189 FERC ¶ 61,212
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 40

[Docket No. RM25-3-000]

Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through for Inverter-Based Resources

(Issued December 19, 2024)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Notice of proposed rulemaking.

SUMMARY: The Federal Energy Regulatory Commission (Commission) proposes to approve proposed Reliability Standards PRC-024-4 (Frequency and Voltage Protection Settings for Synchronous Generators, Type 1 and Type 2 Wind Resources, and Synchronous Condensers) and PRC-029-1 (Frequency and Voltage Ride-through Requirements for Inverter-Based Resources), which the North American Electric Reliability Corporation submitted in response to Commission directives. The Commission seeks comments on all aspects of the proposed approval.

DATES: Comments are due **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Comments, identified by docket number, may be filed in the following ways. Electronic filing through http://www.ferc.gov, is preferred.

- Electronic Filing: Documents must be filed in acceptable native applications and print-to-PDF, but not in scanned or picture format.

- For those unable to file electronically, comments may be filed by USPS mail or by hand (including courier) delivery.
    - Mail via U.S. Postal Service Only: Addressed to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street, N.E., Washington, DC 20426.
    - Hand (including courier) delivery: Deliver to: Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, MD 20852.

FOR FURTHER INFORMATION CONTACT:

Syed Ahmad (Technical Information)
Office of Electric Reliability
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426
(202) 502 8718
Syed.Ahmad@ferc.gov

Boris Voynik (Technical Information)
Office of Electric Reliability
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426
(202) 502 8902
Boris.Voynik@ferc.gov

Felicia West (Legal Information)
Office of General Counsel
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426
(202) 502 8948
Felicia.West@ferc.gov

Hampden T. Macbeth (Legal Information)
Office of General Counsel
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426
(202) 502 8957
Hampden.Macbeth@ferc.gov

SUPPLEMENTARY INFORMATION:

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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through for Inverter-Based Resources — Docket No. RM25-3-000

NOTICE OF PROPOSED RULEMAKING

(Issued December 19, 2024)

1. Pursuant to section 215(d)(2) of the Federal Power Act (FPA),[1] the Commission proposes to approve the addition of the newly defined term "Ride-through" to the North American Electric Reliability Corporation (NERC) Glossary of Terms and to approve the proposed Protection and Control (PRC) Reliability Standards PRC-024-4 (Frequency and Voltage Protection Settings for Synchronous Generators, Type 1 and Type 2 Wind Resources, and Synchronous Condensers)[2] and PRC-029-1 (Frequency and Voltage Ride-through Requirements for Inverter-Based Resources (IBR)). We also propose to approve the associated violation risk factors, violation severity levels, implementation plans, and effective dates for proposed Reliability Standards PRC-024-4 and PRC-029-1, as well as to approve the retirement of currently effective Reliability Standard PRC-024-3.

2. In Order No. 901, the Commission directed NERC to develop new or modified Reliability Standards addressing, among other things, reliability gaps associated with

[1] 16 U.S.C. 824o(d)(2).

[2] Type 1 and type 2 wind resources are not inverter-based wind turbine generators. Rather, type 1 and type 2 wind resources rely on passive induction generators with limited ability to control active power, reactive power, or voltage. NERC, *Reliability Guideline: Power Plant Model Verification for Inverter-Based Resources*, vii, ix (Sept. 2018), https://www.nerc.com/comm/RSTC_Reliability_Guidelines/PPMV_for_Inverter-Based_Resources.pdf.

IBRs tripping or entering momentary cessation in aggregate.[3] Specifically, Order No. 901 directed NERC to submit by November 4, 2024 new or modified Reliability Standards that establish IBR performance requirements, including requirements addressing frequency and voltage ride through, post disturbance ramp rates, phase lock loop synchronization, and other known causes of IBR tripping or momentary cessation.[4]

3. NERC submitted the proposed Reliability Standards in response to Commission directives in Order No. 901.[5] The purpose of proposed Reliability Standard PRC-024-4 "is to ensure that protection of synchronous generators, type 1 and type 2 wind resources, and synchronous condensers do not cause tripping during defined frequency and voltage excursions in support" of the Bulk-Power System."[6] The purpose of proposed Reliability Standard PRC-029-1 is to "ensure that IBRs Ride-through disturbances to support the Bulk-Power System . . . during and after defined frequency and voltage excursions."[7] We seek comments on all aspects of the proposed approvals.

4. We propose to find that proposed Reliability Standards PRC-024-4 and PRC-029-1 are consistent with and responsive to applicable directives in Order No. 901 in

[3] *Reliability Standards to Address Inverter-Based Resources*, Order No. 901, 88 FR 74250 (Oct. 30, 2023), 185 FERC ¶ 61,042 (2023).

[4] *Id.* PP 7, 56, 190, 229.

[5] *See generally supra* n.3.

[6] NERC Petition at 51.

[7] *Id.* at 24. The Bulk-Power System is defined in the FPA as facilities and control systems necessary for operating an interconnected electric energy transmission network (or any portion thereof); and electric energy from generating facilities needed to maintain transmission system reliability. The term does not include facilities used in the local distribution of electric energy. 16 U.S.C. 824o(a)(1).

requiring generator owners of IBRs to ride through frequency and voltage excursions, such as a fault on the transmission or sub-transmission system.

5. In addition, we propose to direct NERC to develop and submit two informational filings 12 months and 24 months after the conclusion of NERC's proposed 12-month exemption request period for existing IBRs. Proposed Reliability Standard PRC-029-1 includes a provision that allows existing IBRs that are already in operation when proposed Reliability Standard PRC-029-1 goes into effect (legacy IBRs) to obtain an exemption to the voltage and frequency Ride-through requirements if hardware replacements would be necessary to comply. The Commission seeks to understand the volume of exemptions, the circumstances in which entities have invoked the exemption provision, and ultimately to understand what if any effect the exemption provision has on the efficacy of Reliability Standard PRC-029-1. Therefore, we propose to direct that NERC submit two informational filings that provide details on requested exemptions from generator owners of legacy IBRs for frequency and/or voltage Ride-through requirements.

I. Background

A. Section 215 and Mandatory Reliability Standards

6. Section 215 of the FPA provides that the Commission may certify an Electric Reliability Organization (ERO), the purpose of which is to develop mandatory and enforceable Reliability Standards, subject to Commission review and approval.[8] Reliability Standards may be enforced by the ERO, subject to Commission oversight, or

[8] 16 U.S.C. 824o(c).

by the Commission independently.[9] Pursuant to section 215 of the FPA, the Commission established a process to select and certify an ERO,[10] and subsequently certified NERC.[11]

B. Order No. 901

7. In Order No. 901, the Commission explained, among other things, that the majority of installed IBRs use grid-following inverters, which can track grid state parameters (e.g., voltage angle) in milliseconds and react nearly instantaneously to changing grid conditions.[12] The Commission then explained that, as found by multiple NERC reports,[13] some IBRs "are not configured or programmed to support grid voltage and frequency in the event of a system disturbance, and, as a result, will reduce power output, exhibit momentary cessation, or trip in response to variations in system voltage or frequency."[14]

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[9] *Id.* 824o(e).

[10] *Rules Concerning Certification of the Elec. Reliability Org.; & Procs. for the Establishment, Approval, & Enforcement of Elec. Reliability Standards*, Order No. 672, 114 FERC ¶ 61,104, *order on reh'g*, Order No. 672-A, 114 FERC ¶ 61,328 (2006); *see also* 18 CFR 39.4(b) (2024).

[11] *N. Am. Elec. Reliability Corp.*, 116 FERC ¶ 61,062, *order on reh'g & compliance*, 117 FERC ¶ 61,126 (2006), *aff'd sub nom. Alcoa, Inc. v. FERC*, 564 F.3d 1342 (D.C. Cir. 2009).

[12] Order No. 901, 185 FERC ¶ 61,042 at P 12.

[13] *Id.* P 26 n.53 (listing 12 NERC reports describing IBR behavior during disturbances).

[14] *Id.* P 12 (footnotes omitted).

8. In addition, the Commission explained that IBRs across the Bulk-Power System exhibit common mode failures that are amplified when IBRs act in the aggregate.[15] "IBRs that enter momentary cessation may act in aggregate and cause a reduction in power output far in excess of any individual IBR's impact on the Bulk-Power System."[16] The Commission emphasized that the anticipated growth of IBRs would exacerbate these reliability concerns.[17]

9. Therefore, the Commission directed NERC to develop new or modified Reliability Standards pertaining to IBRs in four areas: (1) data sharing; (2) model validation; (3) planning and operational studies; and (4) performance requirements.[18] The Commission required NERC to submit by November 4, 2024 new or modified Reliability Standards that require registered IBR generator owners and operators to use appropriate settings "to ride through frequency and voltage system disturbances and that permit IBR tripping only to protect the IBR equipment in scenarios similar to when synchronous generation resources use tripping as protection from internal faults."[19]

10. The Commission mandated that the new or modified ride through Reliability Standards must require registered IBRs to continue to inject current and perform frequency support during Bulk-Power System disturbances. Additionally, the new or

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[15] *Id.* P 13.

[16] *Id.*

[17] *Id.*

[18] *E.g.*, *id.* PP 1, 5, 53.

[19] *Id.* PP 7, 190.

modified Reliability Standards must assure that registered IBR generator owners and operators continue to inject energy into the electric grid during disturbances, within an established no-trip zone. Finally, the Commission directed that the new or modified Reliability Standards must establish requirements for frequency and voltage ride through, post disturbance ramp rates, phase lock loop synchronization, and other known causes of IBR tripping or momentary cessation.[20]

11. The Commission also recognized that some older IBRs may have hardware limitations that IBR owners would have to physically replace and may have settings and configurations that IBR owners could not modify through software updates and in such circumstances could not implement voltage ride through performance requirements. Thus, the Commission directed NERC to "determine whether the new or modified Reliability Standards should provide for a limited and documented exemption for certain registered IBRs from voltage ride through performance requirements."[21] The Commission added that if NERC determined that an exemption is appropriate, the new or modified Reliability Standards should mitigate the reliability impacts to the Bulk-Power System of such an exemption.[22]

[20] *Id.* P 190.

[21] *Id.* P 193.

[22] *Id.* P 199.

II. NERC Petition

12. On November 4, 2024,[23] in response to Order No. 901, NERC submitted for Commission approval the proposed definition of the term Ride-through for the NERC Glossary of Terms, proposed Reliability Standards PRC-024-4 and PRC-029-1, the associated violation risk factors and violation severity levels, implementation plans and effective dates for Reliability Standards PRC-024-4 and PRC-029-1, and the retirement of currently effective Reliability Standard PRC-024-3.[24] NERC asserts that proposed Reliability Standards PRC-024-4 and PRC-029-1 would ensure that applicable Bulk-Power System-connected resources Ride-through system disturbances, avoiding reliability risks associated with unnecessary tripping and momentary cessation.[25]

[23] Following the issuance of Order No. 901, NERC submitted an informational filing that included its Order No. 901 Work Plan with four key milestones for meeting the directives of Order No. 901. Milestone 1: submit Work Plan (completed Jan. 17, 2024). Milestone 2: submit new or modified Reliability Standards to address performance requirements and post-event performance validation for registered IBRs (completed with NERC's filing of three petitions on Nov. 4, 2024). Milestone 3: submit new or modified Reliability Standards to address data sharing and model validation by Nov. 4, 2025. Milestone 4: submit new or modified Reliability Standards to address planning and operational studies requirements for all IBRs by Nov. 4, 2026. NERC, Informational Filing Regarding the Development of Reliability Standards Responsive to Order No. 901, Docket No. RM22-12-000, at 6 (filed Jan. 17, 2024).

[24] NERC Petition at 2-3, 5. Proposed Reliability Standards PRC-024-4 and PRC-029-1 are not attached to this notice of proposed rulemaking. The proposed Reliability Standards are available on the Commission's eLibrary document retrieval system in Docket No. RM25-3-000 and on the NERC website, www.nerc.com.

[25] *Id.* at 1, 19.

According to NERC, proposed Reliability Standard PRC-029-1 addresses 13 of the Order No. 901 directives.[26]

A. Addition of Defined Term Ride-through to NERC Glossary of Terms

13. NERC states that proposed Reliability Standard PRC-029-1 uses the term Ride-through, which NERC proposes to include in the NERC Glossary of Terms. NERC explains that the term Ride-through would mean that "the plant/facility remains connected and continues to operate through voltage or frequency system disturbances."[27]

B. Proposed Reliability Standard PRC-024-4

14. NERC explains that proposed Reliability Standard PRC-024-4 removes language relating to IBR functionality in Requirements R1, R2, R3, and R4 because IBR performance requirements are included in proposed Reliability Standard PRC-029-1. Instead, proposed Reliability Standard PRC-024-4 would maintain capability-based requirements for synchronous generators, synchronous condensers, and type 1 and type 2 wind resources.[28] NERC also notes that, consistent with the proposed definition for IBRs in the NERC Glossary of Terms,[29] type 1 and type 2 wind resources, which operate as

[26] *Id.* Ex. D (Standards Development Consideration of Directives from FERC Order No. 901).

[27] *Id.* at 23.

[28] *Id.* at 15.

[29] On November 4, 2024, NERC concurrently filed along with other Milestone 2 Reliability Standards, a petition with the Commission for approval of its proposed definition for IBR as:

> A plant/facility consisting of individual devices that are capable of exporting Real Power through a power electronic interface(s) such as an inverter or converter, and that are

asynchronous resources and lack modern controllers capable of riding through system events as they do not have a power electronic device, are not considered IBRs.[30] Moreover, NERC explains that, because synchronous units do not require performance-based requirements to Ride-through system disturbances, proposed Reliability Standard PRC-024-4 would continue to address Ride-through compatible frequency and voltage protection setting ranges for synchronous generators, synchronous condensers, and type 1 and type 2 wind resources.[31]

15. NERC also includes minor edits in proposed Reliability Standard PRC-024-4 to maintain the Standard's frequency and voltage protection capability-based requirements for synchronous resources. Specifically, NERC modified section 4.1.1 to restrict the applicability of proposed Reliability Standard PRC-024-4 to synchronous generators and type 1 and type 2 wind resources, and NERC added section 4.2.2 to include synchronous condensers and associated equipment as applicable facilities.[32] Further, NERC modified

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> operated together as a single resource at a common point of interconnection to the electric system. Examples include, but are not limited to, plants/facilities with solar photovoltaic (PV), Type 3 and Type 4 wind, battery energy storage system (BESS), and fuel cell devices.

NERC, Petition for Approval of a New Term "Inverter-Based Resource" Used in NERC Reliability Standards, Docket No. RD25-1-000, at 1 (filed Nov. 4, 2024) (IBR Definition), currently pending before the Commission.

[30] NERC Petition at 49. *See* IBR Definition.

[31] NERC Petition at 49.

[32] *Id.* at 51.

Requirements R1, R2, R3, and R4 to apply to transmission owners that apply frequency, voltage, and volts per hertz protection for their synchronous condensers.

C. Proposed Reliability Standard PRC-029-1

16. NERC explains that proposed Reliability Standard PRC-029-1 would address directives in Order No. 901 by establishing frequency and voltage Ride-through performance requirements for generator owners of IBRs.

1. Proposed Requirement R1

17. Under proposed Requirement R1 each generator owner of a NERC-registered IBR must "ensure the design and operation is such that each IBR meets or exceeds Ride-through requirements, in accordance with the 'must Ride-through zone' as specified in Attachment 1" of proposed Reliability Standard PRC-029-1, except in the following four conditions specified by the Standard:[33]

- The IBR needed to electrically disconnect in order to clear a fault;
- The voltage at the high-side of the main power transformer went outside an accepted hardware limitation, in accordance with Requirement R4;
- The instantaneous positive sequence voltage phase angle change is more than 25 electrical degrees at the high-side of the main power transformer and is initiated by a non-fault switching event on the transmission system; or
- The Volts per Hz (V/Hz) at the high-side of the main power transformer exceed 1.1 per unit for longer than 45 seconds or exceed 1.18 per unit for longer than 2 seconds.[34]

18. NERC explains that it adopted the Institute of Electrical and Electronics Engineers (IEEE) standard 2800-2022's (IEEE 2800-2022) terminology for "must ride-through

[33] *Id.* at 25.

[34] *Id.* at 26.

zones," which are defined in terms of voltage and frequency magnitude and time duration.[35] NERC explains that it considered but ultimately rejected Ride-through criteria more stringent than set forth in IEEE 2800-2022 due to industry comments raised during the IBR technical conference conveyed by NERC.[36] But, NERC adds, the must Ride-through zones in proposed Requirement R1 are "more similar" to IEEE 2800-2022's Ride-through zones, are more robust than currently effective PRC-024-3, and are sufficient to address the recommendations NERC identified in response to reports and assessments analyzing IBR loss of power events.[37]

19. NERC asserts that proposed Requirement R1 is responsive to the directive that NERC develop performance-based Reliability Standards that require IBRs to ride through voltage system disturbances and require post-disturbance ramp rates to return to pre-disturbance levels.[38] Similarly, NERC avers that proposed Requirement R1 is consistent with the directive that IBRs inject current and perform frequency support during a disturbance by requiring IBRs remain connected and fulfill control and regulation

[35] *Id.* at 27.

[36] Following the failure of the third ballot on proposed Reliability Standard PRC-024-4 and proposed Reliability Standard PRC-029-1, NERC convened a public technical conference under section 321 of the NERC Rules of Procedure to discuss issues surrounding the Order No. 901 directives. *Id.* at 7. Section 321 of the NERC Rules of Procedure allows the NERC Board of Trustees to take special actions when a ballot pool has "failed to approve a proposed Reliability Standard that contains a provision to adequately address a specific matter identified in a directive issued" by the Commission. NERC, *Rules of Procedure*, Sec. 321 (Nov. 28, 2023), https://www.nerc.com/AboutNERC/RulesOfProcedure/NERC%20ROP%20effective%2020240627_with%20appendicies_signed.pdf.

[37] NERC Petition at 27-28.

[38] *Id.* at 42.

functions to Ride-through a system disturbance.[39] Additionally, NERC asserts that the provision in proposed Requirement R1 requiring IBRs to meet or exceed Ride-through requirements in Attachment 1 of proposed Reliability Standard PRC-029-1 that restricts the use of momentary cessation satisfies the directive to prohibit momentary cessation in the no-trip zone during disturbances.[40]

2. Proposed Requirement R2

20. Under proposed Requirement R2, each generator owner of a NERC-registered IBR must adhere to voltage Ride-through performance criteria during system disturbances unless a documented hardware limitation exists in accordance with Requirement R4.[41] Similar to Requirement R1, NERC asserts that proposed Requirement R2 satisfies the following directives: (1) that NERC develop performance-based Reliability Standards that require IBRs to ride through voltage system disturbances; and (2) that IBRs inject current and perform frequency support during a disturbance by requiring IBRs remain connected and fulfill control and regulation functions to Ride-through a system disturbance.[42]

3. Proposed Requirement R3

21. Under proposed Requirement R3, each generator owner of a NERC-registered IBR must ensure that its IBR adheres to Ride-through requirements during frequency

[39] *Id.*

[40] *Id.* at 42-43.

[41] *Id.* at 29-33.

[42] *Id.* at 42.

excursion events by continuing to exchange current and remain electrically connected in accordance with the "must ride-through zone" as specified in the proposed Reliability Standard's Attachment 2 and while the "absolute rate of change of frequency (RoCoF) magnitude is less than or equal to 5 Hz/second, unless a documented hardware limitation exists in accordance with Requirement R4."[43] NERC explains that proposed Requirement R3 contains a wider frequency Ride-through band than presently exists in Reliability Standard PRC-024-3 and is consistent with IEEE 2800-2022.[44]

22. NERC asserts that proposed Requirement R3 is responsive to the directive that NERC develop performance-based Reliability Standards that require IBRs to ride through frequency system disturbances.[45] Additionally, NERC contends that proposed Requirement R3 satisfies the directive that IBRs inject current and perform frequency support during a disturbance by requiring IBRs remain connected and fulfill control and regulation functions to Ride-through a system disturbance.[46]

4. Proposed Requirement R4

23. Proposed Requirement R4 would allow each generator owner of an existing legacy IBR, i.e., one in service by the effective date of PRC-029-1, to obtain an exemption to the voltage and frequency Ride-through requirements if the generator owner would need hardware replacements to comply with Requirements R1 through R3. Specifically,

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[43] *Id.* at 33.

[44] *Id.* at 36.

[45] *Id.* at 42.

[46] *Id.*

Requirement R4 provides that "[e]ach Generator Owner identifying an IBR that is in-service by the effective date of PRC-029-1, has known hardware limitations that prevent the IBR from meeting Ride-through criteria as detailed in Requirements R1-R3, and requires an exemption from specific Ride-through criteria shall … [d]ocument information supporting the identified hardware limitation… ."[47] Each generator owner of an IBR must provide the information (unless it is considered proprietary by the original equipment manufacturer) to each planning coordinator, transmission planner, transmission operator, and reliability coordinator in the footprint in which the legacy IBR is located.[48] Moreover, the generator owner must submit documentation to the relevant Compliance Enforcement Authority—typically a Regional Entity—that "must accept that all aspects of the documentation specified in proposed Requirement R4 have been provided by the Generator Owner before an exemption can [be] granted."[49] According to NERC, this last requirement "would ensure that NERC has visibility into each hardware exemption that is granted and that [it has] been accurately limited to the particular limitation of the hardware."[50]

24. NERC explains that it determined that an exemption process for generator owners of legacy IBRs for voltage and frequency performance requirements is necessary. In its petition, NERC expressed concern that hardware limitations would lead entities to take

[47] *Id.* at 36-37.

[48] *Id.* at 37.

[49] *Id.* at 40.

[50] *Id.*

units offline to retrofit IBRs or risk noncompliance and could determine that the economically prudent course of action is to retire the units.[51] The implementation plan gives generator owners 12 months to request an exemption following the effective date of the Reliability Standard, after which NERC will not accept further exemption requests.[52] If the hardware causing the limitation is replaced later, the generator owner must communicate this information to the planning coordinator, transmission planner, reliability coordinator, and transmission operator within 90 days of the hardware replacement and comply with Requirements R1 through R3.[53] Further, NERC explains that the exemptions must be specific and limited to the voltage or frequency bands and associated duration that cannot be satisfied or as to the number of cumulative voltage deviations within a ten-second period that the equipment can Ride-through if it is less than four deviations within any ten-second period.[54]

25. NERC asserts that proposed Requirement R4 meets the directive that NERC determine whether the new or modified Reliability Standards provide an opportunity for certain generator owners of IBRs that are currently in operation and unable to meet performance requirements to request an exemption from voltage ride-through performance requirements.[55] NERC determined that a frequency exemption was also

[51] *Id.* at 38.

[52] *Id.* at 37.

[53] *Id.* at 41.

[54] *Id.* at 39.

[55] *Id.* at 44.

necessary and appropriate because of hardware-based capability limitations for a significant amount of installed IBRs, a concern that was raised during the IBR technical conference convened by NERC.[56]

26. Regarding the Commission directive to NERC to develop new or modified Reliability Standards to mitigate the reliability impacts to the Bulk-Power System of approved exemptions, NERC claims that the reliability impacts of voltage and frequency ride-through exemptions are mitigated by existing Reliability Standards that address the responsibilities of transmission planners, planning coordinators, reliability coordinators, and transmission operators.[57] Moreover, under Milestone 4 of the Order No. 901 Work Plan,[58] NERC indicates that it "will develop Reliability Standards that will specifically require evaluations that include accurately-modeled performance capabilities of IBRs, inclusive of any documented Ride-through criteria exemption accepted through the process detailed in proposed Reliability [Standard] PRC-029-1 Requirement R4, and that evaluate for reliability impacts" on the Bulk-Power System.[59]

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

[57] *Id.* at 46. *See also id.* n.67 (providing as examples existing Reliability Standards IRO-002-7 (Reliability Coordination - Monitoring and Analysis), IRO-008-3 (Reliability Coordinator Operational Analyses and Real-time Assessments), TOP-002-4 (Operations Planning), and TPL-001-5.1 (Transmission System Planning Performance Requirements)).

[58] *See supra* note 23 for more information on the elements of the Order No. 901 Work Plan's milestones.

[59] NERC Petition at 46.

III. Discussion

27. Pursuant to section 215(d)(2) of the FPA, the Commission proposes to approve the proposed definition of Ride-through and proposed Reliability Standards PRC-024-4 and PRC-029-1 as just, reasonable, not unduly discriminatory or preferential, and in the public interest. We also propose to approve the associated violation risk factors, violation severity levels, implementation plans, and effective dates of Reliability Standards PRC-024-4 and PRC-029-1, as well as to approve the retirement of currently effective Reliability Standard PRC-024-3.

28. We propose to find that the proposed Reliability Standards are consistent with the performance requirement directives of Order No. 901 as generator owners of NERC-registered IBRs will be subject to the Ride-through performance requirements of proposed Reliability Standard PRC-029-1 unless exempted under that standard. The Commission seeks comments on all aspects of these proposals.

A. Proposal to Approve the Addition of Defined Term Ride-through to NERC Glossary of Terms

29. NERC's proposed definition of the term Ride-through for inclusion in the NERC Glossary of Terms should provide a clear and consistent understanding of the term across all Reliability Standards, including proposed new or modified Reliability Standards filed with the Commission in response to various Order No. 901 directives. We therefore propose to approve the proposed definition of the term Ride-through for inclusion in the NERC Glossary of Terms.

B. Proposal to Approve Proposed Reliability Standard PRC-024-4

30. Proposed Reliability Standard PRC-024-4 should maintain the Reliability Standard's frequency and voltage protection setting requirements as applicable to only synchronous generators, type 1 and 2 wind resources, and synchronous condensers. Specifically, synchronous generators, type 1 and 2 wind resources, and synchronous condensers will have to have voltage and frequency protection set to avoid tripping during defined frequency and voltage excursions. We believe that it is reasonable to remove references to IBRs in proposed Reliability Standard PRC-024-4 as IBRs would be subject to the Ride-through requirements in proposed Reliability Standard PRC-029-1.

31. Therefore, we propose to approve proposed Reliability Standard PRC-024-4 as just, reasonable, not unduly discriminatory or preferential, and in the public interest. We seek comments on all aspects of our proposed approval of proposed Reliability Standard PRC-024-4.

C. Proposal to Approve Proposed Reliability Standard PRC-029-1

32. We propose to find that the proposed Reliability Standard PRC-029-1 responds to the relevant Order No. 901 Ride-through performance requirement directives. The Ride-through provisions of proposed Requirements R1 through R3 would require that each generator owner of a NERC-registered IBR ensure that their IBR continues to inject current and perform frequency support during a Bulk-Power System disturbance and avoids momentary cessation in the no-trip zone during a disturbance by meeting or exceeding the Ride-through requirements. Further, these proposed provisions establish specific requirements for frequency and voltage Ride-through, post-disturbance ramp

rates, phase lock loop synchronization, and other known causes of IBR tripping or momentary cessation. The Ride-through requirements of proposed Requirements R1 through R3 should strengthen the reliability of the Bulk-Power System by ensuring that IBRs are designed and operated to remain connected to the Bulk-Power system and continue to inject real and/or reactive current during system disturbances.

33. The Commission proposes to find that NERC reasonably determined that an exemption process for generator owners of legacy IBRs for voltage and frequency performance requirements as set out in Requirement R4 is appropriate based on industry input during the standards drafting process, as explained in the NERC Petition.[60] Regarding whether NERC met the Order No. 901 directive to develop new or modified Reliability Standards to mitigate the reliability impacts to the Bulk-Power System of such exemptions, we will defer our determination until after NERC files Milestone 4 Reliability Standards with the Commission by November 4, 2026. As described by NERC's petition, NERC is planning to meet this mitigation directive with its anticipated approach to Milestone 4 Reliability Standards that will require accurate modeling of IBRs' performance capabilities, including accepted Ride-through criteria exemptions, and evaluate reliability impacts on the Bulk-Power System.[61]

34. The Commission seeks comments on its proposed approval of proposed Reliability Standard PRC-029-1. While we seek comments on all aspects of the proposed Reliability Standard, we are particularly interested in comments and supporting materials, where

[60] *Id.* at 38-41.

[61] *Id.* at 46.

applicable, on concerns regarding: (1) the IBR performance requirement set forth in Requirement R1; (2) the absolute RoCoF in Requirement R3; and (3) the adequacy of NERC's proposed exemption provision in Requirement R4 as it pertains to both projects in service and those under contract, but not yet in-service as of the effective date of Reliability Standard PRC-029-1. Comments on whether the exemption provision is too broad or too narrow should address the risks and benefits of expanding or narrowing the exemption provision and should provide detailed, quantified, and fact-based support for their position.

D. Proposed Directive for Informational Filings

35. Finally, we propose to direct NERC to develop and submit two informational filings pertaining to requests for exemption by generator owners of legacy IBRs from frequency and/or voltage Ride-through requirements. While we understand the appropriateness of a limited exemption for certain legacy equipment that may otherwise not be able to comply with the proposed Ride-through requirements, we are concerned about the practical implications of the exemptions as proposed. Specifically, if too many generators are exempt from the frequency and/or voltage Ride-through requirements, proposed Reliability Standard PRC-029-1 may fail to address the reliability gaps associated with IBRs tripping or entering momentary cessation in aggregate that it is intended to address.[62] Accordingly, we propose that 12 months and 24 months after the conclusion of the 12-month exemption request period, NERC submit an informational

[62] *See, e.g.*, Order No. 901, 185 FERC ¶ 61,042 at PP 1, 13, 190.

filing with the following data for (1) each Interconnection and (2) each reliability coordinator area (within that interconnection) within the United States:

- Total number of IBRs for which NERC-registered generator owners will be subject to compliance with Reliability Standard PRC-029-1;
- Aggregated megawatts (MW) capacity of IBRs for which NERC-registered generator owners will be subject to compliance with Reliability Standard PRC-029-1;
- Total number of IBRs for which NERC-registered generator owners requested exemptions;
- Aggregated MW capacity of IBRs for which NERC-registered generator owners requested exemptions;
- Total number of IBRs for which NERC-registered generator owners were granted exemptions;
- Aggregated MW capacity of IBRs for which NERC-registered generator owners were granted exemptions;
- Total number of granted exemptions by exemption type (voltage and/or frequency);
- Aggregated MW capacity of granted exemptions by exemption type (voltage and/or frequency);
- Total number of granted exemptions by IBR type (wind, solar PV, BESS, fuel cell); and

- Aggregated MW capacity of granted exemptions by IBR type (wind, solar PV, BESS, fuel cell).

Additionally, we propose that each informational filing include an analysis of the reasons that entities provided for exemptions (both granted and denied),[63] an evaluation of the efficacy of the exemption process, and any recommendations to modify either the substance or procedural aspects.

IV. Information Collection Statement

36. The FERC-725G information collection requirements are subject to review by the Office of Management and Budget (OMB) under section 3507(d) of the Paperwork Reduction Act of 1995. OMB's regulations require approval of certain information collection requirements imposed by agency rules. Upon approval of a collection of information, OMB will assign an OMB control number and expiration date. Respondents subject to the filing requirements will not be penalized for failing to respond to these collections of information unless the collections of information display a valid OMB control number. The Commission solicits comments on the need for this information, whether the information will have practical utility, the accuracy of the burden estimates, ways to enhance the quality, utility, and clarity of the information to be collected or retained, and any suggested methods for minimizing respondents' burden, including the use of automated information techniques.

[63] NERC Petition at 40 (explaining that under Requirement R4.2.2, NERC will work with regional entities to evaluate exemption submissions in a fair and consistent manner across the ERO Enterprise and NERC will monitor the disposition of requests as the proposed standard is implemented).

37. The Commission bases its paperwork burden estimates on the additional paperwork burden presented by the proposed Reliability Standards PRC-024-4 and PRC-029-1, as modified and new Reliability Standards, respectively, and the proposed directive for NERC to submit two informational filings related to Ride-through exemption requests.[64] Reliability Standards are objective-based and allow entities to choose compliance approaches best tailored to their systems. The NERC Compliance Registry, as of September 2024, identifies the following unique U.S. entities that are subject to mandatory compliance with Reliability Standard PRC-024-4: 1,230 generator owners will have an additional compliance burden. It is estimated that there will be no additional compliance burden for transmission owners that have synchronous condensers, as that data is not included in the NERC Compliance Registry, and transmission owners are already applicable to PRC-024-4. The estimated unique U.S. entities subject to Reliability Standard PRC-029-1 compliance are based on numbers supplied by NERC, with 591 registered generator owners that own bulk electric system (BES) solar and wind facilities and a median of 755 generator owners that own non-BES facilities.[65] Based on these assumptions, we estimate the following reporting burden:

[64] *See supra* P 35.

[65] NERC estimates that 591 BES IBRs and a range of 588 to 922 non-BES IBRs, with a median of 755, will be subject to proposed Reliability Standard PRC-029-1 and the other Milestone 2 Reliability Standards that were filed in Docket Nos. RD25-2-000 and RD25-3-000. *See* NERC, Petition For Approval of Proposed Distribution Monitoring Reliability Standards PRC-028-1 and PRC-002-5, Docket No. RD25-2-000, at 41 n.60 (filed Nov. 4, 2024) (description of NERC estimates of BES IBRs and the range of non-BES IBRs that would be subject to compliance with proposed Reliability Standard PRC-028-1).

Proposed Changes in Burden PRC-024-4 Docket No. RM25-3-000					
Reliability Standard	**Type and Number of Entity[66]** (1)	**Number of Annual Responses Per Entity (**2)	**Total Number of Responses (1)*(2)=(3)**	**Average Number of Burden Hours per Respons e[67] (4)**	**Total Burden Hours (3)*(4)=(5)**
Annual Collection PRC024-4 FERC-725G					
Annual review and record retention	1,230 (GO)	1	1,230	20 hrs. $ 70.67/hr	24,600 hrs. $ 1,738,482
Total for PRC-024-4			1,230	20 hrs. $ 70.67/hr	24,600 hrs. $ 1,738,482

Proposed Burden PRC-029-1 Docket No. RM25-3-000					
Reliability Standard	**Type and Number of Entity[68]** (1)	**Number of Annual Responses Per Entity (**2)	**Total Number of Responses (1)*(2)=(3)**	**Average Number of Burden Hours per Respons e[69] (4)**	**Total Burden Hours (3)*(4)=(5)**

[66] The "Number of Entity" data is compiled from the September 24, 2024, edition of the NERC Compliance Registry.

[67] The estimated hourly cost (salary plus benefits) is a combination of the following categories from the Bureau of Labor Statistics (BLS) website, http://www.bls.gov/oes/current/naics2_22.htm: 75% of the average of an Electrical Engineer (17-2071) $79.31/hr., 79.31 x .75 = 59.4825 ($59.48-rounded) ($59.48/hour); and 25% of an Information and Record Clerk (43-4199) $44.74/hr., $44.74 x .25% = 11.185 ($11.19 rounded) ($11.19/hour), for a total ($59.48+$11.19 = $70.67/hour).

[68] The "Number of Entity" data is compiled from NERC's petition for approval of proposed Reliability Standard PRC-028-1 in Docket No. RD25-2-000. NERC, Petition For Approval of Proposed Distribution Monitoring Reliability Standards PRC-028-1 and PRC-002-5, Docket No. RD25-2-000, at 41 n.60 (filed Nov. 4, 2024).

[69] The estimated hourly cost (salary plus benefits) is a combination of the following categories from the Bureau of Labor Statistics (BLS) website,

Annual Collection PRC-029-1 FERC-725G					
Annual review and record retention	591 (BES IBR GO)	1	591	40 hrs. $ 70.67/hr	23,640 hrs. $ 1,670,638.80
	755 (Non-BES IBR GO)	1	755	80 hrs. $ 70.67/hr	60,400 hrs. $ 4,268,468.00
Total for PRC-024-4			1,346		84,040 hrs. $ 5,939,106.80

38. The responses and burden hours for Years 1-3 will total respectively as follows:

- Year 1-3 each: for proposed Reliability Standard PRC-024-4 will be 1,230 responses; 24,600 hours; and
- Year 1-3 each: for proposed Reliability Standard PRC-029-1 will be 1,346 responses; 84,040 hours.
- The annual cost burden for each year One to Three is $1,738,482 for proposed Reliability Standard PRC-024-4; and $5,939,106.80 for proposed Reliability Standard PRC-029-1.

39. Title: Mandatory Reliability Standards, Revised Protection and Control Reliability Standards

Action: Revision to FERC-725G information collection.

OMB Control No.: 1902-0281.

Respondents: Businesses or other for-profit institutions; not-for-profit institutions.

Frequency of Responses: On Occasion.

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http://www.bls.gov/oes/current/naics2_22.htm: 75% of the average of an Electrical Engineer (17-2071) $79.31/hr., 79.31 x .75 = 59.4825 ($59.48-rounded) ($59.48/hour); and 25% of an Information and Record Clerk (43-4199) $44.74/hr., $44.74 x .25% = 11.185 ($11.19 rounded) ($11.19/hour), for a total ($59.48+$11.19 = $70.67/hour).

Necessity of the Information: This notice of proposed rulemaking proposes to approve the requested modifications to Reliability Standards pertaining to the protection and control of the Bulk-Power System. As discussed above, the Commission proposes to approve proposed Reliability Standards PRC 024-4 and PRC-029-1 pursuant to section 215(d)(2) of the FPA because it establishes frequency and voltage Ride-through requirements for IBRs. Additionally, the Commission proposes to direct NERC to file two informational filings with the Commission on Ride-through exemption requests.

Internal Review: The Commission has reviewed the proposed Reliability Standards and made a determination that its action is necessary to implement section 215 of the FPA. Interested persons may obtain information on the reporting requirements by contacting the following: Federal Energy Regulatory Commission, 888 First Street, NE Washington, DC 20426 [Attention: Kayla Williams, Office of the Executive Director, email: DataClearance@ferc.gov, phone: (202) 502-8663, fax: (202) 273-0873].

40. For submitting comments concerning the collection(s) of information and the associated burden estimate(s), please send your comments to the Commission, and to the Office of Management and Budget, Office of Information and Regulatory Affairs, Washington, DC 20503 [Attention: Desk Officer for the Federal Energy Regulatory Commission, phone: (202) 395-4638, fax: (202) 395-7285]. For security reasons, comments to OMB should be submitted by e-mail to: oira_submission@omb.eop.gov. Comments submitted to OMB should include Docket Number RM25-3-000 and OMB Control Number 1902-0281.

V. Environmental Analysis

41. The Commission is required to prepare an Environmental Assessment or an Environmental Impact Statement for any action that may have a significant adverse effect on the human environment.[70] The Commission has categorically excluded certain actions from this requirement as not having a significant effect on the human environment. Included in the exclusion are rules that are clarifying, corrective, or procedural or that do not substantially change the effect of the regulations being amended.[71] The actions proposed herein falls within this categorical exclusion in the Commission's regulations.

VI. Regulatory Flexibility Act Certification

42. The Regulatory Flexibility Act of 1980 (RFA)[72] generally requires a description and analysis of proposed rules that will have significant economic impact on a substantial number of small entities. The Small Business Administration's (SBA) Office of Size Standards develops the numerical definition of a small business.[73] The SBA revised its size standard for electric utilities (effective March 17, 2023) to a standard based on the number of employees, including affiliates (from the prior standard based on megawatt hour sales).[74]

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[70] *Regulations Implementing the National Environmental Policy Act*, Order No. 486, 52 FR 47897 (Dec. 17, 1987), FERC Stats. & Regs. ¶ 30,783 (1987) (cross-referenced at 41 FERC ¶ 61,284).

[71] 18 CFR 380.4(a)(2)(ii).

[72] 5 U.S.C. 601-612.

[73] 13 CFR 121.101.

[74] 13 CFR 121.201, Subsector 221 (Utilities).

43. Proposed Reliability Standard PRC-024-4 (included in FERC-725G) will apply to approximately 1,230 generator owners and proposed Reliability Standard PRC-029-1 (included in FERC-725G) will apply to approximately 1,346 BES/IBR combined generator owners and non-generator owners in the United States.[75] Pursuant to SBA regulations, the employment threshold for generator owners is 950 employees. We estimate that the percentage of employees that are considered small to be 74.59% based on the North American Industry Classification System 221121 code (Electric Bulk Power Generation) and that the annual cost for each entity will be $1,413.40 for each generator owner and $2,826.80 for each BES IBR generator owner and $5,653.60 for each Non-BES IBR generator owner.

44. We view this as a minimal economic impact for each entity. Accordingly, we certify that the proposed Reliability Standards PRC-024-4 and PRC-029-1 will not have a significant economic impact on a substantial number of small entities. Thus, no regulatory flexibility analysis is required.

VII. Comment Procedures

45. 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 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. Comments must refer to Docket No. RM25-3-000, and must include the commenter's name, the organization they represent, if applicable, and their address in their comments.

[75] Many respondents serve multiple roles in the NERC Compliance Registry, so there is likely double counting in the estimates.

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.

46. The Commission encourages comments to be filed electronically via the eFiling link on the Commission's website at http://www.ferc.gov. The Commission accepts most standard word processing formats. Documents created electronically using word processing software must 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.

47. Commenters that are not able to file comments electronically may file an original of their comment by USPS mail or by courier-or other delivery services. For submission sent via USPS only, filings should be mailed to: Federal Energy Regulatory Commission, Office of the Secretary, 888 First Street, NE, Washington, DC 20426. Submission of filings other than by USPS should be delivered to: Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, MD 20852.

VIII. Document Availability

48. 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 the Commission's Home Page (http://www.ferc.gov).

49. From the Commission'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.

50. User assistance is available for eLibrary and the Commission's website during normal business hours from FERC Online Support at (202) 502-6652 (toll free at 1-866-208-3676) or email at ferconlinesupport@ferc.gov, or the Public Reference Room at (202) 502-8371, TTY (202) 502-8659. E-mail the Public Reference Room at public.referenceroom@ferc.gov.

By direction of the Commission.

(S E A L)

Carlos D. Clay,
Acting Deputy Secretary.