Alberta Reliability Standard
System Restoration from Blackstart Resources
EOP-005-AB-2

1. Purpose

The purpose of this **reliability standard** is to ensure plans, facilities, and personnel are prepared to enable restoration of the **interconnected electric system** starting from **blackstart resources**, to ensure **reliability** is maintained during restoration, and priority is placed on restoring the **interconnected electric system** and the **interconnection** in accordance with the **ISO**'s restoration plan.

2. Applicability

This **reliability standard** applies to:

(a) the **ISO**;

(b) the **operator** of a **transmission facility** that the **ISO** includes in its restoration plan and in a list published on the AESO website that the **ISO** may amend from time to time in accordance with the process set out in Appendix 1;

(c) the **operator** of a **generating unit** that:

(i) is not part of an **aggregated generating facility**;

(ii) has a **maximum authorized real power** rating greater than 18 MW; and

(iii) is directly connected to either the **transmission system** or to **transmission facilities** within the City of Medicine Hat; and

(d) the **operator** of an **electric distribution system** that is identified in the restoration plan of an **operator** of a **transmission facility**.

3. Requirements

R1 Each **operator** of a **transmission facility** must have a restoration plan approved by the **ISO** that allows for the restoration of the **transmission facilities** that it operates to a state whereby the choice of the next load to be restored is not driven by the need to control frequency or voltage, regardless of where the **blackstart resource** is located, following a **disturbance** in which:

(a) one or more areas of the **interconnected electric system** shuts down; and

(b) the use of **blackstart resources** is required to restore the shut-down area(s) to service.

The restoration plan must include:

R1.1 Strategies for system restoration that are coordinated with the **ISO**'s restoration plan.

R1.2 Intentionally left blank.

R1.3 Procedures for restoring:

(a) connections with other **operators** of **transmission facilities**; and

(b) **interconnections** with any adjacent **interconnected transmission operators** under the direction of the **ISO**.

R1.4 The characteristics of each **blackstart resource** that is connected to the **transmission facilities** of the **operator** of a **transmission facility**, including but not limited to the:

(a) name;

(b) location;

(c) megawatt and megavar capacity; and

(d) type of **generating unit**.

R1.5 The identification of the initial switching requirements for any facilities, operated by the **operator** of a **transmission facility**, that are a part of the **cranking paths** identified in the **ISO**'s restoration plan.

R1.6 Acceptable operating voltage and frequency limits during restoration.

R1.7 Operating processes to reestablish connections between the **transmission facilities** of the **operator** of a **transmission facility** for areas that have been restored and are prepared for reconnection.

R1.8 Operating processes to restore loads required to restore the **interconnected electric system**, such as:

(a) station service for substations;

(b) **generating units** to be restarted or stabilized; and

(c) load needed to stabilize generation and frequency, and to provide voltage control.

R1.9 Operating processes for accepting authority from and transferring authority back to the **ISO** in accordance with the **ISO**'s restoration plan.

R2 In the event of changes to the roles and specific tasks of entities identified in a restoration plan:

(a) the **ISO** must provide the affected entities identified in its restoration plan with a description of any changes to their roles and specific tasks prior to the effective date of the plan; and

(b) each **operator** of a **transmission facility** must provide the affected entities identified in its approved restoration plan with a description of their roles and any changes to their roles and specific tasks prior to the effective date of the plan.

R3 Each **operator** of a **transmission facility** must within sixty (60) **days**, or another time period agreed to by the **ISO,** after receiving an updated copy of the **ISO**'s restoration plan:

(a) review its restoration plan;

(b) align its restoration plan, as necessary, with the **ISO**'s restoration plan; and

(c) submit its plan to the **ISO** for approval.

R3.1 The **operator** of a **transmission facility** must, where the **ISO** disapproves a restoration plan submitted pursuant to requirement R3(c), resolve the issues described in the reasons provided by the **ISO** within a timeframe agreed to by the **ISO**.

R4 Each **operator** of a **transmission facility** must update and submit its revised restoration plan to the **ISO** for approval:

(a) within ninety (90) **days** after identifying an unplanned permanent **interconnected electric system** modification; and

(b) no less than ninety (90) **days** prior to implementing a planned **interconnected electric system** modification

that would change the implementation of its restoration plan.

R4.1 The **operator** of a **transmission facility** must, where the **ISO** disapproves a revised restoration plan submitted pursuant to requirement R4, resolve the issues described in the reasons provided by the **ISO** within a timeframe agreed to by the **ISO**.

R5 Each **operator** of a **transmission facility** must have a copy of its current **ISO** approved restoration plan within its primary and backup control rooms for the purpose of ensuring it is available to its **real time** operating personnel.

R5.1 Each **operator** of a **transmission facility** must provide a copy of its current **ISO** approved restoration plan to each **operator** of an **electric distribution system** identified in that plan.

R6 The **ISO** must verify through analysis of actual events, steady state and dynamic simulations, or testing that its restoration plan accomplishes its intended function. This must be completed every five (5) years at a minimum. Such analysis, simulations or testing must verify:

R6.1 the capability of **blackstart resources** to meet the **real power** and **reactive power** requirements of the **cranking paths** and the dynamic capability to supply initial loads;

R6.2 the location and magnitude of loads required to control voltages and frequency within acceptable operating limits; and

R6.3 the capability of **generating units** required to control voltages and frequency within acceptable operating limits.

R7 Each affected **operator** of a **transmission facility** must, following a **disturbance** in which one or more areas of the **interconnected electric system** shuts down and the use of **blackstart resources** is required to restore the shut-down area to service, implement its restoration plan. If the restoration plan cannot be executed as expected, the **operator** of a **transmission facility** must use the strategies for system restoration referred to in requirement R1.1 to facilitate restoration.

R8 Each affected **operator** of a **transmission facility** must, following a **disturbance** in which one or more areas of the **interconnected electric system** shuts down and the use of **blackstart resources** is required to restore the shut-down area to service, resynchronize these areas with each applicable:

(a) neighbouring **operator** of a **transmission facility**'s area; and

(b) **interconnected transmission operator**'s area,

but only with the prior authorization of the **ISO** and in accordance with the procedures included in the **ISO**'s restoration plan.

R9 The **ISO** must have **blackstart resource** testing requirements to verify that each **blackstart resource** is capable of meeting the requirements of the **ISO**'s restoration plan. These **blackstart resource** testing requirements must include:

R9.1 The frequency of testing such that each **blackstart resource** is tested at least once every three (3) calendar years.

R9.2 A list of required tests including:

(a) a test to verify the ability of the **blackstart resource** to:

(i) start the **generating unit(s)** associated with the **blackstart resource** when isolated with no support from the **interconnected electric system**; or

(ii) remain energized without connection to the remainder of the **interconnected electric system**, if designed to do so; and

(b) upon completion of (a), a test to verify the ability of the **generating unit(s)** associated with the **blackstart resource** to energize a bus. If it is not possible to energize a bus during the test, the testing entity must otherwise demonstrate that the **generating unit(s)** associated with the **blackstart resource** has the capability to energize a bus.

R9.3 The minimum duration of each of the required tests.

R10 Each **operator** of a **transmission facility** must include system restoration training for its operating personnel once each calendar year in its operations training program. This training program must include training on the following:

(a) the **operator** of a **transmission facility**'s restoration plan including coordination with the **ISO** and each **operator** of a **generating unit** and **operator** of an **aggregated generating facility** included in its restoration plan;

(b) restoration priorities;

(c) the building of **cranking paths** as included in its restoration plan; and

(d) synchronizing re-energized sections of the **interconnected electric system**.

R11 Each **operator** of a **transmission facility** and **operator** of an **electric distribution system** must provide a minimum of two (2) hours of system restoration training every two (2) calendar years to its field switching personnel identified as performing unique tasks associated with the **operator** of a **transmission facility**'s restoration plan that are outside of their normal tasks.

R12 Each **operator** of a **transmission facility** must participate in the **ISO**'s restoration drills, exercises, or simulations if requested by the **ISO**.

R13 The **ISO** must have written **blackstart resource** agreements or mutually agreed upon procedures or protocols with each **operator** of a **generating unit** with a **blackstart resource**, specifying the terms and conditions of their arrangement. Such agreements must include references to the **blackstart resource** testing requirements, including those specified in requirement R9.

R14 Each **operator** of a **generating unit** with a **blackstart resource** must have documented procedures for starting each **blackstart resource** and energizing a bus.

R15 Each **operator** of a **generating unit** with a **blackstart resource** must notify the **ISO** of any known changes to the capabilities of that **blackstart resource** affecting the ability of the **operator** of a **generating unit** to fulfill the requirements of the **ISO**'s restoration plan within twenty-four (24) hours of becoming aware of such change.

R16 Each **operator** of a **generating unit** with a **blackstart resource** must perform **blackstart resource** tests, and maintain records of such testing, in accordance with the testing requirements set by the **ISO** as referenced in the **blackstart resource** agreements or mutually agreed upon procedures or protocols.

R16.1 Testing records must include at a minimum:

(a) name of the **blackstart resource**;

(b) **generating unit** tested;

(c) date of the test;

(d) duration of the test;

(e) time required to start the **generating unit**; and

(f) an indication of any testing requirements not met under requirement R9.

R16.2 Each **operator** of a **generating unit** with a **blackstart resource** must provide the **blackstart resource** test results within thirty (30) **days** after receiving a request from the **ISO**.

R17 Each operator of a **generating unit** with a **blackstart resource** must provide a minimum of two (2) hours of training every two (2) calendar years to each of its operating personnel responsible for:

(a) the startup of its **blackstart resource**; and

(b) energizing a bus.

R17.1 The training program must include training on the following:

(a) those elements of the **ISO**'s restoration plan that are applicable to the **blackstart resource**, including coordination with the **ISO** and the adjacent **operator** of a **transmission facility**; and

(b) the procedures documented in requirement R14.

R18 Each **operator** of a **generating unit** must participate in the **ISO**'s restoration drills, exercises, or simulations if requested by the **ISO**.

4. Measures

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

MR1 Evidence of having a restoration plan that is approved by the **ISO** and includes the elements as required in requirement R1 exists. Evidence may include, but is not limited to:

(a) email, mail or other equivalent evidence demonstrating approval of the restoration plan by the **ISO**; and

(b) a documented restoration plan including the elements identified in requirement R1.

MR2 Evidence of providing a description of any changes to the roles and specific tasks of affected entities identified in the restoration plan as required in requirement R2 exists. Evidence may include, but is not limited to, a documented restoration plan showing the effective date and dated emails with receipts or registered mail with receipts, including a description of any changes to roles and specific tasks, or other equivalent evidence.

MR3 Evidence of reviewing, aligning and submitting the restoration plan as required in requirement R3 exists. Evidence may include, but is not limited to, a documented restoration plan, including a review or revision history, and emails with receipts or registered mail with receipts, or other equivalent evidence.

MR3.1 Evidence of resolving the issues described in the reasons provided by the **ISO** within a timeframe agreed to by the **ISO** as required in requirement R3.1 exists. Evidence may include, but is not limited to, emails with receipts or registered mail with receipts, or other equivalent evidence.

MR4 Evidence of updating and submitting the revised restoration plan as required in requirement R4 exists. Evidence may include, but is not limited to:

(a) for the date of identifying any unplanned permanent modifications: logs, a dated report, emails, or other equivalent evidence;

(b) for the date of implementing planned modifications: logs, a dated report, emails, or other equivalent evidence;

(c) for updating the restoration plan: a dated documented restoration plan and revision histories, or other equivalent evidence; and

(d) for submitting the revised restoration plan: emails with receipts or registered mail receipts including submission date, or other equivalent evidence.

MR4.1 Evidence of resolving the issues described in the reasons provided by the **ISO** within a timeframe agreed to by the **ISO** as required in requirement R4.1 exists. Evidence may include, but is not limited to, emails with receipts or registered mail with receipts, or other equivalent evidence.

MR5 Evidence of having a copy of the current **ISO** approved restoration plan within the primary and backup control rooms as required in requirement R5 exists. Evidence may include but is not limited to dated records to show that the latest **ISO** approved copy of the restoration plan is available in the primary and backup control rooms and to the **real time** operating personnel in accordance with requirement R5, or other equivalent evidence.

MR5.1 Evidence of providing a copy of the current **ISO** approved restoration plan to each **operator** of an **electric distribution system** as required in requirement R5.1 exists. Evidence may include dated emails with receipts or registered mail receipts, or other equivalent evidence.

MR6 Evidence of verifying every five (5) years that the restoration plan accomplishes its intended function as required in requirement R6 exists. Evidence may include, but is not limited to, dated event analysis assessments, dated study results, or other equivalent evidence.

MR7 Evidence of executing the restoration plan or using the restoration strategies as required in requirement R7 exists. Evidence may include, but is not limited to, sequence of events records, data files, **operator** logs, voice recordings, electronic communications, or other equivalent evidence.

MR8 Evidence of resynchronizing shut down area(s) with the **ISO**'s prior authorization and in accordance with the procedures included in the **ISO**'s restoration plan as required in requirement R8 exists. Evidence may include, but is not limited to, a dated copy of the **ISO**'s restoration plan and a combination of the following evidence as appropriate:

(a) sequence of events records;

(b) data files;

(c) **operator** logs;

(d) voice recordings;

(e) electronic communications,

or other equivalent evidence.

MR9 Evidence of having **blackstart resource** testing requirements as required in requirement R9 exists. Evidence may include, but is not limited to, **blackstart resource** testing requirement documentation, or other equivalent evidence.

MR10 Evidence of including system restoration training within the operations training program as required in requirement R10 exists. Evidence may include, but is not limited to, a documented operations training program including system restoration training for operating personnel, or other equivalent evidence.

MR11 Evidence of providing a minimum of two (2) hours of system restoration training every two (2) calendar years as required in requirement R11 exists. Evidence may include, but is not limited to, training records, training documentation including dates and duration, or other equivalent evidence.

MR12 Evidence of participating in the **ISO**'s restoration drills, exercises, or simulations as required in requirement R12 exists. Evidence may include, but is not limited to:

(1) documentation of the **ISO**'s request; and

(2) training records, participation records, training documentation, or other equivalent evidence.

MR13 Evidence of having written **blackstart resource** agreements or mutually agreed upon procedures or protocols as required in requirement R13 exists. Evidence may include, but is not limited to, executed agreements, procedures or protocols, or other equivalent evidence.

MR14 Evidence of having documented procedures for starting each **blackstart resource** and energizing a bus as required in requirement R14 exists. Evidence may include, but is not limited to, documented procedures, or other equivalent evidence.

MR15 Evidence of notifying the **ISO** of any known changes to the capabilities of the **blackstart resource** as required in requirement R15 exists. Evidence may include, but is not limited to, emails with receipts, registered mail receipts, time stamped voice record(ing)s or operator logs, showing when the **operator** of a **generating unit** with a **blackstart resource** became aware of changes to the **blackstart resource** capabilities and that it notified the **ISO** within twenty-four (24) hours of becoming aware of such changes as required in requirement R15, or other equivalent evidence.

MR16 Evidence of performing **blackstart resource** tests, maintaining records of such testing, and providing the **blackstart resource** test results as required in requirement R16 exists. Evidence may include, but is not limited to, test records, test results, and emails with receipts or registered mail receipts that show that it provided these records to the **ISO** when requested, or other equivalent evidence.

MR17 Evidence of providing a minimum of two (2) hours of training every two (2) calendar years as required in requirement R17 exists. Evidence may include, but is not limited to, training records, training dates, durations and training materials provided, or other equivalent evidence.

MR18 Evidence of participating in the **ISO**'s restoration drills, exercises, or simulations as required in requirement R18 exists. Evidence may include, but is not limited to:

(1) documentation of the **ISO**'s request; and

(2) training records, participation records, training documentation, or other equivalent evidence.

5. Appendices

Appendix 1 – *Amending Process for List of Operators of Transmission Facilities Included in the AESO Restoration Plan*

Revision History

Date	Description
xxxx-xx-xx	Initial release.

Appendix 1

Amending Process for List of Operators of Transmission Facilities included in the AESO Restoration Plan

In order to amend the list referenced in subsection (b) of section 2, *Applicability*, the **ISO** must:

(a) upon determining that an **operator** of a **transmission facility** is to be added to the list, notify each affected **operator** of a **transmission facility** in writing and determine the date on which the amended list comes into effect, which must be no less than the first day of the month following three (3) full calendar quarters (January 1, April 1, July 1, October 1) after the date of notice, for the **operator** to meet the applicable requirements;

(b) upon determining that an **operator** of a **transmission facility** is to be deleted, notify each affected **operator** of a **transmission facility** in writing and determine the date on which the amended list comes into effect such that the **operator** will no longer be required to meet the applicable requirements; and

(c) post the amended list with effective dates on the AESO website.