

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. SAC approves SAR for posting (March 10, 2002).
2. Drafting team posts draft SAR for comment (February 7–March 30, 2002) (June 3–July 12, 2002) (August 20–September 23, 2002).
3. SAC approves development of standard (November 20, 2002).
4. JIC assigns development of standard to NERC (January 10, 2003).
5. Drafting team posts drafts for comment (July 1–August 29, 2003) (June 2–July 2, 2004).
6. Drafting team posts draft for review during field test (June 23, 2005–March 31, 2006).
7. Drafting team conducts field test to validate the methodologies proposed for establishing frequency-related limits (July 6, 2005–March 31, 2006).
8. Drafting team posts draft 5, the results of the field test and an implementation plan for comment (June 1–July 15, 2006).
9. Initial ballot conducted October 6–16, 2006.
10. Drafting team posts its response to the comments in the initial draft of the standard and a revised draft 7 and revised implementation plan for comment (January 2–31, 2007)

Description of Current Draft:

The drafting team posted its response to the comments received on the last draft of the standard and implementation plan and is posting the revised standards and implementation plan for a 30-day pre-ballot review period from February 15–March 16, 2007.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Conduct first ballot.	March 19–30, 2006
2. Consider comments submitted with first ballot; post consideration of comments.	April 15, 2006
3. Conduct second ballot.	April 16–26, 2007
4. Post standards and implementation plan for 30-day review by board.	April 2–May 1
5. Board adoption date.	May 2, 2007

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 Area Control Error Limit (BAAL): The Area Control Error value beyond which the Balancing Authority will incur 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}).

Balancing Authority Area Control Error Limit Event (BAAL Event): Whenever the clock-minute average ACE falls below the BAAL_{Low} or exceeds the BAAL_{High} for one or more consecutive clock-minutes.

Balancing Authority Area Control Error Limit Violation (BAAL Violation): Whenever the Balancing Authority clock-minute average ACE is below the BAAL_{Low} for more than thirty consecutive clock-minutes or above the BAAL_{High} for more than thirty consecutive clock-minutes.

Balancing Authority Area Control Error Limit Event Duration (BAAL Event Duration): The length of a Balancing Authority Area Control Error Limit event, measured in consecutive clock-minutes. The duration of the event is calculated beginning when the first clock-minute average ACE exceeds the clock-minute average BAAL and ends when the clock-minute average ACE no longer exceeds the clock-minute average BAAL.

Control Performance Measure (CPM): The reliability measure that sets the limits of a Balancing Authority's Area Control Error over a specified time period.

Frequency Trigger Limit High (FTL_{High}): An Interconnection frequency limit set by establishing a single contingency margin below the upper Frequency Abnormal Limit. FTL_{High} is a fixed value, established for each Interconnection.

Frequency Trigger Limit Low (FTL_{Low}): An Interconnection frequency limit set by establishing a single contingency margin above the lower Frequency Abnormal Limit. FTL_{Low} is a fixed value, established for each Interconnection.

A. Introduction

1. **Title:** **Balance of Resources and Demand**
2. **Number:** **BAL-007-1**
3. **Purpose:** To maintain Interconnection frequency within predefined frequency limits under all conditions (i.e., normal and abnormal), to prevent frequency-related instability; unplanned tripping of load or generation; or uncontrolled separation or Cascading outages that adversely impact the reliability of the Interconnection.
4. **Applicability**
 - 4.1. Balancing Authority
5. **Proposed Effective Dates:**

Eastern Interconnection and ERCOT: On the first day of the first quarter, six months after applicable regulatory approvals.

WECC and Hydro-Québec: On the first day of the first quarter, twelve months after applicable regulatory approvals.

B. Requirements

- R1.** The Balancing Authority shall balance its resources and demand in real-time so that its clock-minute average of ACE (ACE_i) does not exceed its Balancing Authority ACE Limits (BAALs), as defined in BAL-007 Attachment 1, for more than 30 consecutive clock-minutes. *[Violation Risk Factor: Medium] [Mitigation Time Horizon: Real-time Operations]*
 - R1.1.** The Balancing Authority shall report each BAAL Violation to its Compliance Monitor within five business days of the initiation of the event. The report shall include the date and time of the event, the limit(s) violated, a chronological depiction of the degree and duration of the violation, and a chronological list of actions taken, including directives issued and results achieved. *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Assessment]*
- R2.** The Balancing Authority shall maintain a 12-month rolling average of at least 100% on its one-minute Control Performance Measure (CPM). *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Assessment]*
 - R2.1.** The Balancing Authority shall report the current reporting month and 12-month rolling average of its one-minute CPM to its Compliance Monitor no later than the 20th of each month for the prior month's data, using the formula in BAL-007 Attachment 2.

C. Measures

- M1.** The Balancing Authority shall have evidence it provided its Compliance Monitor with a report for each BAAL Violation that exceeded 30 consecutive clock-minutes in accordance with Requirement 1.1.
- M2.** The Balancing Authority shall have evidence it maintained a 12-month rolling average of its CPM of at least 100%.
- M3.** The Balancing Authority shall have evidence that it calculated and reported its monthly and 12-month rolling average of CPM using the formulas in BAL-007 Attachment 2 in accordance with Requirement 2.1.

D. Compliance

1. **Compliance Monitoring Process**

1.1. Compliance Monitoring Responsibility

Regional Entity.

1.2. Compliance Monitoring Period and Reset Time Frame

The reporting period for CPM is one calendar month, starting on the month's first second, and ending on the last second of the month.

The Performance-reset Period is one calendar month.

1.3. Data Retention

The Balancing Authority shall retain its clock-minute averages of ACE, Frequency Error, and Actual Frequency for the preceding calendar year (January – December) plus the current year.

The Compliance Monitor shall retain audit data for three calendar years.

1.4. Additional Compliance Information

The Compliance Monitor shall use monthly CPM Reports and reports of BAAL Violations to monitor compliance. The Compliance Monitor may also use periodic audits (on site, per a schedule), spot reviews, investigations initiated in response to a complaint, or other methods as provided for in the Compliance Monitoring Enforcement Program to assess performance.

The Balancing Authority shall have the following documentation available for its Compliance Monitor to inspect during a scheduled, on-site review or within five business days of a request as part of a triggered investigation:

1.4.1 Source data for calculating CPM.

1.4.2 Copies of monthly Control Performance Reports.

1.4.3 Copies of BAAL Violation Reports.

2. Violation Severity Levels (Note: Apply sanctions separately for each type of violation and for each violation.)

2.1. BAAL¹ violation:

2.1.1 Lower: 30 minutes < BAAL Event Duration ≤ 45 minutes

2.1.2 Moderate: 45 minutes < BAAL Event Duration ≤ 60 minutes

2.1.3 High: 60 minutes < BAAL Event Duration ≤ 75 minutes

2.1.4 Severe: BAAL Event Duration > 75 minutes

2.2. CPM Requirement:

2.2.1 Lower: 95% < 12 month rolling average of the one-minute CPM ending in the last month measured < 100%

2.2.2 Moderate: 85% < 12 month rolling average of the one-minute CPM ending in the last month measured ≤ 95%

2.2.3 High: 70% < 12 month rolling average of the one-minute CPM ending in the last month measured ≤ 85%

¹ This does not include violations involving extenuating circumstances approved by the Compliance Monitor.

2.2.4 Severe: 12 month rolling average of the one-minute CPM ending in the last month measured < 70%

E. Regional Differences

None

F. Associated Documents

BAAL Violation Report

Version History

Version	Date	Action	Change Tracking

BAL-007 Attachment 1
Calculation of BAAL_{Low} and BAAL_{High}

The Balancing Authority shall implement the set of BAALs calculated as follows²:

When actual frequency is less than 60 Hertz, BAAL_{HIGH} does not apply and the BAAL_{Low} is as follows:

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

When actual frequency is greater than 60 Hertz, BAAL_{LOW} does not apply and the BAAL_{High} is as follows:

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

When frequency is equal to 60 Hertz, BAAL does not apply.

Where:

BAAL_{Low} is the Low Balancing Authority ACE Limit for Balancing Authority, i (MW)

10 is a constant to convert the frequency bias setting from MW/0.1 Hz to MW/Hz

B_i is Frequency Bias for Balancing Authority, i (MW/0.1 Hz)

FTL_{Low} is the Low Frequency Trigger Limit (Hz)

60 is the nominal frequency for the Interconnection (60.000 Hz)

F_A is the Actual Frequency for the Interconnection (Hz)

BAAL_{High} is the High Balancing Authority ACE Limit for Balancing Authority, i (MW)

FTL_{High} is the High Frequency Trigger Limit (Hz)

² 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, the Balancing Authority shall exclude that one-minute interval from the data reported for compliance to BAL-007.

BAL-007 Attachment 2

Calculation of 12-month Rolling Average One-minute CPM

The Balancing Authority shall calculate a 12-month rolling average of its one-minute CPM. The Balancing Authority shall calculate its CPM performance as a percentage from the MW-Hz error value computed over a rolling 12-month period as follows:

1. Calculate a CPM Compliance Factor ($CF_{1\text{-minute}}$) for each one-minute period during the rolling 12-month period as follows:

- 1.1. Calculate a one-minute $CF_{1\text{-minute}}$ value.³

$$CF_{1\text{-minute}} = \left(\frac{ACE_i}{-10 B_i} \right)_{1\text{-minute}} * \left(\frac{\Delta F_{1\text{-minute}}}{\epsilon_{1\text{-minute}}^2} \right)$$

Where:

$$ACE = (\Sigma I_A - \Sigma I_S) - 10B (F_A - F_S) - I_{ME}$$

ΣI_A is the algebraic sum of actual tie flows of all the Balancing Authority's metered boundaries (MW)

ΣI_S is the algebraic sum of scheduled tie flows of all the Balancing Authority's metered boundaries (MW)

B is the Balancing Authority's Frequency Bias (MW/0.1 Hz)

10 is a constant to convert the frequency bias setting from MW/0.1 Hz to MW/Hz

F_A is the actual frequency (Hz)

F_S is the scheduled frequency (Hz)

I_{ME} is the meter error recognized as the difference between the integrated hourly average of the net tie line instantaneous interchange MW (ΣI_A) and the hourly net interchange demand measurement (MWh)

ACE_i is the ACE of the Balancing Authority under consideration (Clock-minute average of ACE) (MW)

B_i is the Frequency Bias of the Balancing Authority under consideration (MW/0.1 Hz)

$\Delta F_{1\text{-minute}}$ is the clock-minute average of the difference between actual and scheduled frequency (Hz)

$\epsilon_{1\text{-minute}}$ is the one-minute targeted frequency limit for the Interconnection⁴ (constant) (Hz)

i is representative of the Balancing Authority under consideration

³ To ensure that the average ACE and Frequency Deviation calculated for any one-minute interval is representative of that one-minute interval, at least 50% of both ACE and Frequency Deviation samples during that one-minute interval must be present. Should a sustained interruption in the recording of ACE or Frequency Deviation due to loss of telemetry or computer unavailability result in a one-minute interval not containing at least 50% of the samples of both ACE and Frequency Deviation, the Balancing Authority shall exclude that one-minute interval from the calculation of CPM.

⁴ This is the targeted root mean square of one-minute average Frequency Error from a schedule based on frequency performance over a given year. The limit is the same for every Balancing Authority within an Interconnection.

2. Calculate a one-minute CPM value.

$$CPM_{1\text{-minute}} = (2 - CF_{1\text{-minute}}) * 100\%$$

3. Calculate a one-month CPM value as an average of all of the month's one-minute CPM calculations.

$$CPM_{\text{month}} = (\sum CPM_{1\text{-minute}} \text{ for the month}) / (\# \text{ of minutes in the month with valid data})$$

4. Calculate a 12-month rolling CPM value as an average of all of the 12 preceding month's one-minute CPM calculations.

$$CPM = (\sum CPM_{1\text{-minute}} \text{ for the year}) / (\# \text{ of minutes in the year with valid data})$$

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. SAC approves SAR for posting (March 10, 2002).
2. Drafting team posts draft SAR for comment (February 7–March 30, 2002) (June 3–July 12, 2002) (August 20–September 23, 2002).
3. SAC approves development of standard (November 20, 2002).
4. JIC assigns development of standard to NERC (January 10, 2003).
5. Drafting team posts drafts for comment (July 1–August 29, 2003) (June 2–July 2, 2004).
6. Drafting team posts draft for review during field test (June 23, 2005–March 31, 2006).
7. Drafting team conducts field test to validate the methodologies proposed for establishing frequency-related limits (July 6, 2005–March 31, 2006).
8. Drafting team posts draft 5, the results of the field test and an implementation plan for comment (June 1–July 15, 2006).
9. Initial ballot conducted October 6–16, 2006.
10. Drafting team posts its response to the comments in the initial draft of the standard and a revised draft 7 and revised implementation plan for comment (January 2–31, 2007)

Description of Current Draft:

The drafting team posted its response to the comments received on the last draft of the standard and implementation plan and is posting the revised standards and implementation plan for a 30-day pre-ballot review period from February 15–March 16, 2007.

Future Development Plan:

Anticipated Actions

1. Post final draft of standards and implementation plan for a 30-day pre-ballot review.
2. Conduct first ballot.
3. Consider comments submitted with first ballot; post consideration of comments.
4. Conduct second ballot.
5. Post standards and implementation plan for 30-day review by board.
6. Board adoption date.

Anticipated Date

February 15–March 16, 2007

March 19–30, 2006

April 15, 2006

April 16–26, 2007

April 2–May 1

May 2, 2007

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.

Frequency Abnormal Limits (FAL_{Low}, FAL_{High}): The Interconnection frequency limits that can not be exceeded without exposing the Interconnection to unacceptable risk. FAL_{Low} and FAL_{High} are fixed values, established for each Interconnection.

Frequency Abnormal Limit Violation (FAL Violation): Whenever Interconnection frequency falls below the FAL_{Low} or exceeds FAL_{High}.

Frequency Event: Whenever Interconnection frequency falls below FTL_{Low} or exceeds FTL_{High} for one or more consecutive clock-minutes.

Frequency Trigger Limit Violation (FTL Violation): Whenever Interconnection average frequency falls below FTL_{Low} for more than thirty consecutive clock-minutes or exceeds FTL_{High} for more than thirty consecutive clock-minutes.

A. Introduction

1. **Title:** Frequency and Area Control Error
2. **Number:** BAL-008-1
3. **Purpose:** To maintain Interconnection frequency within predefined frequency limits under all conditions (i.e. normal and abnormal), to prevent frequency-related instability; unplanned tripping of load or generation; or uncontrolled separation or Cascading outages that adversely impact the reliability of the Interconnection.
4. **Applicability**
 - 4.1. Reliability Coordinator
5. **Proposed Effective Dates:**

Eastern Interconnection and ERCOT: On the first day of the first quarter, six months after applicable regulatory approvals.

WECC and Hydro-Quebec: On the first day of the first quarter, twelve months after applicable regulatory approvals.

B. Requirements

- R1. If the duration of a Frequency Event exceeds five consecutive clock-minutes, each Reliability Coordinator within the affected Interconnection shall take the following actions to return frequency to within the Frequency Trigger Limits: *[Violation Risk Factor: Medium] [Mitigation Time Horizon: Real-time Operations]*
 - R1.1. Notify its Balancing Authorities that a Frequency Trigger Limit (FTL) has been exceeded.
 - R1.2. Direct each of its Balancing Authorities with an ACE in the same direction as the frequency error, to take actions to return its ACE to within its BAALs.
 - R1.3. Notify its Balancing Authorities when the Interconnection frequency has returned to a value that is within the FTLs. *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Real-time Operations]*
- R2. Prior to an FTL Violation or an FAL Violation, each Reliability Coordinator within the affected Interconnection shall have taken the following actions to try to return frequency to within the Frequency Trigger Limits:¹ *[Violation Risk Factor: Medium] [Mitigation Time Horizon: Real-time Operations]*
 - R2.1. Notify its Balancing Authorities of the Interconnection frequency conditions.
 - R2.2. Direct each of its Balancing Authorities with an ACE in the same direction as the Frequency Error to act to return ACE to zero.
 - R2.3. Notify its Balancing Authorities when the Interconnection frequency has returned to a value that is within the FTLs and Balancing Authorities can return to normal operations. *[Violation Risk Factor: Medium] [Mitigation Time Horizon: Real-time Operations]*

¹ Interconnection frequency falls below FTL_{Low} or exceeds FTL_{High} for more than thirty consecutive clock-minutes or whenever Interconnection frequency is below FAL_{Low} or exceeds FAL_{High}

- R3.** Each Reliability Coordinator shall complete and submit a Frequency Limit Violation Report to its Compliance Monitor within five business days for each instance of an FTL Violation or an FAL Violation. [*Violation Risk Factor: Lower*] [*Mitigation Time Horizon: Operations Assessment*]

C. Measures

- M1.** The Reliability Coordinator shall have evidence that it responded to each Frequency Event in accordance with Requirements 1 and 2.
- M2.** The Reliability Coordinator shall have evidence it completed and submitted a Frequency Limit Violation Report for each FTL Violation and each FAL Violation (Requirement 3).

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Entity.

1.2. Compliance Monitoring Period and Reset Time Frame

The Performance-Reset Period is one calendar year without a violation.

1.3. Data Retention

The Reliability Coordinator shall retain all report-related data for the preceding calendar year (January–December) plus the current year.

The Compliance Monitor shall retain all audit data for three years.

Additional Compliance Information

The Reliability Coordinator shall demonstrate compliance through reporting on an event-driven basis. The Compliance Monitor may also use periodic audits (on site, per a schedule), spot reviews, triggered investigations, or other methods as provided for in the Compliance Monitoring Enforcement Program to assess performance.

The Reliability Coordinator shall have the following documentation available for inspection during a scheduled, on-site review or within five business days of a request as part of an investigation upon complaint:

- Frequency Limit Violation Reports

2. Violation Severity Levels²

2.1. Lower: There shall be a single lower violation if any one or more of the following conditions exist:

- 2.1.1** The duration of a Frequency Event exceeded five consecutive clock-minutes and the Reliability Coordinator did not make the notification identified in R1.3.
- 2.1.2** There was an FTL Violation or an FAL Violation and the Reliability Coordinator did not make the notification identified in R2.3.
- 2.1.3** The Reliability Coordinator submitted a Frequency Limit Violation Report to its Compliance Monitor that was 1-5 days business late.

² This does not include violations involving extenuating circumstances approved by the Compliance Monitor.

- 2.2. Moderate: There shall be a single moderate violation if one or more of the following conditions exist:**
- 2.2.1** The duration of a Frequency Event exceeded five consecutive clock-minutes and the Reliability Coordinator did not make the notification identified in R1.1.
 - 2.2.2** There was an FTL Violation or an FAL Violation and the Reliability Coordinator did not make the notification identified in R2.1.
 - 2.2.3** The Reliability Coordinator submitted a Frequency Limit Violation Report to its Compliance Monitor that was 6-10 business days late.
- 2.3. High: There shall be a single high violation if one or more of the following conditions exist:**
- 2.3.1** The duration of a Frequency Event exceeded five consecutive clock-minutes and the Reliability Coordinator did not issue the directive identified in R1.2.
 - 2.3.2** There was an FTL Violation or an FAL Violation and the Reliability Coordinator did not make the notification identified in R2.2.
 - 2.3.3** The Reliability Coordinator submitted a Frequency Limit Violation Report to its Compliance Monitor that was 11-15 business days late.
- 2.4. Severe: There shall be a separate severe violation for each of the following conditions that exist:**
- 2.4.1** There was an FTL Violation, and the Reliability Coordinator did not take any of the three actions identified in R1.
 - 2.4.2** There was an FTL Violation or an FAL Violation and the Reliability Coordinator did not take any of the three actions identified in R2.
 - 2.4.3** The Reliability Coordinator did not submit a Frequency Limit Violation Report to its Compliance Monitor or the report was submitted more than 15 business days late.

E. Regional Differences

None

F. Associated Documents

Frequency Limit Violation Report

Version History

Version	Date	Action	Change Tracking

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. SAC approves SAR for posting (March 10, 2002).
2. Drafting team posts draft SAR for comment (February 7–March 30, 2002) (June 3–July 12, 2002) (August 20–September 23, 2002).
3. SAC approves development of standard (November 20, 2002).
4. JIC assigns development of standard to NERC (January 10, 2003).
5. Drafting team posts drafts for comment (July 1–August 29, 2003) (June 2–July 2, 2004).
6. Drafting team posts draft for review during field test (June 23, 2005–March 31, 2006).
7. Drafting team conducts field test to validate the methodologies proposed for establishing frequency-related limits (July 6, 2005–March 31, 2006).
8. Drafting team posts draft 5, the results of the field test and an implementation plan for comment (June 1–July 15, 2006).
9. Initial ballot conducted October 6 - 16, 2006.
10. Drafting team posts its response to the comments in the initial draft of the standard and a revised draft 7 and revised implementation plan for comment (January 2–31, 2007)

Description of Current Draft:

The drafting team posted its response to the comments received on the last draft of the standard and implementation plan and is posting the revised standards and implementation plan for a 30-day pre-ballot review period from February 15–March 16, 2007.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Post final draft of standards and implementation plan for a 30-day pre-ballot review.	February 15–March 16, 2007
2. Conduct first ballot.	March 19–30, 2006
3. Consider comments submitted with first ballot; post consideration of comments.	April 15, 2006
4. Conduct second ballot.	April 16-26, 2007
5. Post standards and implementation plan for 30-day review by board.	April 2–May 1
6. Board adoption date.	May 2, 2007

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.

Frequency Relay Limits (FRL_{High} FRL_{Low}): The limits that, if exceeded, result in tripping of Interconnection-approved frequency-related relays that automatically act to protect property from permanent damage or arrest uncontrolled frequency declines. FRL_{High} and FRL_{Low} are fixed values, established for each Interconnection.

A. Introduction

1. **Title:** Actions to Return Frequency to within FTL
2. **Number:** BAL-009-1
3. **Purpose:** To maintain Interconnection frequency within predefined frequency limits under all conditions (i.e. normal and abnormal), to prevent frequency-related instability; unplanned tripping of load or generation; or uncontrolled separation or Cascading outages that adversely impact the reliability of the Interconnection.
4. **Applicability**
 - 4.1. Balancing Authority.
5. **Proposed Effective Dates:**

Eastern Interconnection and ERCOT: On the first day of the first quarter, six months after applicable regulatory approvals.

WECC and Hydro-Quebec: On the first day of the first quarter, twelve months after applicable regulatory approvals.

B. Requirements

- R1. When Interconnection frequency exceeds the Frequency Trigger Limit (FTL) and the Reliability Coordinator directs the Balancing Authority to act to adjust its Area Control Error (ACE), the Balancing Authority shall comply with that directive. [*Violation Risk Factor: Medium*]
[*Mitigation Time Horizon: Real-time Operations*]
 - R1.1. The Balancing Authority shall immediately inform its Reliability Coordinator if complying with the Reliability Coordinator's directive will endanger personnel; damage equipment; violate regulatory or statutory requirements; or if conditions are such that compliance with the directive is not physically possible.

C. Measures

- M1. The Balancing Authority shall have the following documented to show how it met each of the Reliability Coordinator's directives issued relative to adjusting ACE:
 - M1.1 Acknowledgement of the Reliability Coordinator's directive.
 - M1.2 Actions taken to comply with the Reliability Coordinator's directive.
 - M1.3 Notification(s) made to the Reliability Coordinator in response to the Reliability Coordinator's directive.
 - M1.4 Summary of results achieved as reported to its Reliability Coordinator.

D. Compliance

1. **Compliance Monitoring Process**
 - 1.1. **Compliance Monitoring Responsibility**

Regional Entity.
 - 1.2. **Compliance Monitoring Period and Reset Time Frame**

The Performance-reset Period is one calendar year without a violation.
 - 1.3. **Data Retention**

The Balancing Authority shall keep documentation for the preceding calendar year (January–December) plus current year.

The Compliance Monitor shall keep audit data for three years.

1.4. Additional Compliance Information

The Balancing Authority shall demonstrate compliance through self-certification submitted to its Compliance Monitor annually. The Compliance Monitor may also use scheduled on-site reviews every three years, spot reviews, investigations initiated in response to a complaint, or other methods as provided for in the Compliance Monitoring Enforcement Program to assess performance.

The Balancing Authority shall have evidence identified in Measure 1 available for its Compliance Monitor to inspect during a scheduled, on-site review or within 5 business days of a request as part of an investigation.

2. Violation Severity Levels

2.1. Lower: Not applicable.

2.2. Moderate: Not applicable.

2.3. High: Not applicable.

2.4. Severe: Did not follow a Reliability Coordinator directive or did not immediately inform the Reliability Coordinator if it could not follow that directive.

E. Regional Differences

None

F. Associated Documents

None

Version History

Version	Date	Action	Change Tracking

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. SAC approves SAR for posting (March 10, 2002).
2. Drafting team posts draft SAR for comment (February 7–March 30, 2002) (June 3–July 12, 2002) (August 20–September 23, 2002).
3. SAC approves development of standard (November 20, 2002).
4. JIC assigns development of standard to NERC (January 10, 2003).
5. Drafting team posts drafts for comment (July 1–August 29, 2003) (June 2–July 2, 2004).
6. Drafting team posts draft for review during field test (June 23, 2005–March 31, 2006).
7. Drafting team conducts field test to validate the methodologies proposed for establishing frequency-related limits (July 6, 2005–March 31, 2006).
8. Drafting team posts draft 5, the results of the field test and an implementation plan for comment (June 1–July 15, 2006).
9. Initial ballot conducted October 6–16, 2006.
10. Drafting team posts its response to the comments in the initial draft of the standard and a revised draft 7 and revised implementation plan for comment (January 2–31, 2007)

Description of Current Draft:

The drafting team posted its response to the comments received on the last draft of the standard and implementation plan and is posting the revised standards and implementation plan for a 30-day pre-ballot review period from February 15–March 16, 2007.

Future Development Plan:

Anticipated Actions

1. Post final draft of standards and implementation plan for a 30-day pre-ballot review.
2. Conduct first ballot.
3. Consider comments submitted with first ballot; post consideration of comments.
4. Conduct second ballot.
5. Post standards and implementation plan for 30-day review by board.
6. Board adoption date.

Anticipated Date

February 15–March 16, 2007

March 19–30, 2006

April 15, 2006

April 16–26, 2007

April 2–May 1

May 2, 2007

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.

None introduced in this standard.

A. Introduction

1. **Title:** **Frequency Bias Settings**
2. **Number:** **BAL-010-1**
3. **Purpose:** To maintain Interconnection frequency within a predefined frequency profile under all conditions (i.e. normal and abnormal), to prevent frequency-related instability; unplanned tripping of load or generation; or uncontrolled separation or Cascading outages that adversely impact the reliability of the Interconnection.
4. **Applicability**
 - 4.1. Balancing Authority.
5. **Proposed Effective Date:**

Eastern Interconnection and ERCOT: On the first day of the first quarter, three months after applicable regulatory approvals.

WECC and Hydro-Quebec: On the first day of the first quarter, nine months after applicable regulatory approvals.

B. Requirements

- R1. The Balancing Authority shall have a documented methodology for developing its Frequency Bias Setting such that the Balancing Authority's Frequency Bias Setting is as close as practical to, or greater than, the Balancing Authority's Frequency Response¹. [*Violation Risk Factor: Lower*] [*Mitigation Time Horizon: Operations Planning*]
 - R1.1. The methodology shall identify whether Frequency Bias is calculated on a periodic, continuous or annual basis.
 - R1.2. The Balancing Authority shall develop its Frequency Bias Setting (expressed in Megawatts per 0.1 Hertz) methodology, using either a fixed Frequency Bias Setting or a variable Frequency Bias Setting as follows:
 - R1.2.1. The Balancing Authority using a fixed Frequency Bias Setting shall identify a megawatt-to-frequency deviation response that is applicable to all hours for all system configurations. The fixed value shall be determined by observing and averaging the Frequency Response characteristic for at least three disturbances during On-Peak hours.
 - R1.2.2. The Balancing Authority using a variable frequency bias setting shall have an average Frequency Bias Setting of at least 1% of the estimated monthly peak Load and/or generation.
 - R1.3. The Balancing Authority's monthly average Frequency Bias Setting shall meet one of the following criteria:
 - R1.3.1. The Balancing Authority that is responsible for both generation and Load² within its Balancing Authority Area shall have a monthly average Frequency Bias Setting of at least 1% of its estimated peak demand for the month per 0.1 Hertz change.

¹ The frequency response calculation must include all dynamic transfers which impact the frequency bias obligation of the Balancing Authority.

² Any loads brought within the Balancing Authority Area boundaries for Frequency Bias support.

The Balancing Authority shall demonstrate compliance through self-certification submitted to its Compliance Monitor annually. The Compliance Monitor may also use scheduled on-site reviews every three years, spot reviews, investigations upon complaint, or other methods as provided for in the Compliance Monitoring Enforcement Program to assess performance.

The Balancing Authority shall make the following documentation available for its Compliance Monitor to inspect during a scheduled, on-site review or within 5 business days of a request as part of an investigation upon complaint:

- 1.4.1 Estimated Annual Peak Load.
- 1.4.2 Estimated Maximum Generation Level.
- 1.4.3 Methodology for developing its Frequency Bias Setting.
- 1.4.4 ACE equation.
- 1.4.5 Confirmation that NERC approved use of the latest Frequency Bias Setting.

2. Violation Severity Levels

2.1. Lower: **There shall be a lower violation if the following condition exists:**

2.1.1 There is a documented methodology for the Frequency Bias Setting but it does not identify whether the Frequency Bias is calculated on a periodic, continuous or annual basis (R1.1)

2.2. Moderate: Not applicable.

2.3. High: **There shall be a high violation if the following condition exists:**

2.3.1 There is a documented methodology for the Frequency Bias Setting but it is non-compliant with either R1.2, or R1.3.

2.4. Severe: **There shall be a single severe violation if any of the following conditions exist:**

2.4.1 There is no documented methodology for determining Frequency Bias Setting (R1).

2.4.2 The updated Frequency Bias Setting was not submitted to NERC, and implemented in accordance with R2.

2.4.3 The updated methodology for the Frequency Bias Setting was not submitted to NERC, and implemented in accordance with R3.

2.4.4 Not using the latest approved Frequency Bias Setting in its ACE equation.(R4)

E. Regional Differences

None

F. Associated Documents

None

Version History

Version	Date	Action	Change Tracking

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. SAC approves SAR for posting (March 10, 2002).
2. Drafting team posts draft SAR for comment (February 7–March 30, 2002) (June 3–July 12, 2002) (August 20–September 23, 2002).
3. SAC approves development of standard (November 20, 2002).
4. JIC assigns development of standard to NERC (January 10, 2003).
5. Drafting team posts drafts for comment (July 1–August 29, 2003) (June 2–July 2, 2004).
6. Drafting team posts draft for review during field test (June 23, 2005–March 31, 2006).
7. Drafting team conducts field test to validate the methodologies proposed for establishing frequency-related limits (July 6, 2005–March 31, 2006).
8. Drafting team posts draft 5, the results of the field test and an implementation plan for comment (June 1–July 15, 2006).
9. Initial ballot conducted October 6–16, 2006.
10. Drafting team posts its response to the comments in the initial draft of the standard and a revised draft 7 and revised implementation plan for comment (January 2–31, 2007)

Description of Current Draft:

The drafting team posted its response to the comments received on the last draft of the standard and implementation plan and is posting the revised standards and implementation plan for a 30-day pre-ballot review period from February 15–March 16, 2007.

Future Development Plan:

Anticipated Actions

Anticipated Date

- | | |
|--|----------------------------|
| 1. Post final draft of standards and implementation plan for a 30-day pre-ballot review. | February 15–March 16, 2007 |
| 2. Conduct first ballot. | March 19–30, 2006 |
| 3. Consider comments submitted with first ballot; post consideration of comments | April 15, 2006 |
| 4. Conduct second ballot. | April 16–26, 2007 |
| 5. Post standards and implementation plan for 30-day review by board. | April 2 –May 1 |
| 6. Board adoption date. | May 2, 2007 |

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.

None introduced in this standard.

A. Introduction

1. **Title:** **Frequency Limits**
2. **Number:** **BAL-011-1**
3. **Purpose:** To maintain Interconnection frequency within a predefined frequency limits under all conditions (i.e. normal and abnormal), to prevent frequency-related instability; unplanned tripping of load or generation; or uncontrolled separation or Cascading outages that adversely impact the reliability of the Interconnection.
4. **Applicability**
 - 4.1. NERC
5. **Effective Date:** First day of first quarter after applicable regulatory approvals.

B. Requirements

- R1. NERC shall develop a set of Interconnection frequency limits, including high and low Frequency Trigger Limits (FTLs), high and low Frequency Abnormal Limits (FALs) and high and low Frequency Relay Limit (FRLs) for each Interconnection. *[Violation Risk Factor: Medium] [Mitigation Time Horizon: Operations Planning]*
- R2. NERC shall set FRL_{Low} to match the highest approved (firm load) Under Frequency Load Shed (UFLS) relay setting for the Interconnection. *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*
- R3. NERC shall set FAL_{Low} at FRL_{Low} plus the low Minimum Safe Frequency Deadband, where: *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*
 - R3.1. The low Minimum Safe Frequency Deadband is the low Minimum Safe Megawatt Deadband in megawatts divided by the Frequency Response of the Interconnection in megawatts per hertz:
 - R3.2. The low Minimum Safe Megawatt Deadband is the once in ten year maximum loss of generation probability (as determined from the NERC GADS database) for each Interconnection.
 - R3.3. The Interconnection's Frequency Response is the average of the prior 3 years' Frequency Response (beta in Megawatts per 0.1 Hertz).
- R4. NERC shall set FTL_{Low} at FAL_{Low} plus the frequency change associated with the largest single Contingency for the Interconnection, where: *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*
 - R4.1. The frequency change associated with the largest single Contingency is the size of the single largest loss of generation or firm schedule in the Interconnection, (MW), multiplied by the Frequency Response of the Interconnection (MW/0.1 Hz).
- R5. NERC shall set FTL_{High} at $60 + (60 - FTL_{Low})$. *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*
- R6. NERC shall set FAL_{High} , at $60 + (60 - FAL_{Low})$. *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*
- R7. NERC shall set FRL_{High} , at $60 + (60 - FRL_{Low})$. *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*
- R8. NERC shall review each Interconnection's FTLs, FALs and FRLs, and shall revise these limits if needed, by December 1 of each year. NERC may review these limits at any time and may

revise the limits based on changes to an Interconnection’s lowest frequency relay settings, actual contingencies or Frequency Response. *[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*

- R9.** NERC shall distribute an Interconnection-specific set of FTLs, FALs and FRLs to the Reliability Coordinators, Balancing Authorities, Planning Authorities and Transmission Planners within each Interconnection 30 days before the limits become effective.*[Violation Risk Factor: Lower] [Mitigation Time Horizon: Operations Planning]*

C. Measures

- M1.** NERC shall have evidence it developed, reviewed and distributed a set of frequency limits for each Interconnection as specified in Requirements 1 through 9.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Third-party monitor without vested interest in the outcome.

1.2. Compliance Monitoring Period and Reset Time Frame

Not applicable.

1.3. Data Retention

Not applicable.

1.4. Additional Compliance Information

Not applicable

2. Violation Severity Levels

2.1. Lower: Not applicable.

2.2. Moderate: Not applicable.

2.3. High: Not applicable.

2.4. Severe: Not applicable.

E. Regional Differences

None

F. Associated Documents

None

Version History

Version	Date	Action	Change Tracking