

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 25 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 25 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 (delta F) and the arresting frequency (Point C) must exceed 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	Delta F	Point C	
		Under Frequency	Over Frequency
East	0.04Hz	< 59.97	> 60.03
West	0.05Hz	< 59.97	> 60.03
Texas	0.15Hz	< 59.90	> 60.10
HQ	0.20Hz	< 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.~~
- ~~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, 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 15 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, additional frequency excursion events not satisfying the criteria specified.~~

Frequency Response Obligation (FRO) for the Interconnection

~~The ERO, in consultation with regional representatives, has established a target contingency protection criteria 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. ~~Additionally~~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. ~~The Base Obligation in Table 2 is calculated by dividing the Contingency Protection Criteria MWs by the difference between the Starting Frequency and the Target Minimum Frequency times 10 to arrive at a MW/.1 Hz number. The Reliability Margin is then added to arrive at the Interconnection FRO.~~

	<i>Eastern</i>	<i>Western</i>	<i>Texas</i> ERCO <i>I</i>	<i>HQ</i>	
<i>Starting Frequency</i>	60	60	60	60	Hz
<i>*Target Minimum Frequency</i> <i>Highest UFLS</i>	59.6	59.5	59.3	58.5	Hz

Contingency Protection Criteria	4500	2740	27 50	17 00	MW
**Base Obligation	11 25	54 8	22 9	11 3	MW/0.1 Hz
<u>Interconnection FRO (includes With 25% Reliability Safety Margin)</u>	1406	685	286	141	MW/0.1Hz

Table 12: 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 ~~ERCOT 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 by submitting a SAR with supporting technical documentation. ~~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 implementation of the Frequency Bias Setting ~~for~~ 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 ~~and~~ peak generation. ~~The Initial~~ FRO allocation will be based on the following method:

$$FRO_{BA} = FRO_{Int} \times \frac{Peak Gen_{BA} + Peak Load_{BA}}{Peak Gen_{Int} + Peak Load_{Int}}$$

Where:

- Peak Gen_{BA} is the average of monthly "Output of Generating Plants", FERC Form 714, column f of Part II - Schedule 3.
- Peak Load_{BA} is the average of "Monthly Peak Demand (MW)", FERC Form 714, column j of Part II - Schedule 3.
- Peak Gen_{Int} is the sum of all Peak Gen_{BA} values reported in that interconnection.
- Peak Load_{Int} is the sum of all Peak Load_{BA} values reported in that interconnection.

The data used for this calculation is from the most recently filed Form 714. As an example, a report to NERC in January 2013 would use the Form 714 data filed in 2012, which utilized data from 2011.

Balancing Authorities that are not FERC jurisdictional should use the Form 714 Instructions to assemble and submit equivalent data to the ERO for use in the FRO Allocation process.

Balancing Authorities that elect to form a FRSG as a means to jointly meet the FRO will calculate their FRM performance one of two ways:

- Calculate a group NI_A and measure the group response to all events in the reporting year on a single FRS Form 1, or
- Jointly submit the individual BAs' Form 1s, with a summary spreadsheet that sums each participant's individual event performance.

Balancing Authorities that merge or that transfer load or generation are encouraged to notify the ERO of the change in footprint and corresponding changes in allocation such that the net obligation to the Interconnection remains the same and so that CPS limits can be adjusted.

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

Each Balancing Authority ~~shall~~ reports its previous year's Frequency Response Measure (FRM), Frequency Bias Setting and Frequency Bias type (fixed or variable) to the ERO by February 10 each year to allow the ERO to validate the revised Frequency Bias Settings on FRS Form 1 ~~by January 10 each year~~. If the ERO posts the official list of events after ~~January~~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 submitted in FRS Form 1 and FRS Form 2 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.~~

A BA using a fixed Frequency Bias Setting sets its Frequency Bias Setting to the greater of (in absolute value):

- Any number the BA chooses between 100% and 125% of its Frequency Response Measure as calculated on FRS Form 1
- Interconnection [r1] Minimum as determined by the ERO

For purposes of calculating the minimum Frequency Bias Setting, a Balancing Authority participating in a Frequency Response Sharing Group will need to calculate its stand-alone Frequency Response Measure using FRS Form 1 and FRS Form 2 to determine its minimum Frequency Bias Setting.

A Balancing Authority providing Overlap Regulation will report the projected peak demand and generation of its combined BAs' areas on FRS Form 1 as described in Requirement R4.

Frequency Response Measure (FRM)

The Balancing Authority will calculate its 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 for each event shown on FRS Form 1. 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 (NA_i) 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 approximately 16 seconds before the event up to the time of the event for the pre-event NA_i, and frequency (A values) and approximately 20 to 52 seconds after the event for the post-event NA_i (B values) in the computation of SEFRD values, dependent on the data scan rate of the Balancing Authority's Energy Management System (EMS).

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 FRSG or a provider of Overlap Regulation Service will provide an FRS Form 1 for the aggregate of its participants.

Events with a "Point C" that causes the Interconnection Frequency to be lower than that shown in Table 1 above (or higher than an equal change in frequency going above 60 Hz) may be included in the list of events for that interconnection. However, the calculation of the BA response to such an event will be adjusted to show a frequency change only to the Target Minimum Frequency shown in Table 1 above (or a high frequency amount of an equal quantity).

Attachment A
BAL-003-1 Frequency Response and Frequency Bias Setting
Supporting Document