

# Alberta Reliability Standard System Operating Limits Methodology for the Planning Horizon FAC-010-AB1-2.1



## 1. Purpose

The purpose of this **reliability standard** is to ensure that **system operating limits** used in the reliable planning of the **bulk electric system** are determined based on an established methodology or methodologies.

## 2. Applicability

This **reliability standard** applies to:

- (a) the **ISO**.

## 3. Requirements

**R1** The **ISO** must have a documented **system operating limit** methodology for use in developing **system operating limits** that:

- (a) is applicable for developing **system operating limits** used in the **ISO**'s planning horizon;
- (b) states that **system operating limits** must not exceed any associated **facility rating**; and
- (c) includes a description of how to identify the subset of **system operating limits** that qualify as **interconnected reliability operating limits**.

**R2** The **system operating limit** methodology of the **ISO** must include a requirement:

**R2.1** That **system operating limits** developed in the pre-contingency state, and with all facilities in service:

- (a) result in:
  - i. **bulk electric system** performance that demonstrates transient, dynamic and voltage stability;
  - ii. all facilities operating within their **facility ratings**; and
  - iii. system conditions within thermal, voltage and stability limits;and

- (b) reflect expected system conditions and changes to **bulk electric system** topology.

**R2.2** That **system operating limits** developed starting with all facilities in service and following any single **contingency** including:

- (a) single line to ground **fault** or three-phase **fault**, whichever is most severe, with **normal clearing**, on any **generating unit**, line, transformer or shunt device;
- (b) loss of any **generating unit**, line, transformer or shunt device without a **fault**; or
- (c) single pole block, with **normal clearing**, in a monopolar or bipolar high voltage direct current system;

result in **bulk electric system** performance that:

- (d) demonstrates transient, dynamic and voltage stability;

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- (e) has all facilities operating within their **facility ratings**;
  - (f) is within voltage and stability limits; and
  - (g) has no **cascading** or uncontrolled separation,
- with either or both of the following responses to the single **contingency** being acceptable:
- (h) planned or controlled interruption of electric supply to radial customers or some local network customers connected to or supplied by the facility on which the **fault** occurred or by the affected area; or
  - (i) **bulk electric system** reconfiguration through manual or automatic control or protection actions.

**R2.3** Intentionally left blank.

**R2.4** That following a single **contingency**, in preparation for the next **contingency** when developing **system operating limits**, the **ISO** may make system adjustments, including changes to generation, uses of the **transmission system**, and the **transmission system** topology.

**R2.5** That **system operating limits** developed starting with all facilities in service and following any of the multiple **contingencies** identified in **reliability standard TPL-003-AB**, result in **bulk electric system** performance that:

- (a) demonstrates transient, dynamic and voltage **stability**;
- (b) has all facilities operating within their **facility ratings**;
- (c) is within voltage and stability limits; and
- (d) has no **cascading** or uncontrolled separation,

with any of the following responses to such multiple **contingencies** being acceptable:

- (e) planned or controlled interruption of electric supply to radial customers or some local network customers connected to or supplied by the facility on which the **fault** occurred or by the affected area;
- (f) **bulk electric system** reconfiguration through manual or automatic control or protection actions; or
- (g) planned or controlled interruption of **demand** to **demand customers**, the planned removal of a **generating unit**, or the curtailment of firm, non-recallable power transfers.

**R2.6** Intentionally left blank.

**R3** In addition to requirements R1 through R2, the **ISO** must include within the **system operating limit** methodology a description of the:

- (a) study model, which must include at least the Alberta system as well as the critical modeling details from other interconnected jurisdictions that would impact any facility under study;

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- (b) selection of applicable **contingencies**;
  - (c) level of system detail included in the study model used to determine **system operating limits**;
  - (d) allowed uses of **remedial action schemes**;
  - (e) anticipated **transmission system** configuration, generation **dispatch** and **load** level;
  - (f) criteria for determining when violating a **system operating limit** qualifies as an **interconnection reliability operating limit** and criteria for developing any associated **interconnection reliability operating limit**  $T_v$ ; and
  - (g) any reliability margins applied.
- R4** The **ISO** must provide its **system operating limit** methodology, and any update to that methodology, to all of the following prior to implementation of the methodology or any update to the methodology:
- (a) each adjacent planning authority; and
  - (b) each planning authority that indicated it has a **reliability**-related need for the methodology.
- R5** Intentionally left blank.
- R6** The **system operating limit** methodology of the **ISO** must include a requirement that:
- R6.1** for **interconnections** with other systems within the **WECC**, starting with all facilities in service and following any of the multiple **contingencies** identified in **reliability standard** TPL-003-AB or any of the following multiple **contingencies**:
- (a) simultaneous permanent phase to ground **faults** of each of two (2) adjacent transmission circuits on a multiple circuit tower with **normal clearing**. If multiple circuit towers are used only for station entrance and exit purposes, and if they do not exceed five (5) towers at each station, this condition is an acceptable risk and therefore can be excluded;
  - (b) a permanent phase to ground **fault** on any **generating unit**, transmission circuit, transformer, or **collector bus** section with delayed **fault** clearing except for **collector bus** sectionalizing breakers or **collector bus** tie breakers as specified in requirement R6.2;
  - (c) simultaneous permanent loss of both poles of a direct current bipolar facility without an alternating current **fault**;
  - (d) the failure of a circuit breaker associated with a remedial action scheme to operate when required following the loss of any **system element** without a **fault**, or a permanent phase to ground **fault**, with **normal clearing**, on any transmission circuit, transformer or **collector bus** section; or
  - (e) a single-line-to-ground **fault** with **normal clearing** on common mode **contingency** of two (2) adjacent circuits on separate towers unless the **ISO** determines the event frequency is less than one (1) in thirty (30) years,

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the **system operating limits** result in **bulk electric system** performance that:

- (f) demonstrates transient, dynamic and voltage **stability**;
- (g) has all facilities operating within their **facility ratings**;
- (h) is within voltage and stability limits; and
- (i) has no **cascading** or uncontrolled separation,

with any of the following responses to such multiple **contingencies** being acceptable:

- (j) planned or controlled interruption of electric supply to radial customers or some local network customers connected to or supplied by the facility on which the **fault** occurred or by the affected area;
- (k) **bulk electric system** reconfiguration through manual or automatic control or protection actions; or
- (l) planned or controlled interruption of **demand** to **demand customers**, the planned removal of a **generating unit**, or the curtailment of firm, non-recallable power transfers.

**R6.2** for **interconnections** with other systems within the **WECC**, starting with all facilities in service and following either of these multiple **contingencies**:

- (a) a common mode **outage** of two (2) **generating units** connected to the same switchyard not otherwise addressed by **reliability standard** FAC-010-AB; or
- (b) the loss of multiple **collector bus** sections as a result of failure or delayed clearing of a **collector bus** tie or **collector bus** sectionalizing breaker to clear a permanent phase to ground **fault**, the **system operating limits** result in **bulk electric system** performance such that **cascading** does not occur on other systems in other jurisdictions within the **WECC**.

**R6.3** where the **ISO** makes changes to any **contingencies** and required responses identified in requirements R6.1 and R6.2 for specific facilities on **interconnections** to other systems within the **WECC** in accordance with the **WECC** performance category adjustment process based upon system performance and robust design, the **system operating limits** result in **bulk electric system** performance that satisfies the performance requirements in requirements R2.4.

## 4. Measures

The following measures correspond to the requirements identified in Section 3 of this **reliability standard**. For example, MR1 is the measure for R1.

**MR1** Evidence of having a documented **system operating limit** methodology as required in requirement R1 exists.

**MR2** Evidence of the **system operating limit** methodology including requirements as required in sub requirements R2.1, R2.2, R2.4 and R2.5 exists.

**MR3** Evidence of the **system operating limit** methodology including the description(s) as required in requirement R3 exists.

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**MR4** Evidence of providing the **system operating limit** methodology as required in requirement R4 exists. Evidence may include, but is not limited to, email or mail to an appropriate recipient that identifies contents submitted.

**MR5** Intentionally left blank.

**MR6** Evidence of the **system operating limit** methodology including requirements as required in sub requirements R6.1 through R6.3 exists.

## Revision History

Effective	Description
2012-07-01	Initial Release
2015-09-01	Revised for ISO assumption of RC functionality for the Alberta footprint
2016-08-30	Inclusion of the defined term <b>system element</b> .