NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

December 30, 2019

VIA ELECTRONIC FILING

Rachelle Verret Morphy
Saskatchewan Electric Reliability Authority
2025 Victoria Avenue
Regina, Saskatchewan, Canada S4P 0S1

Re: *North American Electric Reliability Corporation*

Dear Ms. Morphy:

The North American Electric Reliability Corporation ("NERC") hereby submits Notice of Filing of the North American Electric Reliability Corporation of Proposed Reliability Standard BAL-003-2. NERC requests, to the extent necessary, a waiver of any applicable filing requirements with respect to this filing.

Please contact the undersigned if you have any questions concerning this filing.

Respectfully submitted,

/s/ Lauren Perotti

Lauren Perotti
Senior Counsel for the North American Electric Reliability Corporation

Enclosure

3353 Peachtree Road NE
Suite 600, North Tower
Atlanta, GA 30326
404-446-2560 | www.nerc.com

BEFORE THE
CROWN INVESTMENT CORPORATION
OF THE PROVINCE OF SASKATCHEWAN

NORTH AMERICAN ELECTRIC	**)**
RELIABILITY CORPORATION	**)**

NOTICE OF FILING OF THE NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION OF PROPOSED RELIABILITY STANDARD BAL-003-2

Lauren Perotti
Senior Counsel
Candice Castaneda
Counsel
North American Electric Reliability Corporation
1325 G Street, N.W., Suite 600
Washington, D.C. 20005
(202) 400-3000
lauren.perotti@nerc.net
candice.castaneda@nerc.net

Counsel for the North American Electric Reliability Corporation

December 30, 2019

TABLE OF CONTENTS

BEFORE THE
CROWN INVESTMENT CORPORATION
OF THE PROVINCE OF SASKATCHEWAN

NORTH AMERICAN ELECTRIC	**)**
RELIABILITY CORPORATION	**)**

NOTICE OF FILING OF THE NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION OF PROPOSED RELIABILITY STANDARD BAL-003-2

The North American Electric Reliability Corporation ("NERC") hereby submits proposed Reliability Standard BAL-003-2 – Frequency Response and Frequency Bias Setting. Proposed Reliability Standard BAL-003-2 enhances reliability and improves upon the currently effective version of the standard by refining and clarifying the process and methods for calculating the amount of Frequency Response that must be provided in a given operating year to support the reliable operation of the Bulk Power System.[1] Additionally, the proposed standard provides NERC with increased flexibility to incorporate additional refinements to the annual process as future lessons are learned.

Proposed Reliability Standard BAL-003-2 (**Exhibit A**) is just, reasonable, not unduly discriminatory or preferential, and in the public interest. NERC also provides notice of the associated implementation plan (**Exhibit B**) as detailed in this filing, the associated Violation Risk Factors ("VRFs") and Violation Severity Levels ("VSLs") (**Exhibit C**), and the retirement of currently effective Reliability Standard BAL-003-1.1.

This filing presents the technical basis and purpose of the proposed Reliability Standard, a demonstration that the proposed Reliability Standard meets the Reliability Standards criteria

[1] Unless otherwise indicated, capitalized terms used in this filing shall have the meaning set forth in the *Glossary of Terms Used in NERC Reliability Standards* ("NERC Glossary"), https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf.

(**Exhibit D**), and a summary of the standard development history (**Exhibit I**). The proposed Reliability Standard was adopted by the NERC Board of Trustees on November 5, 2019.

Additionally, NERC submits the revised *Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard* (or "*Procedure*") (**Exhibit E)**. The *Procedure* supports proposed Reliability Standard BAL-003-2.

I. SUMMARY

Frequency Response is a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load. As such, it is a critical component to the reliable operation of the Bulk Power System, particularly during disturbances and restoration.[2] Power system operators manage or control frequency primarily through adjustments to generator output intended to restore balance between generation and load. Failure to maintain frequency can disrupt the operation of equipment and initiate disconnection of power plant equipment to prevent them from being damaged, which could lead to wide-spread blackouts.

Currently effective Reliability Standard BAL-003-1.1 provides requirements which are designed to ensure sufficient Frequency Response from Balancing Authorities to maintain Interconnection frequency within predefined boundaries by arresting frequency deviations and supporting frequency until the frequency is restored to its scheduled value. The standard is intended to provide consistent methods for determining the amount of Frequency Response needed in each Interconnection as well as measuring Frequency Response performance.

Attachment A to the standard discusses the establishment of the Interconnection Frequency Response Obligation ("IFRO"). The IFRO is the minimum amount of Frequency Response that

[2] System frequency reflects the instantaneous balance between generation and load. Reliable operation of a power system depends on maintaining frequency within predetermined boundaries above and below a scheduled value, which is 60 Hertz ("Hz") in North America.

must be maintained by an Interconnection. Attachment A also describes the process the ERO follows to validate the Balancing Authority's Frequency Response Standard ("FRS") Form 1 data and publish the official Frequency Bias Settings. FRS Form 1 provides the instructions and calculations to measure Frequency Response performance at the Balancing Authority level. The *Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard*, or *Procedure*, outlines how the ERO conducts a transparent process annually to identify a list of frequency events to be used by Balancing Authorities to calculate their Frequency Response performance to assess whether the Balancing Authority met its Frequency Response Obligation and to determine an appropriate Frequency Bias Setting.

Supporting documents for the currently effective standard were developed using engineering judgment on the data collection and process needed to determine the IFRO, as well as the processing of raw data to assess compliance. In the course of implementing the standard, NERC identified minor implementation issues and process inefficiencies. Further, it was anticipated that as Frequency Response improves, the approaches embedded in the standard for collecting annual samples would need to be modified.

Proposed Reliability Standard BAL-003-2 improves upon currently effective Reliability Standard BAL-003-1.1 by addressing these issues through a series of targeted revisions to Attachment A, the related forms, and supporting *Procedure.*

Specifically, and as discussed further herein, these revisions:

- Address issues related to frequency performance calculations in the currently effective standard, which could result in the IFRO values being increased year over year despite improved performance, or being decreased despite worsened performance;

- Provide a repeatable and consistent method for determining the Interconnection Resource Contingency Criteria (now referred to as the "Resource Loss Protection

Criteria" or "RLPC") for all Interconnections; the RLPC reflects the Interconnection design resource loss which is used to determine the IFRO; and

- Clarify language related to Frequency Response Reserve Sharing Groups and the timeline for Frequency Response and Frequency Bias Setting activities.

To allow NERC to make timely process improvements in the future as new lessons are learned, NERC has removed some procedural detail from Attachment A and included it in the *Procedure*. The FRS Form 1 has also been revised to support the new data required by the proposed standard and revised *Procedure.*

Collectively, these revisions will enhance the effectiveness of the BAL-003 Reliability Standard and thereby advance the reliability of the Bulk Power System. Proposed Reliability Standard BAL-003-2 and the associated implementation plan is just, reasonable, not unduly discriminatory or preferential, and in the public interest.

II. NOTICES AND COMMUNICATIONS

Notices and communications with respect to this filing may be addressed to the following:

Lauren Perotti
Senior Counsel
Candice Castaneda
Counsel
North American Electric Reliability Corporation
1325 G Street, N.W., Suite 600
Washington, D.C. 20005
(202) 400-3000
(202) 644-8099 – facsimile
lauren.perotti@nerc.net
candice.castaneda@nerc.net

Howard Gugel
Vice President and Director of Engineering and Standards
North American Electric Reliability Corporation
3353 Peachtree Road, N.E.
Suite 600, North Tower
Atlanta, GA 30326
(404) 446-2560
(404) 446-2595 – facsimile
howard.gugel@nerc.net

III. BACKGROUND

A. NERC Reliability Standards Development Procedure

The proposed Reliability Standard was developed in an open and fair manner and in accordance with the Reliability Standard development process. NERC develops Reliability

Standards in accordance with Section 300 (Reliability Standards Development) of the NERC Rules of Procedure ("ROP") and the NERC Standard Processes Manual ("SPM").[3]

NERC's rules provide for reasonable notice and opportunity for public comment, due process, openness, and a balance of interests in developing Reliability Standards, and thus satisfy the criteria for approving Reliability Standards. NERC's standard development process is accredited by the American National Standards Institute and is open to any person or entity with a legitimate interest in the reliability of the Bulk Power System. Stakeholders must approve, and the NERC Board of Trustees must adopt, a Reliability Standard before NERC submits the Reliability Standard to the applicable governmental authorities.

B. Procedural History

1. History of the BAL-003 Reliability Standard

On April 4, 2006, NERC submitted the NERC Resource and Demand Balancing Reliability Standards, including Reliability Standard BAL-003-0. In its order approving the standard, the Federal Energy Regulatory Commission ("FERC") directed NERC to develop modifications that would, among other things, "define[] the necessary amount of Frequency Response needed for Reliable Operation for each balancing authority with methods of obtaining and measuring that the frequency response is achieved."[4]

In response to this directive, NERC developed Reliability Standard BAL-003-1, which was submitted on April 8, 2013. In its order approving the standard, FERC found that it "addresses an

---

[3] The NERC Rules of Procedure are available at https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx. The NERC Standard Processes Manual is available at https://www.nerc.com/comm/SC/Documents/Appendix_3A_StandardsProcessesManual.pdf.

[4] *See Mandatory Reliability Standards for the Bulk-Power System*, Order No. 693, 118 FERC ¶ 61,218 at P 375, *order on reh'g*, Order No. 693-A, 120 FERC ¶ 61,053 (2007).

existing gap in reliability and the Commission's directives set forth in Order No. 693."[5] FERC directed NERC to "submit two reports, and to continue its ongoing analysis of certain aspects of BAL-003-1 to address concerns regarding specific provisions of the Reliability Standard and to determine the effectiveness of Reliability Standard BAL-003-1 in providing an adequate amount of frequency response."[6] FERC stated that, depending on the results and recommendations of the reports, further refinements to the standard may be warranted.[7] Additionally, FERC directed NERC to revise the Violation Risk Factor and Violation Severity Levels for Requirement R1.[8]

On September 4, 2014, NERC submitted the FERC-directed VRF and VSL revisions for Requirement R1 of Reliability Standard BAL-003-1. NERC submitted errata version Reliability Standard BAL-003-1.1 on September 2, 2015.

2. Order No. 794 Informational Filings

As noted in the preceding section, in Order No. 794 FERC directed NERC to submit two reports. On June 30, 2017, NERC submitted to FERC the first of the reports directed by Order No. 794, addressing the results and recommendations of a light-load case study of the Eastern Interconnection.[9] On June 29, 2018, NERC submitted to FERC the second of the reports directed by Order No. 794, addressing: (1) an evaluation of the use of the linear regression methodology to calculate frequency response; and (2) the availability of resources for applicable entities to meet the Frequency Response Obligation.[10]

---

5 *Frequency Response and Frequency Bias Setting Reliability Standard*, Order No. 794, 146 FERC ¶ 61,024, P 1 (2014) ("Order No. 794").

6 *Id*. at P 3 (internal citation omitted).

7 *Id*. at P 3.

8 *Id*. at PP 90, 95.

9 Order No. 794 at P 3; *Informational Filing of the North American Electric Reliability Corporation Regarding the Light-Load Case Study of the Eastern Interconnection*, Docket No. RM13-11-000 (filed June 30, 2017).

10 Order No. 794 at P 3; *Informational Filing of the North American Electric Reliability Corporation*, Docket No. RM13-11-000 (Jun. 29, 2018).

3. Frequency Response Annual Analysis

Each year, NERC files with FERC on an informational basis its annual report for the administration and support of Reliability Standard BAL-003-1.1 titled the Frequency Response Annual Analysis ("FRAA").[11] The FRAA contains the annual analysis, calculation, and recommendations for the IFRO for each of the four electrical interconnections of North America for the coming operational year (December through November).

4. *Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard*

The revised *Procedure*, attached to this filing as **Exhibit E**, represents the first revision to this document since its initial submission as part of NERC's proposed Reliability Standard BAL-003-1 filing. NERC must file with FERC on an informational basis any revisions to the *Procedure* in accordance with the revision process set forth in that document.[12]

C. Development of the Proposed Reliability Standard

This section provides an overview of the procedural history of proposed Reliability Standard BAL-003-2.

1. 2016 FRAA Report

In the course of preparing the 2016 FRAA, NERC identified what it called "inconsistencies" in IFRO calculations under Reliability Standard BAL-003-1.1. Due to these issues, NERC recommended maintaining the 2016 IFRO values for operating year 2017.[13] NERC

---

[11] The 2012 *Frequency Response Initiative Report* was included as Exhibit F to NERC's April 8, 2013 BAL-003-1 filing. Reports for subsequent years were submitted to FERC in Docket No. RM13-11-000 as follows: (i) 2014 FRAA, submitted March 20, 2015; (ii) 2015 FRAA, submitted December 16, 2015; (iii) 2016 FRAA, submitted October 21, 2016; (iv) 2017 FRAA, submitted November 29, 2017, (v) 2018 FRAA, submitted November 29, 2018; and (vi) 2019 FRAA, submitted November 21, 2019.

[12] *See* **Exhibit E** (revised *Procedure*) at iv (describing the revision process for the *Procedure*, which provides that any changes must be accompanied by a technical justification, must be posted for a 45-day formal comment period, must be discussed in a public meeting, and must be submitted to the NERC Board of Trustees for adoption; additionally, any changes shall be filed with FERC for informational purposes).

[13] 2016 FRAA at v.

also recommended that the NERC Resources Subcommittee "develop a Standard Authorization Request (SAR) to revise the IFRO calculation in BAL- 003- 1 due to inconsistencies identified in the 2016 [FRAA] such as the IFRO values with respect to Point C and varying Value B, the Eastern Interconnection Resource Contingency Protection Criteria, event selection criteria, and evaluation of t_0."[14]

Additionally, Recommendations 3 and 4 of the report recommended as follows:

> 3. The Resource Contingency Protection Criteria for each interconnection should be revised to help ensure sufficient primary frequency response is maintained. The Eastern Interconnection uses the "largest resource event in [the] last 10 years", which is the 4 August 2007 event. The Standard Authorization Request (SAR) should revisit this issue for modifications to [the] BAL-003-1 standard, and the Resources Subcommittee should recommend how the events are selected for each interconnection.
>
> 4. Many events, particularly in the Eastern Interconnection due to its large synchronous inertia, tend to have a frequency nadir point that exceeds the t_0+12 seconds specified in BAL-003-1. Therefore, some events are characterized with a Point C value that is only partially down the arresting period of the event and does not accurately reflect the actual nadir. BAL-003-1 should be modified to allow for accurate representation of the Point C nadir value if exceeding t_0+12 seconds. The actual event nadir can occur at any time, including beyond the time period used for calculating Value B (t_0+20 through t_0+52 seconds), and may be the value known as Point C' which typically occurs from 72 to 95 seconds after t_0.[15]

The 2016 FRAA was filed with FERC on October 21, 2016.[16] Subsequent year FRAA reports continued to identify these issues and recommended that they be addressed, while maintaining 2016 IFRO values in the meantime.

---

[14] *Id*. at v, Recommendation 2.

[15] *Id*. at v, Recommendations 3-4 (internal citation omitted).

[16] *See supra* n. 29.

2. Procedural History of Project 2017-01 Modifications to BAL-003-1.1

As recommended by the 2016 FRAA Report, the NERC Operating Committee Resources Subcommittee developed a Standard Authorization Request to develop modifications to Reliability Standard BAL-003-1.1. The Standard Authorization Request was posted from June 19, 2017 through July 18, 2017. A second Standard Authorization Request was submitted by Northwest Power Pool recommending that the project add a second phase to address additional issues. The second request was posted for comment from November 2, 2017 through December 1, 2017.

The project was thereafter broken out into two phases. The purpose of the first phase was to address the recommendations of the 2016 FRAA report to address IFRO calculation issues, primarily though targeted revisions to BAL-003-1.1 Attachment A and the supporting documents. The purpose of the second phase is to address broader potential revisions to BAL-003 requirements, including consideration of the IFRO method in its entirety and revisions to the applicable entities.

Following one informal comment period and one formal 45-day comment period and ballot, the final draft of proposed Reliability Standard BAL-003-2 was approved by the ballot pool on October 24, 2019. The proposed standard received 100 percent weighted segment approval with 92.96 percent quorum. Revisions to the *Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard* and FRS Form 1 were posted alongside the draft BAL-003-2 standard. The revised *Procedure* was discussed in two public meetings and was presented to the Operating Committee for informational purposes on March 5, 2019.[17] On November 5, 2019, the NERC Board of Trustees adopted proposed Reliability Standard BAL-003-2 and the revised

[17] *See* NERC, *Meeting Minutes – Operating Committee* (March 5-6, 2019), Agenda Item 15 at 17, https://www.nerc.com/comm/OC/Pages/AgendasHighlightsandMinutes.aspx.

Procedure, thus officially concluding work under the first phase of Project 2017-01. Work under the multi-year second phase of the project remains ongoing.

IV. JUSTIFICATION

As discussed below and in **Exhibit D**, proposed Reliability Standard BAL-003-2 improves upon currently effective Reliability Standard BAL-003-1.1 by enhancing the processes for the calculation of IFROs to eliminate unintended counter-incentives and improving the effectiveness of the standard, thereby advancing the reliability of the Bulk Power System. As discussed below, no changes are proposed to the purpose, applicability, or requirements. Substantial revisions are proposed in Attachment A, as administrative items associated with implementation of the standard were recommended for movement from the standard itself into the *Procedure*. Additionally, the supporting forms and the *Procedure* have been revised accordingly.

In this section, NERC provides: (a) a brief overview of the proposed standard; (b) a description of each of the changes in the proposed standard and, where appropriate, corresponding revisions to the *Procedure*; and (c) discussion of the enforceability of the proposed standard.

A. Overview of Proposed Reliability Standard BAL-003-2

The purpose of proposed Reliability Standard BAL-003-2, which remains unchanged from currently effective Reliability Standard BAL-003-1.1, is "[t]o require sufficient Frequency Response from the Balancing Authority (BA) to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to its scheduled value. To provide consistent methods for measuring Frequency

Response and determining the Frequency Bias Setting." The proposed standard would continue to apply to Balancing Authorities and Frequency Response Sharing Groups.[18]

Proposed Reliability Standard BAL-003-2 consists of the following four requirements, which remain unchanged from the currently effective version:

- Requirement R1 specifies that each applicable entity shall achieve an annual Frequency Response Measure (as calculated and reported in accordance with Attachment A) that is equal to or more negative than its Frequency Response Obligation to ensure that sufficient Frequency Response is provided by each applicable entity to maintain Interconnection Frequency Response equal to or more negative than the Interconnection Frequency Response Obligation.

- Requirement R2 specifies that each Balancing Authority that is a member of a multiple Balancing Authority Interconnection and is not receiving Overlap Regulation Service and uses a fixed Frequency Bias Setting shall implement the Frequency Bias Setting determined in accordance with Attachment A, as validated by the ERO, into its Area Control Error calculation during the implementation period specified by the ERO and shall use this Frequency Bias Setting until directed to change by the ERO.

- Requirement R3 specifies that each Balancing Authority that is a member of a multiple Balancing Authority Interconnection and is not receiving Overlap Regulation Service and is utilizing a variable Frequency Bias Setting shall maintain a Frequency Bias Setting that is: (1) less than zero at all times, and (2) equal to or more negative than its Frequency Response Obligation when Frequency varies from 60 Hz by more than +/- 0.036 Hz.

- Requirement R4 specifies that each Balancing Authority that is performing Overlap Regulation Service shall modify its Frequency Bias Setting in its Area Control Error calculation, in order to represent the Frequency Bias Setting for the combined Balancing Authority Area, to be equivalent to either: (i) the sum of the Frequency Bias Settings as shown on FRS Form 1 and FRS Form 2 for the participating Balancing Authorities as validated by the ERO; (ii) the Frequency Bias Setting shown on FRS Form 1 and FRS Form 2 for the entirety of the participating Balancing Authorities' Areas.

The revisions in proposed Reliability Standard BAL-003-2 are concentrated in Attachment A to the standard, BAL-003-2 Frequency Response and Frequency Bias Setting Standard

[18] A Frequency Response Sharing Group is defined in the NERC Glossary as "a group whose members consist of two or more Balancing Authorities that collectively maintain, allocate, and supply operating resources required to jointly meet the sum of the Frequency Response Obligations of its members."

Supporting Document, which is referenced in Requirements R1 and R2. Revisions are also made to the FRS Form 1 referenced in Requirement R4 and Attachment A, as well as the *Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard*, referenced in Attachment A. These revisions are discussed in detail in the following section.

B. Justification for Proposed Reliability Standard BAL-003-2

This section discusses the revisions reflected in proposed Reliability Standard BAL-003-2, including corresponding revisions to the associated *Procedure*, and how these revisions improve the effectiveness of the BAL-003 Reliability Standard. These revisions are grouped as follows: (1) revisions to the calculation of Max Delta Frequency; (2) revisions to the methods used to determine the Interconnection Resource Loss Protection Criteria; (3) clarifying revisions; and (4) revisions to the *Procedure* to select Frequency Response Standard excursion events for analysis.

1. Calculation of Max Data Frequency

Proposed Reliability Standard BAL-003-2 streamlines Table 1 in Attachment A and removes multiple data frequency lines that were intended to be used in the calculation of IFROs. The purpose of these revisions is to address certain issues that were identified in the 2016 FRAA related to the application of these values; specifically, that application of these values could have the unintended effect of penalizing an Interconnection, by means of a higher IFRO, for improved performance, while rewarding an Interconnection, by means of a lower IFRO, for decreased performance. Proposed Reliability Standard BAL-003-2 addresses this issue by revising Attachment A, Table 1 and related supporting materials by removing all frequency lines but the Max Delta Frequency. The revised *Procedure* defines Max Delta Frequency as that defined for the specific Interconnection in the 2017 FRAA. In the future, NERC would pursue any changes to the process for defining the Max Delta Frequency through the open and transparent revision process set forth in the *Procedure*. This would allow for more timely incorporation of necessary

adjustments, such as to incorporate recommendations that result from analysis in future FRAA reports.

These revisions are necessary for the following reasons. As NERC observed in the 2016 FRAA, all of the calculations of the IFRO in the currently effective standard are based on avoiding instantaneous or time-delayed tripping of the highest set point of under frequency load shedding ("UFLS"), either for the initial nadir (Point C), or for any lower frequency that might occur during the frequency event. Because the ability to measure the frequency nadir at the Balancing Authority level is limited by the Supervisory Control and Data Acquisition scan rates available to calculate Point C, an adjustment factor (CB_R) was added to capture the relationship between Value B and Point C.

While Point C may not be captured accurately at the Balancing Authority level due to energy management system scan rates, it is captured accurately at the Interconnection level using FNet frequency data recorders. Balancing Authority performance for individual frequency events, under currently effective Reliability Standard BAL-003-1.1, is based on the change in Net Actual Interchange for that Balancing Authority from the Value A to Value B time intervals, as compared to the change in A-B frequency, as measured by that Balancing Authority. An accurate measurement of Point C at the Balancing Authority level is not necessary to measure Balancing Authority performance.

The original intent of the CB_R adjustment in the IFRO calculation was to address a scenario where A-C was increasing (arresting period performance declining), while A-B was unchanged (stabilizing period performance stable). Under this scenario, the increase in CB_R would result in an increase in the IFRO. However, what was observed in the 2016 FRAA[19] was that the CB_R (and

[19] *See* 2016 FRAA at vii.

resulting IFRO) will also increase when A-C arresting period performance is unchanged and stabilizing period performance is improving, with A-B getting smaller. It was also observed that if A-B increases (declining stabilizing period performance) and A-C is unchanged, then the CB_R would decrease, as would the resulting IFRO. Stated differently, an Interconnection could be penalized for improved Frequency Response performance as measured against Value B, or, conversely, rewarded for poor performance.

The drafting team determined that, in light of these issues, the appropriate way to address the Max Delta Frequency calculation was to place the calculation in the *Procedure*, with its value set as supported by NERC Staff analysis in the 2017 FRAA. This revision would allow for flexibility to perform additional analysis and review in future years. The revisions in proposed Reliability Standard BAL-003-2 and the associated *Procedure* thus provide a clear, but flexible, method for establishing this aspect of the IFRO calculations going forward.

2. Method Used to Determine the Interconnection Resource Loss Protection Criteria

The Interconnection Resource Loss Protection Criteria, or RLPC, is the Interconnection design resource loss measured in MW. It is used to determine the IFRO. In currently effective Reliability Standard BAL-003-1.1, this measure is referred to as the Resource Contingency Criteria (or "RCC"). As defined in Attachment A to currently effective BAL-003-1.1, this measure is based on the largest "N-2" event, defined as a single initiating event that leads to multiple electrical facilities being removed from service, identified in each Interconnection except for the Eastern Interconnection. For the Eastern Interconnection, the RLPC is calculated by using the largest single event in the previous ten years.

Proposed Reliability Standard BAL-003-2 improves upon the currently effective standard as follows. Language regarding the calculation of the Resource Contingency Criteria is removed

from Attachment A to the standard; the revised *Procedure* sets forth a detailed and consistent method for determining RLPCs across all Interconnections.[20] This method is further described in the associated background document, included as **Exhibit G** to this filing.

The revised *Procedure* will determine the Interconnection RLPC in accordance with a process where Balancing Authorities will provide their two largest resource loss values and largest resource loss due to an N-1 or N-2 Remedial Action Scheme event. Under this process, the calculated RLPC should meet or exceed, but never fall short of, any credible N-2 resource loss event scenario. RLPCs would be evaluated annually and would reflect changes in system conditions based on information submitted by Balancing Authorities.

NERC notes that, compared to the currently effective standard, the largest adjustment is in the proposed RLPC value for the Eastern Interconnection. The present RLPC for the Eastern Interconnection of 4,500 MW was recommended in the *2012 Frequency Response Initiative Report*[21] and reflected what had been the largest resource contingency event in the previous ten years at the time of the report: an August 2007 event that involved nine generators across three states and resulted in a loss of 4,457 MW and a frequency nadir of 59.863 Hz.

Since the 2012 report was issued, the largest resource loss event in the Eastern Interconnection was a loss of 2,344 MW in April 2013. This event, however, did not represent the largest potential N-2 event for the Eastern Interconnection, which, according to the target RLPC value using 2018 data, is 3,209 MW. During the drafting process it was determined that using a consistent approach for all Interconnections, one that ensures that the RLPC meets or exceeds any

[20] *See* Exhibit E (revised *Procedure*) at Chapter 3.

[21] *See Notice of Filing of NERC of Proposed Reliability Standard BAL-003-1 – Frequency Response and Frequency Bias Setting*, Exhibit F at 55 (April 8, 2013).

credible N-2 event, would be preferable to the years-based approach for determining the Eastern Interconnection RLPC used in the current standard.

3. Revised Target IFRO Values

Proposed Reliability Standard BAL-003-2 revises the target IFRO values for each of the four North American Interconnections in Attachment A Table 1, based on the adjustments made to the frequency and RLPC calculations discussed in the previous sections. These values are appropriately labeled target values, as they remain subject to change as part of the annual review process.

During the development process for proposed BAL-003-2, NERC staff performed an independent analysis using dynamic simulations to validate the proposed target IFRO values for the Eastern, Western, and ERCOT Interconnections based on the proposed RLPC calculation formula. In performing its analysis, staff used the proposed values for RLPC, and the values from the 2017 FRAA for the Maximum Delta Frequency and Credit for Load Resources. Please refer to this report, attached as **Exhibit F** to this filing, for further information on the assumptions, methods, and data used in the analysis, as well as a detailed description of the results of the dynamic simulations. In conclusion, NERC staff's study validated the proposed IFRO calculation formula. The proposed target values for the Western and ERCOT Interconnections were successfully validated within 5 MW/.1 Hz of the IFRO that had been established through the IFRO calculation formula, with resulting minimum Point C frequency nadir above the threshold for UFLS for the respective Interconnection.[22] However, under the circumstances and assumptions of NERC staff's dynamic simulations, the calculated target IFRO for the Eastern Interconnection (-

[22] *Interconnection Frequency Response Obligation Determination and Validation: BAL-003-2 SDT Revised RLPC and IFRO Method*, Exhibit F, at iv (Executive Summary).

764 MW/.1Hz) appeared to be slightly lower than what would be required (IFRO -787 MW/.1Hz) to avoid under frequency load shedding.[23]

For the Eastern Interconnection, NERC proposes to implement the planned reduction in target IFRO in three increments. As provided in Attachment A, if the Interconnection Frequency Response Measure declines by more than ten percent, then NERC will halt the IFRO reduction until the cause of the degradation is identified. This measured approach will help ensure the planned IFRO reduction would not pose a risk to reliability when implemented. As an additional measure of conservatism, the final target IFRO in Attachment A Table 1 has been adjusted to reflect the IFRO value validated through NERC staff's analysis.

It is important to note that all IFRO values contained in Attachment A Table 1 are target values, not final values, and remain subject to change as determined through NERC's annual process. The IFRO values would continue to be evaluated annually based on changes in the RLPC, with the final IFRO values for the operating year adjusted as appropriate. Additionally, no reductions in IFROs would be implemented without first being validated through the use of dynamic simulations.

4. Clarifications and Other Revisions

Proposed Reliability Standard BAL-003-2 Attachment A contains several revisions to clarify the obligations of Frequency Response Sharing Groups with respect to the calculation of Frequency Response Measure performance. The Timeline for Balancing Authority Frequency Response and Frequency Bias Setting Activities has been updated and streamlined. These changes are shown in redline in Exhibit A.

[23] *Id.* at 6.

5. Other Revisions to the *Procedure* and Supporting Documents

The *Procedure* specifies the criteria to be used by the ERO to select Frequency Response Standard excursion events for analysis. In addition to the revisions to the *Procedure* discussed above in the context of associated changes to the BAL-003 standard, the Point C frequency nadir has been revised, from being defined as the "arrested value of frequency observed within **12** seconds following the start of the excursion," to the "arrested value of frequency observed within **20** seconds following the start of the excursion."[24] This revision, which responds to a recommendation from the 2016 FRAA,[25] will more accurately capture the true frequency nadir during the arresting period of an event.

Additionally, supporting FRS Form 1 has been updated to include provision of resource loss data to support the calculation of the RLPC, in accordance with the revised *Procedure*.

C. Enforceability of Proposed Reliability Standard BAL-003-2

Proposed Reliability Standard BAL-003-2 includes VRFs and VSLs. The VRFs assess the impact to reliability caused by violations of a specific requirement and are one of several elements used to determine an appropriate sanction when the associated requirement is violated. The VSLs provide guidance on the way that NERC will enforce the requirements of the proposed Reliability Standard. The VRFs in proposed Reliability Standard BAL-003-2 are unchanged from currently

---

[24] **Exhibit E** (revised *Procedure*) at Chapter 1 (Event Selection Criteria 3.a.ii) (emphasis added).

[25] *See* 2016 FRAA at v. Recommendation 4 of the 2016 FRAA stated:

> Many events, particularly in the Eastern Interconnection due to its large synchronous inertia, tend to have a frequency nadir point that exceeds the t0 3+12 seconds specified in BAL- 003- 1. Therefore, some events are characterized with a Point C value that is only partially down the arresting period of the event and does not accurately reflect the actual nadir. BAL- 003- 1 should be modified to allow for accurate representation of the Point C nadir value if exceeding t0+12 seconds. The actual event nadir can occur at any time, including beyond the time period used for calculating Value B (t0+20 through t0+52 seconds), and may be the value known as Point C' which typically occurs from 72 to 95 seconds after t0.

effective Reliability Standard BAL-003-1.1. The VSLs for Requirements R2 through R4 remain unchanged from the currently effective standard. The VSL for Requirement R1 is revised to establish clear and progressive thresholds for the different levels of noncompliance. The VRFs and VSLs for proposed Reliability Standard BAL-003-2 continue to comport with NERC and FERC guidelines related to their assignment.

Proposed Reliability Standard BAL-003-2 includes measures that support each requirement by clearly identifying what is required and how the requirement will be enforced. These measures, which are unchanged from the currently effective Reliability Standard BAL-003-1.1, help ensure that the requirements will be enforced in a clear, consistent, non-preferential manner, and without prejudice to any party.

V. EFFECTIVE DATE

The proposed implementation plan for proposed Reliability Standard BAL-003-2 is included as **Exhibit B**. Under NERC's proposed implementation plan, where approval by an applicable governmental authority is required, the standard shall become effective on the first operating year (which begins on December 1st) that is 90 days after the effective date of the applicable governmental authority's order approving the standard, or as otherwise provided for by the applicable governmental authority. Where approval by an applicable governmental authority is not required, the standard shall become effective on the first operating year (which begins on December 1st) that is 90 days after the date the standard is adopted by the NERC Board of Trustees, or as otherwise provided for in that jurisdiction. Currently effective Reliability Standard BAL-003-1.1 would be retired immediately prior to the effective date of the proposed standard. The proposed implementation plan balances the need for prompt implementation of the proposed standard while aligning its implementation with the existing BAL-003 timelines for calculation of IFRO values for the coming operating year.

Respectfully submitted,

/s/ Lauren A. Perotti
Lauren A. Perotti
Senior Counsel
Candice Castaneda
Counsel
North American Electric Reliability Corporation
1325 G Street, N.W., Suite 600
Washington, D.C. 20005
(202) 400-3000
lauren.perotti@nerc.net
candice.castaneda@nerc.net

Counsel for the North American Electric Reliability Corporation

Date: December 30, 2019

EXHIBITS A-C

EXHIBITS E-H

EXHIBITS I

Exhibit D -- Reliability Standards Criteria

Reliability Standards Criteria

The discussion explains how the proposed Reliability Standard has met or exceeded the Reliability Standards criteria.

1. Proposed Reliability Standards must be designed to achieve a specified reliability goal and must contain a technically sound means to achieve that goal.

Proposed Reliability Standard BAL-003-2 provides requirements which are designed to ensure sufficient Frequency Response from Balancing Authorities to maintain Interconnection frequency within predefined boundaries by arresting frequency deviations and supporting frequency until the frequency is restored to its scheduled value. The standard is intended to provide consistent methods for determining the amount of Frequency Response needed in each Interconnection as well as measuring Frequency Response performance.

Proposed Reliability Standard BAL-003-2 improves upon the current version of the standard through a set of targeted revisions to Attachment A to the standard. Corresponding revisions are also made to the supporting forms and *Procedure for ERO Support of Frequency Response and Frequency Bias Setting Standard*. These revisions enhance the effectiveness of the standard by: (i) addressing issues related to frequency performance calculations in the currently effective standard, which could result in the Interconnection Frequency Response Obligation ("IFRO") values being increased year over year despite improved performance, or being decreased despite worsened performance; (ii) providing a repeatable and consistent method for determining the Interconnection Resource Contingency Criteria for all Interconnections; and (iii) clarifying language related to Frequency Response Reserve Sharing Groups and the timeline for Frequency Response and Frequency Bias Setting activities. These revisions are technically justified and

provide a sound means of achieving the BAL-003 standard's goals of ensuring that sufficient Frequency Response is available to support Interconnection frequency.

2. Proposed Reliability Standards must be applicable only to users, owners and operators of the bulk power system, and must be clear and unambiguous as to what is required and who is required to comply.

The proposed Reliability Standard is clear and unambiguous as to what is required and who is required to comply. The applicability of proposed Reliability Standard BAL-003-2 has not changed from the currently effective standard: it continues to remain applicable to Balancing Authorities and Frequency Response Sharing Groups. The proposed Reliability Standard clearly articulates the actions that such entities must take to comply with the standard.

3. A proposed Reliability Standard must include clear and understandable consequences and a range of penalties (monetary and/or non-monetary) for a violation.

The Violation Risk Factors ("VRFs") and Violation Severity Levels ("VSLs") for the proposed Reliability Standard comport with NERC and FERC guidelines related to their assignment. The assignment of the severity level for each VSL is consistent with the corresponding requirement and the VSLs should ensure uniformity and consistency in the determination of penalties. The VSLs do not use any ambiguous terminology, thereby supporting uniformity and consistency in the determination of similar penalties for similar violations. For these reasons, the proposed Reliability Standard includes clear and understandable consequences.

4. A proposed Reliability Standard must identify clear and objective criterion or measure for compliance, so that it can be enforced in a consistent and non preferential manner.

The proposed Reliability Standard contains Measures that support each Requirement by clearly identifying what is required and how the Requirement will be enforced. These measures help provide clarity regarding how the Requirements will be enforced and help ensure that the

Requirements will be enforced in a clear, consistent, and non-preferential manner and without prejudice to any party.

5. Proposed Reliability Standards should achieve a reliability goal effectively and efficiently — but do not necessarily have to reflect "best practices" without regard to implementation cost or historical regional infrastructure design.

The proposed Reliability Standard achieves its reliability goals effectively and efficiently. The proposed Reliability Standard clearly enumerates the responsibilities of applicable entities with respect to achieving an annual Frequency Response Measure equal to or more negative than its Frequency Response Obligation and implementing Frequency Bias Settings.

6. Proposed Reliability Standards cannot be "lowest common denominator," i.e., cannot reflect a compromise that does not adequately protect Bulk-Power System reliability. Proposed Reliability Standards can consider costs to implement for smaller entities, but not at consequences of less than excellence in operating system reliability.

The proposed Reliability Standard does not reflect a "lowest common denominator" approach. To the contrary, the proposed Reliability Standard contains significant reliability benefits for the BPS and addresses issues identified by NERC in the 2016 Frequency Response Annual Analysis report.[1] The revisions would enhance the effectiveness of the proposed standard and provided needed flexibility to address any future issues related to the calculation of Interconnection Frequency Response Obligation in a timely manner.

7. Proposed Reliability Standards must be designed to apply throughout North America to the maximum extent achievable with a single Reliability Standard while not favoring one geographic area or regional model. It should take into account regional variations in the organization and corporate structures of transmission owners and operators, variations in generation fuel type and ownership patterns, and regional variations in market design if these affect the proposed Reliability Standard.

The proposed Reliability Standard applies consistently throughout North America and does not favor one geographic area or regional model. The proposed standard would further this

[1] *See* Section III.D.1.

criterion by providing a method for determining the Resource Loss Protection Criteria that is consistent across all Interconnections.

8. Proposed Reliability Standards should cause no undue negative effect on competition or restriction of the grid beyond any restriction necessary for reliability.

Proposed Reliability Standard BAL-003-2 has no undue negative effect on competition and does not unreasonably restrict the available transmission capacity or limit the use of the BPS in a preferential manner. The proposed standard requires the same performance by each of the applicable entities. The information sharing required by the proposed standard is necessary for reliability and can be accomplished without presenting any market or competition-related concerns.

9. The implementation time for the proposed Reliability Standard is reasonable.

The proposed effective date for proposed Reliability Standard BAL-003-2 is just and reasonable and appropriately balances the urgency in the need to implement the standard while aligning its implementation with the existing BAL-003 timelines for calculation of IFRO values for the coming operating year. The proposed implementation plan is attached as **Exhibit B** to this filing.

10. The Reliability Standard was developed in an open and fair manner and in accordance with the Reliability Standard development process.

The proposed Reliability Standard was developed in accordance with NERC's ANSI-accredited processes for developing and approving Reliability Standards. **Exhibit I** includes a summary of the Reliability Standard development proceedings, and details the processes followed to develop the proposed Reliability Standard. These processes included, among other things, comment periods, pre-ballot review periods, and balloting periods. Additionally, all meetings of the standard drafting team were properly noticed and open to the public.

11. NERC must explain any balancing of vital public interests in the development of proposed Reliability Standards.

NERC has identified no competing public interests regarding the request for approval of this proposed Reliability Standard. No comments were received that indicated the proposed Reliability Standard conflicts with other vital public interests.

12. Proposed Reliability Standards must consider any other appropriate factors.

No other negative factors relevant to whether the proposed Reliability Standard is just and reasonable were identified.