UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Frequency Response and Frequency Bias Setting Reliability Standard Market Implications of Frequency Response and Frequency Bias Setting Requirements	Docket Nos. RM13-11-000 & AD13-8-000

COMMENTS OF THE ELECTRICITY CONSUMERS RESOURCE COUNCIL (ELCON)

The Electricity Consumers Resource Council (ELCON) appreciates the opportunity to comment on the Commission's *Notice of Proposed Rulemaking* (NOPR) to approve a NERC Reliability Standard that defines the necessary amount of Frequency Response needed for reliable operations for each Balancing Authority within an Interconnection, and to assess the potential market and commercial impacts of certain requirements of the Reliability Standard. ELCON is the national association representing large industrial consumers of electricity. ELCON member companies produce a wide range of products from virtually every segment of the manufacturing community. ELCON members operate hundreds of major facilities and are consumers of electricity in the footprints of all organized markets and other regions throughout the United States. Accordingly, ELCON members have a substantial interest in the efficient and reliable function of the electric grid.

On March 29, 2013, NERC filed a petition with the Commission for the approval of proposed Reliability Standard BAL-003-1 (Frequency Response and Frequency Bias Settings). The specific goal of BAL-003-1is to ensure that each of the Interconnections have sufficient Frequency Response to guard against under-frequency load shedding (UFLS) due to an event in that Interconnection. BAL-003-1would ensure that Balancing

Authorities (BAs) provide Frequency Response necessary to ensure that frequency does not reach the point where coordinated UFLS relays are set to curtail loads. BAL-003-1 includes requirements for the measurement and provision of Frequency Response, filling a gap in NERC's current standards, and it would establish a minimum Frequency Response Obligation for each BA, provide a uniform calculation of Frequency Response, establish Frequency Bias Settings with values closer to actual BA frequency response, and encourages coordinated automatic generation control (AGC) operation.

On July 18, 2013, the Commission issued a NOPR that proposes to approve BAL-003-1. The NOPR also proposed to require NERC to submit an analysis of the availability of frequency response resources during the first year of BAL-003-1's implementation. If BAs are unable to meet their obligations, NERC will be required to recommend changes to improve compliance. The NOPR also proposes to require NERC to revise BAL-003-1 to address concerns over the withdrawal of Primary Frequency Response before activation of Secondary Frequency Response. The premature withdrawal can lead to under-frequency load shedding and possible cascading outages.

Also on July 18, 2013, the Commission issued concurrently a *Notice of Request for Comments* (Notice) in Docket Number AD13-8-000 ("Market Implications of Frequency Response and Frequency Bias Setting Requirements"). The Notice seeks comment on potential market and commercial impacts of certain requirements in BAL-003-1. Specifically, these are (1) allowing the minimum Frequency Bias Setting to be different than actual frequency response for prolonged periods; (2) not accounting for transmission limitations and historical flows when calculating each BA's Frequency Response Obligation; and (3) crediting the entire Western Interconnection for load resources. One possible market implication mentioned in the Notice is consideration of the need for compensation for the provision of frequency response services.

Executive Summary

ELCON supports the Commission's proposed approval of BAL-003-1. We believe that in the context of Primary, Secondary and Tertiary Frequency Controls, existing or pending NERC Reliability Standards are sufficient to assure compliance by Balancing Authorities. Among the various directives proposed in the NOPR, ELCON supports the directive that NERC submit a report within 15 months after implementation of BAL-003-1 that provides an analysis of the availability of resources for each BA to meet its Frequency Response Obligation during the first year of implementation. We also recommend that, going forward, the analysis be done on a regular basis.

However, there is evidence of a steady decline in Frequency Response in each of the Interconnection. Past industry unbundling and public policies intended to expand the use of variable energy resources (such as wind and solar) and distributed generation contribute to the declining turbine-generator resource base that traditionally provides Frequency Response. ELCON urges the Commission to direct the establishment of a workable scheme for compensation of Frequency Response that also allows the deployment of non-traditional resources such as demand response.

Introduction

Frequency Response is a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load. It is typically provided by the automatic and autonomous actions of turbine governors with some response being provided by changes in demand (primarily from synchronous motors). Frequency Response is one of three critical components of frequency control necessary for the reliable operation of the Bulk Power System, particularly during disturbances and restoration. Power system operators manage or control frequency primarily through adjustments to the output of generators with the goal of restoring balance between generation and load. According to NERC, 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.

Frequency control can be divided into four specific resources with different but over-lapping timeframes:[1]

- Primary Frequency Control (i.e., Frequency Response) – Actions provided by the Interconnection to arrest and stabilize frequency in response to frequency deviations. Primary Control comes traditionally from the inertial response of automatic generator governors, load response (typically from synchronous motors), and other devices that provide an immediate response based on local (device-level) control systems. The timeframe is zero to 30 seconds.
- Secondary Frequency Control (Regulation Service) [2] – Actions provided by an individual Balancing Authority or its Reserve Sharing Group to correct the resource-load unbalance that created the original frequency deviation, which will restore both Scheduled Frequency and Primary frequency response. Secondary Control comes from either manual or automated dispatch from a centralized control system and includes both Spinning and Non-Spinning Reserves. The timeframe is 0.5 seconds to 20 minutes.
- Tertiary Frequency Control (Imbalance/Reserves) – Actions provided by Balancing Authorities on a balanced basis that are coordinated so there is a net-zero effect on area control error (ACE). Examples of Tertiary Control include dispatching generation to serve native load, economic dispatch, dispatching generation to affect interchange, and re-dispatching generation. Tertiary Control actions are intended to replace Secondary Control Response by reconfiguring reserves. The time-frame is 20 minutes or greater.

---

[1] North American Electric Reliability Corporation, Frequency Response Initiative Report: The Reliability Role of Frequency Response, October 30, 2012, at 9. Also, North American Electric Reliability Corporation, Balancing and Frequency Control, January 26, 2011, at 11-14.

[2] Secondary Frequency Control is called by a variety of names depending on the ISO or RTO. Regulation Reserve (Regulation Up and Regulation Down), Regulation Services (Reg Service-Up and Reg Service-Down), Regulation, and Regulating Reserve are the terms currently in use.

- Time Control – This includes small offsets to scheduled frequency to keep long-term average frequency at 60 Hz. The timeframe is in hours.

BAL-003-1 would establish a minimum Frequency Response Obligation for each BA, provides a uniform calculation of Frequency Response, establishes Frequency Bias Settings that establish values closer to actual Balancing Authority Frequency Response, and encourages coordinated AGC operation. BAL-003-1 consists of four requirements, and is applicable to BAs and Frequency Response Sharing Groups (i.e., groups whose members consist of two or more BAs that collectively maintain, allocate, and supply operating resources required to jointly meet the sum of the Frequency Response Obligations of its members). In addition to these requirements, the BAL-003-1 package includes four new or modified definitions for addition to the NERC Glossary, Violation Risk Factors and Violation Severity Levels, an implementation plan, and retirement of currently-effective BAL-003-0.1b.

NERC proposes to define Frequency Response Obligation as "[t]he Balancing Authority's share of the required Frequency Response needed for the reliable operation of an Interconnection. This will be calculated as MW/0.1Hz." NERC proposes to revise the definition of Frequency Bias Setting as "[a] number, either fixed or variable, usually expressed in MW/0.1 Hz, included in a Balancing Authority's Area Control Error equation to account for the Balancing Authority's inverse Frequency Response contribution to the Interconnection, and discourage response withdrawal through secondary control systems."[3]

These matters are not addressed in any currently-effective Reliability Standard. The Commission proposes to approve BAL-003-1 because it addresses an important reliability gap, and also because it responses to certain directives from Order No. 693.[4]

---

[3] Frequency Bias Setting is a secondary control setting of the AGC system, not a primary control parameter, and changes in the Frequency Bias Setting of a BA do not change the primary frequency response. NOPR at P12.

[4] In Order No. 693, issued on March 16, 2007, the Commission approved 83 of107 proposed "Version Zero" Reliability Standards, including BAL-003-0. That order also directed NERC to address certain issues identified by FERC

However, the Commission's proposed approval of BAL-003-1 (as filed by NERC) is subject to certain conditions. These conditions are meant to address the following concerns: (1) Requirement R1, the calculation of Frequency Response Measure[5] by using the median statistical method, *i.e.*, selecting the middle value in a set of data that is arranged in an ascending or descending order; (2) the potential for early withdrawal of primary frequency response before secondary frequency response, *i.e.*, automatic generation control, is activated; (3) the need to study frequency response during low-load conditions; (4) appropriate identification of resource contingency criteria in the Western Interconnection; and (5) the need to adequately ensure that each BA has available the resources it needs to meet its frequency response obligation.

While the Commission proposes to approve BAL-003-1 in Docket No. RM13-11-000, it concurrently seeks comment in Docket No. AD13-8-000 on the potential market and commercial impacts of certain of the requirements of BAL-003-1. Specifically, the Commission seeks comment on the potential market and commercial impacts of:

- Allowing the minimum Frequency Bias Setting to be different than actual frequency response for prolonged periods, and how such impacts may be addressed in future versions of BAL-003-1, in market rules and tariffs, or by other means.
- Not accounting for transmission limitations and historical flows when calculating each BA's Frequency Response Obligation, and how such impacts may be addressed in future versions of BAL-003-1, in market rules and tariffs, or by other means.
- Crediting the entire Western Interconnection for load resources and how such impacts may be addressed in future versions of BAL-003-1, in market rules and tariffs, or by other means.

[5] NERC proposes to define Frequency Response Measure as "[t]he median of all the frequency response observations reported annually by Balancing Authorities or Frequency Response Sharing Groups for frequency events specified by the ERO. This will be calculated as MW/0.1Hz."

In addition, the Commission seeks information about any other market-related implications (*e.g.*, implications on the need for compensation for provision of frequency response services, impacts on availability of transmission capacity, energy or ancillary services to the market, etc.) of the requirements in BAL-003-1. The Commission is not proposing changes to BAL-003-1 regarding the market-related issues raised in the Notice. Instead, stakeholder comments are intended to inform the Commission's consideration of whether potential future actions are necessary under sections 205, 206 and/or 215(d)(5) of the Federal Power Act to coordinate the requirements of BAL-003-1 with tariffs and markets rules subject to the Commission's jurisdiction.

ELCON Comments

ELCON fully appreciates the concepts behind the need to provide adequate Frequency Response when generation or load is suddenly lost. We also are cognizant of the complexity in fine-tuning frequency performance over a wide area, and the difficulty in adequately measuring actual response against expected response. In our view, BAL-003-1 has established an effective framework that is both technically solid and consistently measurable. Therefore, ELCON supports the Commission's proposal to approve BAL-003-1.

In these comments, ELCON responds to the Commission's inquiries concerning the methods that BAs must apply to achieve Frequency Response and the premature withdrawal of primary frequency response. ELCON takes no position on the determination of Interconnection Frequency Obligation, the use of "median" in determining the Frequency Response Measure, the need for a "Light-Load Case Study," or the assignment of Violation Risk Factors and Violation Severity levels. ELCON also offers comments on potential market and commercial implications of the requirements in BAL-003-1 and some recommendations for dealing with the identified implications. In the short term, any concerns must rely heavily on the availability and performance of generation resources, and a proper mix of market-based compensation and standards-based compliance. In the longer term, other resources, particularly Demand Response

Resources, need to be deployed as the fleet of turbine-generators declines as a proportion of total resources. This may require a new taxonomy for ancillary services and ancillary service markets.

In order to properly address these subjects, ELCON separately addresses generator performance under primary, secondary, and tertiary response time frames – as each involves different control mechanisms. Since BAL-003-1 targets BA-level Frequency Response, we will first look at secondary and tertiary response. In each case, we point out that there are already mandatory reliability requirements in place or pending regulatory approval that assure generator availability. In addition, the organized wholesale electric markets all have some degree of ancillary services markets for compensating secondary and tertiary response, which provides further assurance of availability and cost effectiveness.

1. Secondary Frequency Response Is Adequately Addressed by NERC Reliability Standards (Including BAL-003-1) But the Provision of Regulation Services in Ancillary Services Markets Needs Further Development.

Secondary Frequency Response (Regulation) is primarily delivered through AGC – which is governed by NERC Standard BAL-005-0.2b. Since the control is in the hands of the BAs, the responsibility to ensure its operability remains with them.

In addition, TOP-003-1 calls for Generator Operators to coordinate planned outages with the Transmission Operator – who passes that information to the BA. As a practical matter, this information is simultaneously sent to both entities; as governed by Interconnection agreements and ISO operating protocols. This means that the BA is aware of all AGC capacity that will be unavailable due to planned maintenance well ahead of time – and can plan mitigating actions accordingly.

Lastly, PRC-024-1 is designed to ensure that Generator Operators are able to ride through specifically defined frequency deviations – which can best assure their availability when needed for secondary frequency response support. Once it takes

effect, a violation can be assessed for generators who drop off-line during a frequency (and voltage) transient within the standard's "no-trip zones".

In addition to these mandatory requirements, the Commission's landmark October 20, 2011 Order No. 755 on Frequency Regulation Compensation requires organized wholesale electric markets to ensure just and reasonable compensation for Frequency Regulation Service. The compensation is also required to account for the superiority of faster-ramping resources, the resource's opportunity costs, and performance that reflects the quantity of Frequency Regulation Service provided by a resource when the resource is accurately following the dispatch signal. To date, all seven of the organized markets have some form of ancillary services market for secondary frequency control.[6] However, only three ISOs and RTOs unbundle Regulation services into separate Regulation-Up and Regulation-Down, which expands the range of technologies available in the market with exception ramping capabilities.[7] Having separate markets for Regulation-Up and Regulation-Down better reflects system conditions.[8]

2. Tertiary Frequency Response Is Adequately Addressed by NERC Reliability Standards.

Tertiary Frequency Response is provided by System Operator dispatch – generally to predetermined spinning and non-spinning reserves. These reserve units are also subject to TOP-003-1 (and will be subject to PRC-024-1), assuring their availability when needed. In addition, performance incentives are built into ancillary services contracts for such services. If there is a need for emergency dispatch to

[6] Sandia National Laboratory, A Survey of Operating Reserve Market in US ISO/RTO-managed Electric Energy Regions, SAND2012-1000, September 2012 at 14.

[7] See, for example, Comments of Occidental Chemical Corporation and Occidental Permian LTD Regarding Notice of Proposed Rulemaking, Docket Nos. RM11-7-000 & AD10-11-000 ("Frequency Regulation Compensation in the Organized Wholesale Energy Markets"), at 2-3.

[8] Sandia at 15.

generators not part of the reserve pool, a Reliability Directive can be issued, which would subject the Generator Operator to potential penalties for non-action.

3. The Commission Needs to Address the Decline in Primary Frequency Response by Encouraging the Deployment of Non-Traditional Sources of Frequency Response and Establishing a Cost-Effective Compensation Scheme.

Primary Frequency Response is mostly driven by generator governors – and is probably the most crucial element related to electric system reliability. During the early moments of a frequency event, these mechanisms must quickly offset fluctuating real-power flows until AGCs can be engaged.

As with Secondary/Tertiary Frequency Response, generator availability is assured through PRC-024-1 and TOP-003-1. In addition, MOD-027-1 – also pending the Commission's approval – requires regular validations of a generator's frequency performance. Specifically, MOD-027-1 calls for the real time performance to be measured during an actual event or test, which assures that the governor is online and operating within specified parameters.

According to NERC there is evidence of a steady decline in Frequency Response in the three Interconnections going back to 1991, when NERC approached the Electric Power Research Institute (EPRI) with a request to investigate the phenomenon.[9] NERC claims that there is no confirmed reason for the decline, although it is widely understood that the following factors may contribute now or in the future:

- The withdrawal of primary frequency response by turbine-generator control systems using setpoint output targets for generator output. Typically these are "outer-loop control systems" that defeat the primary frequency response of the governors after a short time to return the unit to its economically committed MW output. This was the subject of the 1992 EPRI study.[10]

[9] North American Electric Reliability Corporation, Frequency Response Initiative Report: The Reliability Role of Frequency Response, October 30, 2012, at 22. The EPRI study was completed in 1992.

[10] *Id.* at 31.

- The displacement of traditional turbine-generators in the dispatch queue to accommodate wind generation in light-load conditions.[11]
- The growing market share of renewable energy resources (*e.g.*, solar and wind) that do not have an inertial response.[12]
- The loss of load damping factor by the replacement of synchronous motors (which have an inertial response) by variable speed motors.[13]
- The growth in distributed generation. Power systems with multiple smaller turbine generators have less rotational inertial than systems with fewer but larger turbine generators.[14]
- Competitive pressures to reduce generation reserves.[15]

These factors can probably be viewed as the unintended consequences of industry unbundling and public policies promoting variable energy and distributed resources. To the extent that these factors cause the problem of declining Frequency Response to persist and increase in the future, it is imperative that new sources of Frequency Response be deployed. ELCON urges the Commission to address this growing problem.

Specifically, there is a pressing need for a market for Primary Frequency Response market. This could take the form of an additional ancillary service, or a monthly reconciliation similar to that used to balance out inadvertent interchange. The BA and the Generator Operator will be highly incentivized in either scenario to ensure that governor response is available when needed, and in the most efficient manner. But this market needs to be expanded to allow participation by non-traditional resources such as demand response.

---

[11] *Id.* at 38-39.

[12] *Id.* at 38.

[13] *Id.* at 38.

[14] National Energy Technology Laboratory, Frequency Instability Problems in the North American Interconnections, DOE/NETL-2011/1473, May 2011, at 5.

[15] Id. at 6.

4. ELCON Supports the Commission's Directive That NERC Prepare An Analysis of the Availability of Resources for Each Balancing Authority to Meet Its Frequency Response Obligation.

BAL-003-1 would impose an obligation on each BA to obtain Frequency Response, and a BA not meeting this obligation would not be in compliance with BAL-003-1. However, the BAs must obtain Frequency Response from available resources, and BAL-003-1 would impose no obligation on those resources to provide the service. 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 BA to meet its Frequency Response Obligation during BAL-003-1's first year of implementation. The report should also provide data indicating whether actual Frequency Response was sufficient to meet each BA's Frequency Response Obligation. Further, upon completion of this analysis, should the findings indicate that the Frequency Response Obligation was not met, NERC should provide appropriate recommendations to ensure that frequency response can be maintained at all times within each Balancing Authority's footprint.

ELCON supports this directive and recommends that NERC perform the analysis on a regular basis thereafter to track changes in the types of resources that are providing Frequency Response. This type of time series data will be valuable for monitoring the success of the Commission's policies to promote the application of non-traditional resource (including demand response) to offset the anticipated decline in turbine-generation.

Conclusion

As discussed in these comments, ELCON:

(1) supports the Commission's approval of BAL-003-1 and the proposed directive that NERC submit a report within 15 months after implementation of BAL-003-1 that provides an analysis of the availability of resources for each BA to meet its

Frequency Response Obligation during the first year of implementation; further, such analysis should be done on a regular basis going forward; and

(2) urges the Commission to direct the establishment of a workable scheme for compensation of Frequency Response that allows the deployment of non-traditional resources such as demand response.

NOTICES AND COMMUNICATIONS

Notices and communications with regard to these proceedings should be addressed to:

John P. Hughes
Vice President, Technical Affairs
ELECTRICITY CONSUMERS RESOURCE COUNCIL
1111 Nineteenth Street, NW, Suite 700
Washington, DC 20036
Email: jhughes@elcon.org
Phone: (202) 682-1390

W. Richard Bidstrup
CLEARY GOTTLIEB STEEN & HAMILTON LLP
2000 Pennsylvania Avenue, NW, Suite 900
Washington, DC 20006
Email: rbidstrup@cgsh.com
Phone: (202) 974-1500

Respectfully submitted,
/s/ W. RICHARD BIDSTRUP
W. Richard Bidstrup
CLEARY GOTTLIEB STEEN & HAMILTON LLP
2000 Pennsylvania Avenue, N.W., Suite 900
Washington D.C. 20006
Counsel for ELCON

Dated: September 27, 2013

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary of this proceeding.

Dated at Washington, D.C.: September 27, 2013

/s/ W. RICHARD BIDSTRUP
W, Richard Bidstrup