

Attachment A

BAL-003-1 Frequency Response & Frequency Bias Setting Standard

Supporting Document

Background

This document outlines the ERO process for supporting the Frequency Response Standard (FRS).

Event Selection Criteria

The ERO will use the following criteria to select FRS frequency excursion events for analysis.

1. The evaluation period for performing the annual Frequency Bias Setting and the Frequency Response Measure (FRM) calculation is December 1 of the prior year through November 30 of the current year.
2. The ERO will identify at least 205 frequency excursion events in each Interconnection for calculating the Frequency Bias Setting and the FRM. If the ERO cannot identify in a given evaluation period 205 frequency excursion events satisfying the limits specified in criteria 3 below, then similar acceptable events from the previous evaluation period also satisfying listed criteria will be included with the data set by the ERO for determining FRS compliance.
3. The ERO will use two limits to determine if an acceptable frequency excursion event for determining FRM has occurred:
 - a. The change in frequency as defined by the difference from the (A Value to delta-F) and Point C and the arresting frequency (Point C) must exceeds the excursion threshold values specified for the Interconnection in Table 1 below. Point C is the arrested value of frequency observed within 8 seconds following the start of the excursion.

Interconnection	A Value Delta-F to Pt C	Point C	
		Under Frequency	Over Frequency
East	0.04Hz	< 59.97	> 60.03
West	0.075Hz	< 59.957	> 60.053
Texas	0.15Hz	< 59.90	> 60.10
HQ	0.320Hz	< 59.85	> 60.15

Table 1: Interconnection Frequency Excursion Threshold Values

b. The time from the start of the rapid change in frequency until the point at which Frequency has stabilized within a narrow range should be less than 18 seconds.

~~b.c.~~ If any data value in the B Value average recovers to the A Value the event will not be evaluated.

4. Pre-disturbance frequency should be relatively steady and near 60.000 Hz. The A Value is computed as an average over the period from -16 seconds to 0 seconds before the frequency transient begins to decline.
5. Events that coincide with a second event that does not stabilize before the first scan used in the B-Value will not be considered.
6. Frequency excursion events occurring during periods when large interchange schedule ramping or load change is happening, and frequency excursion events occurring within 5 minutes of the top of the hour, ~~will~~ should be excluded from consideration if other acceptable frequency excursion events can be used for analysis.
7. Select the cleanest 2 or 3 frequency excursion events occurring monthly that satisfy selection criteria. If there are not 2 frequency excursion events satisfying selection criteria occurring during the month, then other frequency excursion events from the same season of the year satisfying selection criteria should be considered for use if necessary.

To assist Balancing Authority preparation for complying with this standard, the ERO will provide quarterly posting of candidate frequency excursion events for the current year FRM calculation. The ERO will post the final list of frequency excursion events used for standard compliance by December 10⁵ each year. Balancing Authorities are encouraged to develop scanning tools that identify candidate frequency excursion events so they are ready to access data files when needed.

NOTE: *The ERO may use for analysis of Interconnection frequency performance, but not for Balancing Authority Frequency Response compliance, additional frequency excursion events not satisfying the criteria specified.*

Frequency Response Obligation (FRO) for the Interconnection

~~A target contingency protection criteria will be established for e~~Each Interconnection ~~will establish target contingency protection criteria.~~ The default target listed in Table 2 is based on the largest category C (N-2) event identified. However, this contingency protection criterion includes a ~~reliability~~safety margin to prevent Point C from encroaching on the interconnection’s highest Under Frequency Load Shed (UFLS) step for credible contingencies.

	Eastern	Western	Texas	HQ	
Starting Frequency	60	60	60	60	Hz
*Target Minimum Frequency Highest UFLS	59.6	59.5	59.3	58.5	Hz
Contingency Protection Criteria	4500	2740	2750	1700	MW
**Base Obligation	1125	548	229	113	MW/0.1Hz
Interconnection FRO (includes With 25%	1406	685	286	141	MW/0.1Hz

ReliabilitySafety Margin)					
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Table 2: Interconnection Frequency Response Obligations

*The Eastern Interconnection set point listed is a compromise value for the highest UFLS step setting of 59.5Hz used in the east and the ~~special protection scheme's~~ highest UFLS step setting of 59.7Hz used in Florida. It is extremely unlikely that an event elsewhere in the Eastern Interconnection would cause the Florida UFLS ~~special protection scheme step~~ to "false trip".

**In the Base Obligation measure for Texas, 1150 MW (Load Resources triggered by Under Frequency Relays at 59.70 Hz) was reduced from its Contingency Protection Criteria level of 2750 MW to get 229 MW/0.1 Hz. This was reduced to accurately account for designed response from Load Resources within 30 cycles.

An Interconnection may propose alternate FRO protection criteria to the ERO. The ERO will confirm the proposed alternate FRO protection criteria.

Balancing Authority Frequency Response Obligation (FRO) and Frequency Bias Setting

The ERO will manage the administrative procedure for annually assigning an FRO and Frequency Bias Setting to each Balancing Authority.

For a multiple Balancing Authority interconnection, the Interconnection Frequency Response Obligation shown in Table 2 is allocated based on either the Balancing Authority Peak Demand or peak generation. Initial FRO allocation will be based on the following method:

$$\left[\frac{\text{Projected BA Peak Load} + \text{BA installed capacity}}{\text{Projected Interconnection Peak Load} + \text{Interconnection installed capacity}} \right] \times \text{Interconnection FRO}$$

Each Balancing Authority shall report its previous year's Frequency Response Measure (FRM), Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO on FRS Form 1 by January 10 each year. If the ERO posts the official list of events after December 10, Balancing Authorities will be given 30 days from the date the ERO posts the official list of events to submit their FRS Form 1.

Once the ERO validates the data for all Balancing Authorities, the ERO will use FRS Form 1 data to post the following information for each Balancing Authority for the upcoming year:

- Frequency Bias Setting
- Frequency Response Obligation (FRO)

Frequency Bias Setting will be the greater of (in absolute terms) the FRM or the Interconnection minimum (as defined in Attachment B). FRS Form 1 will automatically calculate the Balancing Authority's Bias Settings. Balancing Authorities that provide Overlap Regulation will submit a FRS Form 1 that represents both the provider's and the recipient(s)' footprint. Once the data listed above is fully posted, the ERO will announce the three-day implementation period ~~date~~ for changing the Frequency Bias Setting.

Frequency Response Measure (FRM)

The FRM will be computed from Single Event Frequency Response Data (SEFRD), defined as: "the data from an individual event from a Balancing Authority that is used to calculate its Frequency Response, expressed in MW/0.1Hz" as calculated on FRS Form 2. The SEFRD for a typical Balancing Authority in an Interconnection with more than one Balancing Authority is basically the change in its Net Actual Interchange on its tie lines with its adjacent Balancing Authorities divided by the change in Interconnection frequency. (Some Balancing Authorities may choose to apply corrections to their Net Actual Interchange values to account for factors such as nonconforming loads. FRS Form 1 shows the types of adjustments that are allowed.) The ERO will use a standardized sampling interval of 20 to 52 seconds in the computation of SEFRD values.

Assuming data entry is correct FRS Form 1 will automatically calculate the Balancing Authority's FRM for the past 12 months as the median of the SEFRD values. A Balancing Authority electing to report as an RSG or a provider of Overlap Regulation Service will provide an FRS Form 1 for the aggregate of its participants.