

# NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

## Project 2023-02

PRC-030-1 Unexpected Inverter-Based Resource Event Mitigation

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Mark Gutzmann, Chair (XCEL Energy)

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**RELIABILITY | RESILIENCE | SECURITY**



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- Notice of Open Meeting
  - Participants are reminded that this webinar is public. The access number was widely distributed. Speakers on the call should keep in mind that the listening audience may include members of the press and representatives of various governmental authorities, in addition to the expected participation by industry stakeholders.

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	Chester Li	Hydro One
	David Marshall	Southern Company Services
	Dan Waugh	NextEra Energy
	Anthony Williams	Duke Energy
	Li Yu	Hawaiian Electric Company
<b>PMOS Liaison</b>	Claudine Fritz	Exelon Corp
<b>NERC Staff</b>	Josh Blume, Standards Developer	North American Electric Reliability Corporation
	Lauren Perotti, Counsel	North American Electric Reliability Corporation

- Part of FERC Order No. 901 Milestone 2
  - Title: Analysis and Mitigation of BES Inverter-Based Resource Performance Issues

### Industry Need:

- Multiple NERC disturbance reports identifying undesired performance of BPS-connected IBRs during grid faults
  - Significant reliability risks posed by such undesired performance
- All such events should be analyzed with root causes of undesired performance identified and possible mitigating actions documented and taken as appropriate
  - Responsibility of the GO to analyze all applicable events, cooperates with reliability entities such as RC, BA, TOP by providing operational data and analytical results
  - Provides flexibility to determine appropriate and timely course of actions

The SAR Drafting Team believes that a new standard should be developed specific to IBRs to ensure that any unexpected ceasing of current injection (partial or full) is analyzed by the applicable Generator Owner and mitigated to the extent possible.

### **Part 3: Post-Event Performance Validation**

Responsibilities for triggering and conducting a post-event analysis by functional registrations with a wider view and the establishment of corrective action plans will be identified through the completion of active Project 2023-02 (Analysis and Mitigation of BES Inverter-Based Resource Performance Issues).<sup>12</sup> Some modifications may be needed by the team to assure all directives from Order No. 901 are effectively addressed. The standard developer on this project will work their drafting team to review and update their project as appropriate to address the directives identified in Appendix B: **Milestone 2 Part 3: Post-Event Performance Validation**.

#### **Additional Notes for this Drafting Team**

- The Generator Operator function was not previously identified in earlier drafts. Both drafting teams will ensure that the drafts include clear expectations for Generator Owners (to assure control systems are set in accordance with criteria) and for Generator Operators (to assure the applicable facilities adhere to criteria during a system disturbance). Clarity regarding who is responsible for implementing corrective action plans will be addressed.
- Corrective Action Plans, as required for entities in Project 2023-02 (Analysis and Mitigation of BES Inverter-Based Resource Performance Issues), could include other system or facility enhancements that are irrespective of individual IBR plant level exemptions from Project 2020-02 (Modifications to PRC-024 Generator Ride-through). It would be the responsibility of these wider area entities to resolve larger issues resulting from IBRs not meeting performance expectations.

The Drafting Team received comments after the initial ballot. The industry comments that the DT received generally reflects the following topics:

- Clarify Applicability for Functional Entity, Facilities and IBR definition
- Simplify Requirement R1 and Requirement R2
- Proposal to change MVA threshold to MW
- Incorporate Requirement R1 Exclusion Footnotes into the requirement body
- Concerns over time window for Analysis and CAP creation
- Concerns on functional entity data requests

- Substantive changes to standards explained:
  - Explained why the Drafting Team is not making changes to any other standards
  - Clarified Applicability, BES scope and usage of IBR
  - Simplified and consolidated requirements by combining former Requirement R1 and Requirement R2
  - Incorporated exclusion footnotes into current Requirement R1
  - Increased monitoring identification time window from two seconds to “no longer than” four seconds
  - Increased performance window for Analysis and CAP creation
  - Eliminated data delivery requirement from the standard
  - Ensured standard alignment between PRC-028/029/030



### PRC-030-1 – Unexpected Inverter-Based Resource Event Mitigation

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## A. Introduction

1. **Title:** Unexpected Inverter-Based Resource Event Mitigation
2. **Number:** PRC-030-1
3. **Purpose:** Identify, analyze, and mitigate unexpected inverter-based resource (IBR) change of power output.
4. **Applicability:**
  - 4.1. **Functional Entities:**
    - 4.1.1. Generator Owner that owns equipment as identified in section 4.2
  - 4.2. **Facilities:**
    - 4.2.1. ~~BES-ulk Power System (BPS) i~~nverter-b~~ased~~ rResources<sup>1</sup> (IBR)
5. **Effective Date:** See Implementation Plan for PRC-030-1

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<sup>1</sup> For the purpose of this standard, the main power transformer is the power transformer that steps up voltage from the collection system voltage to the nominal transmission/interconnecting system voltage for inverter-based resources. In case of offshore wind plants connecting via a dedicated VSC-HVDC, the main power transformer is the onshore main power transformer.

- R1.** Each applicable Generator Owner shall ~~have~~ implement a documented process to identify ~~unexpected~~ changes<sup>‡</sup> in active power output ~~occurring within a two-second period and is that are~~ the greater of ~~either 2010%~~ of the plant's gross nameplate rating, ~~or 20 MVAMW, and occurring during a period that is no longer than 4 seconds.~~ Changes in active power for the following are excluded: [Violation Risk Factor: Medium] [Time Horizon: Operations Planning]
- Changes associated with intermittent primary energy source<sup>2</sup> availability;
  - Resource dispatch, resource ramping, planned outages, or planned resource testing; or
  - Loss of Transmission Provider's interconnection facilities.
- M1.** Each applicable Generator Owner shall have evidence which ~~may~~ includes but is not limited to: (1) ~~at the~~ documented process for detecting ~~unexpected~~ changes in output as described in Requirement R1, (2) evidence to demonstrate implementation of its documented process, (3) actual data recordings, and (~~3~~4) identification of gross nameplate rating.

### Exceptions to Requirement R1

~~‡ Unexpected changes in power output includes any change of generation that is not attributed to factors such as weather patterns, change of wind, change in irradiance, curtailment, ramping, planned outage, planned testing, or the loss of a Transmission Line connecting the IBR generators.~~

<sup>2</sup> Examples include changes in wind, solar irradiance.

**PRC-030-1 – Unexpected Inverter-Based Resource Event Mitigation**

~~R4.R2.~~ Each applicable Generator Owner ~~shall analyze its IBRs performance,~~ within ~~4590~~<sup>4</sup> calendar days of ~~either the event identified~~ identifying an active power change event pursuant to Requirement R~~12~~ or following receipt of a request pursuant to Requirement R3. The analysis shall include all of the following from its applicable Reliability Coordinator, Balancing Authority, or Transmission Operator that identified a Disturbance and a change in the inverter-based resource(s) active power output, shall: *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*

2.1. Analyze its IBR facility performance during the event, including:

~~4.1.0.2.1.1.~~ The Determination of the root cause(s) of ~~unexpected~~ change(s) in active power output;

~~4.2.~~ The applicability to its other IBR facilities that could be affected by the same cause of unexpected change(s) in power output; and

2.1.2. Documentation of the facility’s Ride-through performance including reactive power response during the event;

2.1.3. Assessment of any performance issues identified and if corrective actions are needed; and

2.1.4. Determination of the susceptibility of its other inverter-based resource facilities to similar events.

~~4.3.2.2.~~ Notification to each Upon request, provide the analysis results to the requesting applicable ~~Balancing Authority,~~ Reliability Coordinator, Balancing Authority, or Transmission Operator ~~of the analysis results.~~

~~M4.M2.~~ Each applicable Generator Owner shall have dated ~~analysis~~ documentation, of the required analysis developed in accordance with ~~Requirements R4~~ Requirement R2. Evidence may include, but is not limited to: (1) an analysis report, (2) actual data recordings or derivations, (3) documents describing the device specification and device configuration or settings, and (4) plant configuration.

**R5-R3.** ~~Each~~ If performance issues and corrective actions were identified in Requirement R2 Part 2.1.3, each applicable Generator Owner shall, within ~~45~~60 ~~calendar~~ days of completing the analysis in Requirement ~~R4R2~~, develop one of the following and provide it to ~~each~~the applicable Reliability Coordinator, Balancing Authority, and Transmission Operator: [*Violation Risk Factor: Medium*] [*Time Horizon: Operations Planning*]

**5.1.** ~~A~~ Corrective Action Plan (CAP) for the identified ~~Inverter Based Resource~~ inverter-based resource(s), including other applicable facilities owned by the Generator Owner as identified in Requirement ~~R4R2~~ Part ~~4.22.1.3~~; or

**5.2.** ~~A~~ technical justification that addresses why corrective actions will not be applied or implemented.

**M5-M3.** Each applicable Generator Owner shall have dated evidence (electronic or hardcopy format) that demonstrates it developed a CAP or a technical justification, and evidence of transmittal to the Reliability Coordinator, Balancing Authority, and Transmission Operator in accordance with Requirement ~~R5R3~~.

~~R2.R4.~~ Each applicable Generator Owner shall, for each of its Corrective Action Plans developed pursuant to Requirement ~~R5R3~~: *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning, Long-term Planning]*

~~6.1.4.1.~~ Implement the CAP;

~~6.2.4.2.~~ Update the CAP if actions or timetables change; and

~~6.3.4.3.~~ Notify each applicable Reliability Coordinator if CAP actions or timetables change and when the CAP is completed.

~~M6.M4.~~ Acceptable evidence may include, but is not limited to, dated documentation such as CAPs, project or work management program records, settings sheets, work orders, maintenance records, communication with equipment manufacturers, and communication with each applicable Reliability Coordinator that documents the implementation, updating, or completion of a CAP in accordance with Requirement ~~R5R3~~.

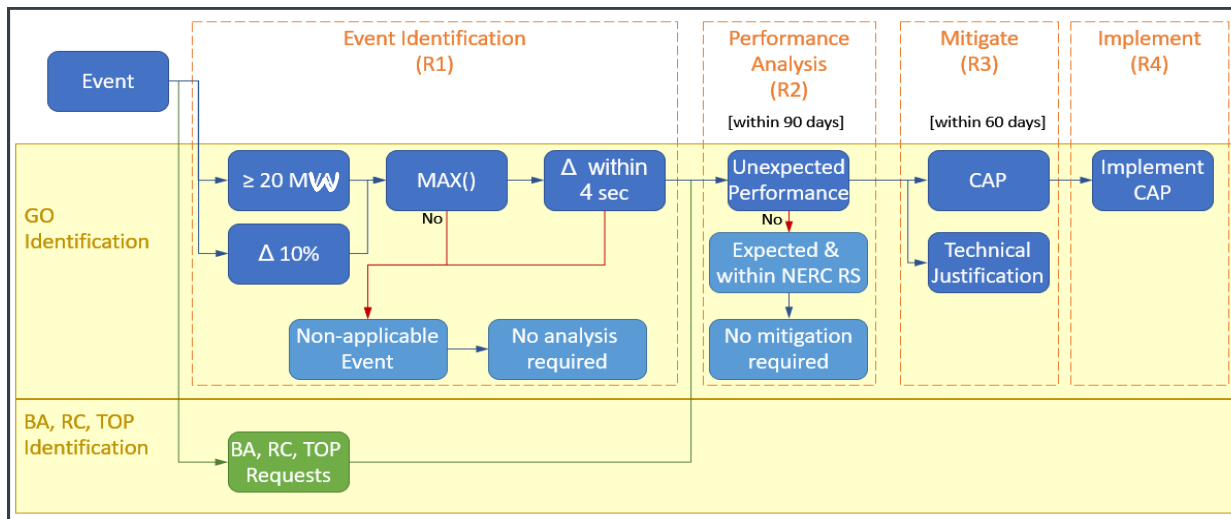


Figure 1.1: PRC-030-1 Flowchart

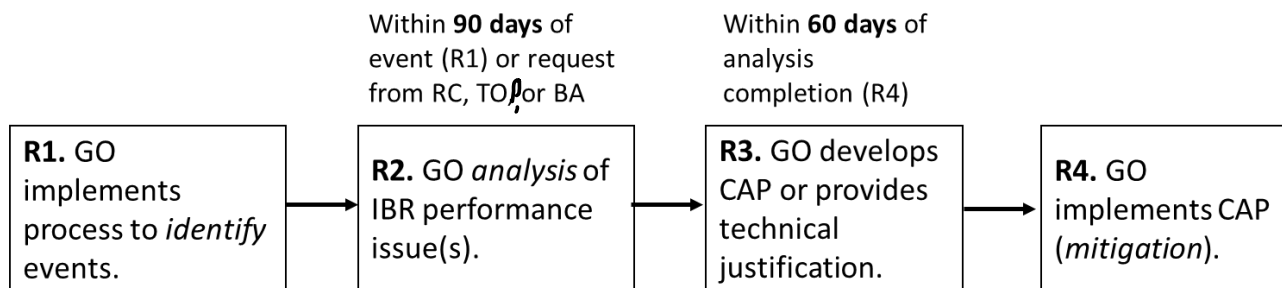


Figure 1.2: Relationship of PRC-030-1

- Effective Date Reliability Standards PRC-030-1
  - Within six months after FERC adopts the reliability standard

**Applicable Standard(s)**

PRC-030-1 Unexpected Inverter-Based Resource Event Mitigation

**Requested Retirement(s)**

None

**Prerequisite Standard(s)**

These standard(s) or definitions must be approved before the Applicable Standard becomes effective:

PRC-028-1 Disturbance Monitoring and Reporting Requirements for Inverter-Based Resources

[PRC-029-1 Frequency and Voltage Ride Through Requirements for Inverter-Based Generating Resources](#)

**Applicable Entities**

Generator Owner (GO)

**Effective Date**

The effective date for the proposed Reliability Standard is provided below.

**Standard PRC-030-1**

Where approval by an Applicable Governmental Authority is required, Reliability Standard PRC-030-1 shall become effective on the first day of the first calendar quarter that is six months after the effective date of the applicable governmental authority’s order approving the standard, or as otherwise provided for by the applicable governmental authority.

Where approval by an applicable governmental authority is not required, Reliability Standard PRC-030-1 shall become effective on the first day of the first calendar quarter that is six months after the date the standard is adopted by the NERC Board of Trustees, or as otherwise provided for in that jurisdiction.

- Relevant information
  - [Project page](#)
- Ballot dates
  - 34-day additional ballot and comment period
  - June 7, 2024 to July 10, 2024
  - Non-binding polls and information for VRFs and VSLs will be from July 1, 2024 to July 10, 2024
- Contact
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# Questions and Answers