

Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Description of Current Draft

This is the first posting of the draft standard for a 45-day formal comment period with an initial ballot.

Completed Actions	Date
Standards Committee approved SAR for posting	June 10, 2014
SAR posted for comment	July 16, 2014

Anticipated Actions	Date
45-day formal comment period with parallel ballot	August/September 2015
Final ballot	October 2015
NERC Board adoption	November 2015

New or Modified Terms Used in NERC Reliability Standards

This section includes all new or modified terms used in the proposed standard that will be included in the *Glossary of Terms Used in NERC Reliability Standards* upon applicable regulatory approval. Terms used in the proposed standard that are already defined and are not being modified can be found in the *Glossary of Terms Used in NERC Reliability Standards*. The new or revised terms listed below will be presented for approval with the proposed standard.

Term:

Automatic Generation Control (AGC): Centrally located equipment that automatically adjusts resources generation in a Balancing Authority Area from a central location to help maintain the Reporting ACE in that of a Balancing Authority's Area within the bounds required by applicable NERC Reliability Standards interchange schedule plus Frequency Bias. AGC may also accommodate automatic inadvertent payback and time error correction. Resources utilized under AGC may include, but are not limited to, conventional generation, variable energy resources, storage devices and loads acting as resources (such as Demand Response).

Actual Frequency (F_A): The Interconnection frequency measured in Hertz (Hz).

Actual Net Interchange (NI_A): The algebraic sum of actual megawatt transfers across all Tie Lines, including Pseudo-Ties, to and from all Adjacent Balancing Authority areas within the same Interconnection. Actual megawatt transfers on asynchronous DC tie lines that are directly connected to another Interconnection are excluded from Actual Net Interchange.

Scheduled Net Interchange (NI_S): The algebraic sum of all scheduled megawatt transfers, including Dynamic Schedules, to and from all Adjacent Balancing Authority areas within the same Interconnection, including the effect of scheduled ramps. Scheduled megawatt transfers on asynchronous DC tie lines directly connected to another Interconnection are excluded from Scheduled Net Interchange.

Interchange Meter Error (I_{ME}): A term, normally zero, used in the Reporting ACE calculation to compensate for data or equipment errors affecting any other components of the Reporting ACE calculation.

Automatic Time Error Correction (I_{ATEC}): The addition of a component to the ACE equation for the Western Interconnection that modifies the control point for the purpose of continuously paying back Primary Inadvertent Interchange to correct accumulated time error. Automatic Time Error Correction is only applicable in the Western Interconnection.

$$I_{ATEC} = \frac{PI_{accum}^{on/off\ peak}}{(1-Y)*H} \quad \text{when operating in Automatic Time Error Correction Mode.}$$

The absolute value of I_{ATEC} shall not exceed L_{max}.

I_{ATEC} shall be zero when operating in any other AGC mode.

- L_{max} is the maximum value allowed for I_{ATEC} set by each BA between $0.2 * |B_i|$ and L_{10} , $0.2 * |B_i| \leq L_{max} \leq L_{10}$.
- $L_{10} = 1.65 * \epsilon_{10} \sqrt{(-10B_i)(-10B_S)}$.
- ϵ_{10} is a constant derived from the targeted frequency bound. It is the targeted root-mean-square (RMS) value of ten-minute average frequency error based on frequency performance over a given year. The bound, ϵ_{10} , is the same for every Balancing Authority Area within an Interconnection.
- $Y = B_i / B_S$.
- H = Number of hours used to payback primary inadvertent interchange energy. The value of H is set to 3.
- B_i = Frequency Bias Setting for the Balancing Authority Area (MW / 0.1 Hz).
- B_S = Sum of the minimum Frequency Bias Settings for the Interconnection (MW / 0.1 Hz).
- Primary Inadvertent Interchange (PII_{hourly}) is $(1-Y) * (I_{actual} - B_i * \Delta TE/6)$
- I_{actual} is the hourly Inadvertent Interchange for the last hour.
 ΔTE is the hourly change in system Time Error as distributed by the Interconnection time monitor, where: $\Delta TE = TE_{end\ hour} - TE_{begin\ hour} - TD_{adj} - (t) * (TE_{offset})$
- TD_{adj} is the Reliability Coordinator adjustment for differences with Interconnection time monitor control center clocks.
- t is the number of minutes of manual Time Error Correction that occurred during the hour.
- TE_{offset} is 0.000 or +0.020 or -0.020.
- PII_{accum} is the Balancing Authority Area's accumulated PII_{hourly} in MWh. An On-Peak and Off-Peak accumulation accounting is required,
 where:

$$PII_{accum}^{on/offpeak} = \text{last period's } PII_{accum}^{on/offpeak} + PII_{hourly}$$

Reporting ACE: The scan rate values of a Balancing Authority Area's (BAA) Area Control Error (ACE) measured in MW includes the difference between the Balancing Authority Area's Actual Net Interchange and its Scheduled Net Interchange, plus its Frequency Bias Setting obligation, plus correction for any known meter error. In the Western Interconnection, Reporting ACE includes Automatic Time Error Correction (ATEC).

Reporting ACE is calculated as follows:

$$\text{Reporting ACE} = (NI_A - NI_S) - 10B (F_A - F_S) - I_{ME}$$

Reporting ACE is calculated in the Western Interconnection as follows:

$$\text{Reporting ACE} = (NI_A - NI_S) - 10B (F_A - F_S) - I_{ME} + I_{ATEC}$$

Where:

- NI_A = Actual Net Interchange.
- NI_S = Scheduled Net Interchange.
- B = Frequency Bias Setting.

- F_A = Actual Frequency.
- F_S = Scheduled Frequency.
- I_{ME} = Interchange Meter Error.
- I_{ATEC} = Automatic Time Error Correction.

All NERC Interconnections with multiple Balancing Authority Areas operate using the principles of Tie-line Bias (TLB) Control and require the use of an ACE equation similar to the Reporting ACE defined above. Any modification(s) to this specified Reporting ACE equation that is(are) implemented for all BAAs on an Interconnection and is(are) consistent with the following four principles of Tie Line Bias control will provide a valid alternative to this Reporting ACE equation:

1. All portions of the Interconnection are included in exactly one BAA so that the sum of all BAAs' generation, load, and loss is the same as total Interconnection generation, load, and loss;
2. The algebraic sum of all BAAs' Scheduled Net Interchange is equal to zero at all times and the sum of all BAAs' Actual Net Interchange values is equal to zero at all times;
3. The use of a common Scheduled Frequency F_S for all BAAs at all times; and,
4. Excludes metering or computational errors. (The inclusion and use of the I_{ME} term corrects for known metering or computational errors.)

When this standard has received ballot approval, the text boxes will be moved to the Supplemental Material Section of the *standard*.

A. Introduction

- 1. Title:** Balancing Authority Control
- 2. Number:** BAL-005-1
- 3. Purpose:** This standard establishes requirements for acquiring data necessary to calculate Reporting Area Control Error (Reporting ACE). The standard also specifies a minimum periodicity, accuracy, and availability requirement for acquisition of the data and for providing the information to the System Operator.
- 4. Applicability:**
 - 4.1. Functional Entities:**
 - 4.1.1.** Balancing Authority
 - 4.2. Facilities:**
 - 4.2.1.** N/A

Effective Date: See Implementation Plan

B. Requirements and Measures

Rationale for Requirement R1: Reporting ACE is an essential measurement of the BA's contribution to the reliability of the Interconnection. Common source data (meaning data from the same source) is critical to calculating Reporting ACE that is consistent between Balancing Authorities. When data sources are not common, confusion can be created between BAs resulting in delayed or incorrect operator action.

The intent of Requirement R1 is to provide accuracy in the measurements and calculations used in Reporting ACE, hourly inadvertent energy, and Frequency Response measurements. It specifies the need for common metering points for instantaneous and hourly integrated values for the tie line megawatt flow values between Balancing Authority Areas. Common data source requirements also apply when more than two Balancing Authorities participate in allocating shares of a generation resource or in supplementary regulation, for example.

- R1.** Each Balancing Authority shall ensure that each Tie-Line, Pseudo-Tie, and Dynamic Schedule with an Adjacent Balancing Authority is equipped with a mutually agreed-upon time synchronized common source to determine hourly megawatt-hour values. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*
 - 1.1.** These values shall be exchanged between Adjacent Balancing Authorities.

- M1.** The Balancing Authority shall have dated evidence such as voice recordings or transcripts, operator logs, electronic communications, or other equivalent evidence that will be used to determine if the Balancing Authority and its adjacent Balancing Authority have agreed upon a time synchronized common source to determine megawatt-hour values.

Rationale for Requirement R2: Real-time operation of a Balancing Authority requires real-time information. A sufficient scan rate is key to an Operator's trust in real-time information. Without a sufficient scan rate, an operator may question the accuracy of data during events which would degrade the operator's ability to maintain reliability.

- R2.** The Balancing Authority shall use a scan rate of no more than six seconds in acquiring data necessary to calculate Reporting ACE. *[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*
- M2.** Each Balancing Authority will have dated documentation demonstrating that the data necessary to calculate Reporting ACE was scanned at a rate of no more than six seconds. Acceptable evidence may include historical data, dated archive files; or data from other databases, spreadsheets, or displays that demonstrate compliance.

Rationale for Requirement R3: The RC is responsible for coordinating the reliability of bulk electric systems for member BA's. When a BA is unable to calculate its ACE for an extended period of time, this information must be communicated to the RC so that the RC has sufficient knowledge of system conditions to assess any unintended reliability consequences that may occur on the wide area.

- R3.** A Balancing Authority that is unable to calculate Reporting ACE for more than 30-consecutive minutes shall notify its Reliability Coordinator within 45 minutes of the beginning of an inability to calculate Reporting ACE. *[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*
- M3.** Each Balancing Authority will have dated records to show when it was unable to calculate Reporting ACE for more than 30 consecutive minutes and that it notified its Reliability Coordinator within 45 minutes of the beginning of an inability to calculate Reporting ACE. Such evidence may include, but is not limited to, dated voice recordings, operating logs, or other communication documentation.

Rationale for Requirement R4: Frequency is the basic measurement for interconnection health, and a critical component for calculating Reporting ACE. Without sufficient

available frequency data the BA operator will lack situational awareness and will be unable to make correct decisions when maintaining reliability.

- R4.** Each Balancing Authority shall use frequency metering equipment for the calculation of Reporting ACE: *[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*
- 4.1.** that is available a minimum of 99.95% for each calendar year; and,
 - 4.2.** with a minimum accuracy of 0.001 Hz.
- M4.** The Balancing Authority shall have evidence such as dated documents or other evidence in hard copy or electronic format showing the frequency metering equipment used for the calculation of Reporting ACE had a minimum availability of 99.95% for each calendar year and had a minimum accuracy of 0.001 Hz to demonstrate compliance with Requirement R4.

Rationale for Requirement R5: System operators utilize Reporting ACE as a primary metric to determine operating actions or instructions. When data inputs into the ACE calculation are incorrect, the operator should be made aware through visual display. When an operator questions the validity of data, actions are delayed and the probability of adverse events occurring can increase.

- R5.** The Balancing Authority shall make available to the operator information associated with Reporting ACE including, but not limited to, quality flags indicating missing or invalid data. *[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*
- M5.** Each Balancing Authority Area shall have evidence such as a graphical display or dated alarm log that provides indication of data validity for the real-time Reporting ACE based on both the calculated result and all of the associated inputs therein.

Rationale for Requirement R6: Reporting ACE is an essential measurement of the BA's contribution to the reliability of the Interconnection. Since Reporting ACE is a measure of the BA's reliability performance for BAL-001, and BAL-002, it is critical that Reporting ACE be sufficiently available to assure reliability.

- R6.** Each Balancing Authority's system used to calculate Reporting ACE shall be available a minimum of 99.5% of each calendar year. *[Violation Risk Factor: Medium] [Time Horizon: Operations Assessment]*

- M6.** Each Balancing Authority will have dated documentation demonstrating that the system necessary to calculate Reporting ACE has a minimum availability of 99.5% for each calendar year. Acceptable evidence may include historical data, dated archive files; or data from other databases, spreadsheets, or displays that demonstrate compliance.

Rationale for Requirement R7: Reporting ACE is a measure of the BA’s reliability performance for BAL-001, and BAL-002. Without a process to address persistent errors in the ACE calculation, the operator can lose trust in the validity of Reporting ACE resulting in delayed or incorrect decisions regarding the reliability of the bulk electric system.

- R7.** Each Balancing Authority that is within a multiple Balancing Authority Interconnection shall implement an Operating Process to identify and mitigate errors affecting the scan-rate accuracy of data used in the calculation of Reporting ACE for each Balancing Authority Area. *[Violation Risk Factor: Medium] [Time Horizon: Same-day Operations]*
- M7.** Each Balancing Authority shall have a current Operating Process meeting the provisions of Requirement R7 and evidence to show that the process was implemented, such as dated communications or incorporation in System Operator task verification.

Rationale for Requirement R8: Reporting ACE is an essential measurement of the BA’s contribution to the reliability of the Interconnection. Common source data is critical to calculating Reporting ACE that is consistent between Balancing Authorities. When data sources are not common, confusion can be created between BAs resulting in delayed or incorrect operator action.

The intent of Requirement R8 is to provide accuracy in the measurement and calculations used in Reporting ACE. It specifies the need for common metering points for instantaneous values for the tie-line megawatt flow values between Balancing Authority Areas. Common data source requirements also apply to instantaneous values for pseudo-ties and dynamic schedules, and can extend to more than two Balancing Authorities that participate in allocating shares of a generation resource in supplementary regulation, for example.

- R8.** Each Balancing Authority shall agree with an Adjacent Balancing Authority on a common source for respective Tie-Lines, Pseudo-Ties, and Dynamic Schedules and shall implement that common source to provide common information to both Balancing Authorities for the calculation of Reporting ACE. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*

- M8.** The Balancing Authority shall have dated evidence such as voice recordings or transcripts, operator logs, electronic communications, or other equivalent evidence that will be used to determine if it agreed with its adjacent Balancing Authority on a common source for the components used in the calculation of Reporting ACE.

C. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

As defined in the NERC Rules of Procedure, “Compliance Enforcement Authority” means NERC or the Regional Entity in their respective roles of monitoring and enforcing compliance with the NERC Reliability Standards.

1.2. Evidence Retention

The following evidence retention period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full-time period since the last audit.

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- The applicable entity shall keep data or evidence to show compliance for the current year, plus three previous calendar years.

1.3. Compliance Monitoring and Assessment Processes:

As defined in the NERC Rules of Procedure, “Compliance Monitoring and Assessment Processes” refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

1.4. Additional Compliance Information

None

Table of Compliance Elements

R #	Time Horizon	VRF	Violation Severity Levels			
			Lower VSL	Moderate VSL	High VSL	Severe VSL
R1.	Operations Planning	Medium	N/A	N/A	N/A	<p>The Balancing Authority failed to agree upon a time synchronized common source for hourly megawatt hour values with its Adjacent Balancing Authorities</p> <p>Or</p> <p>The Balancing Authority failed to provide the megawatt hour values to its Adjacent Balancing Authorities.</p>
R2.	Real-time Operations	Medium	N/A	N/A	N/A	<p>Balancing Authority was using a scan rate of greater than six seconds to acquire the data necessary to calculate Reporting ACE.</p>

<p>R3.</p>	<p>Real-time Operations</p>	<p>Medium</p>	<p>The Balancing Authority failed to notify its Reliability Coordinator within 45 minutes of the beginning of an inability to calculate Reporting ACE but notified its Reliability Coordinator in less than or equal to 50 minutes from the beginning of an inability to calculate Reporting ACE.</p>	<p>The Balancing Authority failed to notify its Reliability Coordinator within 50 minutes of the beginning of an inability to calculate Reporting ACE but notified its Reliability Coordinator in less than or equal to 55 minutes from the beginning of an inability to calculate Reporting ACE.</p>	<p>The Balancing Authority failed to notify its Reliability Coordinator within 55 minutes of the beginning of an inability to calculate Reporting ACE but notified its Reliability Coordinator in less than or equal to 60 minutes from the beginning of an inability to calculate Reporting ACE.</p>	<p>The Balancing Authority failed to notify its Reliability Coordinator within 60 minutes of the beginning of an inability to calculate Reporting ACE.</p>
<p>R4.</p>	<p>Real-time Operations</p>	<p>Medium</p>	<p>The Balancing Authority's frequency metering equipment used for the calculation of Reporting ACE was available less than 99.95% of the calendar year but was available greater than or equal to 99.94 % of the calendar year.</p>	<p>The Balancing Authority's frequency metering equipment used for the calculation of Reporting ACE was available less than 99.94% of the calendar year but was available greater than or equal to 99.93 % of the calendar year.</p>	<p>The Balancing Authority's frequency metering equipment used for the calculation of Reporting ACE was available less than 99.93% of the calendar year but was available greater than or equal to 99.92 % of the calendar year.</p>	<p>The Balancing Authority's frequency metering equipment used for the calculation of Reporting ACE was available less than 99.92% of the calendar year Or The Balancing Authority's frequency metering equipment used for the</p>

						calculation of Reporting ACE failed to have a minimum accuracy of 0.001 Hz.
R5.	Real-time Operations	Medium	N/A	N/A	N/A	The Balancing Authority failed to make available information indicating missing or invalid data associated with Reporting ACE to its operators.
R6.	Operations Assessment	Medium	The Balancing Authority’s system used for the calculation of Reporting ACE was available less than 99.5% of the calendar year but was available greater than or equal to 99.4 % of the calendar year.	The Balancing Authority’s system used for the calculation of Reporting ACE was available less than 99.4% of the calendar year but was available greater than or equal to 99.3 % of the calendar year.	The Balancing Authority’s system used for the calculation of Reporting ACE was available less than 99.3% of the calendar year but was available greater than or equal to 99.2 % of the calendar year.	The Balancing Authority’s system used for the calculation of Reporting ACE was available less than 99.2% of the calendar year.
R7.	Same-day Operations	Medium	N/A	N/A	N/A	The Balancing authority failed to implement an Operating Process to

						identify and mitigate errors affecting the scan-rate accuracy of data used in the calculation of Reporting ACE.
R8.	Operations Planning	Medium	N/A	N/A	N/A	<p>The Balancing Authority failed to agree upon a common source for tie-lines, Pseudo-ties and Dynamic Schedules with its Adjacent Balancing Authorities</p> <p>Or</p> <p>The Balancing Authority failed to implement the common source to provide common information to both Balancing Authorities.</p>

D. Regional Variances

None.

E. Interpretations

None.

F. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking

Standards Attachments

NOTE: Use this section for attachments or other documents that are referenced in the standard as part of the requirements. These should appear after the end of the standard template and before the Supplemental Material. If there are none, delete this section.

Supplemental Material

[Application Guidelines, Guidelines and Technical Basis, Training Material, Reference Material and/or other Supplemental Material]

Rationale

Upon Board approval, the text from the rationale boxes will be moved to this section.