

2023 ERO Reliability Risk Priorities Report and related NERC Project 2023-02: Performance of IBRs

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- Primary objectives are to identify key risks to the BPS that merit attention and to recommend mitigating actions that align with those risks.
- It differs from other NERC reports in that it provides industry with strategic direction to plan for imminent risks and their mitigation.

Common Themes and Emerging Trends

- Collaboration is key to future BPS reliability
- Grid transformation is happening quickly, and reliability considerations must align with the pace of change
- Security threats continue to increase
- The BPS depends on and is impacted by other infrastructure providers

Risk Categories (in order of priority in 2023)

- Changing Resource Mix
- Resource Adequacy and Performance
- Cyber Security Vulnerabilities
- Extreme Natural Events / Extreme Events
- Critical Infrastructure Interdependencies
- Bulk Power System Planning
- Control and Protection Systems Complexity
- Physical Security Vulnerabilities
- Loss of Situational Awareness
- Human Performance and Skilled Workforce
- Electromagnetic Pulse

Risk Profiles

Energy Policy



- A. Federal
- B. State
- C. Provincial

Grid Transformation



- A. Bulk Power System Planning
- B. Resource Adequacy and Performance
- C. Increased Complexity in Protection and Control Systems
- D. Situational Awareness Challenges
- E. Human Performance and Skilled Workforce
- F. Changing Resource Mix

Resilience/ Extreme Events



- A. Extreme Natural Events, Widespread Impact
 - GMD
- B. Other Extreme Natural Events

Security Risks



- A. Physical
- B. Cyber
- C. Electromagnetic Pulse

Critical Infrastructure Interdependencies



- A. Communications
- B. Water/Wastewater
- C. Oil
- D. Natural Gas

Energy Policy

- Decarbonization, decentralization, and electrification have been active policy areas.
- Implementation of policies in these areas is accelerating, and, with changes in the resource mix, extreme weather events, and physical and cyber security challenges, **reliability implications are emerging**
- It will take strong collaboration and partnerships across a multitude of boundaries to mitigate the emerging risks we face today – state, federal, provincial and private – **ensuring reliability of the grid is a prioritized tenet of critical infrastructure**
 - **Education for policymakers and regulators to increase awareness of the reliability implications of policy decisions is a critical need**

Grid Transformation

- The BPS is becoming more complex, and the need to model, analyze, and operate the BPS at higher fidelity further exacerbates training, staffing, and workforce issues.
 - Competition for available skilled workers is becoming a roadblock and an emerging risk.
- Today, new renewable and storage projects can be completed in eighteen months and the next generations of inverters with valuable capabilities are released every two years.
 - The multi-year cycles for clearing interconnect queues and updating grid management and market software platforms are becoming reliability risks.

Grid Transformation: Description of Risk

- Energy Adequacy: Resource adequacy assessments have historically focused on ensuring generation and transmission capacity to serve peak demand, and it was assumed that energy from those peak planned resources would be sufficient to meet demand in all other hours of the year.
 - Periods of highest system risk may no longer be peak load hours, and energy availability and real-time performance during periods of risk will be of paramount importance
- Essential Reliability Services: Transformation of the resource mix can alter the provision of and need for essential reliability services, interconnection capabilities and settings, and other ancillary services for BPS reliability and system operations, such as voltage control and reactive support, frequency response, ride-through, ramping/balancing, and stability.
- Equipment Standards and Settings: Detailed information on equipment characteristics, capabilities and settings, and limitations must be incorporated into the long-term planning, operational planning, and operating time horizons. **This is particularly true for digital controls and inverter-based resources.**
 - For example, **future inverters connecting at transmission voltages must comply with the IEEE 2800 standard.**

NERC SAR Request: Analysis and Mitigation of BES Inverter-Based Resource Performance Issues

- Unlike synchronous generation, IBRs can reduce power output very quickly based on the power electronic controls and protections, and the reduction does not necessarily require the operation of an ac circuit breaker
- The proposed standard project is focused specifically on identifying, analyzing, and mitigating reliability issues for BES inverter-based resources.
- Rather than complicate the existing PRC-004 focused on Protection Systems, IRPS 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.
- The purpose of this proposed project is to introduce a new standard or modify the existing PRC-004 standard that requires analysis and mitigation of unexpected or unwarranted protection and control operations from inverter-based resources following the identification of such a performance issue
- This will ensure that IBR loss events (either through protection or control actions) such as those that have occurred numerous times as documented in the NERC disturbance reports are included in the types of events that must be analyzed and mitigated.
- The onus of analysis and development of mitigating actions should be on the asset owner to eliminate the possible risk of repeated abnormal performance issues.
- The SAR should be applicable to all BES inverter-based generating resources

NERC SAR Request: Legacy Systems

- Some legacy equipment may not be able to mitigate performance issues; however, these events should be analyzed with root causes of misoperation identified and possible mitigating actions (or lack thereof) should be documented for all applicable parties.
- Considerations will be given for legacy equipment; however, analysis and documentation of mitigation actions (where possible) should still occur. The project should clarify that any protections and controls within an IBR facility that causes abnormal performance of the facility should be included in this type of analysis.
- IRPS recognizes that legacy equipment may not be able to eliminate or fully mitigate performance issues at those facilities; however, analysis and determination of any possible mitigations should be explored and reported to the TOP, RC, and BA and documented by the GO/GOP.
- This will ensure that possible mitigating actions are fully explored and communicated to all necessary parties

NERC Project 2023-02 Performance of IBRs

- January: RSC Approved the posting of the SAR
- June: RSC Approved the members of the Drafting Team
- July 24: Introductory Drafting Team meeting (public meeting)