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	)))	**Docket No. RM25-3-000**

ADVICE OF THE WESTERN INTERCONNECTION REGIONAL ADVISORY BODY ON THE NOTICE OF PROPOSED RULEMAKING

I. Introduction

The Western Interconnection Regional Advisory Body ("WIRAB")[1] appreciates the opportunity to submit advice to the Federal Energy Regulatory Commission ("Commission") on the Notice of Proposed Rulemaking ("NOPR") issued on December 19, 2024.[2] WIRAB consists of representatives of the Governors of the Western states, Premiers of the Western Canadian provinces, and Mexican jurisdictions with territory in the Western Interconnection.

The Commission proposes to approve the proposed North American Electric Reliability Corporation (NERC) 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 NERC submitted in response to Commission directives.[3]

The Commission seeks comments on all aspects of the proposed approval and additionally is

[1] WIRAB is authorized, pursuant to Section 215(j) of the Federal Power Act, to provide advice to Western Electricity Coordinating Council ("WECC"), the Electric Reliability Organization ("ERO") (i.e., NERC), and the Commission on whether proposed reliability standards and the governance and budgets of the ERO and WECC are in the public interest, and on any other topic upon which the Commission requests guidance.
[2] Notice of Proposed Rulemaking re: Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through for Inverter-Based Resources under RM25-3 (*issued* December 19, 2024) RM25-3-000
[3] Final Rule re: Reliability Standards to Address Inverter-Based Resources. RM22-12-000; Order No. 901. Issued October 19, 2023

requesting feedback on specific aspects of the proposed NERC PRC-029-1 approval.

II. Background

WIRAB supports the Commission's approach to ensuring that existing and newly connecting inverter-based resources (IBRs) to the Bulk-Power System (BPS) can withstand grid voltage and frequency excursions (i.e., ride through) caused by grid events such as fault, loss of generation or load, or other abnormal operating conditions. Generator ride-through capability and performance are foundational to all other essential reliability services (ERS) and to reliable operation of the BPS.

WIRAB recently conducted an *Inverter-Based Resource Risk Assessment* and published its findings in a technical report.[4] This assessment included a thorough analysis of current and past efforts to address challenges with IBR integration, a gap analysis of how well the Western Interconnection is doing to adopt reliability risk mitigation efforts for IBRs, and draft regulatory and policy recommendations to address the identified gaps and improve or accelerate the implementation of IBR risk mitigations. One of the key recommendations from this assessment is that FERC and NERC should seek industry consensus and feedback around how best to harmonize the adoption and implementation of IBR requirements. FERC NOPRs are an excellent medium for getting industry feedback on IBR risk mitigations, and this NOPR on the proposed NERC PRC-029-1 is a great example of this process.

The Commission is seeking comments on all aspects of the proposed NERC PRC-029-1, and specifically comments on concerns regarding specific topics related to the proposed requirements including:

(1) IBR performance requirement set forth in Requirement R1

[4] WIRAB, *Inverter-Based Resource Risk Assessment*, September 2024. [Online] Available: https://www.westernenergyboard.org/wp-content/uploads/Technical_Report-WIRAB_IBR_Risk_Assessment_10-02-2024.pdf

(2) Absolute rate of change of frequency (ROCOF) in Requirement R3

(3) 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.

Additionally, FERC is seeking comments on whether the exemption provision is too broad or too narrow and describing the risks and benefits of expanding or narrowing the exemption provision.[5]

III. NOPR Summary

In this NOPR, FERC is proposing the following in regard to the new NERC definition of "Ride-through," the proposed NERC PRC-024-4 Reliability Standard, and the proposed NERC PRC-029-1 Reliability Standard.

1. The Commission proposes to approve the addition of the newly defined term "Ride-through" to the NERC Glossary of Terms.
2. The Commission proposes to approve the proposed NERC PRC-024-4 (Frequency and Voltage Protection Settings for Synchronous Generators, Type 1 and Type 2 Wind Resources, and Synchronous Condensers) Reliability Standard.
3. The Commission proposes to approve the proposed NERC PRC-029-1 (Frequency and Voltage Ride-through Requirements for Inverter-Based Resources (IBR)) Reliability Standard.
4. The Commission proposes 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.

[5] The Commission requested that these comments provide detailed, quantified, and fact-based support for their position.

5. The Commission proposes to find that NERC PRC-024-4 and NERC PRC-029-1 are consistent with and responsive to applicable directives in Order No. 901 in requiring generator owners of IBRs to ride through frequency and voltage excursions, such as a fault on the transmission or sub-transmission system.
6. The Commission proposes 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, the Commission proposes 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.

IV. Recommendations

WIRAB offers the following advice regarding the proposed approvals outlined in the NOPR and the topics on which FERC requested input:

1. **WIRAB recommends the collection of more specific information on exemption requests in order to fully understand the extent of legacy IBRs and the potential risk from these exemption to the BPS.**

In the NOPR, FERC directs two information filings from NERC to evaluate the impact of the exemption process built into the PRC-029-1 standard. The details required for each information filing are contained in the NOPR and cover various metrics of the exemption requests received by NERC; however, WIRAB recommends that additional information in those filings are required for FERC to make an informed decision. WIRAB recommends that FERC should require each informational filing from NERC to include the following additional information: 1) an analysis by NERC of the reason(s) that entities requested exemptions (both granted and denied); 2) the existing ride-through capabilities of the legacy IBRs for which exemptions were approved; and 3) a risk assessment study within each interconnection performed by NERC to evaluate if and how these exemptions could result in any reliability risks to the BPS. Realizing that all of this information may not be available to NERC from the current proposed draft of PRC-029-1, WIRAB recommends that NERC require data submittals for any entities who request exemptions to PRC-029-1 in order to gather the additional information required from each entity to perform these additional analyses and risk assessment studies. An additional approach could be to update Requirement R4.1 in the PRC-029-1 standard to add this required information for any entity seeking an equipment limitation. While we recognize this detailed information and analysis by NERC will require additional effort, WIRAB believes without it, FERC will not have all the information to truly evaluate the necessity of hardware exemptions for legacy IBRs and the potential risk to the BPS from these exemptions. Simply put, this information is necessary to fully understand the risks.

2. **WIRAB recommends that FERC should require NERC to explore the concept of IBR ride-through maximization and whether this could further help support bulk power system**

reliability, particularly for the existing IBR fleet that receive exemptions from the PRC-029-1 standard due to equipment limitations.

WIRAB is concerned that legacy IBRs may not fully support grid reliability and, in some cases, could negatively impact the bulk power system. If granted an equipment limitation exemption from the PRC-029 standard, these legacy resources would have no compliance obligations for voltage and frequency ride-through requirements, potentially increasing reliability risks. Ride-through maximization refers to setting a legacy IBR's equipment to the maximum capability allowed by the corresponding physical equipment.[6] Maximizing this capability allows legacy IBRs to perform at their maximum capability to support the grid, providing reliability benefits to the BPS within the limitations of the existing equipment. ERCOT has implemented maximization requirements for legacy resources, and the general concept of maximization is good for system reliability but must be implemented strategically and carefully. Industry survey data collected by NERC has found that many resources are not currently configured with ride-through capabilities set at their maximum levels, meaning additional BPS reliability support is available on the grid today from these resources.[7] This is to be expected because this has not been a requirement in the past; however, further reliability benefits could be achieved. Ride-through maximization would likely enable more exemptions to the PRC-029-1 standard for legacy IBRs that would otherwise require significant hardware-based upgrades to comply with the standard, while also ensuring that the legacy IBRs are configured in a way that minimizes any risks of unexpected or abnormal tripping. However, WIRAB recommends that any IBR maximization requirements be implemented with care to ensure that expectations are clear. For example, NERC could specify whether maximization applies to the IBR units (turbines and inverters) or if it also

[6] https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Inverter-Based_Resource_Performance_Guideline.pdf
[7] https://www.nerc.com/comm/RSTC_Reliability_Guidelines/NERC_Inverter-Based_Resource_Performance_Issues_Public_Report_2023.pdf

applies to balance of plant relays (which becomes more difficult to justify maximization).

3. **WIRAB recommends that Requirement R4 be updated to more clearly define the details of what should be communicated between the entity seeking a hardware or equipment limitation and its Planning Coordinator(s) (PC), Transmission Planner(s) (TP), and Reliability Coordinator(s) (RC).**

In the proposed NERC PRC-029-1 Reliability Standard, Requirement R4 provides that entities with documented equipment limitations for legacy IBRs shall communicate these limitations to their associated PC, TP, and RC. Requirement R4.1 and its sub-requirements then go into the specific documentation that must be included in the communication. WIRAB recommends that Requirement R4 should be updated to more clearly define the details of this communication between the entity seeking the hardware limitation and its PC, TP, and RC. Details should include timeframes for communication, file formats, an explanation of the reason(s) the equipment cannot meet the requirements, and other general information to ensure a thoroughly adequate transfer of information for the equipment limitation requests. As the industry has seen with similar processes on-going in other regions, having detailed and thorough process steps well defined will ensure that these exemption requests can be handled efficiently, accurately, and consistently by all parties. Failing to provide more structure around these equipment limitation requests may result in inefficient steps and inconsistent implementation of the equipment limitation process.[8]

4. **WIRAB recommends that the proposed PRC-029-1 Reliability Standard be reviewed for**

[8] https://www.nerc.com/pa/Stand/202002_Transmissionconnected_Resources_DL/Technical%20Conference%20Details_Agenda_Bios_Presentations_Transcripts.pdf

omissions and inconsistencies between it and voltage and frequency ride-through requirements adopted from the IEEE 2800-2022 Standard.

One of the key recommendations from WIRAB's *IBR Risk Assessment*[9] is that FERC and NERC should seek industry consensus and feedback around how best to harmonize the adoption and implementation of IBR requirements, including with the *IEEE-2800-2022 Standard for Interconnection and Interoperability of IBRs Interconnecting with Associated Transmission Electric Power Systems*. The proposed PRC-029-1 Reliability Standard had many of its voltage and frequency ride-through requirements adopted from IEEE 2800-2022. However, the proposed PRC-029-1 standard is missing many of the technical details, clarifications, and equipment considerations that are captured in the IEEE 2800-2022 standard. With PRC-029-1 lacking the specificity that is captured by IEEE 2800-2022 as developed by hundreds of industry subject matter experts, it is expected that PRC-029-1 could introduce challenges, cost impacts, and inefficiencies on the various IBR resources, the entities that own and operate them, and FERC and NERC for overseeing their performance and reliability impacts on the BPS. These omissions and inconsistencies in the PRC-029-1 standard should be updated to reflect the specific requirements detailed in the IEEE 2800-2022 standard. Below are a sample of some of the inconsistencies and omissions in the proposed PRC-029-1 standard. All inconsistencies and omissions in the proposed PRC-029-1 standard should be reviewed and updated for clarity and completeness.

a. IEEE 2800-2022 recognizes limitations with VSC-HVDC equipment in meeting consecutive voltage deviation ride-through capabilities, yet the PRC-029 standard does not recognize these limitations.

[9] WIRAB, *Inverter-Based Resource Risk Assessment*, September 2024. [Online] Available: https://www.westernenergyboard.org/wp-content/uploads/Technical_Report-WIRAB_IBR_Risk_Assessment_10-02-2024.pdf

b. IEEE 2800-2022 allows for an exception for self-protection when negative-sequence voltage is greater than a specified duration and threshold, which is often required for Type III WTG based plants. This exception is missing in the PRC-029-1 standard.

c. IEEE 2800-2022 recognizes 500kV system voltages are actually operated in the range of 525kV and therefore has equipment rated up to 550kV. This recognition of 500kV operation conditions and their corresponding updated voltage ride-through curves is missing in the PRC-029-1 standard.

d. IEEE 2800-2022 Section 7.2.2.1 has an exception on IBR post-disturbance current limitations for voltage disturbances that reduce RPA voltage to less than 50% of nominal. This exception is missing in the PRC-029-1 standard.

e. For voltages greater than 1.05 per unit and less than or equal to 1.10 per unit, a ride-through duration of 1800 seconds is specified in both the IEEE 2800-2022 and proposed PRC-029-1 standards. However, the IEEE 2800-2022 standard specifies that this ride-through duration is cumulative over a 3600 second time period. This specification is missing in the PRC-029-1 standard.

f. The IEEE 2800-2022 standard explicitly states that the voltage ride-through curves are to be interpreted as voltage vs time duration to ensure that there is no incorrect interpretation that these curves are "envelope" curves. This explanation is missing from the PRC-029-1 standard.

5. WIRAB recommends that the PRC-029-1 standard be updated to reflect and encourage the adoption of IEEE 2800-2022, to ensure consistency in the technical requirements for IBRs and allow for quicker adoption and implementation of the IBR capability and performance

requirements that are necessary to improve BPS reliability.

Many equipment manufacturers, IBR owners and operators, and grid owners and operators across the nation are working to adopt the IEEE 2800-2022 standard for performance and capability requirements for IBRs. The IEEE 2800-2022 standard is becoming the de facto industry for performance and capability requirements for IBRs. With the nature of the overlap between the IEEE 2800-2022 standard and new NERC standards for IBRs addressing FERC Order 901 directives, there are many in the industry concerned about regulatory compliance risks with the adoption of IEEE 2800-2022 prior to the full approval and implementation of the FERC Order 901 reliability standards. Those new reliability standards will not be fully realized and implemented until 2030, yet the industry is working to act now on adopting IEEE 2800-2022 which is a net benefit to BPS reliability across the nation. This conflict could be resolved with some enhancement of the draft PRC-029-1 standard to reflect that the full adoption of IEEE 2800-2022 ride-through requirements would be an acceptable option for compliance. This could be completed by updating all PRC-029-1 requirements with the full technical requirement language detailed in IEEE 2800-2022 or specific reference to the IEEE 2800-2022 clauses. By having the proposed PRC-029-1 standard updated to reflect and encourage the adoption of IEEE 2800-2022, the industry will have consistency in the technical requirements for IBRs and allow for quicker adoption and implementation of the IBR capability and performance requirements that are necessary to improve BPS reliability.

V. Additional WIRAB Advice:

WIRAB provides the following advice and discussion based on observations of the standards development process used for PRC-029-1:

1. **WIRAB recommends review of the NERC Standards Development Process in order to more effectively incorporate industry feedback. The process did not facilitate full stakeholder engagement which would have been beneficial in the context of urgent standards development projects, such as those mandated from FERC Order 901.**

In the development process of NERC PRC-029-1 over the course of 2024, it ultimately led to the first ever use of Rule 321 in the NERC Rules of Procedure, which resulted in a Technical Workshop that was quickly organized at the end of 2024 prior to the FERC deadline for Milestone 2 directives. While the workshop was able to result in an updated version of the PRC-029-1 standard which passed the balloting process with NERC stakeholders, there were two main issues with the workshop: 1) given the short timeframe of the announcement and occurrence of the workshop, it was difficult to include the industry broadly at the in-person workshop; and 2) the updates to the PRC-029-1 standard resulting from the workshop were not new updates, as the industry had been providing these same updates and recommendations to the standard drafting team throughout the PRC-029-1 development process during industry comment periods and balloting sessions.

As the FERC Order 901 work continues with Milestone 3 directives in 2025, WIRAB encourages FERC and NERC to incorporate industry feedback and comments earlier in the standard development process, whether by more comment periods, webinars, or technical workshops. WIRAB is encouraged to see this taking shape already in January 2025 with the Reliable IBR Integration and Milestone 3 Workshop and recommends continued meetings with the industry to resolve any questions, challenges, or concepts that the standard drafting teams are considering as they develop standards.

WIRAB is also encouraged to see the creation of the new NERC Standards Modernization

Task Force, which aims to initiate a strategic review of the Reliability Standards development process to ensure standards can be developed in a more efficient and effective manner to better address a complex and rapidly evolving risk landscape. This Task Force's mission is timely, but WIRAB urges FERC and NERC to prioritize the timely and effective development of FERC Order 901 Milestone 3 and 4 standards, leveraging lessons learned from the NERC PRC-029-1 development process. Ensuring that these standards address industry needs and enhance reliability for customers is critical to maintaining a reliable and secure bulk power system.

VI. Conclusion

WIRAB appreciates the Commission's proactive approach to ensuring system reliability in the United States and appreciates the opportunity to provide comments on the proposed NERC IBR-related Reliability Standards. With the rapidly changing resource mix throughout the United States and especially in the Western Interconnection, planning now for the future resource mix is vital to maintaining a reliable grid at reasonable cost.

(Signature Block on the Following Pages)

Respectfully Submitted,

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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 in this proceeding.

Dated at Denver, CO this 24 day of March, 2025.

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