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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

Docket No. RM16-6-000

Essential Reliability Services and the Evolving Bulk-Power System—Primary Frequency
Response

Notice of Request for Supplemental Comments

(August 18, 2017)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Notice of Request for Supplemental Comments.

SUMMARY: On November 17, 2016, the Federal Energy Regulatory Commission (Commission) issued a Notice of Proposed Rulemaking (NOPR) that, among other things, proposed to revise the Commission's regulations to require all newly interconnecting large and small generating facilities, both synchronous and non-synchronous, to install and enable primary frequency response capability as a condition of interconnection. In this notice, the Commission seeks supplemental comments related to whether and when electric storage resources should be required to provide primary frequency response, and the costs associated with primary frequency response capabilities for small generating facilities.

DATES: Comments are due [**Insert date 21 days after publication in the FEDERAL REGISTER**].

ADDRESSES: You may submit comments, identified by Docket No. RM16-6-000, by any of the following methods:

- Electronic filing through <http://www.ferc.gov>. Documents created electronically using word processing software should be filed in native applications or print-to-PDF format and not in a scanned format. Commenters filing electronically do not need to make a paper filing.
- Mail/Hand Delivery: Commenters unable to file comments electronically may mail or hand deliver comments to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street, NE, Washington, DC 20426.

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SUPPLEMENTARY INFORMATION:

160 FERC ¶ 61,011
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Essential Reliability Services and the Evolving Bulk-
Power System—Primary Frequency Response

Docket No. RM16-6-000

NOTICE OF REQUEST FOR SUPPLEMENTAL COMMENTS

(August 18, 2017)

1. On November 17, 2016, the Federal Energy Regulatory Commission (Commission) issued a Notice of Proposed Rulemaking (NOPR)¹ that proposed to modify the *pro forma* Large Generator Interconnection Agreement (LGIA) and the *pro forma* Small Generator Interconnection Agreement (SGIA), pursuant to its authority under section 206 of the Federal Power Act (FPA) to ensure that rates, terms and conditions of jurisdictional service remain just and reasonable and not unduly discriminatory or preferential.² As modified, the *pro forma* LGIA and *pro forma* SGIA would require all new large and small generating facilities, both synchronous and non-synchronous, to install, maintain, and operate equipment capable of providing primary frequency response as a condition of interconnection. The Commission also proposed certain operating requirements, including minimum requirements for droop and deadband

¹ *Essential Reliability Services and the Evolving Bulk-Power System—Primary Frequency Response*, Notice of Proposed Rulemaking, 81 FR 85176 (November 25, 2016), 157 FERC ¶ 61,122 (2016) (NOPR).

² 16 U.S.C. 824e (2012).

parameters, and requirements to ensure the timely and sustained response to frequency deviations in the *pro forma* LGIA and *pro forma* SGIA. In this notice, the Commission seeks supplemental comments related to whether and when electric storage resources should be required to provide primary frequency response, and the costs associated with primary frequency response capabilities for small generating facilities.

I. Background

2. Following a Notice of Inquiry (NOI) that explored a broad range of issues regarding primary frequency response and the evolving Bulk-Power System,³ the Commission issued the NOPR at issue in this proceeding. In the NOPR, the Commission explained that its proposals address concerns that the existing *pro forma* LGIA contains only limited primary frequency response requirements, and those requirements only apply to large synchronous generating facilities, and do not reflect recent technological advancements enabling new large and small non-synchronous generating facilities to install the capability to provide primary frequency response.⁴ Further, the Commission stated that to avoid establishing new requirements that could be unduly discriminatory or preferential, the proposed reforms would impose comparable primary frequency response requirements on both new large and small generating facilities.⁵ In addition, the

³ *Essential Reliability Services and the Evolving Bulk-Power System—Primary Frequency Response*, 154 FERC ¶ 61,117 (2016).

⁴ NOPR, 157 FERC ¶ 61,122 at PP 2, 11, 13.

⁵ *Id.* P 2.

Commission did not propose to: (1) apply these requirements to generating facilities regulated by the Nuclear Regulatory Commission; (2) impose a headroom requirement; or (3) mandate that new generating facilities receive compensation for complying with the proposed requirements, noting that a public utility is not prohibited from filing a proposal for primary frequency response compensation under FPA section 205,⁶ if it so chooses.⁷

3. In the NOPR, the Commission explained that the proposed requirements will help ensure adequate primary frequency response capability as the resource mix continues to evolve, with fair and consistent treatment for all types of generating facilities, and will help balancing authorities meet their frequency response obligations under NERC Reliability Standard BAL-003-1.1.⁸

II. Request for Comments

A. Electric Storage Resources

4. The NOPR proposals did not propose provisions specific to electric storage resources. Several commenters raise concerns that, by failing to address electric storage

⁶ 16 U.S.C. 824d (2012).

⁷ *Id.* PP 1, 55.

⁸ *Id.* P 43. In January 2014, the Commission approved Reliability Standard BAL-003-1 requiring balancing authorities to meet a minimum required Frequency Response Obligation. While Reliability Standard BAL-003-1 establishes requirements for balancing authorities, it does not impose requirements on individual generating facilities. *Frequency Response and Frequency Bias Setting Reliability Standard*, Order No. 794, 146 FERC ¶ 61,024 (2014).

resources' unique technical attributes, the NOPR requirements could pose an unduly discriminatory burden on electric storage resources. The Energy Storage Association (ESA) asserts that the proposed requirements could result in unique, adverse impacts on electric storage resources. Particularly, ESA states that the proposed use of nameplate capacity as the basis for primary frequency response service and the fact that electric storage resources are capable of operating at the full range of their capacity (i.e., they have no minimum set point) will require storage to provide a "greater magnitude of [primary frequency response] service than traditional generating facilities."⁹ ESA also explains that while traditional generating facilities would have no primary frequency response obligations while offline, electric storage resources are always online, even when not charging or discharging, and under the requirements proposed in the NOPR, they would therefore be required to provide primary frequency response on a more frequent basis than generating facilities that can go offline.¹⁰ Further, ESA explains that the optimal depth of discharge differs among various electric storage technologies, and exceeding the optimal depth of discharge accelerates the degradation of the facility and increases operations and maintenance costs.¹¹

5. To address its concerns, ESA requests that the Final Rule: (1) allow electric storage resources to specify a minimum set point for the purposes of primary frequency

⁹ ESA Comments at 4.

¹⁰ *Id.* at 3-4.

¹¹ *Id.*

response capability as a condition of interconnection; and (2) include inadequate state of charge as an operational constraint that would relieve electric storage resources from the sustained response requirement.¹² In the absence of these changes, ESA requests an exemption from the proposed primary frequency response requirements.¹³ In its comments, AES Companies (AES) seeks a complete exemption from the proposed NOPR requirements for electric storage resources.¹⁴ AES also asserts that a droop requirement of five percent would needlessly limit the contribution that electric storage resources that are specifically designed for primary frequency response can make to grid stability.¹⁵

6. In light of these concerns, the Commission seeks additional information to better understand the performance characteristics and limitations of electric storage resources, possible ramifications of the proposed primary frequency response requirements on electric storage resources, and what changes, if any, are needed to address the issues raised by ESA and others. Accordingly, the Commission seeks comment on the following questions:

¹² *Id.* at 4-5.

¹³ *Id.* at 5.

¹⁴ AES Comments at 17 and 19 (specifying changes to the proposed *pro forma* language).

¹⁵ *Id.* at 6-7.

1. Some commenters state that certain proposed requirements are not appropriate for electric storage resources, in particular, certain of the proposed settings related to droop (e.g., basing the droop parameter on nameplate capacity) and the requirement for timely and sustained response to frequency deviations.
 - a. Are there challenges or operational implications (e.g., unusual or excessive wear and tear) of requiring electric storage resources to implement the proposed operating settings for droop (including basing the droop parameter on nameplate capacity), deadband, and timely and sustained response? If so, please provide an explanation, and explain how these challenges are different than those faced by other synchronous and non-synchronous generating facilities.
 - b. Also, please explain whether and how possible impacts of the proposed requirements on electric storage resources vary by their state of charge, and whether those possible impacts are the same or different for all electric storage technologies. If these impacts vary by the type of electric storage technology, please elaborate.
 - c. If the proposed operating settings for droop, deadband, and sustained response would cause any operational or other concerns unique to electric storage resources that would justify different operating settings than those proposed in the NOPR, what minimum requirements for droop, deadband, and timely and sustained

response might be more appropriate for the effective provision of primary frequency response from electric storage resources? Or are there parameters other than those discussed in the NOPR (e.g., droop, deadband) that are more applicable to electric storage resources that could be used to accomplish effective timely and sustained primary frequency response? If so, what would those parameters be?

2. Are there risks associated with requiring electric storage resources, which are energy-limited, to provide timely and sustained primary frequency response, such as possible adverse effects on an electric storage resource's ability to fulfill other obligations (e.g., providing energy or other ancillary services)?
3. Please describe the relationship between electric storage resources being online and the provision of primary frequency response.
 - a. Are electric storage resources that are always online available on a more frequent basis to provide primary frequency response than generating facilities that start-up and shut-down (i.e., go offline)? If so, please elaborate on possible operational or other impacts, if any, that the proposed requirements may have on generating facilities that are always online, as compared to generating facilities that go offline.

- b. Please discuss whether it is possible to “turn off” an electric storage resource’s primary frequency response capability (i.e., disable the ability to respond to frequency deviations without physically disconnecting from the grid) when the electric storage resource is neither charging nor discharging and not providing other services (e.g., energy or other ancillary services) to the power system. To the extent possible, please explain if this ability would vary by the type of electric storage technology.
4. Please explain what is meant by “minimum set point” and elaborate on how and by whom it would be defined and determined.
 - a. Could possible adverse impacts of the proposed primary frequency response requirements on electric storage resources be minimized or eliminated, if owners/operators of such resources or another entity were allowed to establish a minimum set point for the provision of primary frequency response service? If so, please elaborate.
 - b. Would the primary frequency response requirements proposed in the NOPR result in electric storage resources that have no such minimum set point providing a greater magnitude of primary frequency response for a given frequency deviation than other generating facilities of equal nameplate capacity that have a minimum set point? Please provide an explanation as to why this is or is not the case.

- c. How and in what ways would the implementation of such a minimum set point change an electric storage resource's response to frequency deviations, as compared to other generating facilities that do not implement a minimum set point? As part of this explanation, please explain whether the implementation of a minimum set point would: (1) limit the provision of primary frequency response for electric storage resources to a megawatt (MW) range (i.e., between a minimum value and the nameplate capacity of the electric storage resource); (2) be used in lieu of nameplate capacity as the basis of the droop curve (i.e., reduce the expected proportional MW response to frequency deviations below that of other generating facilities of equivalent nameplate capacity for a given percentage droop (e.g., a 5 percent droop)); or (3) be used in some other way.
- d. If owners/operators of electric storage resources or another entity were allowed to establish a minimum set point for the purposes of primary frequency response:
- i. How would they determine the appropriate value of the minimum set point for a given electric storage resource? What technical characteristics or economic factors should be considered in establishing a minimum set point for the various types of electric storage resources?

- ii. Should the minimum set point be static, or dynamic and subject to change based on technical or other factors? If it is subject to change, please explain the factors that would warrant such changes.
 - iii. Should owners/operators of electric storage resources be required to specify in their interconnection agreements the value of the minimum set point and indicate whether it is static or dynamic? In what manner should this information be provided to the relevant balancing authority?
- 5. Please explain what is meant by “inadequate state of charge” and elaborate on how and by whom it would be defined and determined.
 - a. Could possible adverse impacts of the proposed primary frequency response requirements on electric storage resources be minimized or eliminated if owners/operators of such resources or another entity were allowed to define inadequate state of charge as an explicit operational constraint relieving electric storage resources from providing sustained response when in that “inadequate” state? If so, please elaborate.
 - b. If owners/operators of electric storage resources or another entity were allowed to define inadequate state of charge as an operational constraint for electric storage resources:

- i. How would they determine what level of charge is “inadequate” thus preventing electric storage resources from providing sustained primary frequency response output?
 - ii. Should the inadequate state of charge parameter be static, or dynamic and subject to change based on technical or other factors? If it is subject to change, please explain the factors that would warrant such changes.
 - iii. Should owners/operators of electric storage resources be required to specify in their interconnection agreements a parameter for “inadequate state of charge” and indicate whether it is static or dynamic? In what manner should this information be provided to the relevant balancing authority?
6. What impacts, if any, would owners/operators of electric storage resources experience if their resources are not allowed to maintain a specified range of state of charge?
 - a. Is there a certain range of state of charge (expressed as a percentage of total charge) that would enable an electric storage resource to provide primary frequency response without possible adverse impacts?
 - b. Would this range be the same for all electric storage resources, or would it depend on the particular technology of a given electric

storage resource and/or the duration that the resource could sustain its output?

- c. Are there differences in terms of adverse impacts on an electric storage resource depending on whether its state of charge is low (e.g., five percent remaining charge) or high (e.g., 98 percent remaining charge)? If so, please elaborate.
 - d. To the extent there are adverse impacts, would they differ for different electric storage technologies? If so, please elaborate.
7. In lieu of (1) establishing a minimum set point for electric storage resources and (2) including an inadequate state of charge as an operational constraint, could owners/operators of all or certain types of electric storage resources or another entity specify an operating range¹⁶ outside of which electric storage resources would not be required to provide and/or sustain primary frequency response to prevent adverse impacts on the electric storage resources?
- a. Would it be possible to base such an operating range on manufacturer specifications and, if so, would establishing such an operating range potentially address concerns about the harm to the

¹⁶ For the purposes of this notice, “operating range” is defined as minimum state of charge, maximum state of charge, maximum rate of charge, and maximum rate of discharge.

resource, degradation of its useful life, or other potential adverse impacts?

- b. Would it be possible to specify such an operating range at the time of interconnection and include the operating range in the interconnection agreement? By what means should the operating range be communicated to the relevant balancing authority?
8. Are there other mechanisms or ways to address the concerns raised by ESA and others on the proposed primary frequency response requirements instead of: (1) establishing a minimum set point and including an inadequate state of charge as an operational constraint; or (2) establishing an operating range as described above.

B. Small Generating Facilities

7. In the NOPR, the Commission proposed that small generating facilities be subject to new primary frequency response requirements in the *pro forma* SGIA. The Commission stated that the record indicates that small generating facilities are capable of installing and enabling governors at low cost in a manner comparable to large generating facilities.¹⁷

¹⁷ NOPR, 157 FERC ¶ 61,122 at P 41 (citing IEEE-P1547 Working Group Comments at 1, 5, and 7).

8. Some commenters raise concerns that small generating facilities could face disproportionate costs to install primary frequency response capability.¹⁸ For example, the Public Interest Organizations state that the Commission's discussion of the economic impact on small generating facilities of installing primary frequency response capability is limited, and claims the information in the NOPR does not directly support the Commission's conclusion that "small generating facilities are capable of installing and enabling governors at low cost in a manner comparable to large generating facilities."¹⁹ Public Interest Organizations encourage the Commission to further investigate the cost for small renewable energy generating facilities to install frequency response capability before making the proposed revisions to the *pro forma* SGIA.²⁰ National Rural Electric Cooperative Association (NRECA) asserts that the record is insufficient to conclude that the proposed primary frequency response capability requirement will not pose an undue burden on smaller generating facilities.²¹

9. Other commenters request that the Commission consider a size limitation. In particular, Idaho Power Company (Idaho Power), NRECA, and Tennessee Valley

¹⁸ Public Interest Organizations Comments at 3; NRECA Comments at 8.

¹⁹ Public Interest Organizations Comments at 3 (citing NOPR, 157 FERC ¶ 61,122 at P 42).

²⁰ *Id.* at 3-4.

²¹ NRECA Comments at 8.

Authority (TVA) request the Commission adopt a size limitation for applying the NOPR requirements.²²

10. To augment the record regarding the ability of small generating facilities to comply with the proposed primary frequency response requirements, and their potential economic impact, the Commission seeks comment on the following questions:

1. Are the costs for small generating facilities to install, maintain, and operate governors or equivalent controls proportionally comparable to the costs for large generating facilities? If costs are proportionally higher for small generating facilities to install, maintain, and operate governors or equivalent controls, what accounts for these higher costs? Quantify, to the extent possible, any general differences in these costs between small and large generating facilities.
2. If small generating facilities were required to comply with the proposed primary frequency response requirements, do recent technological advances in primary frequency response capability minimize or eliminate possible barriers to entry of small generating facilities? If not, in what specific ways could the proposed requirements be a barrier to entry? Should such negative impacts occur, please discuss means by which the Commission could potentially mitigate or eliminate them?

²² Idaho Power Comments at 2; NRECA Comments at 8; TVA Comments at 3-4.

3. Is an exemption appropriate for all or a subset of small generating facilities based on possible disproportionate cost impacts of installing the capability to provide primary frequency response? If so, please provide specific cost data demonstrating that is the case.
4. Given their increasing market penetration and operational role in the Bulk-Power System, please discuss the extent to which small generating facilities are necessary to ensure adequate primary frequency response.
5. Please discuss whether PJM Interconnection, L.L.C.'s (PJM's) recent changes to its interconnection agreements, which require new large and small non-synchronous generating facilities to install enhanced inverters that include primary frequency response capability,²³ address concerns regarding possible disproportionate costs or barriers resulting from applying the NOPR proposals to the entire set of small generating facilities. If yes, please discuss the viability of applying PJM's approach in other regions.

III. Comment Procedures

11. The Commission invites interested persons to submit comments on the matters and issues proposed in this notice to be adopted, including any related matters or alternative proposals that commenters may wish to discuss. Comments are due **[INSERT DATE 21 days after publication in the FEDERAL REGISTER]**. Comments must refer to

²³ See NOPR, 157 FERC ¶ 61,122 at P 42 (citing *PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,097, at P 28 (2015)).

Docket No. RM16-6-000, and must include the commenter's name, the organization they represent, if applicable, and their address in their comments.

12. The Commission encourages comments to be filed electronically via the eFiling link on the Commission's web site at <http://www.ferc.gov>. The Commission accepts most standard word processing formats. Documents created electronically using word processing software should be filed in native applications or print-to-PDF format and not in a scanned format. Commenters filing electronically do not need to make a paper filing.

13. Commenters that are not able to file comments electronically must send an original of their comments to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street NE, Washington, DC 20426.

14. All comments will be placed in the Commission's public files and may be viewed, printed, or downloaded remotely as described in the Document Availability section below. Commenters on this proposal are not required to serve copies of their comments on other commenters.

IV. Document Availability

15. In addition to publishing the full text of this document in the Federal Register, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through FERC's Home Page (<http://www.ferc.gov>) and in FERC's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, NE, Room 2A, Washington DC 20426.

16. From FERC's Home Page on the Internet, this information is available on eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number excluding the last three digits of this document in the docket number field.

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By direction of the Commission.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.

Document Content(s)

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