

# Alberta Reliability Standard

## Facilities Design, Connections and Maintenance

### FAC-010-AB-2.1 - System Operation Limits Methodology for the Planning Horizon



#### 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:

- (a) **system operating limits** developed in the pre-**contingency** state and with all facilities in service result in **bulk electric system** performance that demonstrates transient, dynamic and voltage stability;
- (b) all facilities operate within their facility ratings;
- (c) system conditions are within thermal, voltage and stability limits; and
- (d) reflect the 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 faulted **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;

# Alberta Reliability Standard

## Facilities Design, Connections and Maintenance

### FAC-010-AB-2.1 - System Operation Limits Methodology for the Planning Horizon



- (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 faulted **facility** or by the affected area; or
  - (i) **bulk electric system** reconfiguration through manual or automatic control or protection actions;

**R2.3** 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;

**R2.4** 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 faulted facility 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.

**R3** The **system operating limit** methodology of the **ISO** must include a requirement that:

**R3.1** 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

# Alberta Reliability Standard

## Facilities Design, Connections and Maintenance

### FAC-010-AB-2.1 - System Operation Limits Methodology for the Planning Horizon



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 R3.2;
- (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 **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,

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 faulted facility 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.

**R3.2** 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**.

# Alberta Reliability Standard

## Facilities Design, Connections and Maintenance

### FAC-010-AB-2.1 - System Operation Limits Methodology for the Planning Horizon



- R3.3** where the **ISO** makes changes to any **contingencies** and required responses identified in requirements **R3.1** and **R3.2** 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.
- R4** In addition to requirements R1 through R3, 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;
  - (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.
- R5** 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 each planning authority that indicated it has a **reliability**-related need for the methodology; and
  - (b) the **WECC** Reliability Coordinator.
- R6** If a recipient of the **system operating limit** methodology as specified in requirement R5 provides written technical comments on the **system operating limit** methodology of the **ISO**, the **ISO** must provide a written response to that recipient within forty five (45) **days** of receipt of those comments. The **ISO**'s response must indicate whether the **ISO** will make a change to the **system operating limit** methodology and, if the **ISO** will not make a change, the reason why.

#### 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.

# Alberta Reliability Standard Facilities Design, Connections and Maintenance FAC-010-AB-2.1 - *System Operation Limits Methodology for the Planning Horizon*



- MR2** Evidence of the **system operating limit** methodology including requirements as required in sub requirements R2.1 through R2.4 exists.
- MR3** Evidence of the **system operating limit** methodology including requirements as required in sub requirements R3.1 through R3.3 exists.
- MR4** Evidence of the **system operating limit** methodology including the description(s) as required in requirement R4 exists.
- MR5** Evidence of providing the **system operating limit** methodology as required in requirement R5 exists. Evidence may include email or mail to an appropriate recipient that identifies contents submitted.
- MR6** Evidence of providing a written response as required in requirement R6 exists. Evidence may include email or mail to an appropriate recipient that identifies contents submitted.

## 5. Appendices

No appendices have been defined for this **reliability standard**.

### Revision History

Effective	Description
yyyy/mm/dd	