Standard Development Roadmap

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

Development Steps Completed:

1. The NERC Standards Committee approved the merger of Project 2007-05 Balancing Authority Controls and Project 2007-18 Reliability-based Control as Project 2010-14 Balancing Authority Reliability-based Controls on July 28, 2010.

2. The NERC Standards Committee approved breaking Project 2010-14 Balancing Authority Reliability-based Controls into two phases and moving Phase 1 (Project 2010-14.1 Balancing Authority Reliability-based Controls – Reserves) into formal standards development on July 13, 2011.

Proposed Action Plan and Description of Current Draft:

This is the first posting of the proposed revisions to the standard in accordance with Results-Based Criteria. This proposed draft standard will be posted for a 30-day formal comment period beginning on October ??, 2011 through November ??, 2011.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Second posting	
2. Initial Ballot	
3. Recirculation Ballot	
4. NERC BOT Approval	**October, 2012**

Definitions of Terms Used in Standard

This section includes all newly defined or revised terms used in the proposed standard.
Terms already defined in the Reliability Standards Glossary of Terms are not repeated here.
New or revised definitions listed below become approved when the proposed standard is
approved. When the standard becomes effective, these defined terms will be removed from
the individual standard and added to the Glossary.

Balancing Authority ACE Limit (BAAL): The limit beyond which the Balancing
Authority ~~will incur~~ contributes more than its share of Interconnection frequency control
reliability risk. This definition applies to a high limit ($BAAL_{High}$) and a low limit ($BAAL_{Low}$).

Reporting Ace

A. Introduction

1. **Title**:   **Real Power Balancing Control Performance**

2. **Number**:   BAL-001-1

3. **Purpose**:   To regulate Balancing Authority load/resource balance in support of Interconnection frequency.

4. **Applicability**:

   4.1.   Balancing Authority

5. **Effective Date:** The first day of the first calendar quarter six months after applicable regulatory approval. In those jurisdictions where no regulatory approval is required, the first day of the first quarter after NERC Board of Trustees approval.

B. Background

CPS1 has been retained, and details for calculating CPS1 are included in Attachment 1. Calculation of Reporting ACE has been clarified, and details for calculating Reporting ACE are also included in Attachment 1. The Balancing Authority ACE Limit (BAAL), an interconnection frequency and Balancing Authority ACE measurement, is included in this standard as Requirement 2 and replaces Control Performance Standard (CPS2). Details for the calculation of BAAL are included in Attachment 2.

C. Requirements

R1.   The Balancing Authority shall operate such that, on a rolling 12-month basis, the Balancing Authority's Control Performance Standard 1 (CPS1), as calculated in Attachment 1, is greater than or equal to 100% for the applicable Interconnection in which it operates. *[Violation Risk Factor: Medium] [Time Horizon: Operations Assessment]*

M1.   Each Balancing Authority shall have evidence such as dated calculation output, either in hard copy or electronic format that shows compliance with it achieved Requirement R1.

R2.   Each Balancing Authority shall operate such that its clock-minute average of Reporting ACE does not exceed its clock-minute Balancing Authority ACE Limit (BAAL), as calculated in Attachment 2, for more than 30 consecutive clock-minutes for the applicable Interconnection in which it operates.*[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*

M2.   Each Balancing Authority shall have evidence such as dated calculation output, either in hard copy or electronic format that shows compliance withit achieved Requirement R2.

D. Compliance

1. **Compliance Monitoring Process**

   1.1. Compliance Enforcement Authority

   Regional Entity

   1.2. Compliance Monitoring Period and Reset Timeframe

   Not applicable

1.3. Compliance Monitoring and Enforcement Processes:

Compliance Audits

Self-Certifications

Spot Checking

Compliance Violation Investigations

Self-Reporting

Complaints

Periodic Data Submittals

1.4. Data Retention

The Balancing Authority shall retain data or evidence to show compliance with Requirement R1, R2 and Measure M1, M2 for the current year plus three calendar years unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

Data required for the calculation of Reporting ACE, CPS1, and BAAL shall be retained for the current year plus three calendar years.

If a Balancing Authority is found non-compliant, it shall keep information related to the non-compliance until found compliant or for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all subsequent requested and submitted records.

1.5. Additional Compliance Information

None.

2. Violation Severity Levels

#	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	The Balancing Authority Area's value of CPS1, on a rolling 12-month basis, is less than 100% but greater than or equal to 95% for the applicable Interconnection.	The Balancing Authority Area's value of CPS1, on a rolling 12-month basis, is less than 95% but greater than or equal to 90% for the applicable Interconnection.	The Balancing Authority Area's value of CPS1, on a rolling 12-month basis, is less than 90% but greater than or equal to 85% for the applicable Interconnection.	The Balancing Authority Area's value of CPS1, on a rolling 12-month basis, is less than 85% for the applicable Interconnection.
R2	The Balancing Authority exceeds its clock-minute BAAL for more than 30 consecutive clock-minutes but less than or equal to 45 consecutive clock-minutes.	The Balancing Authority exceeds its clock-minute BAAL for greater than 45 consecutive clock-minutes but less than or equal to 60 consecutive clock-minutes.	The Balancing Authority exceeds its clock-minute BAAL for greater than 60 consecutive clock-minutes but less than or equal to 75 consecutive clock-minutes.	The Balancing Authority exceeds its clock-minute BAAL for greater than 75 consecutive clock-minutes.

E. Regional

None

Version History

Version	Date	Action	Change Tracking
0	February 8, 2005	BOT Approval	New
0	April 1, 2005	Effective Implementation Date	New
0	August 8, 2005	Removed "Proposed" from Effective Date	Errata
0	July 24, 2007	Corrected R3 to reference M1 and M2 instead of R1 and R2	Errata
0a	December 19, 2007	Added Appendix 2 – Interpretation of R1 approved by BOT on October 23, 2007	Revised
0a	January 16, 2008	In Section A.2., Added "a" to end of standard number In Section F, corrected automatic numbering from "2" to "1" and removed "approved" and added parenthesis to "(October 23, 2007)"	Errata
0	January 23, 2008	Reversed errata change from July 24, 2007	Errata
0.1a	October 29, 2008	Board approved errata changes; updated version number to "0.1a"	Errata
0.1a	May 13, 2009	Approved by FERC	
1	TBD	Inclusion of BAAL an exclusion of CPS2	

Attachment 1
Equations Supporting Requirement R1 and Measure M1

CPS1 is calculated as follows: CPS1 = (2 - CF) * 100%.

The frequency-related compliance factor, CF, is a ratio of all one-minute compliance parameters accumulated over 12 months divided by square of the target frequency bound:

$$CF = \frac{CF_{12-month}}{(\epsilon_1)^2}$$

where ϵ_1 is the constant derived from a targeted frequency bound for each Interconnection as follows:

- o   Eastern Interconnection ϵ_1 =0.018 Hz
- o   Western Interconnection ϵ_1 =0.0228 Hz
- o   ERCOT Interconnection ϵ_1 =0.030 Hz
- o   Hydro-Quebec Interconnection ϵ_1 =0.021 Hz

The rating index $CF_{12-month}$ is derived from 12 months of data. The basic unit of data comes from one-minute averages of Reporting ACE, Frequency Error, and Frequency Bias Settings.

Reporting ACE is calculated as follows:

Reporting ACE = $(NI_A - NI_S) - 10B (F_A - F_S) - NME$

Where:

NI_A (Net Interchange Actual) is the algebraic sum of actual transfers of Megawatts metered across all synchronous Tie Lines and Pseudo-Ties.

NI_S (Net Interchange Schedule) is the algebraic sum in whole Megawatts of all scheduled transfers, including Dynamic Schedules, of Megawatts to or from any adjacent synchronous Balancing Authorities incorporating the effects of schedule ramping.

B (Frequency Bias) is the Frequency Bias Setting (in negative MW per 0.1 Hz) for the Balancing Authority.

10 is the constant factor that converts the frequency bias setting to MW per Hz.

F_A (Actual Frequency) is the measured frequency in hertz, to the nearest millihertz.

F_S (Scheduled Frequency) is the scheduled frequency in hertz for the Interconnection. F_S is normally 60 Hz but may be offset to effect manual time error corrections.

NME (Net Meter Error) is the meter error correction factor based on the difference between the integrated hourly average of the net tie line flows (NIA) and the hourly net interchange energy measurement (megawatt-hour).

Comment [TS1]: This term is in the NERC glossary, but the definition is different. There is also a definition of Net Scheduled Interchange that does not match.

Comment [TS2]: Different in Glossary

A clock-minute average is the average of the reporting Balancing Authority's valid measured variable (i.e., for Reporting ACE and for Frequency Error) for each sampling cycle during a given clock-minute.

$$\left(\frac{ACE}{-10B}\right)_{\text{clock-minute}} = \frac{\left(\frac{\sum ACE_{\text{sampling cycles in clock-minute}}}{n_{\text{sampling cycles in clock-minute}}}\right)}{-10B}$$

$$\Delta F_{\text{clock-minute}} = \frac{\sum \Delta F_{\text{sampling cycles in clock-minute}}}{n_{\text{sampling cycles in clock-minute}}}$$

The Balancing Authority's clock-minute compliance factor (CF) becomes:

$$CF_{\text{clock-minute}} = \left[\left(\frac{ACE}{-10B}\right)_{\text{clock-minute}} * \Delta F_{\text{clock-minute}}\right]$$

Normally, sixty (60) clock-minute averages of the reporting Balancing Authority's Reporting ACE and of the respective Interconnection's Frequency Error will be used to compute the respective hourly average compliance parameter.

$$CF_{\text{clock-hour}} = \frac{\sum CF_{\text{clock-minute}}}{n_{\text{clock-minute samples in hour}}}$$

The reporting Balancing Authority shall be able to recalculate and store each of the respective clock-hour averages (CF clock-hour average-month) as well as the respective number of samples for each of the twenty-four (24) hours (one for each clock-hour, i.e., hour-ending (HE) 0100, HE 0200, ..., HE 2400).

$$CF_{\text{clock-hour average-month}} = \frac{\sum\limits_{\text{days-in-month}} [(CF_{\text{clock-hour}})(n_{\text{one-minute samples in clock-hour}})]}{\sum\limits_{\text{days-in month}} [n_{\text{one-minute samples in clock-hour}}]}$$

$$CF_{\text{month}} = \frac{\sum\limits_{\text{hours-in-day}} [(CF_{\text{clock-hour average-month}})(n_{\text{one-minute samples in clock-hour averages}})]}{\sum\limits_{\text{hours-in day}} [n_{\text{one-minute samples in clock-hour averages}}]}$$

The 12-month compliance factor becomes:

$$CF_{\text{12-month}} = \frac{\sum\limits_{i=1}^{12} (CF_{\text{month-i}})(n_{(\text{one-minute samples in month})-i})]}{\sum\limits_{i=1}^{12} [n_{(\text{one-minute samples in month})-i}]}$$

In order to ensure that the average Reporting ACE and Frequency Error calculated for any one-minute interval is representative of that one-minute interval, it is necessary that at least 50% of both Reporting ACE and Frequency Error samples during that one-minute interval be present. Should a sustained interruption in the recording of Reporting ACE or Frequency Error due to loss of telemetering or

computer unavailability result in a one-minute interval not containing at least 50% of samples of both Reporting ACE and Frequency Error, that one-minute interval is excluded from the calculation of CPS1.

A Balancing Authority providing Overlap Regulation Service to another Balancing Authority uses its own Reporting ACE and Frequency Bias Settings combined with the Reporting ACE and Frequency Bias Settings of the Balancing Authority receiving the Regulation Service to calculate CPS1 performance.

A Balancing Authority receiving Overlap Regulation Service is not subject to CPS1compliance evaluation.

Comment [TS3]: Do we need to say why the data is unavailable?

Comment [TS4]: Should missing intervals flagged?

Attachment 2

Equations Supporting Requirement R2 and Measure M2

When Actual Frequency is equal to 60 Hertz, $BAAL_{High}$ and $BAAL_{Low}$ do not apply.

When Actual Frequency is less than 60 Hertz, $BAAL_{High}$ does not apply and $BAAL_{Low}$ is calculated as:

$$BAAL_{Low} = \left(-10B_i \times \left(FTL_{Low} - 60\right)\right) \times \frac{\left(FTL_{Low} - 60\right)}{\left(F_A - 60\right)}$$

When Actual Frequency is greater than 60 Hertz, $BAAL_{Low}$ does not apply and the $BAAL_{High}$ is calculated as:

$$BAAL_{High} = \left(-10B_i \times \left(FTL_{High} - 60\right)\right) \times \frac{\left(FTL_{High} - 60\right)}{\left(F_A - 60\right)}$$

Where:

$BAAL_{Low}$ is the Low Balancing Authority ACE Limit (MW)

$BAAL_{High}$ is the High Balancing Authority ACE Limit (MW)

10 is a constant to convert the Frequency Bias Setting from MW/0.1 Hz to MW/Hz

B_i is the Frequency Bias Setting for a Balancing Authority (MW/0.1 Hz)

60 is the nominal frequency for the Interconnection (Hz)

F_A is the actual frequency for the Interconnection (Hz)

FTL_{Low} is the Low Frequency Trigger Limit (Hz) ($60 - 3\varepsilon_1$)

FTL_{High} is the High Frequency Trigger Limit (Hz) ($60 + 3\varepsilon_1$)

Where ε_1 is the constant derived from a targeted frequency bound for each Interconnection as follows:

- o Eastern Interconnection $\varepsilon_1 = 0.018$ Hz
- o Western Interconnection $\varepsilon_1 = 0.0228$ Hz
- o ERCOT Interconnection $\varepsilon_1 = 0.030$ Hz
- o Hydro-Quebec Interconnection $\varepsilon_1 = 0.021$ Hz

To ensure that the average Actual Frequency calculated for any one-minute interval is representative of that one-minute interval, at least 50% of the Actual Frequency samples during that one-minute interval must be present. Should a sustained interruption in the recording of Actual Frequency due to loss of telemetry or computer unavailability result in a one-minute interval without at least 50% of the samples of Actual Frequency, that one-minute interval is excluded from the data reported for compliance to BAAL.

Comment [TS5]: Do we need to say why the data was missing?

Comment [TS6]: Should missing intervals flagged?

A Balancing Authority providing Overlap Regulation Service to another Balancing Authority uses its own Frequency Bias Settings combined with the Frequency Bias Settings of the Balancing Authority receiving the Regulation Service to calculate BAAL performance.

A Balancing Authority receiving Overlap Regulation Service is not subject to BAAL compliance evaluation.