Alberta Reliability Standard
System Operating Limits Methodology for the Operations Horizon
FAC-011-AB-4

A. Introduction

1. Title: **System Operating Limits** Methodology for the Operations Horizon

2. Number: FAC-011-AB-4

3. Purpose: To ensure that **system operating limits** used in the reliable operation of the **bulk electric system** are determined based on an established methodology or methodologies.

4. Applicability:

4.1. Functional Entities

4.1.1. the **ISO.**

5. Effective Date: January 1, 2028

B. Requirements and Measures

R1. The **ISO** must have a documented methodology for establishing **system operating limits** (i.e., SOL methodology) within its area. *[Alberta Risk Rating: Medium] [Time Horizon: Operations Planning]*

M1. Evidence may include dated electronic or hard copy documentation of its **system operating limit** methodology or other equivalent evidence.

R2. The **ISO** must include in its **system operating limit** methodology the method for **operators** of **transmission facilities** to determine which owner-provided **facility ratings** are to be used in operations such that the **operator** of a **transmission facility** and the **ISO** use common **facility ratings**. *[Alberta Risk Rating: Medium] [Time Horizon: Operations Planning]*

M2. Evidence may include dated electronic or hard copy documentation of its **system operating limit** methodology, or other equivalent evidence, that addresses the items listed in Requirement R2.

R3. The **ISO** must include in its **system operating limit** methodology the method for **operators** of **transmission facilities** to determine the **system voltage limits** to be used in operations. The method must: *[Alberta Risk Rating: Medium] [Time Horizon: Operations Planning]*

3.1. Require that each bus/station that is part of the **bulk electric system** have an associated **system voltage limit**, unless its **system operating limit** methodology specifically allows the exclusion of buses/stations that are part of the **bulk electric system** from the requirement to have an associated **system voltage limit**;

3.2. Require that **system voltage limits** respect voltage-based **facility ratings**;

3.3. Require that **system voltage limits** are greater than or equal to in-service **bulk electric system** relay settings for **under voltage load shed** systems and **under voltage load shed** programs;

3.4. Identify the minimum allowable **system voltage limit**;

3.5. Define the method for determining common **system voltage limits** between the **ISO** and the **operators** of **transmission facilities**, between adjacent **operators** of **transmission facilities**, and between adjacent **reliability coordinators** within the **western interconnection**.

M3. Evidence may include dated electronic or hard copy documentation or other equivalent evidence, of its **system operating limit** methodology that addresses the items listed in Requirement R3.

R4. The **ISO** must include in its **system operating limit** methodology the method for determining the limits to be used in operations. The method must: *[Alberta Risk Rating: Medium] [Time Horizon: Operations Planning]*

4.2. Specify **stability** performance criteria, including any margins applied. The criteria must, at a minimum, include the following:

4.2.1. steady-state voltage **stability**;

4.2.2. transient voltage response;

4.2.3. angular **stability**; and

4.2.4. system damping.

4.3. Require that **stability limits** are established to meet the criteria specified in Requirement R4, Part 4.1 for the **contingencies** identified in Requirement R5 applicable to the establishment of **stability limits** that are expected to produce more severe system impacts on its portion of the **bulk electric system**.

4.4. Describe how the **ISO** establishes **stability** limits when there is an impact to more than one **operator** of a **transmission facility** in its area or other **reliability coordinator** areas.

4.5. Describe how **stability limits** are determined, considering levels of transfers, load and generation dispatch, and system conditions including any changes to system topology such as facility outages.

4.6. Describe the level of detail that is required for the study model(s), including the portion modelled of the **ISO**'s area, and the critical modelling details from other **reliability coordinator** areas, necessary to determine different types of **stability limits**.

4.7. Describe the allowed uses of **remedial action schemes** and other automatic post-**contingency** mitigation actions in establishing **stability limits** used in operations.

4.8. State that the use of **underfrequency load shedding** programs and **under voltage load shed** programs are not allowed in the establishment of **stability limits**.

M4. Evidence may include dated electronic or hard copy documentation or other equivalent evidence, of its **system operating limit** methodology that addresses the items listed in Requirement R4.

R5. The **ISO** must identify in its **system operating limit** methodology the set of **contingency** events for use in determining **stability limits** and the set of **contingency** events for use in performing operational planning analysis and **real-time assessments**. The **system operating limit** methodology for each set must: *[Alberta Risk Rating: Medium] [Time Horizon: Operations Planning]*

5.1. Specify the following single **contingency** events:

5.1.1. Loss of any of the following either by single phase to ground or three phase **fault** (whichever is more severe) with **normal clearing**, or without a **fault**:

- **generating unit** or **aggregated generating facility**;
- transmission circuit;
- transformer;
- shunt device; or
- single pole block in a monopolar or bipolar high voltage direct current system.

5.2. Specify additional single or multiple **contingency** events or types of **contingency** events, if any.

5.3. Describe the method(s) for identifying which, if any, of the **contingency** events provided by the **ISO** in accordance with FAC-014-AB-3, Requirement R7 to use in determining **stability limits**.

M5. Evidence may include dated electronic or hard copy documentation or other equivalent evidence, of its **system operating limit** methodology that addresses the items listed in Requirement R5.

R6. The **ISO** must include the following performance framework in its **system operating limit** methodology to determine **system operating limit** exceedances when performing real-time monitoring, **real-time assessments**, and operational planning analyses: *[Alberta Risk Rating: High] [Time Horizon: Operations Planning]*

6.1. System performance for no **contingencies** demonstrates the following:

6.1.1. Steady state flows through facilities are within **normal ratings**; however, **emergency ratings** may be used when system adjustments to return the flow within its **normal rating** could be executed and completed within the specified time duration of those **emergency ratings**.

6.1.2. Steady state voltages are within normal **system voltage limits**; however, emergency **system voltage limits** may be used when system adjustments to return the voltage within its normal **system voltage limits** could be executed and completed within the specified time duration of those emergency **system voltage limits**.

6.1.3. Predetermined **stability limits** are not exceeded.

6.1.4. Instability, **cascading** or uncontrolled separation that adversely impact the **reliability** of the **bulk electric system** does not occur.[1]

6.2. System performance for the single **contingencies** listed in Requirement R5, Part 5.1 demonstrates the following:

6.2.1. Steady state post-**contingency** flow through facilities within applicable **emergency ratings**. Steady state post-**contingency** flow through a facility must not be above the facility's highest **emergency rating**.

[1] **Stability** evaluations and assessments of instability, **cascading**, and uncontrolled separation can be performed using **real-time assessments** of **stability**, predetermined **stability limits** or other offline analysis techniques.

6.2.2. Steady state post-**contingency** voltages are within emergency **system voltage limits**.

6.2.3. The **stability** performance criteria defined in its **system operating limit** methodology are met.[1]

6.2.4. Instability, **cascading** or uncontrolled separation that adversely impact the **reliability** of the **bulk electric system** does not occur.[1]

6.3. System performance for applicable **contingencies** identified in Requirement R5, Part 5.2 demonstrates that: instability, **cascading**, or uncontrolled separation that adversely impact the reliability of the **bulk electric system** does not occur.

6.4. In determining the system's response to any **contingency** identified in Requirement R5, planned manual load shedding is acceptable only after all other available system adjustments have been made.

M6. Evidence may include dated electronic or hard copy documentation or other equivalent evidence, of its **system operating limit** methodology that addresses the items listed in Requirement R6.

R7. The **ISO** must include in its **system operating limit** methodology a risk-based approach for determining how **system operating limit** exceedances identified as part of real-time monitoring and **real-time assessments** must be communicated and if so, the timeframe that communication must occur. The approach must include: *[Alberta Risk Rating: High] [Time Horizon: Operations Planning]*

7.1. A requirement that the following **system operating limit** exceedances will always be communicated, within a timeframe identified by the **ISO**.

7.1.1. **Interconnected reliability operating limits** exceedances;

7.1.2. **System operating limit** exceedances of **stability limits**;

7.1.3. **System operating limit** exceedances, post-**contingency**, that are identified to have a validated risk of instability, **cascading**, and uncontrolled separation;

7.1.4. **System operating limit** exceedances, pre-**contingency**, of **facility ratings**; and

7.1.5. **System operating limit** exceedances, pre-**contingency**, of normal minimum **system voltage limits**

7.2. A requirement that the following **system operating limit** exceedances must be communicated, if not resolved within 30 minutes, within a timeframe identified by the **ISO**.

7.2.1. **System operating limit** exceedances, post-**contingency,** of **facility ratings** and emergency **system voltage limits**, and

7.2.2. **System operating limit** exceedances, pre-**contingency**, of normal maximum **system voltage limits**.

M7. Evidence may include dated electronic or hard copy documentation or other equivalent evidence, of its **system operating limit** methodology that addresses the items listed in Requirement R7.

R8. The **ISO** must include in its **system operating limit** methodology: *[Alberta Risk Rating: High] [Time Horizon: Operations Planning]*

8.1. A description of how to identify the subset of **system operating limits** that qualify as **interconnection reliability operating limits**.

8.2. Criteria for determining when a **system operating limit** exceedance qualifies as exceeding an **interconnection reliability operating limit** and criteria for developing any associated **interconnection reliability operating limits Tv**.

M8. Acceptable evidence may include dated electronic or hard copy documentation or other equivalent evidence, of its **system operating limit** methodology that addresses the items listed in Requirement R8.

R9. The **ISO** must provide its **system operating limit** methodology to: *[Alberta Risk Rating: Lower] [Time Horizon: Operations Planning]*

9.1. Each **reliability coordinator** that requests and indicates it has a **reliability**-related need within 30 days of a request.

9.2. Each of the following entities prior to the effective date of the **system operating limit** methodology:

9.2.1. Each adjacent **reliability coordinator** within the **western interconnection**;

9.2.2. [Intentionally left blank];

9.2.3. Each **operator** of a **transmission facility** within its area; and

9.2.4. Each **reliability coordinator** that has requested to receive updates and indicated it had a **reliability**-related need.

M9. Evidence may include dated electronic or hard copy documentation such as emails with receipts, registered mail receipts, postings to a secure web site with accompanying notification(s) or other equivalent evidence.

C. Compliance

[Intentionally left blank.]

D. Regional Variances

None.

E. Associated Documents

- AESO Information Document ID# 2016-006, *Radial Circuit* and any amendments made from time to time.
- AESO Information Document ID# 2020-014, *Bulk Electric System Definition* and any amendments made from time to time.
- The AESO's *System Operating Limit Methodology for Operations Horizon* and any amendments made from time to time.

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Version History

Version	Effective Date	Description of Changes
AB-4	2028-01-01	Revised based on NERC FAC-011-4, approved in FERC Docket No. RD22-2-000.
AB-2	2019-12-01	Remove bolding for “real-time”. As approved in AUC Decision 24653-D01-2019, “real-time” was removed from AESO’s *Consolidated Authoritative Document Glossary*.
AB-2	2015-09-01	Initial release.