Why we've chosen what we've chosen on median (Mike, Howard)

The word "average" is a generic term to represent central tendency. The term is often used synonymously with the arithmetic "mean".

The issue with measuring frequency response is that a BA's calculated performance (as opposed to actual performance) is highly variable event to event. This is particularly true for a single BA in a multi-BA Interconnection.

Calculated Frequency Response has a very large noise to signal ratio. A 5000MW BA in the East typically is only called to contribute about 10-15 MW for the loss of a large unit. Its minute to minute load changes can easily wash this contribution out. An arithmetic mean or regression analysis will be influenced by noise-induced outliers.

Statisticians note that the median is a more accurate measure of central tendency than the mean when analyzing a sample that is small and or where scores vary widely. This is the case when estimating a BA's Frequency Response.

A regression would be appropriate if you were trying to forecast "calculated" frequency response for a BA in a multi-BA interconnection.

While not perfect, the median approaches a BA's typical performance after 15-20 observations. More observations give a higher confidence in the estimate of the BA's performance.

Assigning responsibility to generators or resources rather than BAs

The NERC *Functional Model Technical Document* identifies the BA as the entity that manages and deploys Frequency Response. This is because a BA controls the amount and distribution of spinning reserves and also has some control over interruptible resources. This is similar to the relationship between the TOP and voltage control. Even though the TOP may not own generators or capacitor banks, the TOP is still responsible for controlling voltage within limits.

The industry-approved Standards Authorization Request (SAR) for BAL-003 did not include a performance obligation for generators. The drafting team is obliged to stay within the bounds of its SAR.

There are two primary reasons the SAR did not apply a performance obligation on generators. First, there are thousands of generators in North America. It would be many times more costly and difficult to implement a standard that measures all generators and verifies performance is properly calculated. Secondly, given the fact that there presently is sufficient frequency response in all Interconnections, the value of implementing a performance obligation on generators at this time would not outweigh the effort and cost.

The SAR did include a provision for generators to provide data when a BA's performance is marginal. Based on comments, the drafting team added a requirement for generators to provide governor data to their BA if the BA Area performance is approaching non-compliance.

Again, the drafting team cannot include requirements beyond the bounds of its SAR. If the commenter(s) believes there is a need for a generator performance obligation, they are encouraged to submit a SAR to that effect.

VSL Issue

The drafting team does not agree, but believes an explanation would be helpful.

VSLs are a starting point for the enforcement process. The combination of the VSL and VRF is intended to measure a violation's impact on reliability and thus levy an appropriate sanction. Frequency Response is an interconnection-wide resource. The proposed VSLs are intended to put multi-BA Interconnections on the same plain as single-BA Interconnections.

Consider a small BA that whose performance is 70% of its FRO. If all other BAs in the Interconnection are compliant, the small BA's performance has negligible impact on reliability, yet would be sanctioned at the same level as a BA who was responsible for its entire Interconnection. It is not rational to sanction this BA the same as a single BA Interconnection that had insufficient Frequency Response. To do otherwise would treat multi-BA Interconnections tens of times more harshly than single BA Interconnections.

The "Lower" and "Medium" VSLs say that the Interconnection has sufficient Frequency Response but individual BAs are deficient by small or larger amounts respectively. The High and Severe VSLs say the Interconnection does not meet the FRO and assesses sanctions based on whether the BA is deficient by a small or larger amount respectively.

RSG Issues (Don, Mike, Terry)

Based on comments, the drafting team has created a new definition for an entity called a Frequency Respons~~iv~~e Reserve Sharing Group (FRRSG).

Similar to traditional Reserve Sharing Groups for Contingency Reserves, FRRSGs as proposed in this standard , are voluntary organizations whose members determines the terms and conditions of participation. The members of the FRRSG would determine how to allocate sanctions among its members. This standard does not mandate the formation of FRFSGs, but allows them as a means to meet one of the FERC's Order No. 693 directives.

FRRSG performance may be calculated on one of two ways:

- Calculate a group NIa 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 annual performance.

Why we deleted R3

Based on Industry comments and further review, the drafting team has deleted R3 as the requirement is duplicative with R6 and R7 in BAL-005-0.1b.

Minimum frequency bias, variable (Sydney)

To ensure comparable treatment between BAs with fixed Bias Settings, BAs with a variable Bias Setting report their monthly average Bias for the reporting year. This average will be calculated when frequency is greater than 60.036 Hz or less than 59.964 Hz. The average of the 12 months' Bias values must be equal to or more negative than the Interconnection's minimum Bias Setting.

Why the 0.8 bias

Early research by Nathan Cohn[1] on interconnected power system operations found that control is optimum if a BA's Bias Setting is equal to its natural Frequency Response. If there were to be a difference between the two values, it is preferable to be slightly over-biased.

The drafting team has proposed to bring Bias Setting and natural Frequency Response more in line. The process to do this is outlined in Attachment B. The attachment manages a "go slow" approach to making this happen and includes checks to confirm there are not unexpected influences injected into the CPS-related calculations.

Based on concerns raised by the Industry, the drafting team has modified Attachment B to make the initial minimum Bias Setting to be 0.9% of peak and has included a provision that the ERO will evaluate the impact caused by a change in minimum Bias Setting. The evaluation will look at both frequency performance and impact on CPS-related compliance calculations.

Resolution on attachments, background documents

The two attachments outline the processes NERC and the NERC committees will follow to manage support processes for the standard. The attachments carry no compliance obligations on Balancing Authorities.

The drafting team will include a statement in the attachments that specifically states that the attachment outlines a process used by the ERO and carries no compliance obligations on Registered Entities beyond the requirements in the standard.

The Background Document will be presented to the NERC Operating Committee for inclusion in the NERC Operating Manual.

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[1] *Control of Generation and Power Flow on Interconnected Systems*, John Wiley & Sons, 1967

What is the full response (maximum obligation?)

While all large events are subject to review by NERC and the NERC OC or PC, no event more than 1.5 times the FRO will be used in the event section process.

It should be noted that even though events slightly larger than the FRO can be selected, such events will be extremely rare. Since a BA's annual performance is based on the median of all events in the reporting year, no single outlier event will adversely impact a BA's reported performance.

The description language (reliability objective)

This additional wording was added to conform to the current drafting team guidelines that direct teams to include phrases that identify the reliability objective to each requirement. The wording is necessary to pass the NERC quality review process.

How we will monitor L10 and impact on compliance when reducing bias.

NERC and the NERC Operating Committee will review the interaction between the reductions in an Interconnection's minimum Bias Setting and will approve future reductions prior to implementation. NERC and the Operating Committee may also direct reversion of Bias Setting reductions if there are observed negative reliability impacts, to include impacts on other balancing standards' performance scores.

Based on concerns raised by the Industry, the drafting team has modified the [attachment] to make the initial minimum Bias Setting to be 0.9% of peak.

Update event selection

The goal is to have 2-3 large clean events each month. If there are not at least 2 events per month, additional events from the same season may be selected.

To the extent possible, events during ramp periods (+/- 5 minutes from the top of the hour), will not be selected. This does not preclude NERC or the Resources Subcommittee from reviewing such events for reliability impacts.

Events from the previous year will only be used if there are fewer than 20 useable events in a given reporting year. In such cases, events from the least represented season(s) will be randomly selected from the prior year to bring the total to 20.

Things to Consider Changing Based on Comments

- Generator data collection if BA performance is low.
- Change starting point for minimum bias selection to 0.9%.
- Make bias implementation +/- one day from implementation date.
- Posted spreadsheet.
- Create a definition for FC~~C~~RRSG

- Change reference to Florida special protection.
- Include verbiage on how matrix is changed (if change to prevailing UFLS or if NERC and PC/OC concur that a change is needed to reliability margin or objective)
- Expand on FCRRSG in background document
- Update event selection to be clearer with process actually used.
- Include a statement in the attachments that specifically states that the attachment outlines a process used by the ERO and carries no compliance obligations on Registered Entities beyond the requirements in the standard.
- Correct the wording inconsistency between R2 and its VSL. SOCO's comments suggest the language in the VSL be consistent with the language used in the Requirement. The VSL for R2 says a BA 'not receiving Overlap Regulation Service.....' R2 says a BA 'not participating in Overlap Regulation service shall .....'VSLs
- Correct VSL for R 1 wording R1 should have been "...Reserve Sharing Group's...". Alternatively, the wording after "interconnection's FRO" could be revised to: "...and the Balancing Authority's or the Reserve Sharing Group's FRM was..."

Things we should Consider

Scan the no votes (be sure we are responsive to the extent possible

Consider doing an FAQ or webinar on changes

Changes to VSLs based on Comments

VSL R4 Comment - Based on the FERC Guideline #3 "Violation Severity Level Assignment Should Be Consistent with the Corresponding Requirement". ReliabilityFirst suggests the following modification:a. Example for Lower VSL which should be carried throughout all four VSLs –

The Balancing Authority incorrectly modified the Frequency Bias Setting value used in its ACE calculation when providing Overlap Regulation Services with combined footprint setting-error less than 5% of the validated or calculated value

VSL R5 Comment - Based on the FERC Guideline #3 "Violation Severity Level Assignment Should Be Consistent with the Corresponding Requirement". ReliabilityFirst suggests the following modification: a. Example for Lower VSL which should be carried throughout all four VSLs –

The Balancing Authority used a monthly average Frequency Bias Setting whose absolute value was less than or equal to 5% below the minimum specified by the ERO.