Alberta Reliability Standard
Protection System Coordination
PRC-001-~~AB2~~AB3-1.1(ii)

Consultation Draft

December 15, 2015

1. Purpose

The purpose of this **reliability standard** is to ensure **protection systems** are coordinated among operating entities.

2. Applicability

This **reliability standard** applies to:

(a) the **legal owner** of a **transmission facility** that is:

(i) part of the **bulk electric system**; or

(ii) not part of the **bulk electric system** and which the **ISO**:

(A) determines is necessary for the reliable operation of either the **interconnected electric system** or the City of Medicine Hat electric system, and

(B) publishes on the AESO website and may amend from time to time in accordance with the process set out in Appendix 1;

(b) the **legal owner** of a **generating unit** that is:

(i) directly connected to the **bulk electric system** and has a **maximum authorized real power** rating greater than ~~eighteen (~~18~~)~~ MW;

(ii) within a power plant which:

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

(B) is directly connected to the **bulk electric system**; and

(C) has a combined **maximum authorized real power** rating greater ~~than sixty-seven point five (~~67.5~~)~~ MW;

(iii) a **blackstart resource**; or

(iv) regardless of its **maximum authorized real power** rating, material to this **reliability standard** and to the reliability of the **bulk electric system**, as the **ISO** determines and publishes on the AESO website and may amend from time to time in accordance with the process set out in Appendix 1;

(c) the **legal owner** of an **aggregated generating facility** that is:

(i) directly connected to the **bulk electric system** and has a **maximum authorized real power** rating greater than ~~sixty-seven point five (~~67.5~~)~~ MW;

(ii) a **blackstart resource**; or

(iii) regardless of its **maximum authorized real power** rating, material to this **reliability standard** and to the reliability of the **bulk electric system**, as the **ISO** determines and publishes on the AESO website and may amend from time to time in accordance with the process set out in Appendix 1;

(d) the **operator** of a **transmission facility** that is:

(i) part of the **bulk electric system**; or

(ii) not part of the **bulk electric system** and which the **ISO**:

(A) determines is necessary for the reliable operation of either the **interconnected electric system** or the City of Medicine Hat electric system; and

(B) publishes on the AESO website and may amend from time to time in accordance with the process set out in Appendix 1;

(e) the **operator** of a **generating unit** that is:

(i) directly connected to the **bulk electric system** and has a **maximum authorized real power** rating greater than ~~eighteen (~~18~~)~~ MW;

(ii) within a power plant which:

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

(B) is directly connected to the **bulk electric system**; and

(C) has a combined **maximum authorized real power** rating greater than ~~sixty-seven point five (~~67.5~~)~~ MW;

(iii) a **blackstart resource**; or

(iv) regardless of its **maximum authorized real power** rating, material to this **reliability standard** and to the reliability of the **bulk electric system**, as the **ISO** determines and publishes on the AESO website and may amend from time to time in accordance with the process set out in Appendix 1; and

(f) the **operator** of an **aggregated generating facility** that is:

(i) directly connected to the **bulk electric system** and has a **maximum authorized real power** rating greater than ~~sixty-seven point five (~~67.5~~)~~ MW;

(ii) a **blackstart resource**; or

(iii) regardless of its **maximum authorized real power** rating, material to this **reliability standard** and to the reliability of the **bulk electric system**, as the **ISO** determines and publishes on the AESO website and may amend from time to time in accordance with the process set out in Appendix 1~~; and~~.

~~(a) the **ISO**.~~

3. Requirements

R1 ~~The operating personnel of each of the **ISO**, the **operator** of a **transmission facility**, the~~ Each **operator** of a **generating unit** and ~~the **operator**~~**operator** of an **aggregated generating facility** must, upon failure of any component of a **protection system** of a **generating unit** or an **aggregated generating facility** ~~must be familiar with the purpose~~which it operates, take the actions listed in requirement R1.1 and ~~limitations of **protection system** schemes applied in its area~~R1.2.

R2 Each **operator** of a **generating unit** and **operator** of an **aggregated generating facility** must do the following if a protective relay or any equipment of a **protection system** of a **generating unit** or an **aggregated generating facility** that measures voltage, current or frequency from the **generating unit** or the **aggregated generating facility** to the **interconnected electric system** , but excluding the prime mover and associated control systems, fails and such failure reduces **transmission system** reliability:

R2R1.1 notifyNotify the **operator** of a **transmission facility** in its area and the **ISO** as soon as possible, but no longer than twenty four (24) hours after receiving knowledgebecoming aware of such a failure; and, and provide the following information, regardless of whether or not the **generating unit** or **aggregated generating facility** remains on-line:

R2(a) identify the **protection system** that failed; and

(b) identify whether or not a **functionally equivalent protection system** remains in service.

R1.2 commenceCorrect the failure as soon as possible, and proceed diligently thereafter, to correct such failure..

R3 Each **operator** of **R2** Each **operator** of a **transmission facility**, **operator** of a **generating unit** and **operator** of an **aggregated generating facility** must take the actions listed in requirements R2.1 through R2.3 after becoming aware of the failure of any of the following **protection systems** or teleprotection communication channels under its authority:

(a) a **protection system** that protects a **transmission facility** must do the following if a protective relay or equipment fails, and such failure reduces **transmission**greater than 200 kV, where a **functionally equivalent protection** **system** reliability onremains in service;

(a)(b) a **protection system** that protects a **transmission facility** that is part of the **bulk electric system**; where a **functionally equivalent protection system** is not available;

(c) **R3**a teleprotection communication channel(s), where there is an equivalent backup teleprotection communication channel(s), and where the failure lasts for more than sixty (60) continuous minutes; or

(d) a teleprotection communication channel(s), where there is no equivalent backup teleprotection communication channel, and where the failure lasts for more than ten (10) consecutive minutes.

R2.1 notify Provide notification to the **ISO**, and to each directly affected **operator** of a **transmission facility** and, directly affected **operator** of a **generating unit**, directly affected **operator** of an **aggregated generating facility** and directly affected **interconnected transmission operator** as soon as possible, but no longer than twenty four (24) hours after the earlier of receiving knowledge of or detecting such failure; andbecoming aware of such failure, regardless of whether or not the **transmission facility** is removed from service following the awareness of such failure, that includes the following information:

R3.2 commence as soon as possible, and proceed diligently thereafter, to correct such failure unless otherwise directed by the **ISO**.

R4 Intentionally left blank.

(a) **R5**the identification of the **protection system** or teleprotection communication channel(s) that failed;

(b) when the **protection system** or teleprotection communication channel(s) failed;

(c) an estimate of the date when the **protection system** or teleprotection communication channel(s) will be returned to service; and

(d) for **protection system** failures identified in requirement R2(b) or for teleprotection communication channel(s) failures identified in requirement R2(d), a description of the consequences to the **transmission system** of the **protection system** or teleprotection communication channel(s) not being available.

R2.2 Provide a new estimate of the return to service date within five (5) days of the date that the previous estimate, as identified in requirement R2.1(c), is exceeded.

R2.3 Correct the failure as soon as possible.

R3 Each **legal owner** of a **generating unit** and **legal owner** of an **aggregated generating facility** must coordinate all new **protection systems** and all **protection system** changes with each affected interconnecting **legal owner** of a **transmission facility** and notify the **ISO** that such coordination has occurred.

~~**R6**~~**R4** Each **legal owner** of a **transmission facility** must coordinate all new **protection systems** ~~including existing, new~~ and ~~modified~~all **protection** ~~**systems**~~**system** changes with each affected:

(a) adjacent **legal owner** of a **transmission facility**~~, affected~~ ;

(b) **legal owner** of a **generating unit**~~, affected~~ ;

(c) **legal owner** of an **aggregated generating facility**~~, affected~~ ; and

(d) **interconnected transmission** ~~**operators**~~ **operator**,

and must notify the **ISO** that such coordination has occurred.

~~**R7**~~**R5** Each **operator** of a **generating unit**, **operator** of an **aggregated generating facility** and **operator** of a **transmission facility** must identify ~~and~~, notify or coordinate planned changes ~~in generation, transmission, load and/or operating conditions that~~that may require changes in the **protection systems** of others as ~~follows:~~described in requirements R5.1 and R5.2.

~~**R7**~~**R5.1** ~~each~~ Each **operator** of a **generating unit** and **operator** of an **aggregated generating facility** must identify planned changes ~~in each of~~to its generation, load, or operating conditions that may require changes ~~in~~to the **protection systems** of others, and must notify the **ISO** ~~in advance of their changes;~~

~~**R7.2** the **ISO** must notify~~ and coordinate with each affected **operator** of a **transmission facility** ~~and adjacent **interconnected transmission operator** in advance of changes in each of its generation or operating conditions that may require changes in **protection systems**; and~~in advance of making such changes.

~~**R7.3** each~~ **R5.2** Each **operator** of a **transmission facility** must identify planned changes ~~in any of~~to its transmission, load or operating conditions that may require changes ~~in~~to the **protection systems** of others, and ~~provide reasonable prior notice to~~must notify the **ISO** and coordinate with each affected~~:~~

(a) **operator** of a **transmission facility** and adjacent **interconnected transmission operator** of such proposed changes.;

(b) **R8** Each **operator** of a **transmission facility** must monitor the status of each **remedial action scheme** in its area, and must notify each affected **operator** of a **transmission facility**, adjacent **interconnected transmission operator**;

(c) **operator** of a **generating unit**,; and

(b)(d) **operator** of an **aggregated generating facility** and the **ISO** of each change in status.,

R9 Each **operator** of a in advance of making such changes.

R6 Each **operator** of a **transmission facility** must monitor the status (on/off) of each **remedial action scheme** in its area, and must notify the **ISO** and each affected:

(a) **operator** of a **transmission facility**;

(b) adjacent **interconnected transmission operator**;

(c) **operator** of a **generating unit**; and

(a)(d) **operator** of an **aggregated generating facility** must provide reasonable prior notice to the **operator** of a **transmission facility** and the **ISO** of proposed changes to the arming status (on, off and which generator) of any **remedial action scheme** in their facility.,

of each change in status.

4. Measures

The following measures correspond to the requirements identified in Section 4section 3 of this reliability standard. For example, MR1 is the measure for requirement R1.

MR1 Training records are available that indicate trainingEvidence of staff who operate the system in notifying, providing information and correcting failures of any component of a **protection system** schemes and any **remedial action scheme** applicable within their system.

MR2 Measures for this as required in requirement are identified in the subsections belowR1 exists. Evidence may include, but is not limited to:

MR2.1 **MR1.1** voice recordings, operator logs, electronic notifications exist for each failure as specified(emails) or other equivalent evidence; and

MR1.2 work orders, setting change files, electronic records or other equivalent evidence.

MR2 Evidence of providing notification, providing an estimate and correcting failures of any of the **protection systems** or teleprotection communication channel(s) as required in requirement R2.1.; and exists. Evidence may include, but is not limited to:

MR2.2 evidence exists that corrective actions have been taken as specified in requirement R2.2.

MR3 Measures for this requirement are identified in the subsections below:

MR3.1 MR2.1 voice recordings, operator logs, electronic notifications exist for each failure(emails) or other equivalent evidence;

MR2.2 voice recordings, operator logs, electronic notifications (emails) or other equivalent evidence; and

MR2.3 work orders, setting change files, electronic records or other equivalent evidence.

MR3 Evidence of coordinating **protection systems** and notifying the **ISO** as specifiedrequired in requirement R3.1; and exists.

MR3.2 evidence exists that corrective actions have been taken as specified in requirement R3.2.

MR4 Intentionally left blank.

MR5 Evidence existsincludingof coordinating **protection systems** may include, but is not limited to, revisedfault analysis study, letters of agreement on settings, notifications of changes, all of which meets the requirements as specified in requirement R5. or other equivalent evidence.

MR6 Evidence exists that couldof notifying the **ISO** may include, but is not limited to, revisedelectronic notifications (emails), hard copy notifications, or other equivalent evidence.

MR4 Evidence of coordinating **protection systems** and notifying the **ISO** as required in requirement R4 exists.

Evidence of coordinating **protection systems** may include, but is not limited to, a fault analysis study, letters of agreement on settings, notifications of changes, that meets or other equivalent evidence.

Evidence of notifying the requirements as specified in requirement R6**ISO** may include, but is not limited to, electronic notifications (emails), hard copy notifications or other equivalent evidence.

MR7MR5 Measures for this requirement are identified in the subsections below:

MR7MR5.1 evidence existsEvidence of identifying, notifying and shows that allcoordinating planned changes requiringthat may require changes to the **protection** changes were made**systems** of others as specifiedrequired in requirement R7R5.1; exists.

MR7 Evidence may include, but is not limited, to voice recordings, operator logs, electronic notifications (emails) or other equivalent evidence.

MR5.2 evidence existsEvidence of identifying, notifying and shows that allcoordinating planned changes requiringthat may require changes to the **protection** changes were made**systems** of others as specifiedrequired in requirement R7R5.2; exists.

Evidence may include, but is not limited to, voice recordings, operator logs, electronic notifications (emails) or other equivalent evidence.

MR6 Evidence of monitoring the status of each **remedial action scheme** in its area and notifying entities of each change in status as required in requirement R6 exists.

MR7.3 evidence exists and shows that all changes requiring protection changes were made as specified in requirement R7.3.

MR8 Operator logs, Evidence of monitoring the status of each **remedial action scheme** may include, but is not limited to, SCADA data, wiring diagrams or other equivalent evidence.

Evidence of notifying entities may include, but is not limited to, SCADA data, voice recordings or other evidence exists that affected parties were notified as specified in requirement R8.

MR9 Operator, operator logs, voice recordingselectronic notifications (emails) or other evidence exists that affected parties were notified as specified in requirement R9equivalent evidence.

5. Appendices

Appendix 1 – *Amending Process for List of Material Facilities*

Revision History

Effective Date	Description
xxxx-xx-xx	Revised to improve clarity and alignment with Alberta industry and market structure.
2015-05-01	Revised for ISO assumption of RC functionality for the Alberta footprint
2013-01-02	Administrative update – “TFO” and “GFO” replaced with “legal owner of a transmission facility”, “operator of a transmission facility”, “legal owner of a generating unit”, “operator of a generating unit”, “legal owner of an aggregated generating facility”, and “operator of an aggregated generating facility”; applied standard at the bulk electric system level; added Appendix 1; and other minor cleanup items.
2011-01-13	R1
2010-01-22	New Issue

Appendix 1
Amending Process for List of Facilities

In order to amend any list referenced in subsections (a)(ii)(B), (b)(iv), (c)(iii), (d)(ii)(B), (e)(iv) and (f)(iii) of section 2, *Applicability*, the **ISO** must:

(a) upon determining that a **transmission facility**, **generating unit** or **aggregated generating facility** is to be added, notify the **legal owner** and **operator** in writing and determine an effective date, which must be no less than thirty (30) **days** after the date of notice, ~~for the~~ ~~**legal owner** and **operator**~~by which the **transmission facility**, **generating unit** or **aggregated generating facility** is to meet the applicable requirements;

(b) upon determining that a **transmission facility**, **generating unit** or **aggregated generating facility** is to be deleted, notify the **legal owner** and **operator** in writing and determine an effective date ~~for~~on which the ~~**legal owner** and **operator** to~~**transmission facility**, **generating unit** or **aggregated generating facility** will no longer be required to meet the applicable requirements; and

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