WHITE PAPER

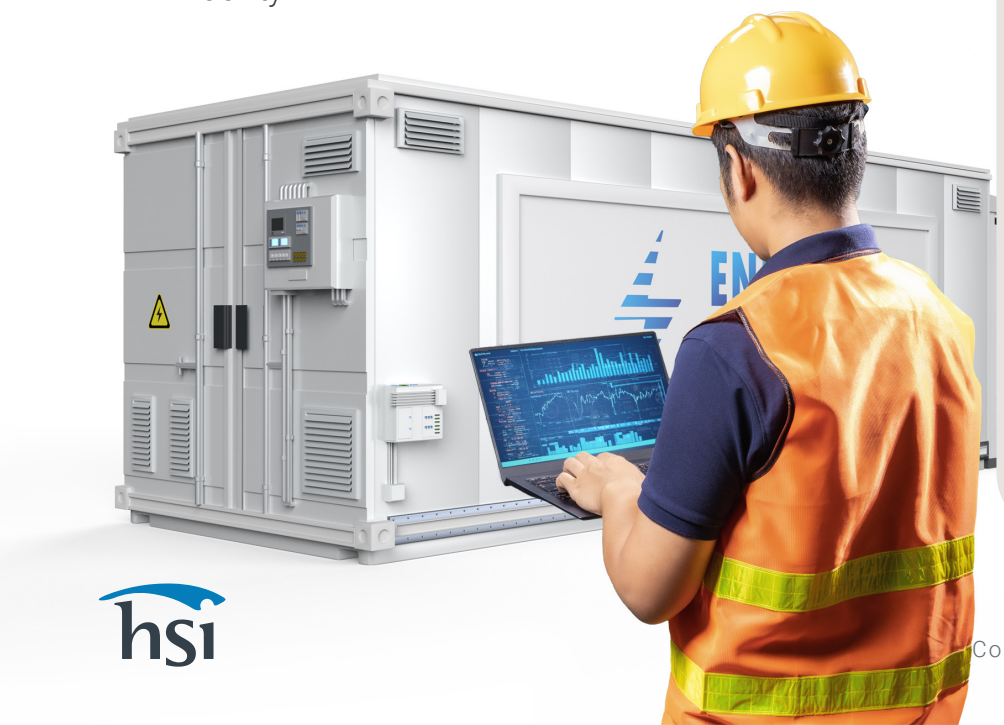
A Comprehensive Approach: **Navigating NERC Compliance Challenges and Integrating Battery Energy Storage Systems**

Integrating battery energy storage systems (BESS) into existing generating facilities poses significant challenges, particularly concerning NERC compliance. Whether it's a combined cycle or solar system, the integration process demands careful navigation.

In recent years, regulatory activity surrounding the integration of inverter-based resources (IBR), notably BESS, has intensified. This trend is expected to continue over the next five to 10 years to uphold bulk reliability standards.

Successfully integrating BESS into existing facilities or establishing them as startups **requires a systematic approach.** Facilities that adopt organized and structured methodologies tend to excel in audits, ensuring NERC compliance by their commercial operations date (COD).

Establishing a BESS facility compliance program can involve modifying startup processes or adjusting existing facility procedures to accommodate the unique characteristics of the BESS. The optimal strategy begins with a comprehensive assessment of all applicable standards for Generator Owners (GO) or Generator Operators (GOP) related to the BESS facility.



Standards Discussed in This White Paper

We include many NERC Reliability Standards in this white paper. To simplify the text, the full name of each standard is listed below. Only the standard number is used in the text. The standards are listed in the order they appear.

COM-001	Communications
COM-002	Operating Personnel Communications
TOP-003	Operational Reliability Data
IRO-010	Reliability Coordinator Data Specification and Collection
EOP-004	Event Reporting
EOP-006	System Restoration Coordination
EOP-011	Emergency Operations and Preparedness
EOP-012	Extreme Cold Weather Preparedness and Operations
FAC-001	Facility Interconnection Requirements
FAC-002	Facility Interconnection Studies
FAC-003	Vegetation Management
MOD-025	Verification and Data Reporting of Generator Real and Reactive Power Capability and Synchronous Condenser Reactive Power Capability
MOD-026	Verification of Models and Data for Generator Excitation Control System or Plant Volt/Var Control Function
MOD-027	Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions
PRC-023	Transmission Relay Loadability
PRC-002	Disturbance Monitoring and Reporting
PRC-004	Protection System Mis-operations
VAR-002	Generator Operation for Maintaining Network Voltage Schedules
PRC-005	Protection System Maintenance
FAC-008	Facility Ratings
PRC-027	Coordination of Protection Systems for Performance During Faults
PRC-006	Specific Training for Personnel

Integrating NERC Compliance into New Facility Commissioning

Commissioning a new facility entails a meticulous approach to NERC compliance, ensuring alignment with relevant standards from the beginning. By systematically listing standards and evaluating their applicability, stakeholders can **establish a unified approach and focus on pertinent standards throughout construction and the COD**. This proactive approach also documents compliance processes for future audits.

Any standards that don't apply to the BESS facility should be clearly identified, with explanations provided for their exclusion. These exclusions can be formally attested to if required during audits, streamlining the compliance process.

Next, the **applicable standards, such as CIP, COM, MOD, and PRC, should be listed**, accompanied by an **outline of necessary actions** within the project timeline to **ensure day-one compliance.**

Integrating NERC compliance seamlessly into the construction phase of a new facility is imperative. Collaboration between compliance and construction teams should be fostered, **treating compliance as an integral aspect of the project plan** rather than an afterthought.

Given that project managers often also serve as construction managers, regular meetings between compliance managers and project managers every two weeks should begin early in the process. As the COD approaches, meeting frequency may increase to twice a week to address any remaining gaps and finalize processes and procedures.

This systematic approach ensures all necessary processes and procedures are developed and ready by the COD, with training initiatives identified and completed. With these preparations in place, obtaining the NERC number and starting power generation activities is all that remains.

Integrating into Existing Facilities

When integrating a BESS into an existing facility, the first step is to assess the existing processes and procedures. This evaluation identifies synergies that can streamline operations, enhance efficiency, and minimize costs. Two key questions to consider are:

- Can existing procedures be used or adapted to integrate the BESS?
- Does the construction team need to develop a new procedure specifically for this facility?

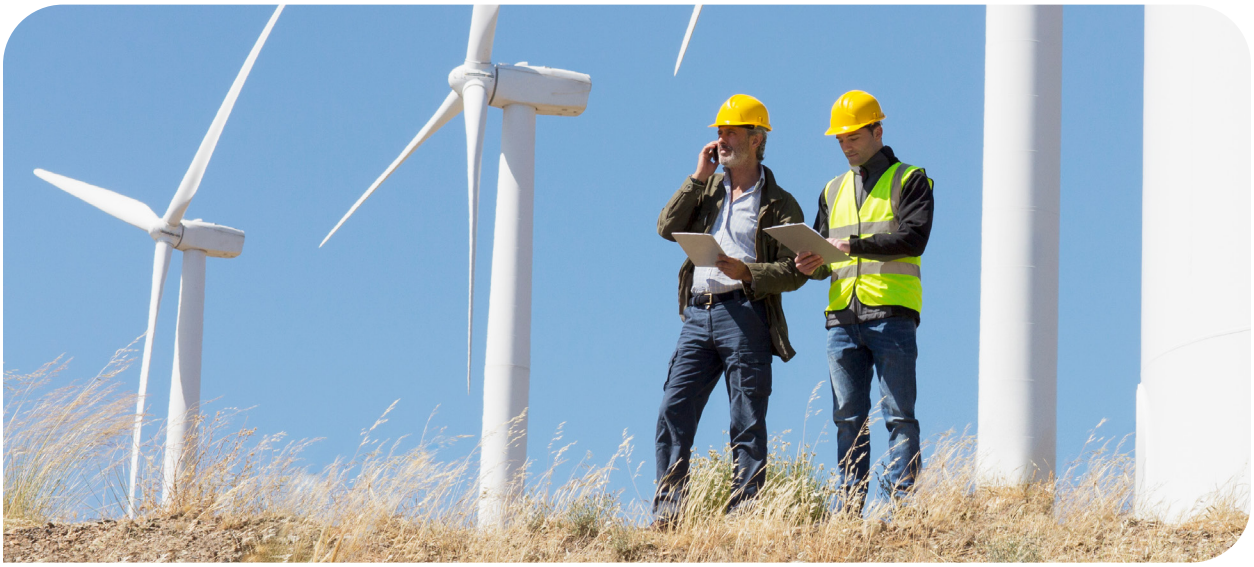
Opting to **update and modify existing procedures proves to be more cost-effective than creating new ones**. Therefore, a thorough examination of existing procedures is essential to determine opportunities for integration and optimization.

Standards Overview

Critical Infrastructure Protection (CIP)

If expanding existing physical and electronic access parameters, supplement your current procedures with an appendix. This appendix documents the updated parameters, ensuring clarity and consistency in operational protocols.

Existing facilities undergo a CIP impact rating evaluation. Even though the NERC standard doesn't require it, you should **identify your cyber assets and cyber systems**. This proactive approach helps maintain transparency and accountability, particularly if you connect or remove transient cyber assets, even for facilities classified as low impact. By **maintaining a comprehensive list, you can effectively manage BESS cyber systems and ensure compliance** with evolving regulatory standards.



Communication (COM)

COM encompasses two standards – **COM-001** and **COM-002**. Compliance with these standards entails two primary tasks:

- Documenting phone numbers for the reliability entities with which the facility will work and incorporating them into the operational procedure
- Providing training for new operators on operating instructions

If the facility is also registered as a GOP, personnel must undergo training on operating instructions. When adding a BESS to an existing facility, personnel may already be trained. However, it's necessary to document any instances where new operators require training as part of the project plan.

Transmission Operations (TOP), and Interconnection Reliability Operations and Coordination (IRO)

TOP-003 and **IRO-010** are interrelated. These standards collaborate to ensure the reliability and efficiency of operational data management.

To effectively comply with these standards, it is essential to collaborate closely with the involved Reliability Entities. They will provide data specifications that must be met to uphold compliance and operational reliability. This collaborative approach facilitates smooth data exchange processes within the transmission operations domain.

Emergency Operations (EOP)

Event Reporting

Event reporting is critical. Operators at new facilities must be equipped to identify network reportable events in accordance with EOP-004. While this standard does not mandate specific training requirements, providing a refresher on NERC standards for the COD is recommended.

Operators primarily focus on plant operations, with NERC compliance not typically their primary responsibility. Reinforcing how their roles can impact compliance helps ensure alignment and awareness.

For new facilities, developing a comprehensive event reporting procedure is essential. Existing facilities can integrate this procedure into their existing protocols or establish it as a standalone process.

The Transmission Operator (TOP) should advise you if the facility is part of their restoration plan. If so, EOP-006 needs to be addressed.

Winterization

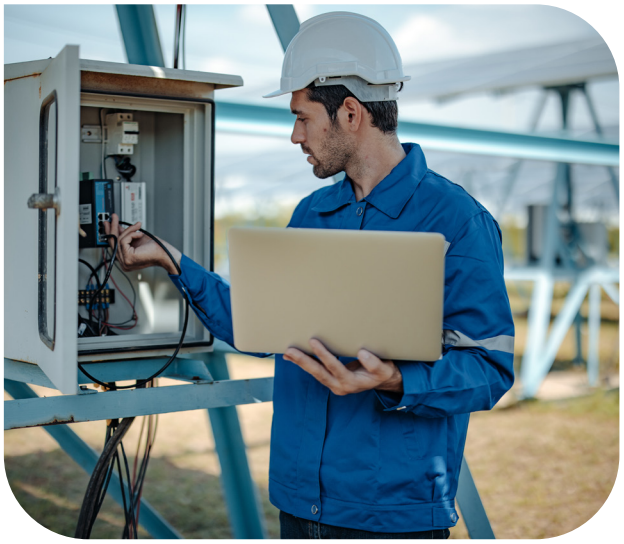
One high-priority standard, EOP-011, and its successor EOP-012, emphasize winterization procedures, which is particularly relevant given the frequency of cold weather challenges. New facilities must develop robust winterization procedures tailored to their geographic location, aligning with the standard's requirements and setting appropriate deadlines for implementation.

Staff must implement lessons learned from previous cold weather seasons. Training needs to be developed ahead of the next cold weather season to ensure readiness and compliance.

Facilities (FAC)

Ensuring compliance with FAC-001 and FAC-002 is paramount for new facility development. It's essential to clarify interconnection requirements for the facility. Like other standards, the requirements can be integrated into existing processes or established as standalone procedures.

While BESS facilities typically don't fall under FAC-003, it's imperative to evaluate its applicability. If FAC-003 is deemed inapplicable, document the rationale behind the decision. This documentation prevents oversight amid personnel turnover and program evolution.



If FAC-003 does apply, develop a comprehensive vegetation management program. Meeting program deadlines and meticulously documenting compliance positions are imperative.

Modeling, Data, and Analysis (MOD)

After testing for MOD standards is complete, the results must be communicated to the Transmission Planner (TP). Compliance with standards such as MOD-025, MOD-026, and MOD-027 requires completion within 365 days of the COD. Recognizing the challenges associated with starting operations and conducting verifications, NERC and the Regional Entities provide ample time for testing, considering factors such as inclement weather.

To ensure compliance, verification procedures must be scheduled and reported to the TP, with tracking incorporated into the project plan. If using a vendor, obtain comprehensive reports demonstrating compliance with each requirement. Clearly outlining the required reports in the Request for Proposal (RFP) upfront streamlines the procurement process and establishes expectations. Additionally, the RFP should specify the documentation required to confirm facility compliance.

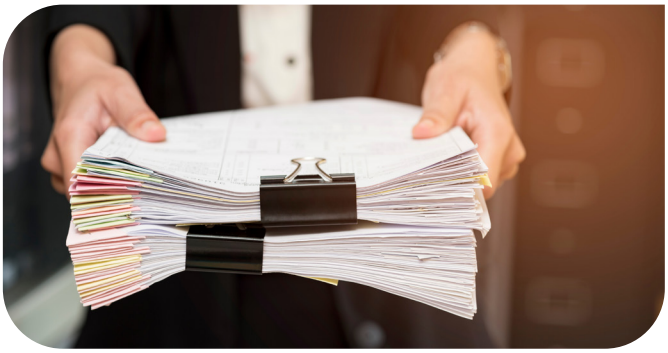
An effective report should delineate NERC requirements, the testing conducted, and the resulting compliance status. This comprehensive approach provides clarity for the compliance team and auditors alike.

Collaboration with the compliance team helps align report sections with NERC requirements and testing protocols. Maintaining thorough documentation of communication with the TP, including acknowledgment of receipt and any questions asked, consolidates evidence within the report, simplifying compliance verification.

Protection and Control (PRC)

New facilities are subject to several PRC standards. Considerations may arise regarding compliance with PRC-023 or PRC-002. Additionally, adherence to PRC-004 may require using existing processes, such as maintaining a log of mis-operations, conducting investigations, and documenting the outcomes.

The Transmission Owner (TO) is responsible for evaluating the applicability of PRC-002 standards and notifying the facility of any relevant requirements. In instances where a standard is deemed inapplicable, obtaining an attestation from the TO stating no notification was provided regarding the necessity of data recording equipment installation is advisable. However, it is better to have concrete evidence confirming the non-applicability of such requirements. Requesting clarification via email and retaining the response in the facility's records strengthens your compliance position.



Voltage and Reactive (VAR)

For compliance with VAR-002, the TOP will communicate your voltage schedule. It is imperative to strictly follow this schedule and document it as compliance evidence.

The TOP's notification serves as crucial compliance evidence. Ensuring alignment with the specified voltage schedule and retaining documentation provides evidence pivotal in demonstrating compliance with VAR standards during compliance audits.

Vendor Availability

When using vendors for facility development, it's important to remember they will leave when the project is finished. Once your facility is online and NERC registered, vendors transition to new projects, leaving you to navigate ongoing compliance independently.

After registering as a GO or GOP, facilities are submitted to an audit. The audit notification can trigger questions, requiring communication with past vendors. However, their focus on new projects may delay response to your NERC compliance inquiries, preventing a timely response to auditors.

To mitigate this risk, incorporate language in the vendor agreement mandating prompt responses to NERC compliance inquiries. By stipulating their responsibility to address compliance-related questions quickly, you can ensure continued support during critical audit periods.

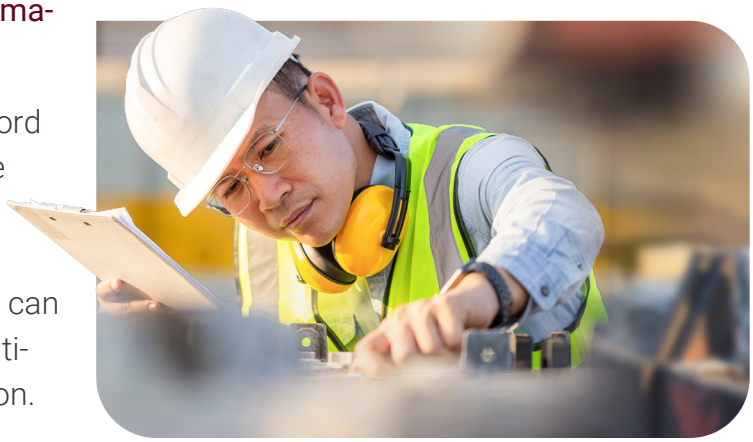
Effective Management of Protection Systems Maintenance and Testing

PRC-005 is on the NERC CMEP as a high-risk standard and is one of the most frequently audited standards. Demonstrating robust internal controls is imperative if selected for an audit. The protection system maintenance program (PSMP) must accurately reflect all maintenance and testing activities.

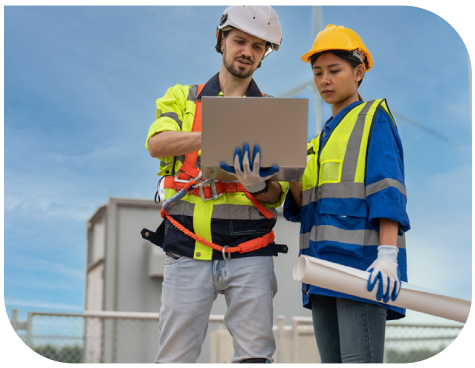
With the introduction of a new facility, the scope and evidence requirements for PRC-005 undergo changes concerning protection system maintenance and testing. **For new facilities, detailed tracking of all installed protective systems encompassed in the PSMP and relevant to PRC-005 is essential.** Documenting work orders is critical.

Start the process by maintaining thorough records, which can be efficiently managed through spreadsheets or dedicated software solutions. **Leveraging software offers the advantage of consolidating and centralizing document tracking and reporting.** Essential data to record includes the installation date of protection systems and SEL relays, corresponding PRC-005 standard table entries, and testing dates with the initial test date serving as the reference point for subsequent tests.

Start tracking early in the process, avoiding the challenge of populating live PRC data with a backlog of work orders after the facility is commissioned. Investing time upfront proves significantly more manageable than retroactively entering data from paper records. As records are completed or maintenance and testing activities occur during the commissioning phase, start populating the spreadsheet or software with the information. **Align testing and maintenance records with the designated PRC-005 components to clearly communicate information to auditors.**



Conduct quality checks promptly upon record submission to identify errors or incomplete paperwork. This process ensures data accuracy and completeness, crucial for demonstrating compliance. Quality checks can be performed internally or by third-party entities to uphold the integrity of the information.



When integrating into an existing facility, segregate new information appropriately or integrate it clearly into existing documentation. Maintain robust internal controls to mitigate risks associated with updates. Particularly with manual spreadsheets, consistency in language and error prevention are paramount. Interruptions are inevitable in operational settings, underscoring the importance of stringent internal control processes to ensure data accuracy and continuity. Simple measures, such as marking completed work orders, can streamline the process and enhance reliability.

Ensuring Data Integrity in PRC-005 Compliance

Maintaining accurate and comprehensive records is fundamental to achieving and demonstrating compliance with the PRC-005 standard. However, we've seen several examples of what not to do. In one case, a client scanned all their records into an enormous PDF file as evidence. The low-quality scans included all the station DC diagrams and the DC elementaries where they do their protection logic checks.

Scanning the information makes sense, but in this case, the information was scanned as a picture and mixed with other files. The data couldn't be searched, which meant it had to be viewed manually to find the needed information, a time-consuming and labor-intensive task.

Preferred strategies for scanning documents include:

- **PDFs used for evidence should be searchable to easily locate the necessary documents**
- **Documents should be separated by transformer, breaker, or even by station**
- **File sizes should be manageable. By scanning everything together, the client created a file that couldn't be shared or downloaded, so it couldn't be provided for evidence**

Document formatting should be part of any vendor agreement

Meeting Milestone Dates

NERC standards become applicable when a facility receives an NCR number and reaches its COD, signifying it is online and actively providing power.

Throughout the compliance journey, **diligent monitoring of PRC-005 records is essential** to identify upcoming battery charter testing dates, as mandated by the standard's quarterly testing requirements.

When field testing is necessary, it's crucial to schedule reminders to ensure timely completion. Some facilities opt for monthly checks instead of quarterly, but regardless of frequency, **maintaining a robust internal control process is vital to prevent missed deadlines.** Centralizing all testing dates on a master calendar facilitates organization and accountability.

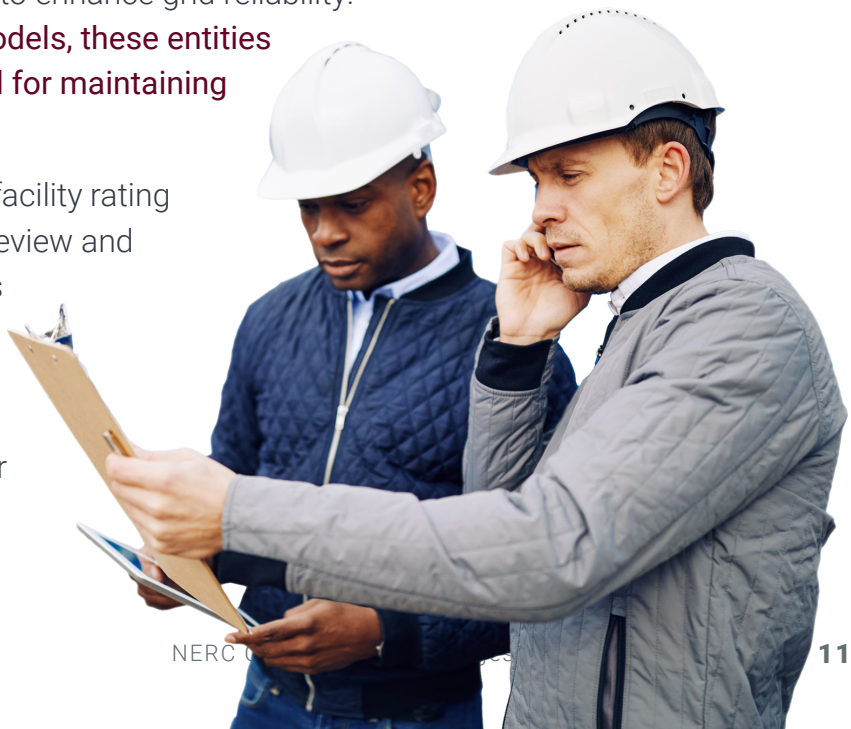
While certain tests like substation checks and walkthroughs are straightforward, others may require facility downtime and advanced scheduling, requiring an RFP process that can span months. This information must reside in a centralized location accessible to all stakeholders, avoiding dependence on individual personnel.

Facilities Design, Connections, and Maintenance (FAC)

FAC-008 is a critical standard within NERC's regulatory framework. The accuracy of facility ratings is paramount, as they serve as crucial inputs for grid operators to conduct contingency analysis effectively. Real-time decision-making hinges upon the precision of these analyses, underscoring the importance of correct data input.

Reliability entities such as Reliability Coordinators (RC), Balancing Authorities (BA), and TOPs rely on accurate facility ratings to enhance grid reliability. **By incorporating ratings into their models, these entities can make informed decisions crucial for maintaining grid stability.**

Integrating a new BESS into existing facility rating methodologies requires meticulous review and adjustment to ensure all components are appropriately captured. Failing to include relevant ratings can require updates to the methodology or new standalone documentation for the facility.



Identifying the most limiting element is critical. Just like PRC-005, this process should be initiated early in the project lifecycle, with comprehensive documentation of all components outlined in advance to avoid last-minute additions.

Several notifications are mandated before COD, such as coordination of protective relays as per PRC-027 requirements. Coordinated efforts between TOs, GOs, and Distribution Providers (DP) must be accurately captured and documented to ensure proper relay settings and operational efficiency.

Effective communication between entities is imperative, often occurring via phone calls. Key tasks and conversations requiring documented evidence should be outlined in the project plan. Once project management teams know information needs to be tracked, they can ensure thorough documentation, typically through email correspondence, for the NERC compliance team's records.

PER-006 Training Requirements

PER-006 is essential for all GOPs. This specialized training delves into protection systems and remedial action schemes (RAS), pivotal components influencing the performance of generating facilities. The training should encompass any unique aspects relevant to each facility's operations.

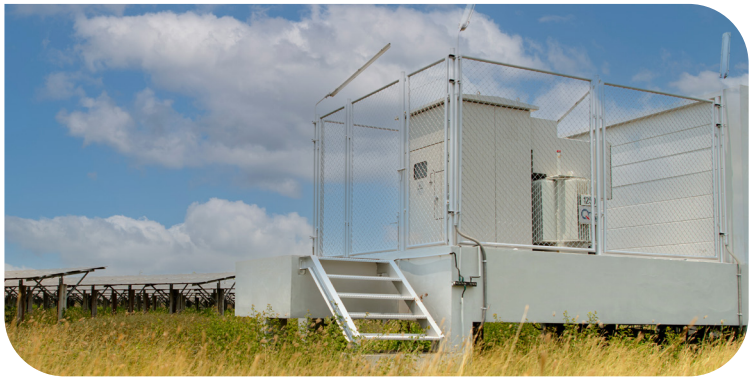
When integrating a new facility into an existing program, these considerations come into play:

- **Update requirements:** assess whether the existing training program needs updating to incorporate all protection information associated with the new facility
- **Operator needs:** determine if operators require new or refresher training to effectively manage the new facility's nuances

During audits, auditors will ask about the existence and documentation of a PER-006 training program. Thorough documentation of training activities, including version control, must be maintained. **Failure to document a review of the training program can raise concern**s for auditors.

An example of good evidence is documenting a comprehensive review of the facility to ensure alignment with training content. Then, document that existing operators have undergone the requisite training, providing a clear train of compliance.

Launching new BESS facilities demands a strategic approach, particularly concerning NERC compliance. As regulatory focus intensifies on IBRs, adherence to compliance standards becomes increasingly important. Various aspects of compliance integration have been discussed, from commissioning new facilities to incorporating BESS into existing setups. By adopting systematic methodologies and maintaining meticulous documentation, facilities can navigate the complexities of NERC compliance with confidence. As the regulatory landscape continues to evolve, proactive measures and collaborative efforts will be instrumental in ensuring grid reliability and operational excellence in the face of dynamic challenges.



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