Alberta Reliability Standard
Automatic Time Error Correction
BAL-004-WECC-AB1-1

1. Purpose

The purpose of this **reliability standard** is to maintain **interconnection** frequency within a predefined frequency profile under all conditions and to ensure that automatic **time error corrections** are effectively conducted in a manner that does not adversely affect the **reliability** of the **western interconnection**.

2. Applicability

This **reliability standard** applies to:

(a) the **ISO**.

3. Requirements

R1 The **ISO**, subject to requirements R1.1, R1.2 and R4, must continuously operate its **automatic generation control** using the following automatic **time error correction** formula when synchronized to the **western interconnection**:

$$ACE_{ATEC} = (NI_A - NI'_S) - 10B_i(F_A - F_S) + I_{ME}$$

Where:

NI_A = **net actual interchange** (MW).

F_A = frequency actual (Hz).

F_S = frequency scheduled (Normally 60 Hz).

B_i = **frequency bias** for the **balancing authority area** (MW / 0.1 Hz).

I_{ME} = meter error correction (MW).

$$NI'_S = NI_S - \frac{\Pi_{Primary}^{On/Off\ peak}}{(1-Y)*H}$$

Where:

NI_S = **net scheduled interchange** (MW).

$Y = B_i / B_S$.

H = number of hours used to payback **inadvertent interchange** energy as determined by the **WECC** Performance Work Group.

B_S = **frequency bias** for the **western interconnection** (MW / 0.1 Hz).

$\Pi_{Primary}^{On/Off\ peak}$ = is the **balancing authority's** accumulated **primary inadvertent interchange** in MWh requiring **on peak** and **off peak** accumulation accounting, where:

$\Pi_{Primary}^{On/Off\ peak}$ = last period's $\Pi_{Primary}^{On/Off\ peak}$ + $(1-Y) * (\Pi_{actual} - B_i * \Delta TE/6)$

II_{actual} is the hourly **inadvertent interchange** for the last hour.

Δ TE is the hourly change in the **time error** of the **interconnected electric system** as distributed by the **WECC** Reliability Coordinator.

Where:

$$\Delta \text{TE} = \text{TE}_{end\ hour} - \text{TE}_{begin\ hour} - \text{TD}_{adj} - (t)*(\text{TE offset})$$

TD_{adj} is any adjustment to the **time error** of the **ISO** coordination center to correct for differences with the **WECC** Reliability Coordinator.

t is the number of minutes of **time error correction** that occurred during the hour.

TE offset is 0.000 or +0.020 or -0.020.

R1.1 Subject to requirement R1.2, the **ISO** must, when calculating NI's, use L_{max} or, where the absolute value of the automatic **time error correction** term of the **WECC** is less than or equal to L_{max}, use the calculated automatic **time error correction** term of the **WECC**. The **ISO** chooses the L_{max} value which is bound from 20% of the **frequency bias** of the **ISO** through L_{10}. L_{10} is the **control performance standard** 2 limit of the **ISO** in MW. The automatic **time error correction** term of the **WECC** is defined as follows:

$$\frac{\text{II}_{Pr\,imary}^{On\,/\,Off\ peak}}{(1-Y)*H}$$

R1.2 The **ISO** may disable automatic **time error correction** term if there is a **reliability** concern in the **interconnected electric system** while executing an automatic **time error correction**.

R2 The **ISO** must, where large accumulations of primary **inadvertent interchange** occur, which is the component of area **inadvertent interchange** caused by the regulating deficiencies of the area:

(a) identify any error and make the corrections;

(b) recalculate the primary **inadvertent interchange** from the time of the error;

(c) adjust the accumulated primary **inadvertent interchange** caused by the error; and

(d) validate the implementation of automatic **time error correction**.

R3 The **ISO** must provide notice to all other **balancing authorities** in the **western interconnection** through WECCnet of the **automatic generation control** operating mode of the **ISO** when the **ISO** is both synchronized to the remainder of the **western interconnection** and operating in any **automatic generation control** mode that does not use automatic **time error correction**.

R4 Subject to requirement R1.2 the automatic **time error correction** of the **ISO** must not be out of service for more than a maximum total of twenty-four (24) hours per calendar quarter, for any reason, while synchronously connected to the **western interconnection**.

R5 The **ISO** must be able to change its **automatic generation control** operating mode among any of the following:

    (a) **flat frequency**;

    (b) flat tie line: a mode that calculates **area control error** to maintain a constant **net interchange schedule**; or

    (c) tie line bias: a mode that allows the **balancing authority** to both maintain its **interchange schedule** and respond to **frequency error** of the **Interconnection**, with or without automatic **time error correction** enabled.

R6 The **ISO** must use the **area control error** values calculated in the **automatic generation control** operating mode in use during the time period being reported when a **reliability standard** requires the **ISO** to submit reports that include **area control error** values.

R7 The **ISO** must, regardless of the **automatic generation control operating** mode, compute for each hour its primary **inadvertent interchange** when checkout for such hour is complete, provided that if the checkout of its previous hour's **net scheduled interchange** data and **net actual interchange** data is not complete on or before fifty (50) minutes after such hour, the **ISO** must compute its primary **inadvertent interchange** for such hour based on the best available data at that time.

R8 The **ISO** must add the primary **inadvertent interchange** computed for each hour in requirement R7 to the accumulated primary **inadvertent interchange** balances for the **on peak** period or **off peak** period, as appropriate.

R9 The **ISO** must use the change in **time error** distributed by the **Interconnection** time monitor in calculating the primary **inadvertent interchange**.

R10 The **ISO** must, if corrections are made to any previous hour's **net scheduled interchange**, **net actual interchange** or the change in **time error** distributed by the **Interconnection** time monitor, recompute the primary **inadvertent interchange** for such hour and must add any changes to the accumulated primary **inadvertent interchange** balances for the **on peak** period or **off peak** period, as appropriate.

R11 The **ISO** must, for each **month**, add **month**-end revenue meter **inadvertent interchange** adjustments, all of which are 100% primary **inadvertent interchange**, to the accumulated primary **inadvertent interchange** balances for the **on peak** period or **off peak** period, as appropriate.

R12 The **ISO** must, when it is synchronized to the remainder of the **western interconnection**, synchronize its **time error** to the nearest zero point zero zero one (0.001) seconds of the **time error** of the **western interconnection** as distributed by the **Interconnection** time monitor at least once per **day**.

4 Measures

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

MR1   Evidence of using the **time error correction** formula for continuous **automatic generation control** operation as required in requirement R1 exists. Evidence may include a documented algorithm of real time calculation indicating that the ACE_{ATEC} is used.

    MR1.1 Evidence of calculating NI's as required in requirement R1.1. exists. Evidence may include validation of energy management system software and historical data showing the **automatic generation control** mode.

    MR1.2 Evidence of only disabling automatic **time error correction** if there is a **reliability** concern, as required in requirement R1.2 exists. Evidence may include electronic logs, **operator** logs, SCADA data or emails.

MR2   Evidence of identifying an error and taking actions as required in requirement R2 exists. Evidence may include electronic logs, **operator** logs, SCADA data, emails or after-the-fact analysis.

MR3   Evidence of providing notice as required in requirement R3 exists. Evidence may include **operator** logs, emails or voice recordings.

MR4   Evidence of the automatic **time error correction** not being out of service as required in requirement R4 exists. Evidence may include historical data showing the **automatic generation control** mode, electronic logs, **operator** logs or voice recordings.

MR5   Evidence of changing the **automatic generation control** operating mode as required in requirement R5 exists. Evidence may include snapshots of the operating interface provided in the energy management system for changing its **automatic generation control** operating mode.

MR6   Evidence of using **area control error** values in reports as required in requirement R6 exists. Evidence may include historical data showing the **automatic generation control** mode and relevant reports.

MR7   Evidence of computing primary **inadvertent interchange** hourly as required in requirement R7 exists. Evidence may include electronic logs or other records.

MR8   Evidence of adding values together as required in requirement R8 exists. Evidence may include an automatic **time error correction** application showing a calculated value was used for each hour.

MR9   Evidence of using the change in **time error** as required in requirement R9 exists. Evidence may include Western Interchange Tool checkout or e-mails.

MR10   Evidence of recomputing and adding the values as required in requirement R10 exists. Evidence may include Western Interchange Tool checkout or e-mails.

MR11   Evidence of adding the values as required in requirement R11 exists. Evidence may include Western Interchange Tool checkout or e-mails.

MR12   Evidence of synchronizing **time error** as required in requirement R12 exists. Evidence may include Western Interchange Tool checkout or e-mails.

5.   Appendices

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

Revision History

Effective	Description
2012-10-01	Initial Release
2015-05-01	Revised for ISO assumption of RC functionality for the Alberta footprint