UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Essential Reliability Services and the Evolving Bulk-Power System -- Primary Frequency Response	**)** **)** **)**	**Docket No. RM16-6-000**

COMMENTS OF THE NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION IN RESPONSE TO NOTICE OF PROPOSED RULEMAKING

Shamai Elstein
Senior Counsel
Candice Castaneda
Counsel
Marisa Hecht
Counsel
North American Electric Reliability Corporation
1325 G Street N.W., Suite 600
Washington, DC 20005
(202) 400-3000

Counsel for the North American Electric Reliability Corporation

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The North American Electric Reliability Corporation ("NERC") hereby provides comments on the Federal Energy Regulatory Commission ("Commission") Notice of Proposed Rulemaking ("NOPR") regarding proposed revisions to the Commission's rules and regulations on primary frequency response.[1] The NOPR follows the Commission's Notice of Inquiry ("NOI")[2] regarding essential reliability services and proposes to impose primary frequency response requirements on newly interconnecting generation through revisions to the *pro forma* Large Generator Interconnection Agreement ("LGIA") and the *pro forma* Small Generator Interconnection Agreement ("SGIA"). The NOPR also requests comment whether the Commission should direct modifications to NERC Reliability Standards or revise the *pro forma* Open Access Transmission Tariff ("OATT") to impose primary frequency response requirements on existing resources.

As described below and detailed in NERC's NOI Comments, revisions to the *pro forma* LGIA and *pro forma* SGIA to support primary frequency response capability would be

[1] *Essential Reliability Services and the Evolving Bulk-Power System—Primary Frequency Response*, 157 FERC ¶ 61,122 (2016) ("NOPR").
[2] *Essential Reliability Services and Evolving Bulk-Power System–Primary Frequency Response*, 154 FERC ¶ 61,117 (2016) ("NOI").

consistent with NERC reliability assessments.[3] As discussed in those assessments, NERC has determined that the rapidly changing resource mix may reduce the level of available frequency response. The proposed revisions to the *pro forma* LGIA and the *pro forma* SGIA are consistent with NERC's determination in the assessments and help ensure sufficient frequency response. As discussed in its comments to the NOI, however, it is still too soon for NERC to determine whether it is necessary or appropriate to revise Reliability Standards to impose primary frequency response requirements on existing generation resources. NERC is continuing to examine frequency response issues closely and is on schedule to address the adequacy of primary frequency response resources and potential enhancements to Reliability Standards by no later than the July 1, 2018 deadline for the informational filing on NERC Reliability Standard BAL-003-1.1 -- Frequency Response and Frequency Bias Setting.[4] These comments describe the status of various NERC frequency response projects.[5] NERC remains committed to examining primary frequency response as an essential reliability service.

I. COMMUNICATIONS

Notices and communications with respect to these comments may be addressed to the

[3] *Comments of North American Electric Reliability Corporation*, Docket No. RM16-6-000 (filed Apr. 25, 2016) ("NOI Comments"). *See also*, NERC's Essential Reliability Services Task Force Measures Framework Report ("Framework Report") and Abstract Document ("Abstract") (issued December 17, 2015), NERC's State of Reliability Report for 2015, the NERC Operating Committee's *Reliability Guideline: Primary Frequency Control* (issued December 15, 2015), the NERC State of Reliability 2015 Report ("2015 SOR"), NERC's 2015 Long-Term Reliability Assessment, and NERC's 2016 Long-Term Reliability Assessment.

[4] In Order No. 794, the Commission directed NERC to submit reports within three months after two years of operating experience once BAL-003-1 R1 becomes effective. *Frequency Response and Frequency Bias Setting Reliability Standard*, Order No. 794, 146 FERC ¶ 61,024 (2014). The reports must address: (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. The reports will also include any recommended revisions to Reliability Standards (such as changes to impose frequency response obligations on generation.

[5] NERC will continue to share any results of its research and analysis, as appropriate and available.

following:[6]

Shamai Elstein*
Senior Counsel
Candice Castaneda*
Counsel
Marisa Hecht*
Counsel
North American Electric Reliability Corporation
1325 G Street N.W., Suite 600
Washington, DC 20005
(202) 400-3000
Shamai.Elstein@nerc.net
Candice.Castaneda@nerc.net
Marisa.Hecht@nerc.net

II. COMMENTS

The Commission's proposed revisions to the *pro forma* LGIA and the *pro forma* SGIA are consistent with NERC reliability assessments regarding a potential decline in frequency response resources due to the changing resource mix.[7] Primary frequency response is an essential reliability service, particularly during events, islanding, and system restoration.[8] Although NERC continues to examine frequency response issues,[9] NERC agrees that the NOPR's proposed revisions to the *pro forma* LGIA and the *pro forma* SGIA could aid in mitigating the risk of declining frequency responsive resources, helping to ensure that sufficient frequency response capability remains ready to respond and support bulk power system ("BPS")

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[6] Persons to be included on the Commission's service list are identified by an asterisk. NERC respectfully requests a waiver of Rule 203 of the Commission's regulations, 18 C.F.R. § 385.203, to allow the inclusion of more than two persons on the service list in this proceeding.

[7] *See e.g.*, NOPR, at P 24; *and* NOI Comments, at Section IV.A.

[8] Frequency response is the ability of a system or elements of the system to react or respond to a change in system frequency and is the metric traditionally used to describe interconnection performance in arresting decline and stabilizing frequency after a loss of resources or load. Primary frequency response is one component for frequency response and is measured by relating the size of the resource lost to the resulting net change in system frequency. Primary frequency response arises from automatic generator governor response, load response, and other mechanisms. *See*, NERC Glossary (explaining that Frequency Response is expressed as the sum of change in demand, plus the change in generation, divided by the change in frequency, expressed in megawatts per 0.1 Hz (MW/0.1 Hz)) and Framework Report.

[9] *See*, NOI Comments, at Section IV.B.

reliability and system restoration.

The Commission's proposed revisions would supplement NERC's current Reliability Standard requirements and ongoing assessments of the potential need for additional Reliability Standard requirements. NERC Reliability Standard BAL-003-1.1 currently requires Balancing Authorities ("BAs") and Frequency Response Sharing Groups ("FRSGs") to take action to ensure sufficient frequency response. On December 1, 2016, all requirements in BAL-003-1.1 became enforceable. Consistent with Commission directive, NERC also continues to examine whether it is necessary or appropriate to revise its Reliability Standards to impose primary frequency response requirements on existing resources. With the support of industry subject matter experts, NERC continues to study frequency response issues and develop guidance to enhance frequency response capability where possible. As discussed in the NOPR and NOI Comments, these projects include, for example, NERC's 2015 industry Advisory, Operating Committee Reliability Guideline: Primary Frequency Control ("OC Guidelines"), and Forward-Looking Frequency Response Assessment.[10] NERC remains on schedule to address the adequacy of primary frequency response resources and potential enhancements to Reliability Standards in the BAL-003-1.1 informational filing. These initiatives and studies demonstrate NERC's commitment to identifying and demonstrating the need for frequency response *capability* at the resource level, as well as frequency response *performance* at the system level.

[10] *See e.g.*, NOPR, at PP 14-16; *and* NOI Comments, at Section IV.B.

A. The NOPR's proposed revisions to the *pro forma* LGIA and the *pro forma* SGIA are consistent with NERC reliability assessments.

The NOPR proposes to revise the *pro forma* LGIA and the *pro forma* SGIA to require that newly interconnecting generation install, maintain, and operate primary frequency response capability under certain minimum operating conditions consistent with NERC OC Guidelines.[11]

The Commission's proposed revisions to the *pro forma* interconnection agreements are consistent with the results of recent NERC reliability assessment recommendations. As detailed in NERC's NOI Comments, NERC has determined that increasing levels of non-synchronous resources installed without controls that enable frequency response capability, coupled with retirement of conventional resources that have traditionally provided primary frequency response, has contributed to the decline in primary frequency response.[12] Moreover, a changing resource mix will further alter the dispatch of resources and combinations of resources across the daily and seasonal demand spectrum, potentially resulting in systems operating states where frequency response capability could be diminished unless a sufficient amount of frequency responsive capacity is included in the dispatch.[13]

To mitigate this risk, the NOPR's proposed revisions would apply measurable, clear requirements, such as those anticipated in the NOI Comments, to newly interconnecting synchronous and non-synchronous resources in a fair and equitable manner that should lead to tighter control and frequency stability.[14] In addition, the NOPR's proposed minimum operating conditions should help ensure that frequency response capability is installed as well as available and ready to respond, regardless of the mix of resources in the dispatch. Such requirements for

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11 NOPR, at PP 43-56 (describing the Commission's proposals in detail).
12 NOI Comments, at Section IV.A.
13 *Id.*
14 NOI Comments, at Section IV.C.1.

the capability of "timely and sustained response to frequency deviations"[15] should promote reliability and help avoid a scenario where the transforming resource mix reduces frequency response capability.

In addition, NERC supports the Commission's proposal to incorporate NERC's OC Guidelines regarding droop and deadband settings and coordination between governor and plant control systems within Sections 9.6.4 and 1.8.4 of the modified *pro forma* LGIA and *pro forma* SGIA, respectively.[16] NERC also notes that the Commission should consider modifying the *pro forma* LGIA and the *pro forma* SGIA to reflect the OC Guideline recommendation that deadbands be implemented without a step to the droop curve, i.e. once outside the deadband the change in output starts from zero and then increases proportionally to interconnection frequency error. As explained in NERC's NOI Comments, the OC Guidelines reflect the most advanced set of continent-wide best practices and information available in support of frequency response capability.[17] NERC also supports the Commission's proposal that primary frequency response capability be tested and confirmed during commissioning.

NERC further suggests the Commission consider requiring Interconnection Customers, as defined in the *pro forma* LGIA and the *pro forma* SGIA, to also provide to relevant BAs, as requested, (i) the status and settings of the governor or equivalent controls and plant level controls; and (ii) situations where the Interconnection Customer needs to operate its generation facility with the governor or equivalent controls and plant level controls not in service. The BA is the entity that has a compliance obligation for providing frequency response. Therefore, it needs to know the status and settings of the governor or equivalent controls and plant level

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15 NOPR, at P 44.
16 NOPR, at PP 52-53.
17 NOPR, at P 31 (describing NERC's NOI Comments).

controls in order to assess whether there is an appropriate amount of frequency reserve available. Providing this information would support BA and FRSG efforts to help ensure sufficient frequency response and their compliance with Reliability Standard BAL-003-1.1.

NERC agrees with the Commission's proposal not to impose a generic headroom requirement at this time. NERC believes there are two facets to helping ensure adequate primary frequency response for an interconnection. First, you must have generation resources that have installed frequency response capability. Second, you must have a generation dispatch that results in an adequate amount of unloaded frequency responsive generation (headroom) or other frequency responsive resources connected to the system at all times. The proposed revisions to the *pro forma* LGIA and *pro forma* SGIA that require primary frequency response capability on newly connected generation will address the first facet. NERC Reliability Standard BAL-003-1.1 currently addresses the second facet. BAs are the responsible entities for ensuring load and generation balancing. BAs are obligated through BAL-003-1.1 to ensure they have adequate headroom on their operating generation or other frequency responsive resources available within their real-time generation dispatch to meet their frequency response obligation. This approach would require headroom on every generator.

B. NERC is continuing to study whether Reliability Standards should impose frequency response requirements on existing resources.

In proposing revisions to the *pro forma* LGIA and the *pro forma* SGIA, the Commission also requests comment whether it should direct modifications to NERC Reliability Standards or the *pro forma* OATT to impose primary frequency response requirements on existing resources.[18]

[18] NOPR, at P 57.

As discussed in NERC's NOI Comments, it is too soon after the implementation of Reliability Standard BAL-003-1.1 to determine whether additional primary frequency response performance or capability requirements for existing resources are necessary or appropriate for inclusion in NERC Reliability Standards. Effective 2016, Reliability Standard BAL-003-1.1, Requirement R1, requires that BAs and FRSGs achieve an annual frequency response measure ("FRM") to meet their frequency response obligation ("FRO") ensuring sufficient frequency response performance in the interconnection.[19] Consistent with Commission directive,[20] NERC has already begun investigating how BAL-003-1.1 may be influencing frequency response performance and capability and whether enhancements to Reliability Standards are necessary.

NERC continues to analyze frequency response issues with the help of stakeholders developing approaches to support frequency response capability. Various NERC initiatives to study and support primary frequency response capability are discussed in NERC's NOI Comments.[21] NERC appreciates this opportunity to provide an update on such projects and explain how they are contributing to greater understanding regarding frequency response needs across the BPS. Since its NOI Comments, NERC has (i) co-hosted a well-attended frequency response workshop with the North American Generator Forum ("NAGF") at NERC's Washington, D.C. Office; (ii) continued work on the Forward-Looking Frequency Response Assessment described in NERC's NOI Comments; (iii) initiated frequency response generator surveys including hosting a survey webinar with support from the NERC OC's Resource Subcommittee ("RS") and NAGF; (iv) begun work on an FRSG Guideline; and (v) begun

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[19] The interconnection frequency response obligation ("IFRO") is calculated on an annual basis to set a required level of response to ensure that frequency excursions caused by loss of large-scale resources do not cause load shedding by under-frequency load shedding programs. Interconnection-level primary frequency response performance is measured against the IFRO to ensure adequate primary frequency controls.

[20] *See* Order No. 794 at P 3.

[21] *See e.g.*, NOI Comments, at Section IV.B.

analysis of frequency response calculations under BAL-003-1.1. More detail on these initiatives is immediately below.

First, on June 22 and 23, 2016, the NERC RS and NAGF co-hosted a Frequency Response Workshop to discuss the importance of frequency response, the history of frequency response initiatives, potential issues, and relevant NERC Reliability Standards. The workshop provided NERC, industry, and Commission staff an opportunity to ask questions about primary frequency response capabilities upon integration of a changing resource mix. Questions included, for example, how technologies and markets might adapt to enhance frequency response. This discussion has helped inform NERC and stakeholder studies, such as the Forward-Looking Frequency Response Assessment.

Second, throughout 2016, NERC has continued working on the Forward-Looking Frequency Response Assessment. The assessment analyzes the potential effects of the changing resource mix on primary frequency response performance over a five-year period. Studies under the assessment include potential scenarios and sensitivities associated with the projected future change in resource mix. NERC is using an interconnection-wide dynamic case[22] to develop the five-year assessment on frequency response performance. Efforts remain on track for an interim study report in 2017.

In addition, at the September 2016 OC meeting, the OC approved an RS initiative to survey generators to support analysis of frequency response in the Eastern, Western, and Quebec Interconnections and enhance dynamic modeling. On December 8, 2016, NERC hosted a webinar, with support from the RS and NAGF, regarding the then-planned generator surveys. These surveys should enhance information gathering regarding primary frequency response

[22] The Eastern Interconnection Reliability Assessment Group – Multi-Regional Modeling Working Group (MMWG) creates these interconnection-wide base-cases.

resource capability at an interconnection level and Generator Owner and Generator Operator efforts to obtain primary frequency response capability. Data gathered through this project should be materially beneficial to NERC's frequency response studies.

The OC continued to work on frequency response issues during its December 2016 meeting. Notably, the OC approved the modification of its Operating Reserve Management Guideline to include guidelines for Frequency Response Sharing Groups.

Further, NERC continues its analysis of BAL-003-1.1 calculations, including IFRO and FRO and the use of median versus linear regression methods to determine frequency response obligations and frequency response measurements.

NERC will publicly post the results of its studies as available and continue actively working with stakeholders to develop guidance as analysis continues.

III. CONCLUSION

Wherefore, for the reasons stated above and in NERC's NOI Comments, NERC supports the NOPR. In addition, NERC appreciates this opportunity to affirm its commitment to examining primary frequency response issues and to provide the status of various NERC frequency response projects. NERC will continue to analyze the impacts of the changing resource mix on frequency response and evaluate whether additional frequency response requirements are necessary for existing resources. NERC will report on this analysis in its informational filing on NERC Reliability Standard BAL-003-1.1 due July 1, 2018 and will continue to apprise the public on frequency response-related findings as they develop.

Respectfully submitted,

/s/ Marisa Hecht

Shamai Elstein
Senior Counsel
Candice Castaneda
Counsel
Marisa Hecht
Counsel
North American Electric Reliability Corporation
1325 G Street, N.W., Suite 600
Washington, DC 20005
(202) 400-3000
(202) 644-8099 – facsimile
shamai.elstein@nerc.net
candice.castaneda@nerc.net
marisa.hecht@nerc.net

Counsel for the North American Electric Reliability Corporation

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CERTIFICATE OF SERVICE

I hereby certify that I have served a copy of the foregoing document upon all parties listed on the official service lists compiled by the Secretary in Docket No. RM16-6-000.

Dated at Washington, DC this 24th day of January, 2017.

/s/ Courtney M. Baughan

Courtney M. Baughan
Legal Assistant
North American Electric Reliability Corporation
1325 G Street, N.W., Suite 600
Washington, DC 20005
(202) 400-3000
courtney.baughan@nerc.net