NERC SPCWG

Activities Report to ERCOT SPWG

November 12th, 2025

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Outline

Meetings

Protection & Control (PRC) Standards – No Update

- PRC-005
- PRC-019
- PRC-024
- PRC-030

Other Activities

- NERC Standards & IEC 61850 Technical Reference Document
- PRC-023-6 Technical Reference & Implementation Guide Documents
- TPL-001-5.1 Footnote 13.d SAR – Implementation Guidance
- Interesting Voltage Sensitive Load Event
- Protection System Misoperation Analysis Annual Report
- Protection System Impacts to the BPS from Emerging Large Loads

NERC SPCWG Meetings

- NERC SPCWG met 2 times since July 2025 ERCOT SPWG meeting
- Next meeting schedule on December 11 via MS Teams

Protection & Control (PRC) Standards Update

Project 2019-04 -New Standard Authorization Requests (SARs) proposed to address testing of AVR protective functions in PRC-005-6

- **PRC-005: Protection System, Automatic Reclosing, and Sudden Pressure Relaying Maintenance Standard**
- **Low Priority**
- SAR accepted October 20,2021
- Nominations for additional drafting team members was sought and closed on December,15, 2021
- 3rd Round of comments ended last Friday (2/26). Provide clarity that the protective functions enabled within analog/Digital AVRs, excitation systems, and other control systems that respond to electrical quantities
- Update the applicability of the standard to include UFLS-only DPs
- Modify requirements to cover Protection System DC supply technologies that are not currently covered in the standard
- Some notable updates to the latest SAR revision:
  - AVR control functions already within scope of PRC-005 but not clarified
  - Fix protection system vs function definition and add to scope
  - Not limiting protection functions just to AVR and generators but to any equipment.
- First draft (**PRC-005-7**) was posted and failed to pass with only 35%.
- Pushed back on calendar to 2025 and beyond (Medium Priority)
- **No Updates**

Protection & Control (PRC) Standards Update

PRC-019-3

- **PRC-019: Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection Standard**
- PRC-019-2 addresses the reliability issue of miscoordination between generator capability, control systems, and protection functions. However, PRC-019-2 was developed with a bias toward synchronous generation and does not sufficiently outline the requirements for all generation resource types. The proposed Standard Authorization Request (SAR) aims to address a number of issues identified by the SPCS and revise the standard to be inclusive of all types of generation resources.
  - First Draft of **PRC-019-3** has been posted for comment and voting that runs through 11/14/2022
    - First Draft failed to pass with only 39% approval
  - Second draft was posted and voting took place between 5/30/23-06/08/23
    - Second draft failed to pass with only 44% approval
- Pushed back on calendar to 2025 and beyond (Medium Priority)
- **No Update**

Protection & Control (PRC) Standards Update

Project 2020-02 Modifications to PRC-024

- **PRC-024: Frequency & Voltage Protection Settings for Synchronous Generators, Type 1 & 2 Wind Resources, and Synchronous Condensers Standard**
- PRC-024-3 is the Generator Voltage and Frequency Ride-Through Settings and Requirements
- New PRC-029 standard to be proposed to deal specifically with the ride-through requirements of IBR. This is going to be based on IEEE 2800. This is designed to address FERC order 901.
- After approval of PRC-029, PRC-024 will be modified to only apply towards synchronous machines.
- Draft 1 posted 04/12/24 -04/22/24
  - PRC-024-3 had 61%. PRC-029-11 had 25%
- Draft 2 posted 06/28/24 -07/08/24
  - PRC-024-3 Passed with 83%. PRC-029-11 Failed with 35%
- Draft 3 for PRC-029-1 posted 08/02/24 –08/12/24. Failed with 53%
- Draft 4 for PRC-029-1 posted 09/24/24 –10/04/24. Passed with 78%
- Final Draft for PRC-024-4 posted 09/25/24 –09/30/24. Passed with 86%
- **PRC-024-4** and **PRC-029**-1 filed with FERC for approval on November 4, 2024
- **PRC-024-4 and PRC-029-1 approved by FERC in its July 24, 2025 ruling.**
  - ***Effective October 1, 2026***

Protection & Control (PRC) Standards Update

Project 2023-02 Analysis and Mitigation of BES Inverter-Based Resource Performance Issues

- **Unexpected Inverter-Based Resource Event Mitigation Standard**
- **New PRC-030-1** standard drafted to require analysis and mitigation unexpected or unwarranted protection and control operations from inverter-based resources following the identification of such a performance issue. This includes any types of protections or controls that result in abnormal performance issues within the plant, including abnormal performance resulting in anomalous behavior of active power output from the facility during events. Considerations may be needed for legacy facilities, but the root cause analysis of the abnormal performance and determination of any mitigating measures should be conducted. The SAR should be applicable to all Bulk Electric System (BES) inverter-based generating resources, including battery energy storage resources.
- Somewhat analogous to PRC-004 for IBR
- Draft 1 posted 04/9/24 -04/18/24 . Failed with only 21%.
- Draft 2 posted 7/1/24 -7/10/24. Failed with only 31% .
- Draft 3 posted 08/02/24 –08/12/24. Passed with 76% .
- Draft 4 posted 09/04/24 –09/13/24. Failed with 69% .
- Final Draft posted 09/23/24 –09/27/24. Passed with 71% .
- PRC-030-1 filed with FERC for approval on November 4, 2024
- PRC-030-1 voted for approval by FERC at its February 20, 2025 meeting
- **PRC-030-1 effective October 1, 2026 given FERC approval of PRC-029-1**

Other Activities

NERC Standards * 61850 Technical Reference Document

- Create a technical reference for 61850 and the impacts on NERC Protection System definition and related standards
- Reference to include clarity in 61850 P&C designs regarding Protections System definition, relay maintenance requirements, and recommended documentation to support design
- Currently working on scope and outline for paper to get approval to add to SPCWG Work Plan.
- Document goal
  - *Explain new technologies utilizing ethernet based protection and how maintenance/design may be handled*
  - *Address issues being raised with ethernet based protection systems*
- **Draft document development on-going. To be made available for NERC SPCWG internal review by 2026 Q1**

Other Activities

PRC-023-6 Technical Reference & Implementation Guide Documents

- **PRC-023-6: Transmission Relay Loadability Standard**
- Technical Reference document approved by RSTC and posted to RSTC document site on 3/12/2025
  - *Determination of Practical Transmission Relaying Loadability Settings*
  - Provides example calculations to help entities comply with the standard while maintaining system reliability
- Draft Implementation Guide for requirement R1 of standard currently been reviewed
  - Clarifies the intent and application of the various criteria in the requirement R1, support more consistent and accurate implementation across the industry
- **Implementation guidance document submitted to RSTC for approval**
  - *RSTC – Reliability and Security Technical Committee*

Other Activities

TPL-001-5.1 Footnote 13d SAR (Project 2022-02)

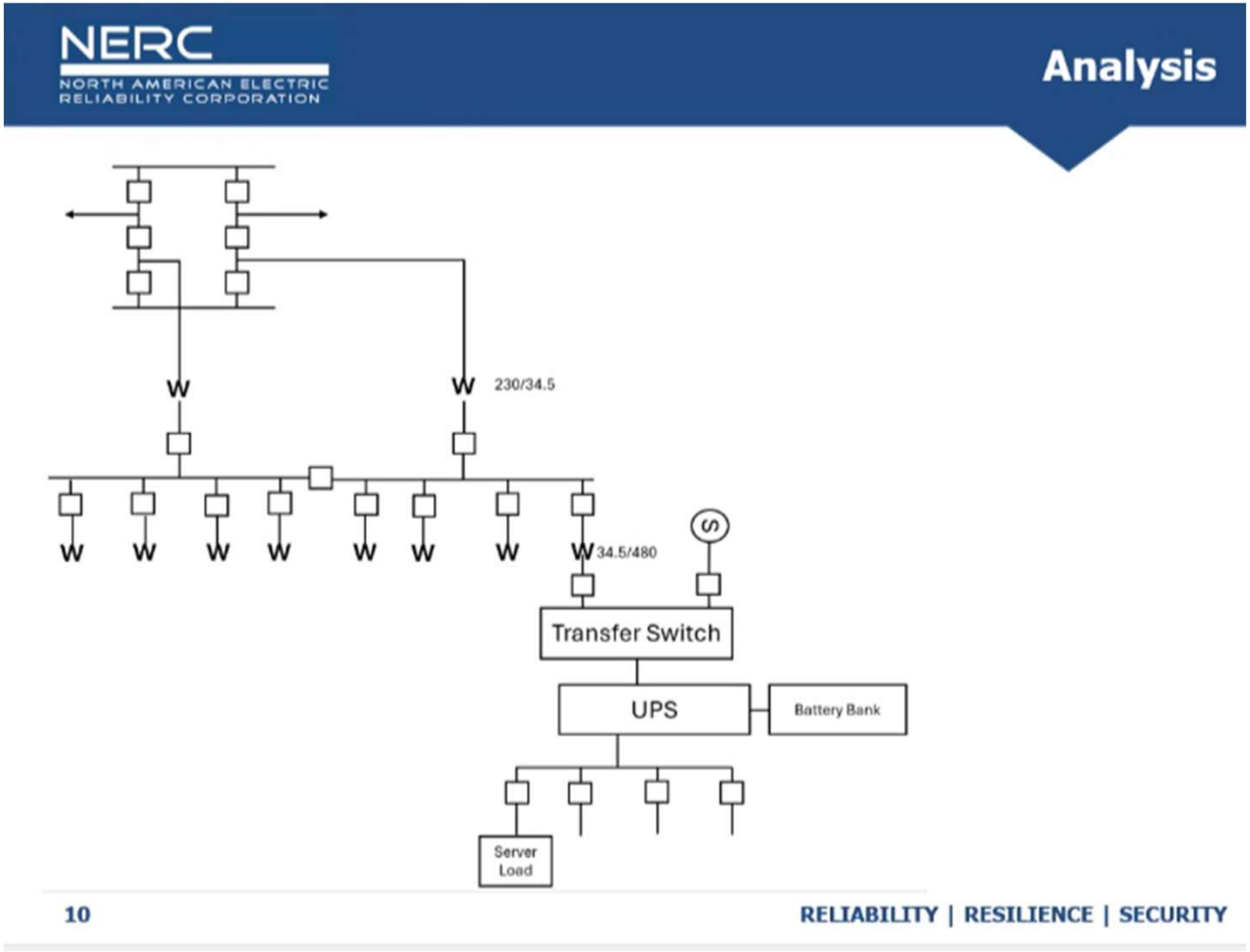
- SAR was posted in April-May of 2023
- TPL-001-5.1 Footnote 13: For purposes of this standard, non-redundant components of a Protection System to consider are as follows:
  a. A single protective relay which responds to electrical quantities, without an alternative (which may or may not respond to electrical quantities) that provides comparable Normal Clearing times;
  b. A single communications system associated with protective functions, necessary for correct operation of a communication-aided protection scheme required for Normal Clearing (an exception is a single communications system that is both monitored and reported at a Control Center);
  c. A single station dc supply associated with protective functions required for Normal Clearing (an exception is a single station dc supply that is both monitored and reported at a Control Center for both low voltage and open circuit);
  d. A single control circuitry (including auxiliary relays and lockout relays) associated with protective functions, from the dc supply through and including the trip coil(s) of the circuit breakers or other interrupting devices, required for Normal Clearing (the trip coil may be excluded if it is both monitored and reported at a Control Center).
- Issue is with item d, which provides an exception for a single trip coil that is monitored, but not the control circuitry.
- This SAR requests that any non-redundant components of the control circuitry may be excluded if they are both monitored and reported.
- They have drafted a 2-page recommendation and would like to get this out
- Implementation guidance endorsed by RSTC on the December 11, 2024 meeting
- NERC compliance group in the process of reviewing the Implementation Guidance for approval
- **Endorsed/approved Implementation Guidance posted on November 5, 2025.**

Voltage Sensitive Large Load Issues – Data Centers

Eastern Interconnection Significant Load loss

- Failed lighting arrestor fault on a 230kV line cleared in 2 – 4 cycles
- 1,151MW total load lost across 25 – 30 substation
  - ***Exclusively data center type loads (~60 individual data centers, within 2 – 85 MVA load size)***
  - Frequency rose to 60.047Hz
  - Load didn't come back immediately after fault was cleared
    - **WHY?**
      - **Several occurrence of voltage depression** – *6 occurrences during autoreclosing*
      - **Data center sensitive to voltage depressions** tracks occurrences –
        - *1st strike result to transfer to UPS*
        - *3rd strike result to transfer/lock-in to generator (**load restoration** to utility connection **manual**)*
    - Cooling load critical after voltage disturbance – it doesn't appear to be included in UPS critical load
- NERC published a brief writeup on the incident on **January 8th**
- There is a plan to publish a full report on this incident
- **Note:** Large load characteristics on the system needs to be considered when applying protection designs
- Second Large load loss in February (1800 MW). A second incident review is underway for crypto load loss in Texas. Anticipated release in a few months.

Typical Data Center Configuration



Other Activities

Protection System Misoperation Analysis Annual Report

- Misoperation analysis report to help understand events occurring on the electric grid
- Overall purpose of report is to provide a deep dive on events useful for protection engineers. Not a metric-based report
- Small group established to work on the report – kickoff meeting in 2025 Q1
  - To coordinate misoperation analysis with Regional Protection System Working Groups/Committees
  - Using previous year Q2 to current year Q1 data, start report in mid-July and publish 1st report by **2026 Q3**
- Likely to have a 1600 Data Request for MIDAS form. This will make optional fields required, add more detail in drop-downs for existing fields, and possibly new fields. 1600 Data Request Process likely takes a couple of years. STILL UNDER CONSIDERATION.
- **First report to focus on incorrect settings and relay failures**
  - *Detailed analysis of 2025 protection system misoperation, and 2020 -2024 historical data & trends*
  - *Following years report will focus on a different topic*

Other Activities

Protection System Impacts to the BPS from Emerging Large Loads

- NERC SPCWG has been asked to assess possible protection system impacts to the Bulk Power System (BPS) from emerging large loads
  i. *Short Analysis of potential risks of large loads to BPS reliability to and from the protection system*
  ii. *UVLS, UFLS, Reclosing, Reclosing/reclosing into a fault, Operator initiated load shedding schemes, protection coordination, transformer in-rush, education of system operations and their impacts on voltages to close in substations, education of large loads so they understand how the protection systems operate, Harmonic injection, Voltage sensitivity, etc.*
- Small group established to work on task and provide report
  - Create a paper that documents areas of awareness between protection systems related to large loads. Highlighting the issues such as: Adaptive Under and Over Load and Frequency Shed Schemes, Fault Values (fault current magnitudes), Compressed Timelines, Education, Power Quality, Sub synchronous Oscillation Events (40MW swing and 23 Hz) and other challenges

Conclusion