

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:

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

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

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

Where:

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

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:

$$\frac{\Pi_{\text{On/Off peak Primary}}}{(1 - Y) * H}$$

- 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**.

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- 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.

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- 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**.

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Revision History

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