

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



#### Applicability

- 1 Section 502.6 applies to:
  - (a) the **operator** of a **generating unit** that is:
    - (i) synchronized to the **interconnected electrical system**; and
    - (ii) directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat,  
  
including a **generating unit** situated within an industrial complex that is directly connected to the **transmission system** but not including any **aggregated generating facilities**;
  - (b) the **legal owner** of a **generating unit** that is:
    - (i) synchronized to the **interconnected electrical system**; and
    - (ii) directly connected to the **transmission system** or to **transmission facilities** within the City of Medicine Hat,  
  
including a **generating unit** situated within an industrial complex that is directly connected to the **transmission system** but not including any **aggregated generating facilities**; and
  - (c) the **ISO**.

#### Requirements

##### Documentation

- 2(1) The **ISO** must, [in accordance and generally consistent with this Section 502.6](#):
  - (a) for a **generating unit** without a functional specification referencing section 502.5 of the **ISO rules**, *Generating Unit Technical Requirements*; or
  - (b) for subsequent upgrades to a **generating unit** with a functional specification referencing section 502.5 of the **ISO rules**, *Generating Unit Technical Requirements*;  
  
[develop-approve](#) a **generating unit** functional document containing details, [work](#) requirements, and specifications for the as-built operation of a **generating unit**.
- ~~(2) The **generating unit** functional document referred to in subsection 2(1) must be generally consistent with the provisions of this section 502.6, but may contain material variances the **ISO** approves of based upon its discrete analysis of any one (1) or more of the technical, economic, safety, operational and **reliability** requirements of the **interconnected electric system** related to the specific **generating unit**.~~
- ~~(23)~~ (23) The **ISO** may, in order to compile the information necessary for the **generating unit** functional document, request information by way of written notice from the **legal owner** of a **generating unit** referenced in subsection 2(1), including:
  - (a) the **maximum authorized real power** value;
  - (b) the **reactive power** capability for:
    - (i) operation in the lagging **power factor** region, including the over excitation limiter settings; and

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



- (ii) operation in the leading **power factor** region, including the under excitation limiter settings;
- (c) the root mean square phase-to-phase voltage value at the **transmission system** step-up transformer of the **generating unit** to be used as the 1.0 per unit voltage value;
- (d) the root mean square phase-to-phase voltage value at the stator winding terminals to be used as the 1.0 per unit voltage value;
- (e) transformer data;
- (f) auxiliary system design;
- (g) voltage ride-through capabilities; and
- (h) any supporting documentation necessary to evaluate the information submitted.

**(34)** The **legal owner** of the **generating unit** must, if available, submit the information requested in subsection 2(23), along with any supporting documentation, no later than the close of business on the thirtieth (30<sup>th</sup>) **business day** after delivery of the notice.

#### Requirements to Operate and Maintain a Generating Unit

**3(1)** This subsection 3 does not apply to:

- (a) excitation systems;
- (b) **automatic voltage regulators**; or
- (c) power system stabilizers.

**(2)** The **legal owner** of a **generating unit** must operate and maintain the **generating unit** to comply with the technical design parameters of section 502.5 of the **ISO rules** for so long as the **generating unit** remains electrically connected to the **transmission system**.

**(3)** The **operator** of a **generating unit** must, if it determines that any **generating unit** equipment required to meet the technical design requirements of an applicable **ISO rule** has become unavailable or is otherwise no longer meeting those requirements, report to the **ISO** in accordance with subsection 3(4) no later than one (1) **business day** after making such a determination.

**(4)** A report to the **ISO** as required by subsection 3(3), must include:

- (a) a description of the cause of the equipment unavailability or the reason that the equipment no longer meets the technical design requirements, as reported pursuant to subsection 3(3);
- (b) a plan to address the problem, including testing; and
- (c) the expected date and time when the equipment will be repaired.

**(5)** The **operator** of a **generating unit** must, if the **generating unit** equipment is not repaired by the expected date and time provided in the report described in subsection 3(4)(c), report to the **ISO** no later than one (1) **business day** after the original expected date and time of the reason why the **generating unit** equipment was not repaired at the expected date and time, and provide the **ISO** with a revised date and time for repair.

**(6)** The **operator** of a **generating unit** must report to the **ISO** no later than one (1) **business days** after the equipment described in subsection 3(3) has been repaired.

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



(7) The **operator** of any **generating unit** that is one of multiple **generating units** within a single facility must, as soon as practicable, verbally notify the **ISO** when it is identified that the auxiliary systems of the facility are configured such that multiple **generating units** will trip or go off-line for a single **contingency** within the facility.

(8) If the **ISO** provides written notice to the **legal owner** of a **generating unit** detailing evidence that the observed performance of the **generating unit** is not consistent with any of the requirements set out in section 502.5 of the **ISO rules**, the **legal owner** must submit to the **ISO** a written report, in accordance with subsection 13, demonstrating that the **generating unit** is capable of meeting those requirements.

(9) The **legal owner** must submit a report pursuant to subsection 3(8) no later than sixty (60) **business days** after receipt of the **ISO's** written notice.

(10) Notwithstanding subsection 3(9), the **legal owner** of a **generating unit** is not required 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 lack of consistency described in subsection 3(8) was caused by equipment problems for the **generating unit** that the **legal owner** corrected prior to the deadline date for the submission of the report; and
- (b) the **ISO** provides written notice to the **legal owner** that the report is not required.

#### Requirements for Governor System

4 Subject to subsection 3, the **operator** of a **generating unit** must only operate the **generating unit** with the **governor system** in service, in droop mode and free to respond to frequency changes.

#### Requirements for Operation at Maximum Authorized Real Power

5(1) The **operator** of a **generating unit** must not operate the **generating unit** above its **maximum authorized real power**.

(2) Notwithstanding subsection 5(1), the **ISO** may, during supply shortfall events, request that the **operator** of a **generating unit** operate above the **maximum authorized real power** of the **generating unit**.

(3) The **ISO** must, when the additional **real power** referred to in subsection 5(2) is no longer required, notify the **operator** of the **generating unit** to return the **generating unit** to a value at or below the **maximum authorized real power**.

#### Operating Requirements for the Synchrophasor Measurement and Sequence of Event Devices

6 The **legal owner** of a **generating unit** must retain the synchrophasor measurements and sequence of event records for a minimum period of one (1) calendar year.

#### Operating Data Requests

7(1) The **ISO** may request, by way of written notice, operating data from the **legal owner** of a **generating unit**, including the records set out in subsection 6.

(2) The **legal owner** of a **generating unit** must:

- (a) submit the operating data requested by the **ISO**, if available, no later than five (5) **business**

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



**days** after receipt of the notice set out in subsection 7(1); or

- (b) if the operating data requested by the **ISO** is not available, advise the **ISO** in writing no later than five (5) **business days** after receipt of the notice set out in subsection 7(1).

#### Reactive Current Compensation Setting

**8(1)** The **ISO** must provide the **legal owner** of a **generating unit** with one hundred and eighty (180) **days'** notice in writing that a change to the reactive current compensation settings of the **generating unit** is required.

**(2)** The **legal owner** of a **generating unit** must, upon receiving notice in a notice in writing from the **ISO** referenced in subsection 8(1), make a change to the reactive current compensation settings of the **generating unit** on or before the date specified by the **ISO**, and must provide written confirmation to the **ISO** that it has done so.

#### Testing Applicability

**9** The following subsections 10 and 11 are only applicable to the **legal owner** of a **generating unit** that meets the following criteria:

- (a) the **generating unit** has:
  - (i) a **maximum authorized real power** equal to or greater than 9 MW; or
  - (ii) a **maximum authorized real power** aggregate equal to or greater than 18 MW, where the **generating unit** is part of a complex with other **generating units**; and
- (b) the **generating unit** is not connected to the in-plant distribution system of an industrial complex with two (2) or more voltage transformations between the stator winding terminals and the **transmission system**.

#### Baseline Testing

**10(1)** The **legal owner** of a **generating unit** must perform baseline testing, including model validation, in accordance with subsection 10(2), to validate the following **generating unit** models:

- (a) synchronous generator 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** equipped with a rotary exciter;
- (c) power system stabilizer for a **generating unit** equipped with a power system stabilizer;
- (d) turbine-**governor system**; and
- (e) other **generating unit** models as the **ISO** requires.

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



(2) The **legal owner** of a **generating unit** must perform baseline testing when any of the following occurs:

- (a) the **generating unit** 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** stator rewind;
- (d) a **generating unit** 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** with respect to the **transmission system**.

(3) Notwithstanding subsection 10(2), where the **legal owner** of a **generating unit** determines that any of the work described in subsections 10(2)(b) through (f) does not result in changes to the modeled behaviour of the **generating unit** with respect to the **transmission system**, base line testing is not required.

(4) The **legal owner** of a **generating unit** referred to in subsections 10(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** must perform **reactive power** verification, in accordance with subsection 12 as part of the baseline testing.

(6) The results of the testing performed pursuant to subsection 10(2) must be reported to the **ISO** in accordance with subsection 13.

#### Model Revalidation Testing

**11(1)** The **legal owner** of a **generating unit** must, for each model referenced in subsection 11(2), perform model revalidation testing no later than five (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** models:

- (a) **excitation system** including the **automatic voltage regulator** in voltage control mode;
- (b) power system stabilizer for **generating units** 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** stating that the modeled response of the **generating unit** is not consistent with the observed response, the **legal owner** must perform model revalidation testing of the **generating unit** in accordance with subsection 11(2).

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



- (4) The **legal owner** of a **generating unit** must provide to the **ISO** the written results of any model revalidation testing no later than sixty (60) **business days** after receipt of the notice described in subsection 11(3).
- (5) Notwithstanding subsection 11(4), the **legal owner** of a **generating unit** is not required 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 11(3) was caused by equipment problems for the **generating unit** 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.
- (7) Notwithstanding subsection 11(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; and
  - (b) the **ISO** must reply to the **legal owner**, in writing, within sixty (60) **business days** of receiving a request under section 11(1)(a).
- (8) The results of any model revalidation testing performed pursuant to subsections 11(1) and 11(3) must be reported to the **ISO** in accordance with the requirements of subsection 13.

#### Reactive Power Verification Testing

- 12(1)** The **legal owner** of a **generating unit** must, subject to subsection 12(3), perform **reactive power** verification testing of the **generating unit** at the **maximum authorized real power** for the **generating unit** at regular intervals no later than five (5) years from the date of the prior **reactive power** verification or re-verification testing..
- (2) The **reactive power** testing for the **generating unit** for the **maximum authorized real power** must achieve:
- (a) the **gross reactive power** at 0.90 lagging **power factor**; and
  - (b) the **gross reactive power** at 0.95 leading **power factor**.
- (3) The **legal owner** of a **generating unit** may test the **generating unit** at values other than the **maximum authorized real power** but only if ambient conditions or **transmission system** limits do not allow the **generating unit** to achieve the **maximum authorized real power** or the **reactive power** requirements.
- (4) Where the **ISO** provides written notice to the **legal owner** of a **generating unit** that the observed response of the **generating unit** is not consistent with the **reactive power** requirements for that **generating unit**, the **legal owner** must perform **reactive power** re-verification testing in accordance with subsection 12(2).
- (5) Subject to the exception in subsection 12(6), the **legal owner** of a **generating unit** must provide the **reactive power** re-verification testing results to the **ISO**, no later than sixty (60) **business days** after receipt of the notice described in subsection 12(4).

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



**(6)** Notwithstanding subsection 12(5), the **legal owner** of a **generating unit** is not required to perform the **reactive power** re-verification testing if, between the date the **ISO** delivers the written notice and the deadline date for the submission of the testing results:

- (a) the **legal owner** demonstrates to the satisfaction of the **ISO** that the lack of consistency described in subsection 12(4) was caused by equipment problems for the **generating unit** that the **legal owner** corrected prior to the testing date; and
- (b) the **ISO** provides written notice to the **legal owner** that the report is not required.

**(7)** The results of any **reactive power** re-verification testing performed pursuant to subsections 12(1) or 12(3) must:

- (a) be reported to the **ISO** in accordance with subsection 13; and
- (b) include the following data:
  - (i) **reactive power** capability curve showing:
    - (A) over-excitation limiters;
    - (B) under-excitation limiters; and
    - (C) any other limiting factors
  - (ii) V curve; and
  - (iii) excitation system maximum continuous output.

#### Model Validation and Reactive Power Verification Reporting

**13(1)** The **legal owner** of a **generating unit** must submit all test results referred to in this section 502.6 to the **ISO** in the form of reports that meet the requirements specified by the **ISO**.

**(2)** In addition to any other reporting requirements specified in this section 502.6, the **legal owner** of a **generating unit** must, unless otherwise specified in this section 502.6, submit a separate report in accordance with subsection 13(1) to the **ISO** no later than one hundred and eighty (180) **days** after the date of completion of each of:

- (a) the first synchronization of a **generating unit** to the **transmission system**;
- (b) the first synchronization of a **generating unit** to the **transmission system** upon completion of any modification described in subsections 10(2);
- (c) the in-service date of any increased **maximum authorized real power** of a **generating unit** the **ISO** approves under section 502.5 of the **ISO rules**;
- (d) the completion of model revalidation testing other than that required in subsection 11(3); and
- (e) the completion of any **reactive power** verification or re-verification testing other than that required in subsection 12(4).

#### Power Quality

**14(1)** The **ISO** must assess voltage unbalance concerns in compliance with the specifications set out in the version of the *International Electrotechnical Commission 61000-3-13, Electromagnetic compatibility (EMC) – Part 3-13: Limits - Assessment of emission limits for the connection of unbalanced installations*

# ISO Rules

## Part 500 Facilities

### Division 502 Technical Requirements

#### Section 502.6 Generating Unit Operating Requirements



to MV, HV and EHV power systems at the **point of connection(s)** of the **generating unit** to the **transmissions system**.

(2) The **legal owner** and **operator** of a **generator unit** must assist the **ISO** in a power quality investigation.

#### Revision History

Date	Description
<a href="#"><u>2019-xx-xx</u></a>	<a href="#"><u>Removed duplication with new Section 103.14, Waivers and Variances; standardized functional specifications language; capitalized references to "Section".</u></a>
2017-11-21	Initial release.