	
2021-02-18	Administrative amendments to align with ISO drafting principles, fix typographical errors, and remove and consolidate some provisions of Section 502.8 in order to improve clarity, reduce repetition, and reduce overall requirements.
2019-12-11	Removed duplication with new Section 103.14, *Waivers and Variances*; standardized functional specifications language; capitalized references to “Section”.

2018-09-01	Revised applicability section; clarified which requirements are applicable to synchronous generating units; added requirements for a distribution connected aggregated generating facility; added additional SCADA requirements for wind aggregated generating facilities to Appendix 2; and added SCADA requirements for solar aggregated generating facilities to Appendix 2.
2015-03-27	Replaced “effective date” with the initial release date in sections 2 and 3; and replaced the word “Effective” in the Revision History to “Date”.
2014-12-23	Appendix 1 amended by combining the two lines concerning generating unit automatic voltage regulation into one line. Appendix 5 amended reflect that the regulating reserve set point signal is sent by ISO every 4 seconds, not every 2 seconds. Appendix 5 amended to include the measurement point for load facility when providing spinning reserve.
2013-02-28	Initial release

Appendix 1 – Supervisory Control and Data Acquisition Data Requirements for Synchronous Generating Units

Facility/ Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each power plant	Status	Communications failure alarm from remote terminal unit acting as a data concentrator for one or more **generating unit** to a **transmission facility control centre**, if applicable	0 = Normal	1= Alarm
		Communications failure indication between an intelligent electronic device and any remote terminal unit acting as a data concentrator	0 = Normal	1= Alarm
For each synchronous **generating unit** directly connected to the **transmission system** or **transmission facilities** in the **service area** of Medicine Hat.	Analog	**Gross real power** as measured at the stator winding terminal	MW	
		Gross **reactive power** as measured at the stator winding terminal	MVAr	
		Generating unit voltage at the generator stator winding terminal or equivalent bus voltage	kV	
		Unit frequency as measured at the stator winding terminal or equivalent bus frequency	Hz	
		Net **real power** as measured on the high side terminal of the **transmission system** step up transformer	MW	
		Net **real power** of summated generation of a facility with multiple **generating units** offering as a single **market participant**	MW	
		Net **reactive power** as measured on the high side terminal of the **transmission system** step up transformer	MVAr	
		Net **reactive power** of summated generation of a facility with multiple **generating units** offering as a single **market participant**	MVAr	
		Unit service load measured on the high side of the unit service transformer if the capacity is greater than 0.5 MW	MW	
		Unit service load measured on the high side of the unit service transformer if the capacity is greater than 0.5 MW	MVAr	
		Station service load **real power** if the capacity is greater than 0.5 MW, or if the station service load is for multiple units then the combined load for those units, measured on the high side of the station service transformer	MW	
		Station service load **reactive power** if the capacity is greater than 0.5 MW, or if the station service load is for multiple units then the combined load for those units, measured on the high side of the station service transformer	MVAr	
		Excitation system **real power** if the capacity is greater than 0.5 MW, measured on the high side of the excitation system transformer	MW	
		Excitation system **reactive power** if the capacity is greater than 0.5 MW, measured on the high side of the excitation system transformer	MVAr	
		Voltage at the **point of connection** to the **transmission system**	kV	
		Automatic voltage regulation setpoint	kV	
		Transmission system step-up transformer tap position if the step up transformer has a load tap changer	Tap position	
		Ambient temperature if the **generating unit** is a gas turbine **generating unit** (range of -50^{0}C and +50^{0}C)	^{0}C	
	Status	Breaker, circuit switchers, motor operated switches, or other devices that can remotely or automatically control the connection to the **interconnected electric system**; and does not include manually operated air breaks.	0 = Open	1= Closed

		Transmission system step up transformer voltage regulator if the **transmission system** step up transformer has a load tap changer	0 = Manual	1= Auto
		Generating unit power system stabilizer status	0 = Off	1 = On
		Generating unit automatic voltage regulation in service and controlling voltage	0 = Off	1 = On
		Remedial action scheme armed status, if applicable	0 = Disarmed	1= Armed
		Remedial action scheme operated status on communications failure, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on runback, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on trip, if applicable	0 = Normal	1 = Alarm
For each distribution connected facility including distributed connected in the **service area** of the City of Medicine Hat. synchronous **generating unit**, or **aggregated facility** consisting of synchronous **generating units**, where the **gross real power** capability is greater than or equal to 5 MW	Analog	**Gross real power** as measured at the stator winding terminal	MW	
		Gross **reactive power** as measured at the stator winding terminal	MVAr	
		Generating unit voltage at the generator stator winding terminal or equivalent bus voltage	kV	
	Status	Breaker, circuit switchers, motor operated air brakes, or other devices that can remotely control the connection to the **interconnected electric system**; and does not include manually operated air breaks.	0 = Open	1= Closed

Appendix 2 – Supervisory Control and Data Acquisition Data Requirements for Aggregated Facilities Containing Wind or Solar Resources

Facility / Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each wind or solar **aggregated facility** directly connected to the **transmission system** or **transmission facilities** in the **service area** of the City of Medicine Hat, and where the **gross real power** capability is greater than or equal to 5 MW.	Analog	**Real power** of each collector system feeder	MW	
		Reactive power of each collector system feeder	MVAr	
		DC power for each collector system feeder (if the wind or solar resource shares an inverter with another technology)	MW	
		Voltage for each **collector bus**	kV	
		Real power of station service greater than 0.5 MW	MW	
		Reactive power of station service greater than 0.5 MW	MVAr	
		Reactive power of each **reactive power** resource (other than **generating units**)	MVAr	
		Real power at the low side of **transmission system** step up transformer	MW	
		Reactive power at the low side of **transmission system** step up transformer	MVAr	
		Transmission system step-up transformer tap position if the step up transformer has a load tap changer	Tap position	
		Net **real power** at the **point of connection**	MW	
		Net **reactive power** at the **point of connection**	MVAr	
		Frequency at the **point of connection**	Hz	
		Voltage at the **point of connection**	kV	
		Voltage regulation system setpoint	kV	
		Potential **real power** capability, where potential **real power** capability is the **real power** that would have been produced at the **point of connection** without **aggregated facility** curtailment and based on **real time** meteorological conditions	MW	
		Real power limit used in the power limiting control system at the **aggregated generating facilities**	MW	
		Wind speed at hub height as collected at the meteorological tower, (for wind facilities)	km/h	
		Wind direction from the true north as collected at the meteorological tower, (for wind facilities)	Degrees	
		Barometric pressure (for wind facilities)	hPa	
		Ambient temperature (for wind facilities)	^{o}C	
		Wind Speed at between 2 to 10 m above ground (for solar facilities)	km/h	
		Wind direction from the true north at between 2 to 10 m above ground (for solar facilities)	Degrees	
		Ambient Temperature (for solar facilities)	^{0}C	
		Global Horizontal Irradiance (for solar facilities)	W/m²	
	Status	Communications failure alarm from remote terminal unit acting as a data concentrator for one or more **generating units** to the **control centre** of a **transmission facility**, if applicable	0 = Normal	1= Alarm
		Communications failure indication between an intelligent electronic device and any remote terminal unit acting as a data concentrator	0 = Normal	1= Alarm
		Each collector system feeder breaker	0 = Open	1 = Closed
		Each **reactive power** resource feeder breaker	0 = Open	1 = Closed

Facility / Service Description	Signal Type	Description	Unit	
		Power limiting control system	0 = Off	1 = On
		Voltage regulation system status	0 = Manual	1 = Automatic
		Breaker, circuit switchers, motor operated switches, or other devices that can remotely or automatically control the connection to the **interconnected electric system**; and does not include manually operated air breaks.	0 = Open	1 = Closed
		Generating unit step up transformer voltage regulator if the **transmission system** step up transformer has a load tap changer	0 = Manual	1 = Automatic
		Remedial action scheme armed status, if applicable	0 = Disarmed	1= Armed
		Remedial action scheme operated status on communications failure, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on runback, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on trip, if applicable	0 = Normal	1 = Alarm
ISO supervisory control data requirements				
For each wind or solar **aggregated facility** directly connected to the **transmission system** or **transmission facilities** in the **service area** of the City of Medicine Hat, and where the **gross real power** capability is greater than or equal to 5 MW.	Analog	Facility limit	MW	
		Reason for facility limit	1 = Transmission, 2= Ramp, 3 = No limit	
Legal owner data acquisition data requirements				
For each wind or solar **aggregated facility**, where the **gross real power** capability is greater than or equal to 5 MW and is connected to an **electric distribution system** including distribution facilities in the **service area** of the City of Medicine Hat**.**	Analog	**Gross real power** as measured at the **collector bus**	MW	
		Gross **reactive power** as measured at the **collector bus**	MVAr	
		DC power for each collector system feeder (if the wind or solar resource shares an inverter with another technology)	MW	
		Generating unit voltage at the **collector bus**	kV	
		Net **real power** at the **point of connection**	MW	
		Net **reactive power** at the **point of connection**	MVAr	
		Frequency at the **point of connection**	Hz	
		Potential **real power** capability, where potential **real power** capability is the **real power** that would have been produced at the **point of connection** without **aggregated generating facilities** curtailment and based on **real time** meteorological conditions.	MW	
		Real power limit used in the power limiting control system at the **aggregated facility**	MW	
		Wind speed at hub height as collected at the meteorological tower, (for wind facilities)	m/s	
		Wind direction from the true north as collected at the meteorological tower, (for wind facilities)	Degrees	

Facility / Service Description	Signal Type	Description	Unit	
		Barometric pressure with precision for instantaneous measurements (for wind facilities)	HPa	
		Ambient temperature (for wind facilities)	^{o}C	
		Wind Speed at between 2 and 10 m above ground (for solar facilities)	km/h	
		Wind direction from the true north at between 2 and 10 m above ground (for solar facilities)	Degrees	
		Ambient Temperature (for solar facilities)	^{0}C	
		Global Horizontal Irradiance (for solar facilities)	W/m²	
	Status	Breaker, circuit switchers, motor operated switches, or other devices that can remotely or automatically control the connection to the **interconnected electric system**; and does not include manually operated air breaks.	0 = Open	1= Closed
ISO supervisory control data requirements				
For each wind or solar **aggregated facility**, where the **gross real power** capability is greater than or equal to 5 MW and is connected to an **electric distribution system** including distribution facilities in the **service area** of the City of Medicine Hat**.**	Analog	Facility limit	MW	
		Reason for facility limit	1 = Transmission, 2= Ramp, 3 = No limit	

Appendix 3 – Supervisory Control and Data Acquisition Data Requirements for Industrial Complexes and Load Facilities

Facility / Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each facility	Status	Communications failure alarm from remote terminal unit acting as a data concentrator for one or more **generating units** to a **transmission facility control centre** (if applicable)	0 = Normal	1= Alarm
		Communications failure indication between an intelligent electronic device and any remote terminal unit acting as a data concentrator	0 = Normal	1= Alarm
For each load facility or industrial complex	Analog	**Real power** at the **point of connection**	MW	
		Reactive power at the **point of connection**	MVAr	
		Voltage at the **point of connection**	kV	
	Status	Breaker, circuit switchers, motor operated switches, or other devices that can remotely or automatically control the connection to the **interconnected electric system**; and does not include manually operated air breaks.	0 = Open	1 = Closed
A **market participant** with a **remedial action scheme** on its load facility or industrial complex	Analog	Total **remedial action scheme** load available	MW	
		Amount of load armed	MW	
	Status	**Remedial action scheme** circuit breaker, circuit switcher, or other controllable isolating devices	0 = Open	1 = Closed
		Arming status of the **remedial action scheme**	0 = Disarmed	1 = Armed
		Remedial action scheme operated status on communications failure, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on runback, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on trip, if applicable	0 = Normal	1 = Alarm

Appendix 4 – Supervisory Control and Data Acquisition Data Requirements for Transmission Facilities

Facility / Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each substation	Status	Communications failure alarm from remote terminal unit acting as a data concentrator for one or more **generating units** to a **transmission facility control centre**, if applicable	0 = Normal	1= Alarm
		Communications failure indication between an intelligent electronic device and each remote terminal unit acting as a data concentrator	0 = Normal	1= Alarm
Bus	Analog	Bus voltage line-to-line. Ring or split buses require a minimum of two voltage sources	kV	
	Status	Breakers, circuit switchers, motor operated switches, or other remotely or automatically controllable isolating device status	0 = Open	1= Closed
Transformer winding greater than 60 kV	Analog	**Real power** as measured on the high side terminal of the transformer	MW	
		Reactive power as measured on the high side terminal of the transformer	MVAr	
		Transformer voltage regulation setpoint if the transformer has a load tap changer	kV	
		Transformer tap position if the step up transformer has a load tap changer	Tap position	
	Status	Load tap changer	0 = Manual	1 = Automatic
Reactive Power Resources	Analog	**Reactive power** of switchable **reactive power** resource - capacitor bank (positive polarity) or reactor (negative polarity)	MVAr	
		Reactive power of dynamic **reactive power** resource – static VAr compensator, synchronous condenser, or other similar device	MVAr	
		Voltage setpoint of dynamic **reactive power** resource – static VAr compensator, synchronous condenser, or other similar device	kV	
	Status	**Reactive power** resource control device - capacitor bank or reactor	0 = Off	1 = On
		Reactive power resource control device – static VAr compensator, synchronous condenser, or other similar device	0 = Off	1 = On
		Automatic voltage regulation status for dynamic **reactive power** resource – static VAr compensator, synchronous condenser, or other similar device	0 = Off	1 = On
Remedial Action Scheme	Status	**Remedial action scheme** circuit breaker, circuit switcher or other controllable isolating devices	0 = Open	1 = Closed
		Remedial action scheme armed status, if applicable	0 = Disarmed	1= Armed
		Remedial action scheme operated status on communications failure, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated on equipment overload, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on trip, if applicable	0 = Normal	1 = Alarm
Transmission line where the nominal voltage is greater than or equal to 60 kV and less than 200 kV	Analog	**Real power**	MW	
		Reactive power	MVAr	
	Status	Breakers, circuit switchers, motor operated switches, or other remotely or automatically controllable isolating device status	0 = Open	1= Closed
Transmission line where the nominal voltage is greater than or equal to 200 kV	Analog	**Real power**	MW	
		Reactive power	MVAr	
		Line side voltage	kV	
	Status	Breakers, circuit switchers, motor operated switches, or other remotely or automatically controllable isolating device status	0 = Open	1= Closed

Appendix 5 – Supervisory Control and Data Acquisition Data Requirements for Ancillary Services

Facility / Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each blackstart resource	Analog	Bus frequency	Hz	
Legal owner data acquisition data requirements				
For each **regulating reserve resource**	Analog	**Gross real power**	MW	
		Net **real power** at the point of connection	MW	
		Gross real power setpoint from the **regulating reserve resource** control system	MW	
		High limit of the **regulating reserve** range	MW	
		Low limit of the **regulating reserve** range	MW	
	Status	**Regulating reserve resource** circuit breaker status (required for all circuit breakers composing the resource)	0 = Open	1= Closed
		Regulating reserve resource control status	0 = Disabled	1= Enabled
ISO supervisory control data requirements				
For each **regulating reserve resource**	Analog	Setpoint every 4 seconds. Note if multiple resources are used to provide the full resource commitment, the **ISO** will send a totalized expected MW output signal	MW	
	Status	**ISO** has control of the **regulating reserve resource**	0 = Disarmed	1= Armed
Legal owner data acquisition data requirements				
For each **spinning reserves resource**	Analog	**Gross real power**	MW	
	Status	**Spinning reserve resource** circuit breaker status (required for all circuit breakers composing the resource)	0 = Open	1= Closed
Legal owner data acquisition data requirements				
For each **supplemental reserve resource**	Analog	**Gross real power**	MW	
	Status	**Supplemental reserve resource** circuit breaker status (required for all circuit breakers composing the resource)	0 = Open	1= Closed
Legal owner data acquisition data requirements				
For each resource providing **load shed service**	Analog	Actual volume of **real power**	MW	
		Offered volume of **real power**	MW	
		Armed volume of **real power** commitment	MW	
	Status	Service provider **dispatch** status indication	0 = Disarmed	1 = Armed
		Service provider trip status confirmation	0 = Normal	1 = Tripped
		Forced outage condition status	0 = Normal	1 = Outage
		Trip status	0 = Normal	1 = Trip

Appendix 6 – Supervisory Control and Data Acquisition Data Requirements for Energy Storage Resources and Aggregated Facilities containing Energy Storage Resources

Facility / Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each **energy storage resource** directly connected to the **transmission system** or **transmission facilities** in the **service area** of the City of Medicine Hat, and where the **gross real power** capability is greater than or equal to 5 MW.	Analog	**Gross real power**	MW	
		Gross **reactive power**	MVAr	
		Gross DC power (if the energy storage resource shares an inverter with another technology)	MW	
		Energy storage resource voltage at the **collector bus**	kV	
		Real power of station service greater than 0.5 MW	MW	
		Reactive power of station service greater than 0.5 MW	MVAr	
		Reactive power of each **reactive power** resource (other than **energy storage resources**)	MVAr	
		Real power at the low side of **transmission system** step up transformer	MW	
		Reactive power at the low side of **transmission system** step up transformer	MVAr	
		Transmission system step-up transformer tap position if the step up transformer has a load tap changer	Tap position	
		Net **real power** at the **point of connection**	MW	
		Net **reactive power** at the **point of connection**	MVAr	
		Frequency at the **point of connection**	Hz	
		Voltage at the **point of connection**	kV	
		Voltage regulation system setpoint	kV	
		State of charge in percent	%	
		State of charge in MWh	MWh	
		Operational maximum state of charge	MWh	
		Operational minimum state of charge	MWh	
	Status	Communications failure alarm from remote terminal unit acting as a data concentrator for one or more **energy storage resources** to the **control centre** of a **transmission facility**, if applicable	0 = Normal	1= Alarm
		Communications failure indication between an intelligent electronic device and any remote terminal unit acting as a data concentrator	0 = Normal	1= Alarm
		Each **reactive power** resource feeder breaker	0 = Open	1 = Closed
		Energy storage resource power system stabilizer (PSS) status	0 = Off	1 = On
		Voltage regulation system status	0 = Manual	1 = Automatic
		Breaker, circuit switchers, motor operated switches, or other devices that can remotely or automatically control the connection to the **interconnected electric system**; and does not include manually operated air breaks.	0 = Open	1 = Closed
		Step up transformer voltage regulator if the **transmission system** step up transformer has a load tap changer	0 = Manual	1 = Automatic
		Remedial action scheme armed status, if applicable	0 = Disarmed	1= Armed
		Remedial action scheme communications failure status, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on runback, if applicable	0 = Normal	1 = Alarm
		Remedial action scheme operated status on trip, if applicable	0 = Normal	1 = Alarm

Facility / Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each **energy storage resource**, where the **gross real power** capability is greater than or equal to 5 MW and is connected to an **electric distribution system** including distribution facilities in the **service area** of the City of Medicine Hat**.**	Analog	**Gross real power**	MW	
		Gross **reactive power**	MVAr	
		Gross DC power (if the energy storage resource shares an inverter with another technology)	MW	
		Energy storage resource voltage at the **collector bus**	kV	
		Net **real power** at the **point of connection**	MW	
		Net **reactive power** at the **point of connection**	MVAr	
		Frequency at the **point of connection**	Hz	
		State of charge in percent	%	
		State of charge in MWh	MWh	
		Operational maximum state of charge	MWh	
		Operational minimum state of charge	MWh	
	Status	Breaker, circuit switchers, motor operated switches, or other devices that can remotely or automatically control the connection to the **interconnected electric system**; and does not include manually operated air breaks.	0 = Open	1= Closed

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.17 Revenue Metering System

Applicability

1 Section 503.17 applies to:

(a) the **legal owner** of a **revenue meter**; and

(b) the **ISO**.

Requirements

Measurement Point Definition Record

2(1) The **legal owner** of a **revenue meter** must, where such **legal owner** requires a new **measurement point definition record** or an amendment to an existing **measurement point definition record**, submit a complete application form to the **ISO** prior to energizing the new or altered **revenue metering system**.

(2) The **ISO** must issue a **measurement point definition record** for a **measurement point** to the **legal owner** of the **revenue meter**, or to a **person** designated by the **legal owner** of the **revenue meter**, if the information in the application form submitted in accordance with subsection 2(1):

(a) is complete;

(b) allows for the proper measurement of **metered energy**, measurement of **metered demand**, and calculation of **apparent power** in accordance with **ISO rules** and the **ISO tariff**, as applicable; and

(c) avoids a metering configuration that results in a deductive totalizing calculation for the **measurement point**.

(3) The **legal owner** of a **revenue meter** must install and operate a **revenue meter** in accordance with the **measurement point definition record** the **ISO** issues in accordance with subsection 2(2).

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #73.

Revenue Meter

3(1) The **legal owner** of a **revenue meter** must ensure that the **revenue meter** has an accuracy class rating that is less than or equal to 0.2% for Watthour measurement if:

(a) the capacity of the **metering point** of the **revenue meter** is greater than or equal to 1.0 MVA; and

(b) the **revenue meter** is not the subject of a dispensation under the *Electricity and Gas Inspection Act*, RSC 1985 c E-4, as amended.

(2) The **legal owner** of a **revenue meter** must ensure that the **revenue meter** has an accuracy class rating that is less than or equal to 0.5% for Varhour measurement if:

(a) the capacity of the **metering point** of the **revenue meter** is greater than or equal to 1.0 MVA; and

(b) the **revenue meter** is not the subject of a dispensation under the *Electricity and Gas Inspection Act*, RSC 1985 c E-4, as amended.

Measurement Transformer

4(1) The **legal owner** of a **revenue meter** must ensure that the measurement transformer has an accuracy class rating less than or equal to 0.3% if:

(a) the capacity of the **metering point** of the **revenue meter** is greater than or equal to 1.0 MVA; and

(b) the measurement transformer is not the subject of a dispensation under the *Electricity and Gas Inspection Act*, RSC 1985 c E-4, as amended.

(2) The **legal owner** of a **revenue meter** must, unless the **ISO** approves otherwise, ensure that the measurement transformer:

(a) is located and connected without compensation methods;

(b) produces a real **metering point**; and

(c) has a dedicated current transformer core for measurement.

Metering Data

5(1) The **legal owner** of a **revenue meter** must retain metering data from the **revenue metering system**, including a record of final estimates and adjustments~~,~~ and the method used to perform the estimates or adjustments, for a period of at least 8 years.

(2) The **legal owner** of a **revenue meter** must process metering data for each **measurement point** in accordance with the algorithm in the **measurement point definition record** issued in accordance with subsection 2(2).

(3) The **legal owner** of a **revenue meter** must, within 30 **days** of energizing the **revenue meter** for the first time, validate the **metering equipment** and the metering data.

(4) The **legal owner** must maintain validation records until the date of the next in-situ test ~~performed~~.

Revenue Meter Testing and Reporting

6(1) The **legal owner** of a **revenue meter** must perform in-situ testing:

(a) upon a change of any **metering equipment** associated with the **revenue meter**; and

(b) as per the testing intervals set out in Table 1:

Table 1 – In-situ Testing Frequency Based on Revenue Meter MW Class

MW Class	Testing Interval
(i) Greater than 20 MW	(A) Every 2 years from the date of commissioning; or (B) For existing revenue meters, every 2 years from the date of the previous in-situ test.
(ii) Greater than or equal to 5 MW and less than or equal to 20 MW	(A) Every 4 years from the date of commissioning; or (B) For existing revenue meters, every 4 years from the date of the previous in-situ test.

(2) The **legal owner** of a **revenue meter** must calculate the MW class in subsection 6(1)(b) as follows:

(a) determine the total active energy in MWh at the **measurement point** for the calendar year; and

(b) divide the total active energy determined in subsection 6(2)(a) by the number of settlement intervals in the same calendar year, including the intervals in which active energy is zero.

(3) The **legal owner** of a **revenue meter** must provide the results of the in-situ test performed in subsection 6(1) to the **ISO** if the test resulted in an error measurement of +/- 3%.

(4) Notwithstanding subsections 6(1), 6(2) and 6(3) above, the **legal owner** of a **revenue meter** must, at the request of the **ISO**, complete and report the results of an in-situ test for the **metering equipment** within 30 **days** of receiving the **ISO**'s request or within a mutually agreed time frame.

Measurement Data Corrections

7 The **legal owner** of a **revenue meter** must, if the **legal owner** discovers an error in measurement data, where the net difference in consumption from the measurement data previously submitted to the **ISO** is:

(a) 100 MWh or greater, for sites other than large micro-generation; or

(b) 100 kWh or greater for large micro-generation sites,

notify the **ISO** in writing of the reason for the error.

Restoration

8(1) The **legal owner** of a **revenue meter** must, upon becoming aware of a failure of the **revenue metering system**, restore the **revenue metering system** within 30 **days**.

(2) The **legal owner** of a **revenue meter** must notify the **ISO** in writing of the failure if the **legal owner** is unable to restore the **revenue metering system** within 30 **days** in accordance with subsection 8(1).

(3) The **legal owner** of a **revenue meter** must include a plan to restore the **revenue metering system** when notifying the **ISO** in accordance with subsection 8(2).

(4) The **legal owner** of a **revenue meter** must notify the **ISO** in writing after completing the restoration of the **revenue metering system** in accordance with the plan referred to in subsection 8(3).

Revision History

Date	Description
2021-03-18	Initial release

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.18 Operation and Maintenance of Facilities

Applicability

1 Section 503.18 applies to:

(a) the **legal owner** and **operator** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**;

and

(b) the **ISO**.

Requirements

Operation and Maintenance

2(1) This subsection 2 does not apply to:

(a) excitation systems;

(b) **automatic voltage regulators**; or

(c) power system stabilizers.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #76.

(21) The **legal owner** must operate and maintain the **generating unit**, **aggregated facility**, or **energy storage resource** to comply with the applicable technical design requirements of Division 503 of the **ISO rules** for so long as the **generating unit**, **aggregated facility**, or **energy storage resource** remains electrically connected.

(32) The **operator** must, if it determines that any equipment required to meet the technical design requirements of an applicable **ISO rule** has become unavailable or is otherwise no longer meeting those requirements, notify the **ISO**, in writing, in accordance with subsection 2(43) no later than one **business day** after making such a determination.

(43) The **operator** must include the following information in the notification to the **ISO** under subsection 2(22):

(a) a description of the cause of the equipment unavailability or the reason that the equipment no longer meets the technical design requirements;

(b) a plan to address the issue identified under subsection 2(32), including testing; and

(c) the expected date and time at which the issue identified under subsection 2(32) will be resolved.

(54) The **operator** must, if the issue identified under subsection 2(32) is not resolved by the expected date and time provided in accordance with subsection 2(43), notify the **ISO** in writing, no later than one **business day** after the original expected date and time, of the reason why the issue was not resolved by the expected date and time, and provide the **ISO** with a revised date and time under subsection 2(43)(c).

(65) The **operator** must notify the **ISO** no later than one **business day** after the issue identified under subsection 2(32) has been resolved.

(76) The **operator** of:

(a) multiple **generating units** or synchronous **energy storage resources** within a single complex; or

(b) an **aggregated facility** containing an **energy storage resource**;

must, as soon as practicable, verbally notify the **ISO** when it determines that the auxiliary systems are configured such that multiple **generating units** or **energy storage resources** will trip or go off-line for a single **contingency** within the facility, such that it is being operated contrary to subsection 2 of Section 503.9 of the **ISO rules**, *Auxiliary Systems*.

(87) The **legal owner** must, if the **ISO** provides written notice detailing evidence that the observed performance of the **generating unit**, **aggregated facility**, or **energy storage resource** is not consistent with any of the applicable requirements set out in Division 503 of the **ISO rules**, submit to the **ISO** a written report demonstrating that the **generating unit**, **aggregated facility**, or **energy storage resource** is capable of meeting those requirements.

(98) The **legal owner** must submit a report no later than 60 **business days** after receipt of the written notice described in subsection 2(87).

(109) The **legal owner** is not required, notwithstanding subsections 2(87) and 2(98), to provide the report if, between the date the **ISO** delivers the written notice and the deadline date for the submission of the report:

(a) the **legal owner** demonstrates to the satisfaction of the **ISO** that the failure to perform in accordance with the requirements set out in Division 503 of the **ISO rules**, was caused by equipment issues with the **generating unit**, **aggregated facility**, or **energy storage resource** that the **legal owner** corrected no later than 60 **business days** after receipt of the written notice described in subsection 2(87); and

(b) the **ISO** provides written notice to the **legal owner** that the report is not required.

Operating Data Requests from the ISO

3(1) The **ISO** may request, by way of written notice, operating data from the **legal owner**, including the records described in Section 503.13 of the **ISO rules**, *Synchrophasor Measurement System* and Section 503.14 of the **ISO rules**, *Sequence of Events Monitoring*.

(2) The **legal owner** must:

(a) submit the operating data requested by the **ISO**, if available, no later than 5 **business days** after receipt of the notice under subsection 3(1); or

(b) if the operating data requested by the **ISO** is not available, advise the **ISO** in writing no later than 5 **business days** after receipt of the notice under subsection 3(1).

Operator Availability

4 The **legal owner** must have designated personnel available 24 hours a **day** every **day** of the calendar year for contact and communication with the **ISO**, in accordance with all applicable **ISO rules** and **reliability standards**.

Revision History

Date	Description

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.18 Operation and Maintenance of Facilities

20XX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.19 Reactive Power Verification Testing

Applicability

1 Section 503.19 applies to:

(a) the **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that is directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat, including a **generating unit**, **aggregated facility**, or **energy storage resource** situated within an industrial complex that is directly connected to the **transmission system**;

and

(b) the **ISO**.

Requirements

Reactive Power Verification Testing

2(1) The **legal owner** must, subject to subsection 2(3), verify the **reactive power** capability of the **generating unit**, **aggregated facility**, or **energy storage resource** at:

(a) the **maximum authorized real power**; and

(b) the **maximum authorized charging power** if applicable~~.~~

at regular intervals no later than 5 years from the date the prior **reactive power** verification or re-verification testing was completed.

(2) The **legal owner** must ensure that the **reactive power** testing for the **generating unit**, **aggregated facility**, or **energy storage resource** for both the **maximum authorized real power** and the **maximum authorized charging power**, if applicable, achieves:

(a) the **gross reactive power** at 0.90 **power factor** supplying **reactive power**; and

(b) the **gross reactive power** at 0.95 **power factor** absorbing **reactive power**.

(3) The **legal owner** may test the **generating unit**, **aggregated facility**, or **energy storage resource** at values other than the **maximum authorized real power** and **maximum authorized charging power**, but only if ambient conditions or **transmission system** limits do not allow the **generating unit**, **aggregated facility**, or **energy storage resource** to achieve the **maximum authorized real power** and **maximum authorized charging power** or the **reactive power** requirements.

(4) The **legal owner** of a **generating unit**, **aggregated facility**, or **energy storage resource** that:

(a) has a common **point of connection** with another **generating unit**, **aggregated facility,** or **energy storage resource**; and

(b) ~~the~~ share **reactive power** resources ~~are shared~~;

must verify that the **reactive power** capability is in accordance with the applicable requirements of Section 503.3 of the **ISO rules**, *Reactive Power.*

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #77

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #77

Inconsistent Test Results

3(1) The **legal owner** must, if the **ISO** provides written notice that the modeled response of the **generating unit**, **aggregated facility**, or **energy storage resource** is not consistent with the observed response:

(a) perform the applicable testing in accordance with this Section 503.19; and

(b) provide the written results of the test to the **ISO** no later than 60 **business days** after receipt of the **ISO**'s notice.

(2) The **legal owner** is, notwithstanding subsection 3(1), not required to perform testing if between the date the **ISO** delivers the written notice and the deadline date for the submission of model testing results:

(a) the **legal owner** demonstrates to the satisfaction of the **ISO** that the inconsistency described in subsection 3(1) was caused by equipment problems that the **legal owner** corrected prior to the testing date; and

(b) the **ISO** provides written notice to the **legal owner** that the testing results are not required.

Reporting

4(1) The **legal owner** must report to the **ISO** the results of reactive power verification testing performed pursuant to this Section 503.19 in the form specified by the **ISO**.

(2) The **legal owner** must, in the form specified by the **ISO**, submit an additional reactive power testing report to the **ISO** no later than 180 **days** after the date of completion of each of the following:

(a) the first connection of a **generating unit**, **aggregated facility**, or **energy storage resource** to the **transmission system** or a **transmission facility** within the **service area** of the City of Medicine Hat;

(b) a modification of a **generating unit**, **aggregated facility**, or **energy storage resource** to the **transmission system** or a **transmission facility** within the **service area** of the City of Medicine Hat;

(c) the in-service date of any increase ~~or decrease~~ to the **maximum authorized real power** or **maximum authorized charging power** of a **generating unit**, **aggregated facility**, or **energy storage resource** that the **ISO** approves;

(d) any model revalidation testing; and

(e) any **reactive power** verification or re-verification testing other than that required in subsection 3(1).

Commented [AESO3]: V2 to V3 change. See AESO Written Reply #78.

Revision History

Date	Description
20XX-XX-XX	

ISO Rules
Part 500 Facilities
Division 503 Technical & Operating Requirements
Section 503.20 Baseline and Model Validation Testing

Applicability

1 Section 503.20 applies to:

(a) the **legal owner** of an **aggregated facility** that is directly connected to the **transmission system**, or to **transmission facilities** within the City of Medicine Hat, and has:

(i) **maximum authorized real power** greater than 9 MW; or

(ii) a range greater than 9 MW between the **maximum authorized charging power** and the **maximum authorized real power**;

including an **aggregated facility** situated within an industrial complex that is directly connected to the **transmission system**;

(b) the **legal owner** of a **generating unit** or **energy storage resource** that is directly connected to the **transmission system**, or to **transmission facilities** within the City of Medicine Hat, and has:

(i) **maximum authorized real power** equal to or greater than 9 MW; or

(ii) **maximum authorized real power** aggregate equal to or greater than 18 MW, where the **generating unit** or **energy storage resource** is part of a complex with other **generating units** or **energy storage resources**;

and

(c) the **ISO**.

2 Section 503.20 does not apply to ~~the~~ a **legal owner** ~~if of a~~the **generating unit**, **aggregated facility**, or **energy storage resource** ~~that~~ is connected to the in-plant distribution system of an industrial complex with 2 or more voltage transformations between the ~~stator winding terminals~~**generating unit**, **aggregated facility**, or **energy storage resource** and the **transmission system**.

Commented [AESO1]: V2 to V3 change. See AESO Written Replies #79.

Requirements

Baseline Testing for Aggregated Facilities

3(1) The **legal owner** of an **aggregated facility** must perform baseline testing, including model validation, in accordance with subsection 3(2), to validate the following models as applicable to the technology used in the **aggregated facility**:

(a) generator or converteer;

(b) excitation system including the:

(i) **voltage regulating system** or **automatic voltage regulator** in voltage control mode; and

(ii) **reactive power** resources;

(c) power system stabilizer, for an **aggregated facility** equipped with a power system stabilizer;

(d) turbine-**governor system** or **real power** controller; and

(e) other **aggregated facility** models as the **ISO** requests.

(2) The **legal owner** of an **aggregated facility** must perform baseline testing when:

(a) the **aggregated facility** is connected to the **transmission system** for the first time;

(b) changes are made to control settings, software, or hardware of:

(i) the **voltage regulating system** or **automatic voltage regulator**; or

(ii) the **governor system**;

or

(c) any modification is made that changes the modell~~l~~ed behaviour of the **aggregated facility** with respect to the **transmission facilities**.

(3) The **legal owner** of an **aggregated facility** is only required to perform testing on those portions of the models that are affected by the modifications described in subsection 3(2).

(4) The **legal owner** of an **aggregated facility** must perform **reactive power** verification, in accordance with Section 503.19 of the **ISO rules**, *Reactive Power Verification Testing* as part of the baseline testing.

(5) The **legal owner** of an **aggregated facility** must report the results of the baseline testing performed pursuant to subsection 3(2) to the **ISO** in accordance with subsection 8.

Baseline Testing for Generating Units and Synchronous Energy Storage Resources

4(1) The **legal owner** of a **generating unit** or synchronous **energy storage resource** must perform baseline testing, including model validation, in accordance with subsection 4(2), to validate the following **generating unit** or synchronous **energy storage resource** models:

(a) synchronous machine including:

(i) open circuit saturation;

(ii) inertia; and

(iii) synchronous machine impedances and time constants;

(b) excitation system including:

(i) the **automatic voltage regulator** in voltage control mode; and

(ii) the open circuit saturation of the exciter for a **generating unit** or synchronous **energy storage resource** equipped with a rotary exciter;

(c) power system stabilizer for a **generating unit** or synchronous **energy storage resource** equipped with a power system stabilizer;

(d) turbine-**governor system**; and

(e) other **generating unit** or synchronous **energy storage resource** models as the **ISO** requires.

(2) The **legal owner** of a **generating unit** or synchronous **energy storage resource** must perform baseline testing when any of the following occurs:

(a) the **generating unit** or synchronous **energy storage resource** is synchronized to the **transmission system** for the first time;

(b) replacement or changes to control settings or software of:

(i) the **automatic voltage regulator**;

(ii) the power system stabilizer; or

(iii) the **governor system**;

(c) a **generating unit** or synchronous **energy storage resource** stator rewind;

(d) a **generating unit** or synchronous **energy storage resource** rotor rewind;

(e) a rotary exciter rewind;

(f) a turbine replacement; or

(g) any other modification ~~is made~~ that changes the modeled behaviour of the **generating unit** or synchronous **energy storage resource** with respect to the **transmission system**.

(3) The **legal owner** of a **generating unit** or synchronous **energy storage resource** is, notwithstanding subsection 4(2), not required to perform baseline testing if any of the work described in subsections 4(2)(b) through (f) does not result in changes to the modeled behaviour of the **generating unit** or synchronous **energy storage resource** with respect to the **transmission system**.

(4) The **legal owner** of a **generating unit** or synchronous **energy storage resource** referred to in subsections 4(2)(b) through (g) is only required to perform testing on those portions of the models that are affected by the modifications.

(5) The **legal owner** of a **generating unit** or synchronous **energy storage resource** must perform **reactive power** verification, in accordance with Section 503.19 of the **ISO rules**, *Reactive Power Verification Testing*, as part of the baseline testing.

(6) The **legal owner** of a **generating unit** or synchronous **energy storage resource** must report the results of the baseline testing performed pursuant to subsection 4(2) to the **ISO** in accordance with subsection 8.

Model Revalidation Testing for Aggregated Facilities

5(1) The **legal owner** of an **aggregated facility** must, for each model referenced in subsection 5(2) and as applicable to the technology used in the **aggregated facility**, perform model revalidation testing no later than 5 calendar years from the date of the most recently completed baseline testing or model revalidation testing.

(2) Model revalidation testing must consist of the following **aggregated facility** models:

(a) ~~the~~ **voltage regulating system** or **automatic voltage regulator** in voltage control mode;

(b) power system stabilizer for an **aggregated facility** equipped with a power system stabilizer; and

(c) **governor system** or **real power** controller.

(3) The **legal owner** of an **aggregated facility** must, whe~~n~~re the **ISO** provides written notice to the **legal owner** ~~of an **aggregated facility** stating~~ that the model~~l~~ed response of the **aggregated facility** is not consistent with the observed response, perform model revalidation testing of the **aggregated facility** in accordance with subsection 5(2).

(4) The **legal owner** of an **aggregated facility** must provide to the **ISO** the written results of any model revalidation testing no later than 60 **business days** after receipt of the notice described in subsection 5(3).

(5) The **legal owner** of an **aggregated facility** is not required, notwithstanding subsection 5(4), to perform the revalidation testing if, between the date the **ISO** delivers the written notice and the deadline date for the submission of model revalidation testing results:

(a) the **legal owner** demonstrates to the satisfaction of the **ISO** that the lack of consistency described in subsection 5(3) was caused by equipment problems for the **aggregated facility** that the **legal owner** corrected prior to the revalidation testing date; and

(b) the **ISO** provides written notice to the **legal owner** that the revalidation testing results are not required.

(6) Notwithstanding subsection 5(1):

(a) the **legal owner** may make a request in writing to the **ISO** for a deferral of model validation testing for no more than one year~~,~~ if ~~within that year~~ there is a planned change to equipment within that year; and

(b) the **ISO** must reply in writing within 60 **business days** of receiving such a request.

(7) The results of any model revalidation testing performed pursuant to subsections 5(1) and 5(3) must be reported to the **ISO** in accordance with the requirements of subsection 8.

Model Revalidation Testing for Generating Units and Synchronous Energy Storage Resources

6(1) The **legal owner** of a **generating unit** or **energy storage resource** must, for each model referenced in subsection 6(2), perform model revalidation testing no later than 5 years from the date of the most recently completed baseline testing or model revalidation testing.

(2) Model revalidation testing must consist of the following **generating unit** or **energy storage resource** models:

(a) **excitation system**, including the **automatic voltage regulator** in voltage control mode;

(b) power system stabilizer for **generating units** or **energy storage resources** equipped with a power system stabilizer; and

(c) turbine-**governor system**.

(3) Where the **ISO** provides written notice to the **legal owner** of a **generating unit** or **energy storage resource** ~~stating~~ that the modeled response of the **generating unit** or **energy storage resource** is not consistent with the observed response, the **legal owner** must perform model revalidation testing of the **generating unit** or **energy storage resource** in accordance with subsection 6(2).

(4) The **legal owner** of a **generating unit** or **energy storage resource** must provide to the **ISO** the written results of any model revalidation testing no later than 60 **business days** after receipt of the notice described in subsection 6(3).

(5) The **legal owner** of a **generating unit** or **energy storage resource** is not required, notwithstanding subsection 6(4), to perform the revalidation testing if, between the date the **ISO** delivers the written notice and the deadline date for the submission of model revalidation testing results:

(a) the **legal owner** demonstrates to the satisfaction of the **ISO** that the lack of consistency described in subsection 6(3) was caused by equipment problems for the **generating unit** or **energy storage resource** that the **legal owner** corrected prior to the revalidation testing date; and

(b) the **ISO** provides written notice to the **legal owner** that the revalidation testing results are not required.

(6) Notwithstanding subsection 6(1):

(a) the **legal owner** may make a request to the **ISO**, in writing, for a deferral of model revalidation

testing for no more than one year~~,~~ if ~~within that year~~ there is a planned change to equipment within that year; and

(b) the **ISO** must reply to the **legal owner**, in writing, within 60 **business days** of receiving a request under section 6(1)(a).

(7) The results of any model revalidation testing performed pursuant to subsections 6(1) and 6(3) must be reported to the **ISO** in accordance with the requirements of subsection 7.

Reporting

7(1) The **legal owner** must report all test results referred to in this Section 503.20 to the **ISO**.

(2) The **legal owner** must~~, in the form specified by the **ISO**,~~ submit an additional testing report to the **ISO**, in the form specified by the **ISO**, no later than 180 **days** after the date of completion of each of:

(a) the first connection of a **generating unit**, **aggregated facility**, or **energy storage resource** to the **transmission system** or a **transmission facility** within the **service area** of the City of Medicine Hat;

(b) the first connection of a **generating unit**, **aggregated facility**, or **energy storage resource** to the **transmission system** or a **transmission facility** within the **service area** of the City of Medicine Hat upon completion of any modification described in subsection 3(2) or 4(2) as applicable;

(c) any increase or decrease to the **maximum authorized real power** or **maximum authorized charging power** of a **generating unit**, **aggregated facility**, or **energy storage resource** that the **ISO** approves; and

(d) any model revalidation testing other than that required in subsections 5 or 6.

Revision History

Date	Description
20XX-XX-XX	

Applicability

1 Section 504.3 applies to:

(a) the **legal owner** of a **transmission facility** that requires:

(i) a new connection to other **transmission facilities** in the **balancing authority area** of the **ISO**;

(ii) a **transmission facility** modification to facilities with equipment listed in subsections 5 or 6; or

(iii) testing in accordance with any **ancillary services** technical requirements;

(b) the **legal owner** of a transmission-connected load facility, ~~including for purposes of this Section 504.3 an **energy storage resource** when the **energy storage resource** is operating in consumption mode,~~ which the **ISO** determines may impact the reliable operation of the **interconnected electric system** and notifies the **legal owner** of such determination, and that requires:

(i) a new connection to other **transmission facilities** in the **balancing authority area** of the **ISO**;

(ii) a **transmission facility** modification to facilities with equipment listed in subsection 5 or 6; or

(iii) testing in accordance with any **ancillary services** technical requirements;

and

(c) the **ISO**.

Requirements

Connecting New Facilities

2(1) The **legal owner** of a **transmission facility** or transmission-connected load facility must not energize its facility until obtaining written confirmation from the **ISO** that:

(a) the **legal owner** has met the energization requirements; and

(b) the **legal owner**'s final **commissioning** plan, required under subsection 4, is approved.

(2) The **legal owner** of a **transmission facility** or transmission-connected load facility must, ~~on the **day** of and~~ not less than one hour prior to energizing any facility, phone the **ISO** and obtain verbal authorization from the **ISO** to energize the facility.

(3) The **legal owner** of a **transmission facility** or transmission-connected load facility may, after receiving the authorization in subsection 2(2), energize the facility and commence the **commissioning** activities.

Conducting Ancillary Services Testing

3(1) The **legal owner** of a **transmission facility** or transmission-connected load facility must not begin testing its facility in accordance with **ancillary services** technical requirements until obtaining written confirmation from the **ISO** that the **legal owner**'s final testing plan, required under subsection 4, is approved.

(2) The **legal owner** of a **transmission facility** or transmission-connected load facility must, ~~on the **day** of and~~ not less than one hour prior to testing any facility in accordance with **ancillary services** technical requirements, phone the **ISO** and obtain verbal authorization from the **ISO** to energize the facility.

(3) The **legal owner** of a **transmission facility** or transmission-connected load facility may, after receiving the authorization in subsection 3(2), commence testing activities in accordance with **ancillary services** technical requirements.

Plans for Commissioning New Facilities or Conducting Ancillary Services Testing

4 The **legal owner** of a **transmission facility** or transmission-connected load facility must provide final, written **commissioning** or testing plans to the **ISO**:

(a) which the **ISO** approves as ~~being able to be implemented~~implementable without impacting the reliable operation of the **interconnected electric system**;

(b) detailing the types of tests the **legal owner** proposes to conduct;

(c) in sufficient time to allow the **ISO** to approve the plans a minimum of 30 **days** prior to **commissioning**; and

(d) containing the minimum detail as noted in subsection 5 and 6, as appropriate.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #82

Plan Details for Commissioning and Ancillary Services Testing of Major Facilities

5 The **legal owner** of a **transmission facility** or transmission-connected load facility that owns any of the following **transmission facilities**:

(a) motors of a rating sufficient to cause operational concerns, as the **ISO** identifies during the connection project process;

(b) static VAr compensators;

(c) high voltage direct current facilities;

(d) flexible alternating current transmission system devices;

(e) phase shifting transformers;

(f) alternating current transmission line series compensation;

(g) synchronous condensers; or

(h) energy storage included in an **needs identification document** that has been ~~designated~~ approved by the **Commission** ~~as a **transmission facility** in accordance with applicable legislation~~,

Commented [AESO2]: Please see reply #9 of the *AESO Written Replies – Energy Storage Definitions*

intending to conduct **commissioning** or **ancillary services** testing activities on such facilities, must include in its **commissioning** or testing plan the details of the proposed testing activities, including the expected output, consumption or transfer of **real power** and **reactive power** from the facility to the **interconnected electric system** and over what periods of time.

Commissioning Minor Facilities Plan Details

6 The **legal owner** of a **transmission facility** or transmission-connected load facility intending to conduct **commissioning** and testing activities on any of the following:

(a) circuit breakers;

(b) transformers and voltage regulators;

(c) capacitor banks;

(d) reactors; and

(e) alternating current transmission lines,

must include in its **commissioning** plan the proposed date and time of energization.

Changes to Approved Commissioning or Testing Activities

7(1) The **ISO** may amend or suspend any **commissioning** or testing activities it has already approved under subsection 4, based on real time **reliability** requirements of the **interconnected electric system** and necessary **ISO** operational flexibility, and it may do so by providing written or verbal notice to the **legal owner** of the facility.

(2) The **legal owner** of a **transmission facility** or transmission-connected load facility may suspend its **commissioning** or testing activities by giving verbal notice to the **ISO**.

(3) The **legal owner** of a **transmission facility** or transmission-connected load facility may amend its **commissioning** or testing activities by making a verbal request to the **ISO** and obtaining verbal approval.

(4) A **legal owner** of a **transmission facility** or transmission-connected load facility that has amended or suspended any previously approved **commissioning** or testing activities must, if the **ISO** requests, submit a revised, written **commissioning** or testing plan and must do so within the timeframe the **ISO** specifies in order to proceed with **commissioning** or testing activities.

Revision History

Effective	Description
xxxx-xx-xx	
2012-12-31	Initial release

ISO Rules
Part 500 Facilities
Division 504 Legal Owners of Transmission Facilities and Load Facilities
Section 504.4 Coordinating Operational Testing

Applicability

1 Section 504.4 applies to:

(a) the **legal owner** of a **transmission facility**:

(i) that is already in normal operation; and

(ii) for which the **legal owner** intends to conduct operational testing activities;

(b) the **legal owner** of a transmission-connected load facility, ~~including for purposes of this Section 504.4 an **energy storage resource** when the **energy storage resource** is operating in consumption mode,~~ which the **ISO** determines may impact the reliable operation of the **interconnected electric system** and notifies the **legal owner** of such determination; and

(i) that is already in normal operation; and

(ii) for which the **legal owner** intends to conduct operational testing activities; and

(c) the **ISO**.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #85

Requirements

Conducting Operational Testing Activities

2(1) The **legal owner** of a **transmission facility** or transmission-connected load facility must not conduct operational testing activities on the facility until obtaining written confirmation from the **ISO** that the **legal owner**'s final operational testing plan, required under subsection 3(2), is approved.

(2) The **legal owner** of a **transmission facility** or transmission-connected load facility must, ~~on the **day** of but~~ no less than one hour prior to conducting operational testing activities on any facilities, phone the **ISO** and obtain verbal authorization from the **ISO** to conduct the activities.

(3) The **legal owner** of a **transmission facility** or a transmission-connected load facility may, after receiving the authorization in subsection 2(2), conduct the testing activities.

Major Operational Testing Plan Details

3(1) The **legal owner** of a **transmission facility** or transmission-connected load facility that owns any of the following **transmission facilities**:

(a) motors of a rating sufficient to cause operational concerns, as the **ISO** identifies~~d~~ during the connection process;

(b) static VAr compensators;

(c) high voltage direct current facilities;

(d) flexible alternating current transmission system devices;

(e) phase shifting transformers;

(f) alternating current transmission line series compensation;

(g) synchronous condensers; or

(h) energy storage ~~that has been designated~~ included in an **needs identification document** that has been approved by the **Commission**~~, as a **transmission facility** in accordance with applicable legislation,~~

must provide its final, written operational testing plans to the **ISO** detailing the proposed date and time of

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #84

Commented [AESO3]: Please see reply #9 of the *AESO Written Replies – Energy Storage Definitions*

testing, the proposed testing activities, including the expected output, consumption or transfer of **real power** and **reactive power** from the facility to the **interconnected electric system** and over what periods of time.

(2) The **legal owner** of a **transmission facility** or transmission-connected load facility that provides final, operational testing plans to the **ISO** under subsection 3(1) must ensure that:

(a) the **ISO** approves such plans as being able to be implemented without impacting the reliable operation of the **interconnected electric system**; and

(a) the **legal owner** provides such plans in sufficient time to allow the **ISO** to approve the plans a minimum of 15 **days** prior to the desired testing date.

Unexpected Operational Testing Plan Details

4 The **legal owner** of a **transmission facility** or transmission-connected load facility who desires to perform operational testing in order to recover from an unexpected operational problem must:

(a) contact the **ISO** by phone to request approval for the testing;

(b) provide a description of the testing, including the expected output, consumption or transfer of **real power** and **reactive power** from the facility to the **interconnected electric system** and over what periods of time;

(c) not initiate the testing until obtaining verbal approval from the **ISO**; and

(d) phone the **ISO** to advise when the testing is complete.

Changes to Approved Testing Activities

5(1) The **ISO** may amend or suspend any testing activities it has already approved, based on real time **reliability** requirements of the **interconnected electric system** and necessary **ISO** operational flexibility, and it may do so by providing written or verbal notice to the **legal owner** of the facility.

(2) The **legal owner** of a **transmission facility** or transmission-connected load facility may suspend its testing activities by giving verbal notice to the **ISO**.

(3) The **legal owner** of a **transmission facility** or transmission-connected load facility may amend its testing activities by making a verbal request to the **ISO** and obtaining verbal approval from the **ISO**.

(4) A **legal owner** of a **transmission facility** or transmission-connected load facility that has amended or suspended any previously approved testing activities must, if the **ISO** requests, submit a revised written operational testing plan and must do so within the timeframe the **ISO** specifies in order to proceed with the testing activities.

Revision History

Effective	Description
XXXX-XX-XX	
2012-12-31	Initial release

ISO Rules
Part 500 Facilities
Division 505 Legal Owners of Generating Facilities
Section 505.3 Coordinating Synchronization, Commissioning, Model and Reactive Power Validation Testing and Ancillary Services Testing

Applicability

1 Section 505.3 applies to:

(a) the **legal owner** of a **generating unit** or **energy storage resource** with a rating ~~of~~ greater than or equal to 5 MW~~5 MW or greater~~ that is connected or to be connected to **transmission facilities** or an **electric distribution system** in the **balancing authority area** of the **ISO** and ~~which such~~where the **generating unit** or **energy storage resource**:

(i) is a new **generating unit** or new **energy storage resource**;

(ii) has been the subject of a modification affecting its net-to-grid operating capabilities;

(iii) requires baseline model validation and reactive power testing; or

(iv) requires testing in accordance with any **ancillary services** technical requirements;

(b) the **legal owner** of an **aggregated facility** with a rating ~~of~~ greater than or equal to 5 MW~~5 MW or greater~~ that is connected or to be connected to **transmission facilities** or to an **electric distribution system** in the **balancing authority area** of the **ISO** and ~~which such~~where the **aggregated facility**:

(i) is a new **aggregated facility**;

(ii) has been the subject of a modification affecting its net-to-grid operating capabilities;

(iii) requires baseline model validation and reactive power testing, ; or

(iv) requires testing in accordance with any **ancillary services** technical requirements;

(c) the **ISO**.

Requirements

Connecting New Facilities

2(1) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must not synchronize its facility until obtaining written confirmation from the **ISO** that:

(a) the **legal owner** has met the energization requirements; and

(b) the **legal owner**'s final **commissioning** plan, required under subsection 3, is approved.

(2) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must, ~~on the day of and~~ not less than one hour prior to synchronizing its facility, phone the **ISO** and obtain verbal authorization from the **ISO** to synchronize the facility.

(3) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** may, after receiving authorization to synchronize its facility, synchronize ~~them~~ it to the **transmission system**.

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #87. Subsections 1, 2 and 4d.

Plans for Commissioning, Model and Reactive Power Validation Testing, or Ancillary Services Testing Activities

3 The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must provide a final, written **commissioning** or testing plan to the **ISO**:

(a) which the **ISO** approves as ~~being able to be implemented~~implementable without impacting the reliable operation of the **interconnected electric system**;

(b) detailing the types of tests the **legal owner** proposes to conduct, including model and reactive power validation tests; and

(c) a minimum of 30 **days** prior to **commissioning** or testing.

Commissioning or Testing Major Facilities Plan Details

4 The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** intending to perform **commissioning**, model and reactive power validation testing, or **ancillary services** testing activities, must include in its **commissioning** or testing plan the details of the proposed testing activities, including the expected output, consumption, or transfer of **real power** and **reactive power** from the facility to the **interconnected electric system** and over what periods of time.

Commented [AESO2]: V2 to V3 change. See AESO Written Reply #87.

~~**4** Any of the following:~~

~~(a) the **legal owner** of a **generating unit** equal to or greater than 5 MW;~~

~~(b) the **legal owner** of an **energy storage resource** equal to or greater than 5 MW;~~

~~(c) the **legal owner** of an **aggregated facility** equal to or greater than 5 MW; or~~

~~(d) the **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** which owns any of the following major transmission or load facilities, including for purposes of this Section 505.3 an **energy storage resource** when the **energy storage resource** is operating in consumption mode:~~

~~(i) motors of a rating sufficient to cause operational concerns, as identified during the connection project process;~~

~~(ii) static VAr compensators;~~

~~(iii) high voltage direct current facilities;~~

~~(iv) flexible alternating current transmission system devices;~~

~~(v) phase shifting transformers;~~

~~(vi) alternating current transmission line series compensation;~~

~~(vii) synchronous condensers; and~~

~~(viii) the alternating current terminal closest to each inverter-based technology, if applicable~~

~~intending to perform **commissioning**, model and reactive power validation testing, or **ancillary services** testing activities on such facilities, must include in its **commissioning** or testing plan the details of the proposed testing activities, including the expected output, consumption, or transfer of **real power** and **reactive power** from the facility to the **interconnected electric system** and over what periods of time.~~

Commissioning Minor Facilities Plan Details

5 A **legal owner** of a **generating unit**, **energy storage resource**, on **aggregated facility** that owns any of the following:

(a) circuit breakers;

(b) transformers and voltage regulators;

(c) capacitor banks;

(d) reactors; and

(e) alternating current transmission lines,

intending to conduct **commissioning** on such facilities must include in its **commissioning** plan the proposed date and time of energization.

Conducting Commissioning, Model and Reactive Power Validation Testing, or Ancillary Services Testing Activities

6(1) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must not begin its **commissioning** or testing activities until obtaining written confirmation from the **ISO** that the **legal owner**'s final **commissioning** or testing plan, required under subsection 3, is approved.

(2) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must, ~~on the **day** of and~~ not less than one hour prior to the scheduled time of **commissioning** or testing, phone the **ISO** and obtain verbal authorization from the **ISO** to proceed.

(3) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** may, after receiving authorization to proceed with its **commissioning** or testing activities, commence the **commissioning** or testing activities.

Changes to Approved Commissioning or Testing Activities

7(1) The **ISO** may amend or suspend any **commissioning**, model and reactive power validation testing, or **ancillary services** testing activities it has already approved under subsection 3, based on real time **reliability** requirements of the **interconnected electric system** and necessary **ISO** operational flexibility, and it may do so by providing written or verbal notice to the **legal owner** of the facility.

(2) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** may suspend its **commissioning**, model and reactive power validation testing, or **ancillary services** testing activities by giving verbal notice to the **ISO**.

(3) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** may amend its **commissioning**, model and reactive power validation testing, or **ancillary services** testing activities by making a verbal request to the **ISO** and obtaining verbal approval.

(4) A **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** that has amended or suspended any previously approved **commissioning**, model and reactive power validation

testing, or **ancillary services** testing activities must, if the **ISO** requests, submit a revised written **commissioning** or testing plan and must do so within the timeframe the **ISO** specifies in order to proceed with **commissioning**, model and reactive power validation testing, or **ancillary services** testing activities.

Revision History

Effective	Description
XXXX-XX-XX	
2012-12-31	Initial release

ISO Rules
Part 500 Facilities
Division 505 Legal Owners of Generating Facilities
Section 505.4 Coordinating Operational Testing

Applicability

Commented [AESO1]: V2 to V3 change. See AESO Written Reply #89, for all changes to this rule

1 Section 505.4 applies to:

(a) the **legal owner** of a **generating unit** or **energy storage resource**:

(i) with a rating of 5 MW or greater ~~than 5 MW~~;

(ii) connected to **transmission facilities** or to an **electric distribution system**, in the **balancing authority area** of the **ISO**;

(iii) that is already in **commercial operation**; and

(iv) for which the **legal owner** intends to conduct operational testing activities;

(b) the **legal owner** of an **aggregated facility**:

(i) with a rating of 5 MW or greater ~~than 5 MW~~;

(ii) connected to **transmission facilities** or to an **electric distribution system**, in the **balancing authority area** of the **ISO**;

(iii) that is already in **commercial operation**; and

(iv) for which the **legal owner** intends to conduct operational testing activities;

(c) the **ISO**.

Requirements

Plans for Operational Testing

2 The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must provide final, written operational testing plans to the **ISO**:

(a) which the **ISO** approves as being able to be implemented without impacting the **reliability** of the **interconnected electric system**;

(b) detailing the proposed date and time of operational testing and expected duration;

(c) specifying the types of operational testing activities;

(d) detailing the expected output of **real power** and **reactive power** from the **generating unit** or **energy storage resource** to the **interconnected electric system** and over what periods of time; and

(e) in sufficient time to allow the **ISO** to approve the operational testing plans a minimum of 15 **days** prior to the desired testing date.

Conducting Operational Testing Activities

3(1) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must not conduct operational testing activities on the **generating unit**, ~~or~~ **energy storage resource** or **aggregated facility** until obtaining written confirmation from the **ISO** that the **legal owner**'s final operational testing plan, required under subsection 2, is approved.

(2) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** must, ~~on the **day** of and~~ no less than one hour prior to conducting operational testing activities, phone the **ISO** and obtain verbal authorization from the **ISO** to conduct the activities.

(3) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** may, after receiving authorization to conduct operational testing activities on a facility, ~~may~~ conduct the activities.

(4) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** that desires to perform operational testing that is required in order to recover from an unexpected operational problem must:

(a) contact the **ISO** by phone to request approval for the operational testing;

(b) provide a description of the operational testing, including the expected output, consumption or transfer of **real power** and **reactive power** from the facility to the **interconnected electric system** and over what periods of time;

(c) not initiate the operational testing until obtaining verbal approval from the **ISO**; and

(d) phone the **ISO** to advise when the operational testing is complete.

Changes to Approved Testing Activities

4(1) The **ISO** may amend or suspend any operational testing activities it has already approved, based on real time **reliability** requirements of the **interconnected electric system** and necessary **ISO** operational flexibility, and it may do so by providing written or verbal notice to the **legal owner** of the facility.

(2) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** may suspend its operational testing activities by giving verbal notice to the **ISO**.

(3) The **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** may amend its operational testing activities by making a verbal request to the **ISO** and obtaining verbal approval from the **ISO**.

(4) A **legal owner** of a **generating unit**, **energy storage resource**, or **aggregated facility** that has amended or suspended any previously approved operational testing activities must, if the **ISO** requests, submit a revised written operational testing plan and must do so within the timeframe the **ISO** specifies in order to proceed with the operational testing activities.

Revision History

Effective	Description
xxxx-xx-xx	
2012-12-31	Initial release