

IN THE UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

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

Answer of Invenenergy Renewables LLC to
Reply of North American Electric Reliability Corporation

On December 19, 2024, the Federal Energy Regulatory Commission (“FERC” or “Commission”) issued a notice of proposed rulemaking (“NOPR”) in the captioned proceeding,¹ seeking comments on the November 4, 2024 petition of the North American Electric Reliability Corporation (“NERC”), in which NERC proposed, among other things, reliability standard PRC-029-1 (Frequency and Voltage Ride-through Requirements for Inverter-based Generating Resources) (“Proposed PRC-029-1”) to promote the reliability of the Bulk-Power System (“BPS”) by establishing voltage and frequency ride-through criteria for Generator Owners of Inverter-Based Resources (“IBR”) during BPS disturbances.² Invenenergy Renewables LLC (“Invenenergy”) filed comments on the NOPR on March 24, 2025³ and reply comments on April 7, 2025.⁴ Invenenergy respectfully submits the following answer to the reply comments of NERC.⁵ Invenenergy appreciates the opportunity to submit this answer and requests that the

¹*Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through for Inverter-Based Resources*, “Notice of Proposed Rulemaking,” 189 FERC ¶ 61,212 (2024).

²*North American Electric Reliability Corporation*, Docket No. RM25-3-000, “Petition of the North American Electric Reliability Corporation for Approval of Proposed Reliability Standards Proposed Reliability Standards PRC-029-1 and PRC-024-4” (Nov. 4, 2024) (“Petition”).

³*Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through for Inverter-Based Resources*, Docket No. RM25-3-000, “Comments of Invenenergy Renewables LLC” (Mar. 24, 2025) (“Initial Comments”).

⁴*Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through for Inverter-Based Resources*, Docket No. RM25-3-000, “Reply Comments of Invenenergy Renewables LLC” (Apr. 7, 2025).

⁵*Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through for Inverter-Based Resources*, Docket No. RM25-3-000, “Reply Comments of the North American Electric Reliability Corporation” (Apr. 18, 2025) (“NERC Reply”).

Commission accept it to clarify the record.⁶

I. ANSWER

In its reply, NERC states that multiple commenters, including Invenergy, “suggest that proposed Reliability Standard PRC-029-1 should allow specific Ride-through exemptions to account for Voltage Source Converter HVDC equipment limitations.”⁷

Invenergy clarifies here that it did not propose an exemption, but requested that the Commission direct NERC to revise Requirement 1 of Proposed PRC-029-1 or, in the alternative, add a note to Attachment 1 of Proposed PRC-029-1 that recognizes the technical limitations of Voltage Source Converters (commonly known as choppers).⁸

Invenergy’s proposal would allow a chopper-reliant IBR that interconnects with the BPS via a high voltage direct current (“HVDC”) transmission line to operate within the technical limitations of its chopper technology *without* requiring an exemption from Proposed PRC-029-1.

HVDC lines commonly rely on choppers to absorb power during times in which voltage conditions prevent active power injection to the grid.⁹ All HVDC-connected offshore wind generators use DC choppers, while certain onshore IBRs connected via HVDC lines use AC choppers. The choppers absorb excess energy from the system to maintain voltage to an acceptable level. The ability of a chopper to absorb excess energy

⁶Invenergy requests leave to submit this reply and, to the extent applicable, waiver of Rule 213(a) of the Commission’s rules of practice and procedure. 18 C.F.R. § 385.213(a) (2024). Though the Commission’s rules generally do not permit answers to answers, the Commission will accept an answer for good cause, where the answer clarifies the record or otherwise assists the Commission in its decision-making process. *FPL Energy Maine Hydro LLC v. Great Lakes Hydro America, LLC and Rumford Falls Hydro LLC*, 132 FERC ¶ 61,049, at P 22 (2010). In this instance, good cause exists because the information provided in this answer will assist the Commission in its decision-making by clarifying the record in this proceeding and resolving the issues raised in the NERC Reply.

⁷NERC Reply at 11.

⁸Initial Comments at Section II.G.

⁹Initial Comments at Section II.G.

is limited by thermal design, and without a sufficient cool down period, a chopper can sustain thermal damage. This thermal limitation may hamper the ability of a chopper-reliant IBR to ride-through voltage deviations over a period greater than two seconds.

Because Proposed PRC-029-1 as currently drafted would require ride-through of voltage deviations for more than two seconds,¹⁰ it must be revised to allow chopper-reliant IBRs to trip under conditions where the chopper would exceed its thermal limit to avoid damaging the choppers. This accommodation is consistent with IEEE-2800-2022, which recognizes that the voltage ride-through of DC chopper-reliant IBRs could be limited by the chopper's energy absorption capability and thermal design. Moreover, no stakeholders participating in the IEEE-2800-2022 or PRC-029-1 developments identified a negative reliability consequence of accommodating such thermal limitations of chopper-reliant IBRs.¹¹

Invenergy appreciates that NERC might not have the discretion to allow exemptions for future IBRs given FERC's direction in Order No. 901 relative to exemptions,¹² but Invenergy did not propose an exemption for chopper-reliant IBRs. It is our understanding that exemption policy intends to accommodate limitations of equipment that existed before the requirements of PRC-029 were in effect; these exemption-related limitations will be mooted for new IBRs by OEM-confirmed performance capabilities of new equipment. In contrast, chopper-reliant IBRs (whether using existing or future equipment) have a fundamental thermal limitation that must be taken into account in proper standard design. Hence, rather than an exemption, we

¹⁰See Proposed PRC-029-1, Attachment 1.

¹¹Initial Comments at Section II.G.

¹²NERC Reply at 12; *Reliability Standards to Address Inverter-Based Resources*, Order No. 901, 185 FERC ¶ 61,042, at P 193 (2023) ("Order No. 901").

proposed that the standard requirements be revised to recognize the technological realities of chopper technology, just as other technological realities are recognized in other exceptions to the ride-through requirements of R1 and the notes to Proposed PRC-029-1 Attachment 1. Order No. 901 required NERC to “develop new or modified Reliability Standards that require registered IBR generator owners and operators to use appropriate settings (*i.e.*, inverter, plant controller, and protection) to ride through frequency and voltage system disturbances *and that permit IBR tripping only to protect the IBR equipment.*”¹³ As such, making either of Invenergy’s proposed changes for chopper-reliant IBRs is within NERC’s remit under Order No. 901 because the changes are solely intended to avoid damaging the chopper equipment. Nevertheless, the Commission has the authority to grant Invenergy’s and other commenters’ request and direct NERC to revise Proposed PRC-029-1 to accommodate the thermal limitations of chopper-reliant IBRs.¹⁴

Invenergy hopes that this answer clarifies Invenergy’s Initial Comments and demonstrates the need for the Commission to direct NERC to revise PRC-029-1 to recognize the limitation of chopper-reliant IBRs in the voltage ride-through requirements of Proposed PRC-029-1 as Invenergy proposes.¹⁵

II. CONCLUSION

For the foregoing reasons, Invenergy respectfully requests that the Commission accept this answer and issue an order directing NERC to make the modifications to

¹³Order No. 901 at P 190 (emphasis added).

¹⁴*See, e.g.*, 16 U.S.C. § 824o(d)(4), (5); 18 C.F.R. § 39.5(c), (e), (f); *Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards*, Order No. 672, 114 FERC 61,104, at P 390; *reh’g*, Order No. 672-A, 114 FERC 61,328 (2006).

¹⁵*See* Initial Comments at 35–36.

Proposed PRC-029-1 as described in Invenergy's Initial Comments, reply comments, and this answer.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that the foregoing document has been served this day upon each person designated on the official service list compiled by the Secretary in this proceeding. Dated at Washington, DC this 1st day of May 2025.

/s/ Deborah A. Carpentier
Deborah A. Carpentier