

**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

**Electric Reliability Organization Interpretation) Docket No. RM13-11-000
Of Specific Requirements of the Disturbance)
Control Performance Standard)**

COMMENTS OF THE ISO/RTO COUNCIL

In accordance with the Commission’s July 18, 2013 Notice of Proposed Rulemaking (“NOPR”) in the above-captioned proceeding, *Frequency Response and Frequency Bias Setting Reliability Standard*, 144 FERC ¶ 61,057 (2013), the ISO/RTO Council (“IRC”)¹ respectfully submits comments concerning the Commission’s proposed approval of Reliability Standard BAL-003-1 (Frequency Response and Frequency Bias Setting) submitted by the North American Electric Reliability Corporation (“NERC”). The IRC supports the approval and implementation of the proposed BAL-003-1 standard, but offers the following comments.

I. Introduction

On March 29, 2013, NERC submitted its petition seeking Commission approval of Reliability Standard BAL-003-1. Proposed BAL-003-1 establishes four requirements pertaining to the measurement and provision of frequency response. In particular, proposed BAL-003-1 establishes a minimum Frequency Response Obligation for each Balancing Authority, provides a uniform calculation of frequency response, establishes Frequency Bias Settings that establish values closer to actual Balancing Authority frequency response and encourages coordinated automatic generation control (“AGC”) operation. In its petition, NERC also sought Commission

¹The IRC is comprised of the Independent System Operators operating as the Alberta Electric System Operator (“AESO”), the California Independent System Operator (“CAISO”), Electric Reliability Council of Texas (“ERCOT”), the Independent Electricity System Operator of Ontario, Inc., (“IESO”), ISO New England, Inc. (“ISONE”), Midcontinent Independent System Operator, Inc., (“MISO”), New York Independent System Operator, Inc. (“NYISO”), PJM Interconnection, L.L.C. (“PJM”), and Southwest Power Pool, Inc. (“SPP”). The IESO and AESO are not FERC jurisdictional and are not joining these comments.

approval of four new or modified definitions for inclusion in the NERC Glossary, Violation Risk Factors (“VRFs”) and Violation Severity Levels (“VSLs”), an implementation plan for the proposed standard, and retirement of currently effective BAL-003-0.1b.

In the NOPR, while the Commission proposes to approve BAL-003-1, it also expressed concern and requested comments regarding certain aspects of the proposed Standard, including: (A) the use of a median statistical method in determining the Frequency Response Measure; (B) the determination of Interconnection Frequency Response Obligations; (C) methods of obtaining frequency response and the need to adequately ensure that each Balancing Authority has available the resources it needs to meet its Frequency Response Obligation; (D) the potential for early withdrawal of primary frequency response before secondary frequency response, *i.e.* automatic generation control, is activated; (E) the need to study frequency response during low-load conditions, *i.e.* through a light-load case study; (F) assignment of VRFs and VSLs; and (G) the supporting documents associated with the proposed Standard, *i.e.* Attachment A and the Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard.² The IRC provides the following comments on these issues.

II. Comments

Although the IRC has some concerns over certain aspects of the proposed standard, the Commission should approve BAL-003-1, and consider the comments contained herein to improve the standard prospectively. Specifically, there are issues with respect to the alignment of compliance responsibility as recognized by the Commission in the NOPR regarding BAs responsibility for meeting requirements that are operationally supported by generators. The IRC agrees with the Commission that this issue should be remedied as discussed in Section C below.

² NOPR at PP 4, 23.

A. Use of the “Median” in Determining the Frequency Response Measure

Requirement 1 of BAL-003-1 provides that each Balancing Authority or Frequency Response Sharing Group must achieve an annual Frequency Response Measure that is equal to or more negative than its Frequency Response Obligation to ensure sufficient frequency response. NERC proposes to define the Frequency Response Measure as “the median of all the Frequency Response observations reported annually by Balancing Authorities or Frequency Response Sharing Groups for the frequency events specified by the ERO.”³ In the NOPR, however, the Commission points out that NERC’s Frequency Response Initiative Report compared the median, mean, and linear regression methods for measuring frequency response, and found that the linear regression method is preferred.⁴ Given this finding, the Commission proposes to direct that NERC develop a modification to apply a more appropriate methodology for determining Frequency Response Measures, and requests comments on whether a more appropriate methodology should be used in the determination of Frequency Response Measures.⁵

The IRC takes the position that the median methodology is the appropriate approach for determining Frequency Response Measures, and should not be modified or replaced by another methodology. The median approach was vetted through the standards drafting process, and agreed to by the standards drafting team and industry as the most appropriate approach for determining average frequency response. The IRC respectfully suggests that this decision remains appropriate and that the Commission should approve the BAL-003-1 Reliability Standard as proposed.

More specifically, based on its analysis of the frequency response measurement process and the various statistical methods that could be used to determine the Frequency Response

³ NOPR at P 24.

⁴ *Id.* at 25.

⁵ *Id.* at P 27.

Measure, the IRC respectfully submits that, while the use of linear regression shows a very slight increase in accuracy of the frequency response measure, such increase is so minimal that its potential value is significantly outweighed by the additional complexities and resource burden posed by the use of the linear regression methodology. Overall, the frequency response measurement process is easily susceptible to distortion due to a very large noise to signal ratio. A Balancing Authority's change in load corresponding to an event can overwhelm the MW contribution that its generator governors provide, which can result in outliers in frequency response observations. These outliers do not represent frequency response, but represent noise in the measurement process. Where populations are skewed, have outliers, and/or data is ordinal, use of the median to determine central tendency is the preferred statistical approach.⁶ This is because the use of the median method allows the overall statistical analysis to resist the influence of outliers as a result of the median's inherent ability to resist influential outliers.⁷ Although linear regression can be utilized to evaluate data with these similar characteristics, use of the linear regression method can be susceptible to the undue influence of strong outliers.⁸

Finally, it is important to note that, in the Frequency Response Initiative Report, the graphs comparing linear regression, median, and mean methods to determining Frequency Response Measure result in substantially similar results with insignificant variability noted between the results of median and linear regression analysis.⁹ Based on this data, although the test cases appear to indicate a slight increase in accuracy, requiring the use of linear regression would add needless complexity to the Frequency Response Measure calculation without corresponding benefits to reliability. In summary, given that the median and linear regression

⁶ See <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3157145/#ref4>.

⁷ See <http://www.amstat.org/publications/jse/v14n2/morrell.html>.

⁸ *Id.*

⁹ See Frequency Response Initiative Report at 75 – 76, located at http://www.nerc.com/docs/pc/FRI_Report_10-30-12_Master_w-appendices.pdf.

methods result in substantially similar frequency response measures and that use of the median approach requires less administrative burden, the use of the median method should be retained during this initial implementation of the BAL-003-1 Reliability Standard. Usage of the median method will further allow NERC and the industry time to gain experience with and data on its sufficiency. If, after a sufficient implementation period, deficiencies in frequency response performance are identified, the standard should be revisited at that time. The Commission should approve the BAL-003-1 Reliability Standard as proposed and, if necessary, after a sufficient implementation period, re-evaluate the use of medians to determine the Frequency Response Measure.

B. Determination of Interconnection Frequency Response Obligation

Proposed BAL-003-1 establishes a target contingency protection criterion for each Interconnection, known as the Interconnection Frequency Response Obligation. The proposed methodology for determining an Interconnection's Frequency Response Obligation is ultimately a function of the applicable resource contingency criteria and the maximum change in frequency. The resource contingency criteria are based on the largest "Category C" event for the Interconnection, except for the Eastern Interconnection, which uses the largest event in the last ten years. For the Eastern Interconnection, the largest event in the last ten years was determined to involve 4,500 MW.¹⁰ The maximum change in frequency is calculated by adjusting the starting frequency for each Interconnection by the "prevailing UFLS first step," *i.e.*, under-frequency load shedding for the Interconnection as adjusted by specific information on the frequency deviations for the observed events which make up the data set used to calculate the Frequency Response Measure.¹¹

¹⁰ NOPR at FN 42.

¹¹ *Id.* at P 28.

For the Eastern Interconnection, Attachment A to the BAL-003-1 Reliability Standard identifies 59.5 Hz as the “first step” of under-frequency load shedding in the calculation of the default Interconnection Frequency Response Obligation. Attachment A notes that this set point is “a compromise value set midway between the stable frequency minimum established in PRC-006-1 (59.3 Hz) and the local protection under frequency load shedding setting of 59.7 Hz used in Florida and Manitoba.”¹² In the NOPR, the Commission stated that NERC did not provide adequate support for the statement that the first-step value of 59.5 Hz in the calculation of the Interconnection Frequency Response Obligation imposes no greater risk of under frequency load shedding operation in the Florida Reliability Coordinating Council footprint (“FRCC”) for an external resource loss than for an internal FRCC event.¹³

The IRC strongly supports the proposed first-step value of 59.5 Hz for the Eastern Interconnection and respectfully submits that NERC has provided sufficient support for utilizing 59.5 Hz as the proposed first-step value for the Eastern Interconnection. As set forth in the NOPR, the Commission’s primary concern regarding the use of a first-step value of 59.5 Hz is Florida’s higher under frequency load shedding setting of 59.7 Hz. The frequency value of 59.7 Hz is a direct result of local conditions specific to and confined within the State of Florida. In particular, these conditions arise out of the observation that an event in Florida results in a wider frequency swing locally than what propagates out to the rest of the Eastern Interconnection.¹⁴ It is notable that there has been no recorded case of frequency in the Eastern Interconnection ever

¹² See Proposed Reliability Standard BAL-003-1, Attachment A at 2.

¹³ NOPR at P 30.

¹⁴ See FNET Oscillation Report (dated June 2, 2013) located at: https://fnet.utk.edu/FNETOsciEventReport/20130602_170708_EI_OscSummary.html. The first graph, entitled “Frequency Plot of All FDRs,” shows the frequency impact associated with a small generator trip in Florida. The light blue line representing Florida show a significant frequency swing specific to Florida (starting at 59.970 Hz, suddenly dropping to below 59.930 Hz, and suddenly peaking up again to above 59.975 Hz before stabilizing around 59.955 Hz) as compared to the rest of the Eastern Interconnect (starting at 59.970 Hz and gradually dropping to a min of 59.945 Hz before stabilizing around 59.955 Hz).

reaching 59.7 Hz and that the FRCC agrees that the starting frequency of 59.5 Hz for the Eastern Interconnection would impose no greater risk of under frequency load shedding operation in the FRCC for an external resource loss than for an internal FRCC event.¹⁵

If the first-step value for determining the Interconnection Frequency Response Obligation was raised from 59.5 Hz to 59.7 Hz to accommodate localized issues that have never resulted in an Interconnection-wide event, many Balancing Authorities in the East would need to increase their regulation-capable reserves by 40%, which would result in Balancing Authorities carrying an estimated 2,000 MW on top of the existing 5,000 MW of frequency response reserve carried in the Eastern Interconnection already. The carrying of these additional MW is not without costs, which are estimated to increase on the order of \$350 million per year in the Eastern Interconnection. Given the localized nature of the concerns driving the first-step value in Florida, and the extreme nature of the event that would be required to drive interconnection-wide impact, the IRC respectfully submits that NERC has sufficient justification for establishing 59.5 Hz as the first-step value for the Eastern Interconnection, which value is widely accepted and reasonable.

Moreover, with full information before it, the standards drafting team and industry have voted in support of the first-step value of 59.5 Hz for the Eastern Interconnection. In fact, as mentioned above, the FRCC has also given its approval of the proposed setting. Accordingly, the IRC respectfully requests that the Commission defer to NERC and industry in this matter, and accept the proposed 59.5 Hz first-step value as the appropriate value for purposes of determining the Eastern Interconnection's Frequency Response Obligation.

C. Methods for Obtaining Frequency Response

¹⁵ See NERC Frequency Response Initiative Report at 4, n.3, located at: http://www.nerc.com/docs/pc/FRI_Report_10-30-12_Master_w-appendices.pdf.

The IRC believes that the standard, as written, creates an inequitable alignment of compliance responsibility and generator performance capability. In particular, the obligations to meet the frequency response requirements lies with the Balancing Authority, yet the ability to provide the service necessary to meet those obligations lies primarily with generators. Accordingly, the IRC agrees with the Commission's concerns in this regard. The proposed Reliability Standard imposes an obligation on each Balancing Authority to obtain frequency response, and a Balancing Authority not meeting its obligation would be in non-compliance with proposed BAL-003-1. The Commission recognizes that, while the Balancing Authorities must obtain frequency response from available resources, the proposed Reliability Standard imposes no obligation on those resources to provide frequency response when called upon by a Balancing Authority.¹⁶ Accordingly, the Commission proposes to direct NERC to submit a report 15 months after implementation of BAL-003-1 that provides an analysis of the availability of resources for each Balancing Authority to meet its Frequency Response Obligation during the first year of implementation.¹⁷

The IRC supports the Commission's proposed directive in this instance, but requests the Commission consider the additional requirements addressed below. IRC members are responsible for balancing within their individual footprints, and fully agree with the Commission's concerns that have been expressed regarding holding Balancing Authorities accountable for a potential violation that results from a generation resource that indicated availability being unwilling or unable to respond when called upon. The IRC respectfully suggests that just as Balancing Authorities have an obligation to call upon generation resources to provide frequency response, generation resources should have a reciprocal requirement to

¹⁶ NOPR at P 34.

¹⁷ *Id.*

respond when called upon to provide the technical performance necessary to support the Balancing Authority obligations.

Balancing Authorities have no control over generators' performance of the function that is necessary to support the relevant Frequency Response Obligations assigned to the Balancing Authorities. The standard should be revised prospectively to appropriately assign responsibilities based on performance capability. Until that occurs, enforcement of the relevant Balancing Authority obligations should recognize the disconnect described above by directing the ERO to administer its enforcement activities to recognize situations where Balancing Authority non-compliance is based on the failure of generator performance necessary to support the Balancing Authority obligation, and assign consequences associated with that non-compliance accordingly.

D. Premature Withdrawal of Primary Frequency Response

In the NOPR, the Commission expressed concern that proposed BAL-003-1 does not adequately address the reliability issue associated with the withdrawal of primary frequency response prior to activation of secondary frequency response. In particular, the Commission points to a diagram illustrating a further drop in frequency in the event that primary frequency is withdrawn before the secondary frequency response is activated.¹⁸ Accordingly, the Commission proposes to direct that NERC develop a modification to BAL-003-1 to address this concern.¹⁹

The IRC believes that the Commission's concern on this topic is unwarranted. To truly understand the potential impact of early primary response withdrawal, the Commission needs to consider a larger, holistic picture taking into account frequency response and withdrawal patterns over an extended period of time and across Interconnections. It is notable that the BAL-003-1

¹⁸ *Id.* at P 35.

¹⁹ *Id.* at P 38.

standard drafting team considered data regarding the mean frequency recovery rate (mHz/Sec) associated with each of the major Interconnections for all frequency impacting events from 2010 to 2013. This data was collected during the Frequency Response Standard Drafting Team's ("FRSDT") field trial and resulted in a graphical analysis illustrating how quickly and steadily frequency is, on average, brought back to a stable level over a five minute response window in all three Interconnections.²⁰ Over the three years of data that was collected, there was no indication of problematic or dramatic frequency drops once a response/recovery kicks in within the first 10-20 seconds.

While there is no disagreement that the withdrawal of primary frequency response before frequency has been restored to schedule can cause a further decline in frequency, as explained in the drafting team's Frequency Response Standard Background Document, early withdrawal of primary frequency response has generally never been a problem because "most responses are incomplete at the time that frequency has been initially arrested and the additional response has generally been sufficient to make up for more than these unpreventable reductions in response."²¹ Further, the IRC respectfully suggests that the graph referenced in the NOPR illustrates a single event and focuses on a very small window of response time (only the first minute), obscuring a more realistic view of the significance and overall impact a minor added frequency decline associated with an early withdrawal of primary response might have on the total frequency response and restoration that actually occurs. Finally, it is notable that the drafting team did take the issue of early withdrawal of primary resources into account when drafting the standard and

²⁰ This data can be found on slide 3 of a presentation given to the FRSDT on September 6, 2013 by the Consortium for Electric Reliability Technology Solutions ("CERTS") and Advanced Systems Researchers ("ARS"), the consultants engaged by the FRSDT to conduct the field trial and compile the resulting analysis.

²¹ See Frequency Response Standard Background Document at 19, located at http://www.nerc.com/pa/Stand/Project%20200712%20Frequency%20Response%20DL/Bal-003-1_Background_Document_Clean_20121130.pdf.

incorporated comments regarding same into proposed BAL-003-1 to address the potential impacts of early withdrawal of primary frequency response.

E. Light-Load Case Study

NERC's Frequency Response Initiative Report recommended the development of a new light-load case study and a corresponding re-simulation of the resource contingency criterion associated with the Eastern Interconnection Frequency Response Obligation.²² Based on this recommendation, the Commission agreed that the study of light-load scenarios would be useful to determine an appropriate Interconnection Frequency Response Obligation for the Eastern Interconnection. Accordingly, the NOPR proposes to direct that NERC conduct and submit the results of its light-load case.²³

The IRC does not oppose the development of a new light-load case study, but believes that better modeling data needs to be collected before an accurate study can be conducted. In particular, inaccurate modeling of governor deadbands and adjustments to model governor performance based on observed performance for frequency excursions will lead to inaccurate assumptions of performance for extreme events during light-load. In this vein, the IRC encourages the Commission to direct that NERC partner with industry to compile the appropriate information needed to ensure an accurate case study, and to review that study through an industry stakeholder process. Moreover, while the IRC agrees that a new light-load case study would be useful, the study should also look at tools to estimate frequency response in real time.

F. Assignment of VRFs and VSLs

In its Petition, NERC proposed a "medium" VRF for each requirement of the proposed BAL-003-1. In the NOPR, the Commission proposes certain changes to the VRF and VSLs

²² NOPR at P 39.

²³ *Id.* at P 41.

associated with Requirement R1, which establishes the Frequency Response Measure a Balancing Authority must achieve to arrest a decline in system frequency. Specifically, the Commission proposes to direct NERC to assign a high VRF to Requirement R1.²⁴ The Commission also takes issue with the VSLs assigned for Requirement R1, because assignment of the VSLs partly relies on the R1 performance of other responsible entities in a given Interconnection.²⁵ The Commission proposes to direct that NERC modify its severity level assignments for Requirement R1 to remove references to performance by other entities or otherwise to address the concern.²⁶

The IRC believes that the drafting team took a rational approach to its VRF and VSL proposal, and appropriately took into account the fact that frequency response is an interconnection-wide service and not Balancing Authority specific. It does not make sense to penalize a single Balancing Authority for a 10% decrease in response, where frequency response is otherwise sufficient amongst its surrounding Balancing Authorities and the reliability of the Interconnection as a whole is not in jeopardy. On the other hand, a 10% decrease in response within the Interconnection as a whole would clearly signal a reliability issue. By suggesting that the VSLs for Requirement 1 be modified to remove references to performance by other entities, the Commission is essentially suggesting that a small deficiency within a single Balancing

²⁴ *Id.* at 42.

²⁵ For Requirement R1, NERC proposes two violation severity levels depending on whether a Balancing Authority or a Frequency Response Sharing Group has an annual Frequency Response Measure “less negative than its Frequency Response Obligation by more than 1% but by at most 30%, or 15 MW/0.1Hz, whichever one is the greater deviation from its [Frequency Response Obligation].” This violation would have a “lower” severity level if “[t]he summation of the Balancing Authorities’ [Frequency Response Measure] within an Interconnection was equal to or more negative than the Interconnection’s IFRO,” and a “high” severity level if this summation “did not meet its [Interconnection Frequency Response Obligation].” Based on these two possibilities for this summation, NERC proposes either a “medium” severity level and a “severe” severity level for a Balancing Authority or Frequency Response Sharing Group with an Frequency Response Measure that is “less negative than its [Frequency Response Obligation] by more than 30% or by more than 15 MW/0.1 Hz, whichever is the greater deviation from its [Frequency Response Obligation].” See NOPR at P 43.

²⁶ NOPR at P 44.

Authority is equivalent to a deficient Interconnection, and therefore should be equivalently penalized as such.

Generally speaking, VRFs and VSLs are intended to approximate the impact of a violation on reliability. In the proposed BAL-003-1 Reliability Standard, the VRFs and VSLs appear appropriate and well-reasoned. With this in mind, the IRC respectfully requests that the Commission accept the VRFs and VSLs as developed by the standard drafting team and agreed to by industry.

III. Conclusion

For the reasons set forth above, the IRC respectfully requests that the Commission approve proposed BAL-003-1, but take prospective action consistent with these comments.

Respectfully submitted,

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