

ISO Rules

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

Facility/ Service Description	Signal Type	Point Description	Parameter/Unit	
	-	-	-	-
	-	-	-	-
<u>Legal owner data acquisition data requirements</u>				
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
		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	<u>Hertz/Hz</u>	
		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			

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		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°C-degrees-to and plus +50°C-degrees-Celsius)	°Cdegrees-Celsius		
	Status		Breaker, circuit switchers, motor operated switches, and-or other devices that can remotely or automatically control the connection to the AIESinterconnected 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 (PSS) status	0 = Off	1 = On
			Generating unit automatic voltage regulation (AVR) 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 total turbine-nameplate rating-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, and-or other devices that can remotely control the connection to the AIESinterconnected 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 SCADA Requirements for Wind or Solar Aggregated Generating Facilities

Facility / Service Description	Signal Type	Point Description	Parameter Unit	
-	-	-	-	-
-	-	-	-	-
<u>Legal owner data acquisition data requirements</u>				
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 over-greater than 0.5 MW	MW	
		Reactive power of station service over-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	Hertz Hz	
		Voltage at the point of connection	kV	
		Voltage regulation system set-point	kV	
		Potential real power capability, being 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 meteorological tower, (for wind facilities)	Metres Meters per second/m/s	
		Wind direction from the true north as collected at the meteorological meteorological tower, (for wind facilities)	Degrees	
		Barometric pressure with precision for instantaneous measurements to the nearest 6 HPA (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			

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<u>ISO supervisory control point requirements</u>				
<u>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 its nameplate rating is greater than or equal to 5 MW.</u>	Analog	(FROM ISO) Facility limit	MW	
		(FROM ISO) Reason for facility limit	1 = Transmission, 2 = Ramp, 3 = No limit	
<u>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 its nameplate rating is greater than or equal to 5 MW.</u>	Status	Communications failure alarm from remote terminal unit acting as a data concentrator for one or more generating units to a <u>the transmission facility control centre of a transmission facility</u> , (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
		<u>P</u> power limiting control system	0 = Off	1 = On
		Voltage regulation system status	0 = Manual	1 = Automatic
		Breaker, circuit switchers, motor operated switches, <u>and/or</u> other devices that can remotely or automatically control the connection to the <u>AIES interconnected electric system</u> ; 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		
<u>ISO supervisory control point data requirements</u>				
<u>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 its nameplate rating is greater than or equal to 5 MW.</u>	Analog	Facility limit	MW	
		Reason for facility limit	1 = Transmission, 2 = Ramp, 3 = No limit	

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<u>gross real power capability rating is greater than or equal to 5 MW.</u>			
<u>Legal owner data acquisition point data requirements</u>			
For each wind or solar aggregated generating facility, where the <u>gross total nameplate rating is real power capability is greater than or equal to 5 MW</u> and is connected to an <u>electric distribution system</u> 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	HzHertz
		Potential real power capability, <u>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, 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</u>	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 <u>meteorological meteorological</u> tower, (for wind facilities)	Meters per secondm/s
		Wind direction from the true north as collected at the <u>meteorological meteorological</u> tower, (for wind facilities)	Degrees
		Barometric pressure with precision for instantaneous measurements <u>to the nearest 6 HPA</u> (for wind facilities)	HPa
		Ambient temperature (for wind facilities)	°C
		Wind Speed at <u>between 2 and</u> 10 m above ground (for solar facilities)	m/s
		Wind direction from the true north at <u>between 2 and</u> 10 m above ground (for solar facilities)	Degrees
	Ambient Temperature (for solar facilities)	°C	
Global Horizontal Irradiance (for solar facilities)	W/m ²		
Status	<u>Breaker, circuit switches, 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.</u>	0 = Open	1 = Closed
<u>ISO supervisory control data requirements</u>			
<u>For each wind or solar aggregated generating facility where the gross real power capability is greater than or equal to 5 MW</u> and is connected to an <u>electric distribution system</u>	Analog	(FROM ISO) Facility limit	MW
		(FROM ISO) Reason for facility limit	1 = Transmission, 2= Ramp, 3 = No limit

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<p>including distribution facilities in the service area of the City of Medicine Hat.</p>				
<p>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.</p>	<p>Status</p>	<p>Breaker, circuit switchers, motor-operated switches and or other devices that can remotely or automatically control the connection to the AIE <u>interconnected electric system</u>; and does not include manually-operated air breaks.</p>	<p>0= Open</p>	<p>1= Closed</p>

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

Facility / Service Description	Signal Type	Point Description	Parameter Unit	
<u>Legal owner data acquisition point data requirements</u>				
-	-	-	-	-
-	-	-	-	-
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 <u>load facility</u> 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, <u>and/or</u> other devices that can remotely or automatically control the connection to the <u>AIES interconnected electric system</u> ; and does not include manually operated air breaks.	0 = Open	1 = Closed
A market participant with a <u>Remedial action scheme</u> on its <u>load facility</u> or industrial complex	Analog	Total <u>Remedial action scheme</u> load available	MW	
		Amount of load armed	MW	
	Status	<u>Remedial action scheme</u> circuit breaker, circuit switcher, or other controllable isolating devices	0 = Open	1 = Closed
		Arming status of the <u>Remedial action scheme</u>	0 = Disarmed	1 = Armed
		<u>Remedial action scheme</u> operated status on communications failure, if applicable	0 = Normal	1 = Alarm
	<u>Remedial action scheme</u> operated status on runback, if applicable	0 = Normal	1 = Alarm	
	<u>Remedial action scheme</u> operated status on trip, if applicable	0 = Normal	1 = Alarm	

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

Facility / Service Description	Signal Type	Point Description	Parameter/Unit	
<u>Legal owner data acquisition point data requirements</u>				
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 busses 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 MVAR	
		Reactive power of dynamic reactive power resource – static VAr SVC compensator , synchronous condenser, or other similar device		
		Voltage setpoint of dynamic reactive power resource – SVC 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 – SVC static VAr compensator , synchronous condenser, or other similar device	0 = Off	1 = On
		Automatic voltage regulation status for dynamic reactive power resource – SVC 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 equal to or	Analog	Real power	MW	
		Reactive power	MVar	
		Line side voltage	kV	

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greater than <u>or</u> <u>equal to</u> 200 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 SCADA Requirements for Ancillary Services

Facility / Service Description	Signal Type	Point Description	Parameter/Unit	
<u>Legal owner data acquisition point data requirements</u>				
-	-	-	-	-
-	-	-	-	-
For each resource providing black start resource services	Analog	Bus frequency in hertz with a range of at least 57 to 63 Hz	Hertz/Hz	
<u>Legal owner data acquisition point data requirements</u>				
For each resource providing regulating reserves 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 set-point 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	
<u>ISO supervisory control point data requirements</u>				
For each regulating reserve resource	Analog	Set-point 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
<u>Legal owner data acquisition point data requirements</u>				
For each resource providing spinning reserve resources	Analog	Gross real power as measured at: 1.a) For generating source pool assets, the stator winding terminal or 2.b) For load pool 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
<u>Legal owner data acquisition point data requirements</u>				
For each resource providing 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
<u>Legal owner data acquisition point data requirements</u>				
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 offer to the ISO	MW	
		Armed Volume of real power commitment of the LSSI resource	MW	

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	Status	<u>LSSI-Load shed service</u> provider status indication	0 = Disarmed	1 = Armed
<u>ISO supervisory control point data requirements</u>				
For each resource providing load facility shed service for imports	Analog	<u>Real power Dispatched volume</u>	<u>MW</u>	
	Status	(From ISO) Dispatch status for load shed service for imports dispatch status	0 = Disarmed	1 = Armed