NERC SPCWG

Activities Report to ERCOT SPWG

July 16th, 2025

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Outline

Meetings

Protection & Control (PRC) Standards Update

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

Other Activities

- NERC Standards & IEC 61850 Technical Reference Document
- TPL-001-5.1 Footnote 13.d SAR – Implementation Guidance
- Interesting Voltage Sensitive Load Event
- Protection System Misoperation Analysis Annual Report

NERC SPCWG Meetings

- NERC SPCWG met 2 times since February 2025 ERCOT SPWG meeting
- Next meeting schedule on August 13-14 in Person

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 (Project 2021-01)

- **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-024-4

- **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-024-3 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**
- **Still Pending Regulatory Approval**

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
- **The effective date of PRC-030-1 is pending 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 to be made available for review ???

Other Activities

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

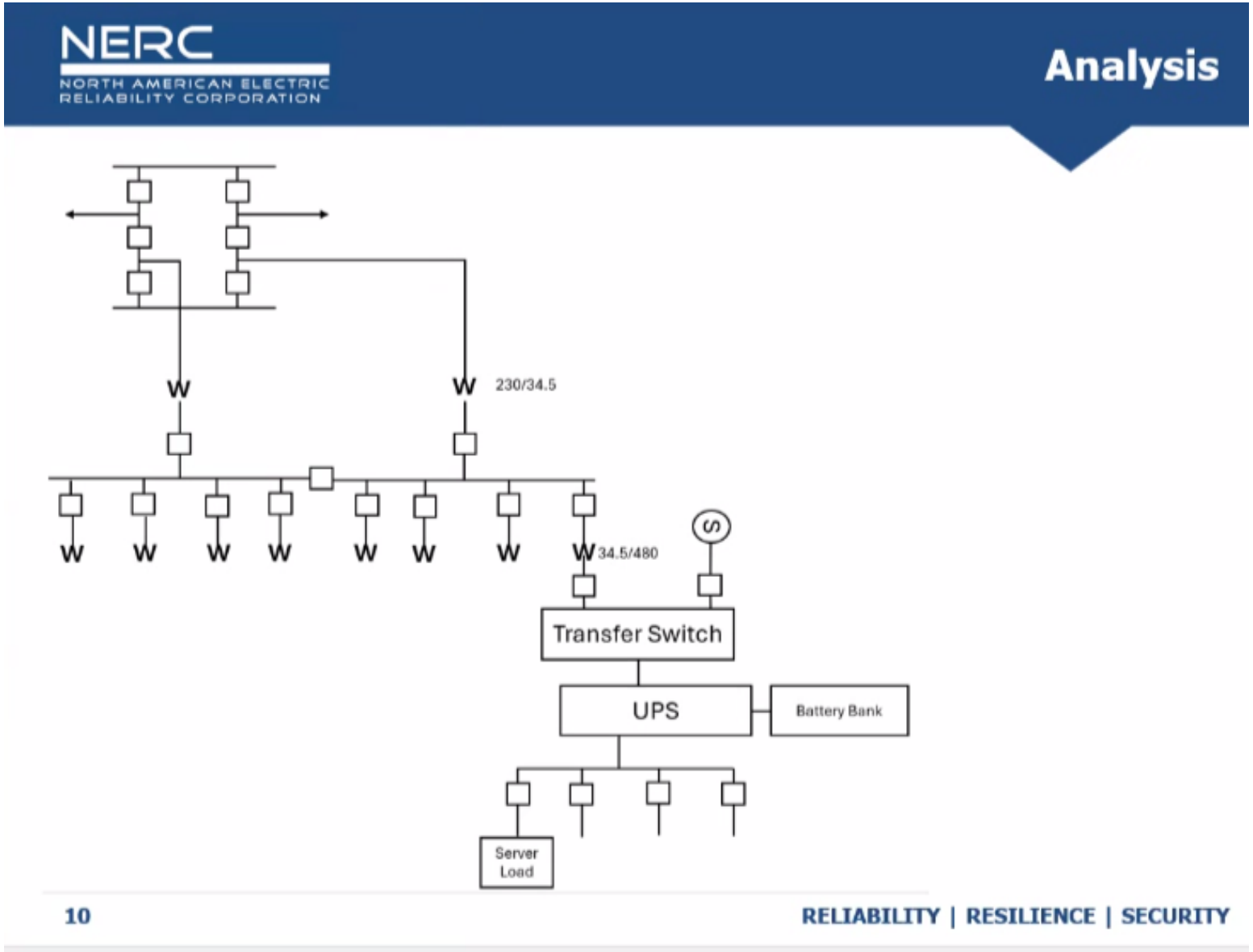
- SAR was posted in April-May of 2023
- TPL-001-5.1 Footnote 13: For purposes of this standard, non-redundant components of a Protection System to consider are as follows:
  a. A single protective relay which responds to electrical quantities, without an alternative (which may or may not respond to electrical 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
- Small group within SPCWG has been formed to write a white paper
- Implementation guidance endorsed by RSTC on the December 11, 2024 meeting
- NERC compliance group in the process of reviewing the Implementation Guidance for approval

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 20th**
- There is a plan to publish a full report on this incident
- **Note:** Large load characteristics on 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 of 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 October 2026
- 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.

Misoperation Analysis Team Region Request - DRAFT

1. Request for detailed information for misoperations with a Cause of Incorrect Settings or Relay failure/malfunction. Provide the information for each reporting quarter.
   a. Please provide the following information specific to misoperations with a cause of Incorrect Settings and a sub cause code of Incorrect Numeric Value Specified, Incorrect User-programmed Logic Specified, or Incorrect System Coordination for the current reporting quarter. - FUTURE, David Penney or new Review/Process Team
      i. Populate column 1.a.i with the protection element, setting, logic, or relay that the incorrect setting was associated with the misoperation. For example, phase distance, differential pickup, timer delay, ground overcurrent, logic setting, etc.
      ii. Populate Column 1.a.ii with the protection scheme associated with the misoperation.
      iii. Populate column 1.a.iii with a summary of the corrective action for the misoperation or identify if no corrective action taken.
      iv. Provide the count and the percentage of these three types of Incorrect settings misoperations to the total misoperations for the reporting quarter
      v. Provide the count and percentage of these three types of Incorrect setting misoperations by Misoperation Category.

Misoperation Analysis Team Region Request - DRAFT

b. Please provide the following information specific to misoperations with a cause of Relay Failure/malfunction for the current reporting quarter. FUTURE, David Penney or new Review/Process Team
   i. Populate Column 1.b.i with the subcause for the relay failure. If a non-microprocessor-based relay failure, please indicate.
   ii. Populate column 1.b.ii with the microprocessor relay manufacturer associated with the misoperation.
   iii. Populate Column 1.b.iii with a summary of the relay failure or malfunction.
   iv. Of the misoperations with a cause of Relay Failure/malfunction, in a few words, summarize what the top relay failure mode is for the quarter.
   v. Provide the count and percentage by Misoperation Category for misoperations caused by Relay Failures/Malfunction for the quarter
   vi. For this item only, consider your regional history of the misoperations with a cause of Relay Failure/malfunction. Is there a specific manufacturer or relay model that is standing out as a problem, based on number of failures and expected installed population. ERCOT SPWG Group or Individual Companies
   vii. Please provide feedback on the feasibility of obtaining the installed count of different manufacturer's relay in your region. ERCOT SPWG Group or Individual Companies

Misoperation Analysis Team Region Request - DRAFT

2. Top Causes of Misoperations
   a. What are your top three causes of misoperations based for most recent (5) years (2020-2024) and how are they trending? David Penney
   b. Provide the count and percentage of misoperations by Misoperation Category for your top 3 causes. David Penney
   c. Provide the count and percentage of misoperations by Equipment Type for your top 3 causes. David Penney
   d. What do you think is the most important misoperation cause to address in your region? ERCOT SPWG Group or Individual Companies
   e. What initiatives have you undertaken to address your top three causes of misoperations? ERCOT SPWG Group or Individual Companies
3. Provide the Counts, Percentage, Trends of Misoperations for the 5-year period 2020-2024 for the items listed below
   a. Misoperation rate. David Penney
   b. Misoperation Category for Incorrect Settings cause, if not already provided in 2b. David Penney
   c. Misoperation Category for Relay Failure/malfunctions cause, if not already provided in 2b. David Penney
   d. Equipment type for Incorrect Settings cause, if not already provided in 2c. David Penney
   e. Equipment type for Relay Failure/malfunctions cause, if not already provided in 2c. David Penney
4. Provide your observations, concerns, and recommendations regarding misoperations in your region. ERCOT SPWG Group or Individual Companies

Questions