

ISO Rules

Part 500 Facilities

Division 502 Technical Requirements

Section 502.8 SCADA Technical and Operating Requirements



Applicability

- 1 Subject to subsections 2 and 3 below, Section 502.8 applies to:
 - (a) the **legal owner** of a **generating unit** or an **aggregated generating facility** that has a **gross real power** capability ~~equal to or~~ 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 a **transmission facility** connected to the **transmission system** or **transmission facilities** in the service area of the City of Medicine Hat;
 - (c) the **legal owner** of a load 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; or
 - (iv) providing **ancillary services**; and
 - (d) the **ISO**.
- 2 The **legal owner** of a **generating unit**, **aggregated generating facility**, **transmission facility**, or a load facility that is energized and commissioned on or after April 7, 2017 must ensure the facility meets the minimum supervisory control and data acquisition requirements of this Section 502.8 and, where applicable, verify ~~to~~with the **ISO** that the facility meets ~~those~~the requirements during **commissioning** and **before** energization.
- 3(1) Subject to subsection 3(3), the provisions of this Section 502.8 do not apply to the **legal owner** of a **generating unit**, **aggregated generating facility**, **transmission facility**, or a load facility that was energized and commissioned prior to April 7, 2017 in accordance with a previous technical requirement, technical standard, **ISO rule** or functional specification, but the **legal owner** of such an existing **generating unit**, **aggregated generating facility**, **transmission facility**, or a load facility must remain compliant with all the standards and requirements set out in that previous technical requirement, technical standard, **ISO rule** or functional specification.
- (2) ~~Notwithstanding subsection 3(1),~~ The ISO may, ~~notwithstanding subsection 3(1)~~ require the **legal owner** of a **generating unit**, **aggregated generating facility**, **transmission facility**, or a load facility to comply with any specific provision or all of the provisions of this Section 502.8, if the **ISO** determines that such compliance is necessary for the safe and reliable operation of the **interconnected electric system**.
- (3) ~~Notwithstanding subsection 3(1),~~ The legal owner of a **generating unit**, **transmission facility**, **aggregated generating facility** or a load facility must, ~~notwithstanding subsection 3(1)~~ comply with the provisions of this Section 502.8 if:
 - (a) it modifies its facilities after April 7, 2017 to:
 - (i) increase its Rate DTS or Rate STS **contract capacity**; or
 - (ii) upgrade or alter the functionality of its supervisory control and data acquisition data system; and

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- (b) the ISO determines that such compliance is necessary for safe and reliable operation of the **interconnected electric system**.

Functional Specification

4 The ISO must, in accordance and generally consistent with this Section 502.8, approve a written functional specification containing details, work requirements, and specifications for the design, construction, and operation of a supervisory control and data acquisition data system for the facility.

Use of the Term Legal Owner

~~5(1) Unless specified otherwise, where the term “legal owner” is used below it includes the legal owner of a generating unit, an aggregated generating facility, a transmission facility or a load.~~

Supervisory Control and Data Acquisition Data Requirements

~~65~~(1) The legal owner of a synchronous **generating unit** must ~~meet~~provide the supervisory control and data acquisition data requirements set out in Appendix 1, SCADA Supervisory Control and Data Acquisition Data Requirements for Synchronous Generating Units.

(2) The legal owner of a wind or solar **aggregated generating facility** must meet the supervisory control and data acquisition data requirements set out in Appendix 2, SCADA Supervisory Control and Data Acquisition Data Requirements for Wind or Solar Aggregated Generating Facilities.

(3) The legal owner of a **generating unit** 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, SCADA Supervisory Control and Data Acquisition Data Requirements for Industrial Complexes and Load Facilities.

(4) The legal owner of a **transmission facility** must meet the supervisory control and data acquisition data requirements set out in Appendix 4, SCADA Supervisory Control and Data Acquisition Data Requirements for Transmission Facilities, if at least one ~~(1)~~ of the following criteria is met:

- (a) the substation contains ~~two (2)~~ or more buses operated ~~above 60 kV~~at a nominal voltage greater than 60 kV;
- (b) the substation contains one ~~(1)~~ or more buses operated ~~above 200 kV~~at a nominal voltage greater than 200 kV;
- (c) the substation contains a capacitor bank, reactor, static VAR compensator or synchronous condenser rated ~~5 MVAR or greater~~ than or equal to 5 MVAR;
- (d) the substation connects ~~three (3)~~ or more transmission lines ~~above~~operated at a nominal voltage greater than 60 kV;
- (e) the substation supplies local site load, with normally energized site load equipment rated ~~at greater than or equal to 5 MVA or greater~~ 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 ~~at greater than or equal to 10 MVA or greater~~;
- (g) the substation supplies **supplemental reserve** load ~~of 5 MVA or greater~~ than or equal to 5 MVA; or
- (h) the substation supplies system load that is part of a **remedial action scheme**.

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- (5) The **legal owner** of a **generating unit**, ~~the legal owner of an aggregated generating facility,~~ or ~~the legal owner of a load facility~~ must, if they provide **ancillary services**, meet the supervisory control and data acquisition data requirements for **ancillary services** set out in Appendix 5, SCADA Supervisory Control and Data Acquisition Data Requirements for Ancillary Services.
- (6) The **ISO** must meet the supervisory control and data acquisition data requirements set out in:
- (i) Appendix 2, SCADA Supervisory Control and Data Acquisition Data Requirements for Wind or Solar Aggregated Generating Facilities; and
 - (ii) Appendix 5, SCADA Supervisory Control and Data Acquisition Data Requirements for Ancillary Services.

Separate Meters

76 A **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

87(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** ~~and must do so using the following means:~~

- ~~(a) — periodic scans; or~~
- ~~(b) — report-by-exception polls.~~

- (2) The **ISO** must configure the **ISO's** communications device to be the “master” device.
- (3) A **legal owner** must configure its communication device to be the “~~slave~~subordinate” device using the appropriate addressing the **ISO** assigns.
- (4) The ~~ISO must, if it initiates communications with a legal owner using report-by-exception polls, must~~ configure ~~and acquire~~ the supervisory control and data acquisition data so that ~~the each~~ data ~~value~~ falls within the allowable deadbands ~~set out for the measurement types specified~~ in Table 1 ~~below when using report-by-exception polls with the ISO.~~

Table 1

Table 1

Allowable Deadband Requirement by Measurement Type

<u>Value Measurement Type</u>	<u>Equipment Normal Rating Range</u>	<u>Allowable Deadband</u>
<u>MW Real power</u>	from 0 to 200 MW; 1.0 MW above <u>200 MW</u>	0.5 MW
	<u>Greater than 200 MW</u>	<u>1.0 MW</u>
<u>MVA Reactive power</u>	0.5 MVAR from 0 to 200 MVA; 1.0 <u>MVA above 200 MVA</u>	0.5 MVA
	<u>Greater than 200 MVA</u>	<u>1.0 MVA</u>
<u>Voltage kV</u>	from 0 to 20 kV; 0.5 kV above 20 kV	0.1 kV

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	<u>Greater than 20 kV</u>	<u>0.5 kV</u>
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(5) A **legal owner** must, if it is providing analog values to the **ISO**, provide those values with **at least one (1) decimal place** the following **minimum accuracy unless otherwise and resolution as** specified in the attached appendices Table 2.

Table 2
Accuracy and Resolution Requirements by Measurement Type

Measurement Type	Units	Accuracy	Resolution
All facilities			
<u>All analog measurements not otherwise specified below</u>		<u>+/-2% of full scale</u>	<u>0.1</u>
<u>Frequency (between 55 Hz and 65 Hz only)</u>	<u>Hz</u>	<u>+/- 0.012 Hz</u>	<u>0.001 Hz</u>
<u>Transformer tap position</u>	<u>Position</u>	<u>Integer Value</u>	<u>1</u>
Renewable aggregated generating facilities			
<u>Ambient temperature (for solar facilities)</u>	<u>°C</u>	<u>+/-1 °C</u>	<u>1°C</u>
<u>Barometric pressure</u>	<u>hPa</u>	<u>6 hPa</u>	<u>1 hPa</u>
<u>Global horizontal irradiance (for solar facilities)</u>	<u>W/m²</u>	<u>+/-25 W/m²</u>	<u>1 W/m²</u>
<u>Potential real power capability</u>	<u>MW</u>	<u>+/-10% of full scale</u>	<u>0.5% of measurement</u>
<u>Wind direction from true north</u>	<u>Degrees</u>	<u>+/-5°</u>	<u>1°</u>
Regulating reserve			
<u>Regulating reserve measurements</u>	<u>MW</u>	<u>0.25% of Full Scale</u>	<u>0.25% of measurement</u>

(6) A **legal owner** must ensure that the transducer is scaled such that the maximum, full scale, ~~value~~ Table 2 values returned ~~is~~ are between 120% and 200% of the ~~nominal~~ normal rating of the equipment ~~rating~~.

(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) A **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) ~~Notwithstanding subsection 8(8), a~~ **legal owner** must, notwithstanding subsection 7(8), report:

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- (a) ~~— real power~~ MVAr measurements from a reactor as negative polarity;
- (b) ~~(a) MW and MVAr~~ **reactive power** measurements from a **collector bus** as positive polarity; ~~and~~
- (b) ~~— MVAr~~ **reactive power** measurements from a capacitor as positive polarity; ~~and.~~
- (c) **reactive power** measurements from a reactor as negative polarity.

(10) A **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 ~~seven (7)~~ hours.

(11) A **legal owner** must ensure that its global positioning system clock functionality provides for ~~one (1) millisecond~~ a time stamped event accuracy of 1 millisecond and can automatically adjust for seasonal changes to daylight savings time.

Supervisory Control and Data Acquisition Communications

~~98(1)~~ A **legal owner** must implement ~~one (1) of the following~~ communication methods for supervisory control and data acquisition data between its facility and the **ISO**: in accordance with Table 3.

- (a) ~~— an internet connection, if the legal owner has a latency time requirement of thirty (30) seconds or greater; or~~
- (b) ~~— a dedicated telecommunications link, if the legal owner has a latency time requirement of less than thirty (30) seconds.~~

~~(2) Table 3~~

Communication Requirements by Maximum Authorized Real Power for Generating Units, Aggregated Generating Facilities, and Load Facilities

<u>Maximum Authorized Real Power</u>	<u>Communication Method Options</u>	<u>Data Latency</u>	<u>Data Availability</u>	<u>Mean Time to Repair</u>
<u>less than 50 MW</u>	<u>Internet or Dedicated</u>	<u>30 seconds</u>	<u>98.0%</u>	<u>48 hours</u>
<u>greater than or equal to 50 MW, and less than 300 MW</u>	<u>Dedicated</u>	<u>15 seconds</u>	<u>98.0%</u>	<u>48 hours</u>
<u>greater than or equal to 300 MW</u>	<u>Dedicated</u>	<u>4 seconds</u>	<u>99.8%</u>	<u>48 hours</u>

~~(2)~~ A **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

<u>Ancillary Service Type</u>	<u>Communication Method Options</u>	<u>Data Latency</u>	<u>Data Availability</u>	<u>Mean Time to Repair</u>
<u>Regulating reserve</u>	<u>Dedicated</u>	<u>2 seconds</u>	<u>99.8%</u>	<u>4 hours</u>
<u>Regulating Reserve for high/low limits</u>	<u>Dedicated</u>	<u>10 seconds</u>	<u>99.8%</u>	<u>4 hours</u>

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<u>Spinning Reserve</u>	<u>Dedicated</u>	<u>10 seconds</u>	<u>99.8%</u>	<u>4 hours</u>
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(3) A 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**

<u>Bus Operating Voltage</u>	<u>Communication Method Options</u>	<u>Data Latency</u>	<u>Data Availability</u>	<u>Mean Time to Repair</u>
<u>Greater than or equal to 60 kV, and less than 200 kV</u>	<u>Dedicated</u>	<u>30 seconds</u>	<u>98.0%</u>	<u>48 hours</u>
<u>greater than or equal to 200 kV</u>	<u>Dedicated</u>	<u>15 seconds</u>	<u>98.0%</u>	<u>48 hours</u>

(4) A 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**

<u>Bus Operating Voltage</u>	<u>Communication Method Options</u>	<u>Data Latency</u>	<u>Data Availability</u>	<u>Mean Time to Repair</u>
<u>greater than or equal to 60 kV, and less than 200 kV</u>	<u>Dedicated</u>	<u>30 seconds</u>	<u>99.8%</u>	<u>4 hours</u>
<u>greater than or equal to 200 kV</u>	<u>Dedicated</u>	<u>15 seconds</u>	<u>99.8%</u>	<u>4 hours</u>

(5) A 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**

<u>Reactive Resource Type</u>	<u>Communication Method Options</u>	<u>Data Latency</u>	<u>Data Availability</u>	<u>Mean Time to Repair</u>
<u>Capacitor bank/ reactor</u>	<u>Dedicated</u>	<u>30 seconds</u>	<u>98.0%</u>	<u>48 hours</u>
<u>Static VAr compensator, synchronous condenser, or other similar device</u>	<u>Dedicated</u>	<u>15 seconds</u>	<u>98.0%</u>	<u>48 hours</u>

(6) A legal owner must provide and maintain a connectivity point and data communication to both the ISO's primary system ~~coordination~~ **control centre and the ISO's backup ~~system coordination~~ **control****

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centre.

(37) The ISO must provide and maintain a connectivity point to the legal owner's facility at both the ISO's primary ~~system coordination~~**control centre** and the ISO's backup ~~system coordination~~**control centre**.

(48) The legal owner of a **generating unit**, an **aggregated generating facility**, or a load **facility** must, if it owns a facility with the capability of combined load and generation greater than 1000 MW, provide ~~two~~ **(2)** communication circuits ~~to that must connect~~ each of the ISO's primary ~~system coordination~~**control centre** and the ISO's backup ~~system coordination~~**control centre** and to each of the legal owner's primary and backup ~~communication centres~~**control centre**.

(59) A legal owner of a **generating unit**, an **aggregated generating facility**, or a load **facility** must, when providing **ancillary services**, send supervisory control and data acquisition data to each of the ISO's primary ~~system coordination~~**control centre** and the ISO's backup ~~system coordination~~**control centre**.

(610) 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 ~~coordination~~**control centre**, with any variations, as appropriate.

(711) A legal owner must, if it changes the communication protocols used between itself and the ISO, communicate these changes to the ISO in writing ~~ninety (90)~~ **business days** prior to changing the protocols.

Notification of ~~Unplanned Availability~~**Actual or Suspected Data Unavailability or Data Error**

109(1) A legal owner must, if ~~any component in the communication circuit~~**supervisory control and data acquisition data** becomes, or is suspected of being unavailable ~~due to an unplanned event or erroneous~~, notify the ISO as soon as practicable, ~~in writing~~, after ~~determining such~~**becoming aware of this data unavailability** ~~due to equipment failure or data error~~.

(2) The ISO may, following receipt of the notification ~~in 10~~**pursuant to subsection 9(1)**, require the legal owner to discontinue the provision of **ancillary services**.

(3) A legal owner must, ~~following or as part of the notification pursuant to subsection 9(1)~~, provide the ISO **with**, as soon as practicable, in writing:

- (a)** the cause of any ~~supervisory control and data acquisition data~~ unavailability ~~reported pursuant to subsection 10(1); or data error~~;
- (b)** ~~in the event of if there is~~ an equipment failure, ~~that relates to subsection 9(3)(a)~~, a plan, ~~that is~~ acceptable to the ISO, to repair the failed equipment, ~~including testing~~; and
- (c)** the expected date when the ~~equipment will be repaired and the required measurements~~ **supervisory control and data acquisition data** will be restored ~~or repaired~~; and
- (d)** ~~if, following the notification pursuant to subsection 9(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, ~~if the equipment is not repaired and required measurements are not restored by the expected date~~, **notify the ISO**, as soon as practicable, in writing, ~~with of any revisions necessary to the revised date plan~~ and the ~~reason why~~**rationale** for the communication system

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~~was not repaired~~revisions to the plan.

(5) The **legal owner** must notify the **ISO** once the ~~equipment is repaired~~supervisory control and the ~~required measurements are~~data acquisition data is restored— or repaired.

Suspected Failure or Erroneous Data of a Remote Terminal Unit

~~11(1)~~ A **legal owner** must, if it suspects that a remote terminal unit has failed or is providing erroneous data, notify the **ISO** as soon as practicable, in writing, after identifying the failure or data error.

~~(2)~~—The **ISO** must, if it suspects that a remote terminal unit has failed or is providing erroneous data, notify the **legal owner** as soon as practicable, after identifying the failure or data error.

~~(3)~~—The **legal owner** must provide the **ISO** as soon as practicable, in writing, with the date it expects to test the remote terminal unit.

~~(4)~~—The **legal owner** must, if it is unable to test the remote terminal unit on the expected date provided under subsection 11(3), provide the **ISO** as soon as practicable, in writing, with the revised date.

~~(5)~~—The **legal owner** must, after testing the remote terminal unit, confirm if there is a problem with the remote terminal unit or not and notify the **ISO** as soon as practicable, in writing, with the results of the test.

~~(6)~~—The **legal owner** must, if the results of the test indicated that the remote terminal unit has actually failed, provide the **ISO** as soon as practicable, in writing, with a plan acceptable to the **ISO** to repair the failed remote terminal unit and the date by which that the **legal owner** expects to repair or replace the remote terminal unit.

~~(7)~~—The **legal owner** must, if the remote terminal unit is not repaired or replaced by the date provided under subsection 11(6), notify the **ISO** as soon as practicable, in writing, with the revised date.

~~(8)~~—The **legal owner** must notify the **ISO** as soon as practicable, in writing, once the remote terminal is repaired or replaced.

Exceptions

~~1210~~ A **legal owner** is not required to comply with the specific supervisory control and data acquisition data submission requirements of this Section 502.8 applicable to a particular device:

- (a) that is being repaired or replaced in accordance with a plan ~~acceptable to~~accepted by the **ISO** ~~under subsections 10 or 11~~pursuant to subsection 9; and
- (b) where the **legal owner** is using reasonable efforts to complete such repair or replacement in accordance with that plan.

Appendices

Appendix 1 – ~~SCADA~~Supervisory Control and Data Acquisition Data Requirements for Synchronous Generating Units

Appendix 2 –~~SCADA~~– Supervisory Control and Data Acquisition Data Requirements for Wind or Solar Aggregated Generating Facilities

Appendix 3 –~~SCADA~~– Supervisory Control and Data Acquisition Data Requirements for Industrial Complexes and Load Facilities

Appendix 4 –~~SCADA~~– Supervisory Control and Data Acquisition Data Requirements for Transmission Facilities

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Appendix 5 ~~–SCADA–~~ *Supervisory Control and Data Acquisition Data* Requirements for Ancillary Services

Revision History

Date	Description
<u>2020-12-xx</u>	<u>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.</u>
2019-12-11	Removed duplication with new Section 103.14, <i>Waivers and Variances</i> ; 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 <u>facility</u> when providing spinning reserve.
2013-02-28	Initial R release

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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	MVA _r	
		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	MVA _r	
		Net reactive power of summated generation of a facility with multiple generating units offering as a single market participant	MVA _r	
		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	MVA _r	
		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	MVA _r	
		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	MVA _r	
		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°C and +50°C)	°C			
Status	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

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		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 generating facilities 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

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Appendix 2 – Supervisory Control and Data Acquisition Data Requirements for Wind or Solar Aggregated Generating Facilities

Facility / Service Description	Signal Type	Description	Unit	
Legal owner data acquisition data requirements				
For each wind or solar aggregated generating 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	
		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 generating facilities 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)	m/s	
		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)	°C	
Wind Speed at between 2 to 10 m above ground (for solar facilities)	m/s			
Wind direction from the true north at between 2 to 10 m above ground (for solar facilities)	Degrees			
Ambient Temperature (for solar facilities)	°C			
Global Horizontal Irradiance (for solar facilities)	W/m ²			
Status	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
		Power limiting control system	0 = Off	1 = On

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Facility / Service Description	Signal Type	Description	Unit	
		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 generating 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 generating 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	
		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 generating facilities	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	
Barometric pressure with precision for instantaneous measurements (for wind facilities)	HPa			

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Facility / Service Description	Signal Type	Description	Unit	
		Ambient temperature (for wind facilities)	°C	
		Wind Speed at between 2 and 10 m above ground (for solar facilities)	m/s	
		Wind direction from the true north at between 2 and 10 m above ground (for solar facilities)	Degrees	
		Ambient Temperature (for solar facilities)	°C	
		Global Horizontal Irradiance (for solar facilities)	W/m ²	
	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 generating 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	

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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	MVA _r	
		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	

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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	
	Status	Transformer tap position if the step up transformer has a load tap changer	Tap position	
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		
		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
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	
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

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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 as measured at the stator winding terminal	MW	
		Net real power as measured on the high side terminal of the step up transformer	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 as measured at: a) For source assets, the stator winding terminal or b) For sink assets the closest circuit breaker or disconnection device to each load facility.	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 either load facility or generation	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 consumed at the point of connection	MW	
		Offered Volume of real power	MW	
		Armed Volume of real power commitment	MW	
	Status	Load shed service provider status indication	0 = Disarmed	1 = Armed
ISO supervisory control data requirements				
For each resource providing load shed service	Analog	Real power dispatched	MW	
	Status	Dispatch status for load shed service	0 = Disarmed	1 = Armed

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Appendix 1 – SCADA Requirements for Synchronous Generating Units

Facility/ Service Description	Signal Type	Point Description	Parameter		Accuracy Level	Resolution	Latency and Availability Requirements Based on Maximum Authorized Real Power							
							Maximum authorized real power less than 50 MW		Maximum authorized real power equal to or greater than 50 MW and less than 300 MW		Maximum authorized real power equal to or greater than 300 MW			
							Latency	Availability (%)	Latency	Availability (%)	Latency	Availability (%)		
For each power plant	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	N/A	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours			
		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		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours		
		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	Hertz										+/- 0.012 Hz	0.001 Hz
		Net real power as measured on the high side terminal of the transmission system step-up transformer	MW										+/- 2% of full scale	0.5% of the point being monitored
		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 minus 50 degrees to plus 50 degrees Celsius)	degrees Celsius		+/- 2% of full scale	1 degree										
For each power plant	Status	Breaker, circuit switchers, motor operated switches and other devices that can remotely or automatically control the connection to the AIES; and does not include manually operated air breaks.	0 = Open	1 = Closed	N/A	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours			
		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 (PSS) status	0 = Off	1 = On										

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Appendix 2 – SCADA Requirements for Wind or Solar Aggregated Generating Facilities

Facility / Service Description	Signal Type	Point Description	Parameter		Accuracy Level	Resolution	Latency and Availability Requirements Based on Maximum Authorized Real Power					
							Maximum authorized real power less than 50 MW		Maximum authorized real power equal to or greater than 50 MW and less than 300 MW		Maximum authorized real power equal to or greater than 300 MW	
							Latency	Availability (%)	Latency	Availability (%)	Latency	Availability (%)
For each wind or solar aggregated generating facility directly connected to the transmission system or transmission facilities in the service area of the City of Medicine Hat,	Analog	Real power of each collector system feeder	MW		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours
		Reactive power of each collector system feeder	MVAR									
		Voltage for each collector bus	kV									
		Real power of station service over 0.5 MW	MW									
		Reactive power of station service over 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		Integer Value	1						
		Net real power at the point of connection	MW		+/- 2% of full scale	0.5% of the point being monitored						
		Net reactive power at the point of connection	MVAR									
		Frequency at the point of connection	Hertz		+/- 0.012 Hz	0.001 Hz						
		Voltage at the point of connection	kV		+/- 2% of full scale	0.5% of the point being monitored						
		Voltage regulation system set point	kV									
		Potential real power capability, being 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		+/- 10% of full scale							
		Real power limit used in the power limiting control system at the aggregated generating facilities	MW		+/- 2% of full scale							
		Wind speed at hub height as collected at the meteorological tower, (for wind facilities)	Meters per second		+/- 2% of anemometer maximum							
		Wind direction from the true north as collected at the meteorological tower, (for wind facilities)	Degrees		+/- 5 degrees	1 degree						
		Barometric pressure with precision for instantaneous measurements to the nearest 6 HPA (for wind facilities)	HPa		Nearest 6 HPA	1 HPA						
		Ambient temperature (for wind facilities)	°C		+/- 1 degrees	1 deg C						
		Wind Speed at 2-10m above ground (for solar facilities)	m/s		+/- 2% of anemometer maximum	0.5% of the point being monitored						
		Wind direction from the true north at 2-10m above ground (for solar facilities)	Degrees		+/- 5 degrees	1 degree						
		Ambient Temperature (for solar facilities)	°C		+/- 1 degrees	1 deg C						
Global Horizontal Irradiance (for solar facilities)	W/m ²		± 25 W/m ²	1 W/m ²								
(FROM ISO) Facility limit	MW		N/A	0.1 MW	Signal sent by ISO							
(FROM ISO) Reason for facility limit			1 = Transmission, 2 = Ramp, 3 = No limit	N/A	Signal sent by ISO							
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	N/A	30 seconds	98.0% mean time to	15 seconds	98.0% mean time to	4 seconds	99.8% mean time to repair is 4 hours	

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		Communications failure indication between an intelligent electronic device and any remote terminal unit acting as a data concentrator	0 = Normal	1 = Alarm			repair is 48 hours	repair is 48 hours
		Each collector system feeder breaker	0 = Open	1 = Closed				
		Each reactive resource feeder breaker	0 = Open	1 = Closed				
		power limiting control system	0 = Off	1 = On				
		Voltage regulation system status	0 = Manual	1 = Automatic				
		Breaker, circuit switchers, motor operated switches and other devices that can remotely or automatically control the connection to the AIES; 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				
For each wind or solar aggregated generating facility, where the total nameplate rating 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		+/- 2% of full scale	0.5% of the point being monitored	latency is 30 seconds availability is 98% mean time to repair is 48 hours	
		Gross reactive power as measured at the collector bus	MVAR					
		Generating unit voltage at the collector bus	kV					
		Net real power at the point of connection	MW		+/- 2% of full scale	0.5% of the point being monitored		
		Net reactive power at the point of connection	MVAR		+/- 2% of full scale	0.5% of the point being monitored		
		Frequency at the point of connection	Hertz		+/- 0.012 Hz	0.001 Hz		
		Potential real power capability, being 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		+/- 10% of full scale	0.5% of the point being monitored		
		Real power limit used in the power limiting control system at the aggregated generating facilities	MW		+/- 2% of full scale	0.5% of the point being monitored		
		Wind speed at hub height as collected at the meteorological tower, (for wind facilities)	Meters per second		+/- 2% of anemometer maximum	0.5% of the point being monitored		
		Wind direction from the true north as collected at the meteorological tower, (for wind facilities)	Degrees		+/- 5 degrees	1 degree		
		Barometric pressure with precision for instantaneous measurements to the nearest 6 HPA (for wind facilities)	HPa		Nearest 6 HPA	1 HPA		
		Ambient temperature (for wind facilities)	°C		+/- 1 degrees	1 deg C		
		Wind Speed at 2-10m above ground (for solar facilities)	m/s			0.5% of the point being monitored		
		Wind direction from the true north at 2-10m above ground (for solar facilities)	Degrees		+/- 5 degrees	1 degree		
		Ambient Temperature (for solar facilities)	°C		+/- 1 degrees	1 deg C		
		Global Horizontal Irradiance (for solar facilities)	W/m ²		± 25 W/m ²	1 W/m ²		
	(FROM ISO) Facility limit	MW		N/A		0.1 MW		Signal sent by ISO
(FROM ISO) Reason for facility limit	1 = Transmission; 2 = Ramp; 3 = No limit		N/A			Signal sent by ISO		
Status		Breaker, circuit switchers, motor operated switches and other devices that can remotely or automatically control the connection to the AIES; and does not include manually operated air breaks.	0 = Open	1 = Closed	N/A		Latency is 30 seconds; Availability is 98%; Mean time to repair is 48 hours	

Appendix 3 – SCADA Requirements for Industrial Complexes and Loads

Facility / Service Description	Signal Type	Point Description	Parameter		Accuracy Level	Resolution	Latency and Availability Requirements Based on Maximum Authorized Real Power					
							Maximum authorized real power less than 50 MW		Maximum authorized real power equal to or greater than 50 MW and less than 300 MW		Maximum authorized real power equal to or greater than 300 MW	
							Latency	Availability (%)	Latency	Availability (%)	Latency	Availability (%)
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	N/A	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours	
		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		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours
		Reactive power at the point of connection	MVar									
		Voltage at the point of connection	kV									
	Status	Breaker, circuit switchers, motor operated switches and other devices that can remotely or automatically control the connection to the AIES; and does not include manually operated air breaks.	0 = Open	1 = Closed	N/A							
A market participant with a Remedial action scheme on its load facility or industrial complex	Analog	Total Remedial action scheme load available	MW		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	99.8% mean time to repair is 4 hours	15 seconds	99.8% mean time to repair is 4 hours	4 seconds	99.8% mean time to repair is 4 hours
		Amount of load armed	MW									
	Status	Remedial action scheme circuit breaker, circuit switcher or other controllable isolating devices	0 = Open	1 = Closed	N/A							
		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										

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Appendix 4 – SCADA Requirements for Transmission Facilities

Facility/ Service Description	Signal Type	Point-Description	Parameter		Accuracy Level	Resolution	Latency and Availability Requirements Based on Transmission Voltage			
							Any one bus operated at 60 kV or above, but less than or equal to 200 kV		Any one bus operated above 200 kV	
							Latency	Availability (%)	Latency	Availability (%)
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	N/A	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	
		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 busses require a minimum of two voltage sources	kV		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours
	Status	Breakers, circuit switchers, motor operated switches, or other remotely or automatically controllable isolating device status	0 = Open	1 = Closed	N/A					
Transformer winding greater than 60 kV	Analog	Real power as measured on the high side terminal of the transformer	MW		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours
		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							
	Status	Transformer tap position if the step-up transformer has a load tap changer	Tap position		Integer Value	1				
Reactive Resources	Analog	Reactive power of switchable reactive power resource – capacitor bank (positive polarity) or reactor (negative polarity)	MVAR		+/- 2% of full scale	0.5% of the point being monitored	-latency is 30 seconds; availability is 98%; mean time to repair is 48 hours			
		Reactive power of dynamic reactive power resource – SVC, synchronous condenser, or other similar device	kV				-latency is 15 seconds; availability is 98%; mean time to repair is 48 hours			
		Voltage setpoint of dynamic reactive power resource – SVC, synchronous condenser, or other similar device	kV				latency is 15 seconds; availability is 98%; mean time to repair is 48 hours			
	Status	Reactive power resource control device – capacitor bank or reactor	0 = Off	1 = On	N/A	-latency is 30 seconds; availability is 98%; mean time to repair is 48 hours				
		Reactive power resource control device – SVC, synchronous condenser, or other similar device	0 = Off	1 = On		-latency is 15 seconds; availability is 98%; mean time to repair is 48 hours				
		Automatic voltage regulation status for dynamic reactive power resource – SVC, synchronous condenser, or other similar device	0 = Off	1 = On		latency is 15 seconds; availability is 98%; mean time to repair is 48 hours				
Remedial Action Scheme	Status	Remedial action scheme circuit breaker, circuit switcher or other controllable isolating devices	0 = Open	1 = Closed	N/A	30 Seconds	99.8% mean time to repair is 4 hours	15 seconds	99.8% mean time to repair is 4 hours	
		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		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	98% mean time to repair is 48 hours	N/A	
	Status	Reactive power	MVAR							
Transmission line where the nominal voltage is equal to or greater than 200 kV	Analog	Real power	MW		+/- 2% of full scale	0.5% of the point being monitored	N/A	15 seconds	98% mean time to repair is 48 hours	
		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	N/A					

ISO Rules
 Part 500 Facilities
 Division 502 Technical Requirements
 Section 502.8 SCADA Technical and Operating Requirements



Appendix 5 – SCADA Requirements for Ancillary Services

Facility / Service Description	Signal Type	Point Description	Parameter		Accuracy Level	Resolution	Latency and Availability Requirements Based on Maximum Authorized Real Power					
							Maximum authorized real power less than 50 MW		Maximum authorized real power equal to or greater than 50 MW and less than 300 MW		Maximum authorized real power equal to or greater than 300 MW	
			Latency	Availability (%)			Latency	Availability (%)	Latency	Availability (%)		
For each resource providing black start services	Analog	Bus frequency in hertz with a range of at least 57 to 63Hz	Hertz		+/- 0.012 Hz	0.001 Hz	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours
For each resource providing regulating reserves	Analog	Gross real power as measured at the stator winding terminal	MW		0.25% of full scale	0.25% of the point being monitored	latency is 2 seconds availability is 99.8% mean time to repair is 4 hours					
		Net real power as measured on the high side terminal of the step up transformer	MW									
		Gross real power set point from the regulating reserve resource control system	MW									
		High limit of the regulation range	MW									
	Status	Low limit of the regulation range	MW		latency is 10 seconds availability is 99.8% mean time to repair is 4 hours							
		(FROM ISO) Set point. Note if multiple resources are used to provide the full resource commitment, the ISO will send a totalized expected MW output signal.	MW								N/A	0.1 MW
For each resource providing spinning reserves	Analog	Gross real power as measured at: a) For generating pool assets, the stator winding terminal or b) For load pool assets the closest circuit breaker or disconnection device to each load.	MW		+/- 2% of full scale	0.5% of the point being monitored	latency is 10 seconds availability is 99.8%, mean time to repair is 4 hours					
		Spinning reserve resource circuit breaker status (required for all circuit breakers composing the resource)	0 = Open	1 = Closed	N/A							
	Status	Regulating reserve resource control status	0 = Disabled	1 = Enabled	N/A		latency is 2 seconds availability is 99.8% mean time to repair is 4 hours					
For each resource providing supplemental reserves either load or generation	Analog	Gross real power	MW		+/- 2% of full scale	0.5% of the point being monitored	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	4 seconds	99.8% mean time to repair is 4 hours
		Supplemental reserve resource circuit breaker status (required for all circuit breakers composing the resource)	0 = Open	1 = Closed	N/A							
For each resource providing load shed service for imports	Analog	Actual Volume, being the real power consumed at the point of connection	MW		+/- 2% of dispatched signal	0.5% of the point being monitored	30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours	N/A	
		Offered Volume, being the participant's real power offer to the ISO	MW									
		Armed Volume, being the real power commitment of the LSSI resource	MW									
		(From ISO) dispatched volume	MW									
	Status	LSSI provider status indication	0 = Disarmed	1 = Armed	N/A		30 seconds	98.0% mean time to repair is 48 hours	15 seconds	98.0% mean time to repair is 48 hours		
		(From ISO) load shed service for imports dispatch status	0 = Disarmed	1 = Armed	N/A		Signal sent by ISO when the load shed service for imports is dispatched on or off					