

Standard Authorization Request (SAR)

Complete and submit this form, with attachment(s) to the [NERC Help Desk](#). Upon entering the Captcha, please type in your contact information, and attach the SAR to your ticket. Once submitted, you will receive a confirmation number which you can use to track your request.

The North American Electric Reliability Corporation (NERC) welcomes suggestions to improve the reliability of the bulk power system through improved Reliability Standards.

Requested information

SAR Title: Federal Energy Regulatory Commission (FERC) Order No. 901 – Milestone 3, Part 2: IBR Model Validation

Date Submitted: 4/29/24

SAR Requester

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SAR Type (Check as many as apply)

- | | |
|---|---|
| <input checked="" type="checkbox"/> New Standard | <input type="checkbox"/> Imminent Action/ Confidential Issue (SPM Section 10) |
| <input checked="" type="checkbox"/> Revision to Existing Standard | <input type="checkbox"/> Variance development or revision |
| <input checked="" type="checkbox"/> Add, Modify or Retire a Glossary Term | <input type="checkbox"/> Other (Please specify) |
| <input checked="" type="checkbox"/> Withdraw/retire an Existing Standard | |

Justification for this proposed standard development project (Check all that apply to help NERC prioritize development)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Regulatory Initiation | <input checked="" type="checkbox"/> NERC Standing Committee Identified |
| <input checked="" type="checkbox"/> Emerging Risk (Reliability Issues Steering Committee) Identified | <input type="checkbox"/> Enhanced Periodic Review Initiated |
| <input checked="" type="checkbox"/> Reliability Standard Development Plan | <input type="checkbox"/> Industry Stakeholder Identified |

What is the risk to the Bulk Electric System (What Bulk Electric System (BES) reliability benefit does the proposed project provide?):

This Standards Authorization Request (SAR) is initiated by NERC, with consultation of the Reliability Security Technical Committee, to address directives issued by the Federal Energy Regulatory Commission (FERC) in Order No. 901. FERC issued Order No. 901 on October 19, 2023, which includes directives on new or modified NERC Reliability Standard projects. FERC Order No. 901 addresses a wide spectrum of reliability risks to the grid from the application of inverter-based resources (IBRs); including both utility scale and behind-the-meter or distributed energy resources (DERs).

Within the Order, are four milestones that include sets of directives to NERC. In the Order, FERC has directed NERC to propose new or modified standards to mitigate reliability gaps in the current NERC Reliability Standards related to IBRs. Specifically, FERC directed NERC to develop new or modified

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Reliability Standards to address the following four broad topic areas related to IBRs: (1) data sharing; (2) data and model validation; (3) planning and operational studies; and (4) performance.

In January 2024, NERC filed the initial **Standards Development Work Plan in Response to FERC Order No. 901** (hereafter referred to as the “Work Plan”). A current version of the Work Plan will be maintained [here](#). The Work Plan discusses how NERC will develop Reliability Standards within three tranches (Milestones 2-4) to meet FERC’s filing deadlines. This Standard Authorization Request addresses Milestone 3 – Part 2 of the Work Plan, related to Reliability Standards for IBR data sharing and model validation.

Milestone 3 of the Work Plan covers the development of data provisioning, parameters, and estimation requirements for IBRs. FERC Order No. 901 directives address three categories of IBR: (1) registered IBR, including sub-Bulk Electric System IBRs to be registered under NERC’s revised Compliance Registry criteria; (2) unregistered IBR; and (3) IBR-DER, to distinguish registered bulk connected IBRs from unregistered bulk connected IBRs as well as the transmission connected IBRs from distribution-connected IBRs. NERC must file the Reliability Standards or definitions developed under Milestone 3 by November 4, 2025.

Purpose or Goal (What are the reliability gap(s) or risk(s) to the Bulk Electric System being addressed, and how does this proposed project provide the reliability-related benefit described above?):

This SAR addresses specific pieces of the NERC filed Work Plan related to Milestone 3 and addresses the various industry comments to meet the regulatory directives of FERC Order No. 901. This project shall coordinate among other projects (i.e., act as a clearing house to tie directive language to standard revisions), develop standard language (i.e., perform the normal duties of a standard development Project), and build upon other Milestones from FERC Order No. 901 Standards Projects to meet regulatory deadlines (i.e., maintain agility based on how FERC Order No. 901 related Projects proceed to meet the directive deadlines).

Specifically, the drafting team will address FERC Order No. 901 directives related to modeling validation (and verification) activities by utilizing actual performance data. This will help ensure the facility’s model(s) reflects the in-service equipment throughout the lifecycle of the IBR facility.

Project Scope (Define the parameters of the proposed project):

The FERC Order No. 901 directives assigned to this SAR are outlined in the Detailed Description section below. The project scope shall address all those directives, and should consider the following objectives during the standards development process:

Phase 1 Objectives:

1. Either revise MOD-033 or create a new IBR model validation Reliability Standard to require model validation using actual performance data.
 - a. include a complete set of validation expectations using performance data (must include performance data of IBR during disturbances as well as other performance measures);

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- b. leverages the most accurate and highest quality model type available (reference data sharing scope from Milestone 3 Part 1 SAR);
 - c. ensure post-interconnection validations are not solely based on staged testing, but instead are periodically validated using performance data;
 - d. be designed to follow and be able to leverage new performance validations expected to be done during the interconnection process (to be established in phase 2 of this SAR);
 - e. include minimum criteria for performing validation (e.g., time, tolerance, impact);
 - f. include some planner/operator flexibility in determining specific performance criteria –
 - g. Require planner and operators to communicate any performance criteria to Generator Owners;
 - h. the DT should ensure any performance criteria established by the DT or by the planner and operators are risk-based and region-specific;
 - i. the DT should consider other criteria may be created by planners and operators to demonstrate performance in upcoming revisions to Reliability Standards due to Milestone 4 projects (planning and operator studies using performance data); and
 - j. the DT must require corrective action plans (CAPs) to be created by planners and operators that require the GO/TO to identify and improve model performance characteristics to align with performance.
2. Revise MOD-026 and MOD-027 to remove IBR from those Standards as this holistic approach includes some form of ongoing quality review and corrections based on new performance-based validation.
 3. The drafting team shall ensure that implementation plans for new or modified Reliability Standards related to Milestone 3 of the Work Plan are aligned and do not create a reliability gap during implementation.

Phase 2 Objectives (not required as part of 901 Milestone 3 timeline)

4. Either revise FAC-002 or create a new SAR to incorporate similar changes to IBR validation during the interconnection process or create a new IBR model validation standard to require model validation using actual performance data to validate model quality during the interconnection process.
 - a. include a complete set of validation expectations using performance data,
 - b. leverages the most accurate and highest quality model type available,
 - c. ensure post-interconnection validations are not based on staged testing but instead are periodically validated using performance data,
 - d. be designed to follow and be able to leverage new performance validations done during the interconnection process,
 - e. include minimum criteria for performing validation (e.g., time, tolerance, impact),
 - f. include some planner/operator flexibility in determining specific performance criteria,
 - g. These are necessary to ensure that performance criteria are risk-based and region-specific
 - h. These should consider parallel criteria developed for TPL-001 and the new PRC-030 to allow corrective action plans to be created by planners and operators that require the

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GO/TO to identify and improve model performance characteristics to align with performance.

Detailed Description (Describe the proposed deliverable(s) with sufficient detail for a drafting team to execute the project. If you propose a new or substantially revised Reliability Standard or definition, provide: (1) a technical justification¹ of developing a new or revised Reliability Standard or definition, which includes a discussion of the risk and impact to reliability-of the BES, and (2) a technical foundation document (e.g., research paper) to guide development of the Standard or definition):

The project scope above will need to account for the specific FERC Directive text in FERC Order 901 to be successful. The drafting team should consider the specific language in the FERC directives, as well as any comments in the FERC Order No. 901 proceeding that FERC directed NERC to consider as part of the standard development process.

FERC Order 901 Directives Assigned to this SAR:

NERC will maintain a current version of NERC Standards Development’s Work Plan to Address FERC Order No. 901 on the NERC website under [Reliability Standards Under Development](#). Included in this Work Plan is a list of the directives in FERC Order No. 901 and their associated mapping to each SAR submitted by NERC. The Work Plan will be updated should any mapping of FERC directives be reassigned due to ongoing work in the various Standards Development Projects. As of April 1, 2024, this SAR will address the following FERC Order No. 901 directives, with the scope for this SAR emphasized in **bold** as appropriate:

1. **“Pursuant to section 215(d)(5) of the FPA, we adopt the NOPR proposal to direct NERC to include in the new or modified Reliability Standards technical criteria to require registered IBR generator owners to install disturbance monitoring equipment at their buses and elements, to require registered IBR generator owners to provide disturbance monitoring data to Bulk-Power System planners and operators for analyzing disturbances on the Bulk-Power System, and to require Bulk-Power System planners and operators to validate registered IBR models using disturbance monitoring data from installed registered IBR generator owners’ disturbance monitoring equipment.”** (P85)
2. “With respect to NERC’s recommendation for model benchmarking, we direct NERC to determine through its standards development process whether the development of benchmark cases to test model performance and a subsequent report comparing model performance are needed and at what periodicity.” (P 126)
3. “Pursuant to section 215(d)(5) of the FPA, we adopt the NOPR proposal and direct NERC to develop new or modified Reliability Standards that require the generator owners of registered IBRs, transmission owners that have unregistered IBRs on their system, and distribution providers that have IBR-DERs on their system to provide models that represent the dynamic behavior of these IBRs at a sufficient level of fidelity to provide to Bulk-Power System planners and operators

¹ The NERC Rules of Procedure require a technical justification for new or substantially revised Reliability Standards. Please attach pertinent information to this form before submittal to NERC.

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to perform valid interconnection-wide, planning, and operational studies on a basis comparable to synchronous generation resources.” (P 140)

4. “We also direct NERC to require the generator owners of registered IBRs and the transmission owners that have unregistered IBRs on their system to provide to the Bulk-Power System planners and operators (e.g., planning coordinators, transmission planners, reliability coordinators, transmission operators, and balancing authorities) dynamic models that accurately represent the dynamic performance of registered and unregistered IBRs, including momentary cessation and/or tripping, and all ride through behavior.” (P 141)
5. “While we decline to include this level of detail in the directive to NERC, we nonetheless direct NERC to establish a standard uniform model verification process.” (P 143)
6. “Therefore, we direct NERC to define the model verification process and to require consistency among the model verification processes for existing Reliability Standards (e.g., FAC-002, MOD-026, and MOD-027) and any new or modified Reliability Standards.” (P 143)
7. “Moreover, although the Reliability Standards will apply to a different (albeit overlapping) set of entities than Order No. 2023, we believe consistency is needed between the complimentary proceedings and therefore direct NERC to include in the new or modified Reliability Standards a similar model verification process timeline consistent with FERC Order No. 2023 modeling deadline requirements.” (P 149)
8. “Pursuant to section 215(d)(5) of the FPA, we adopt the NOPR proposal and direct NERC to submit new or modified Reliability Standards that require Bulk-Power System planners and operators to validate, coordinate, and update in a timely manner the system models by comparing all generator owner, transmission owner, and distribution provider verified IBR models (i.e., models of registered IBRs, unregistered IBRs, and IBR-DERs that in the aggregate have a material impact on the Bulk-Power System) and resulting system models against actual system operational behavior.” (P 156)
9. **“Furthermore, for those areas with IBR-DERs in the aggregate that materially impact the reliable operation of the Bulk-Power System but do not have an associated registered distribution provider, we modify the NOPR proposal to direct NERC to determine the appropriate registered entity responsible for the data and parameters of IBR-DERs in the aggregate and to establish a process that requires identified registered entities to coordinate, validate, and keep up to date the system models.”** (P 157)
10. **“Specifically, we direct NERC to develop new or modified Reliability Standards that require planning coordinators, transmission planners, reliability coordinators, transmission operators, and balancing authorities to establish for each interconnection a uniform framework with modeling criteria, a registered modeling designee, and necessary data exchange requirements both between themselves and with the generator owners, transmission owners, and distribution providers to coordinate the creation of transmission planning, operations, and interconnection-wide models (i.e., system models) and the validation of each respective system model.”** (P 161)

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11. “Further, we direct NERC to include in the new or modified Reliability Standards a requirement for generator owners, transmission owners, and distribution providers to regularly update and communicate the verified data and models of registered IBRs, unregistered IBRs, and IBR-DERs by comparing their resulting models against actual operational behavior to achieve and maintain necessary modeling accuracy for inclusion of these resources in the system models.” (P 161)
12. “For those areas with IBR-DERs in the aggregate that have a material impact on the reliable operation of the Bulk-Power System but do not have an associated registered distribution provider, we modify the NOPR proposal to direct NERC to determine the appropriate registered entity responsible for the models of those IBR-DERs and to determine the registered entities responsible for updating, verifying, and coordinating models for IBR-DERs in the aggregate to meet the system models directives.” (P 161)
13. “Further, we believe that there is a need to have all of the directed Reliability Standards effective and enforceable well in advance of 2030 and direct NERC to ensure that the associated implementation plans sequentially stagger the effective and enforceable dates to ensure an orderly industry transition for complying with the IBR directives in this final rule prior to that date.” (P 226)

Cost Impact Assessment, if known (Provide a paragraph describing the potential cost impacts associated with the proposed project):

The associated cost with implementation of a new standard is currently unknown. There may be potential cost savings if fewer reoccurring staged tests are performed.

Please describe any unique characteristics of the BES facilities that may be impacted by this proposed standard development project (e.g., Dispersed Generation Resources):

Inverter-Based Resources connected to the Bulk Power System (BPS)
Distributed Energy Resources (DER-IBR), in aggregate

To assist the NERC Standards Committee in appointing a drafting team with the appropriate members, please indicate to which Functional Entities the proposed standard(s) should apply (e.g., Transmission Operator, Reliability Coordinator, etc. See the NERC Rules of Procedure Appendix 5A:

Transmission Planner
Reliability Coordinator
Distribution Provider
Generator Owner and Generator Operator
Transmission Owner and Transmission Operator

Do you know of any consensus building activities² in connection with this SAR? If so, please provide any recommendations or findings resulting from the consensus building activity.

² Consensus building activities are occasionally conducted by NERC and/or project review teams. They typically are conducted to obtain industry inputs prior to proposing any standard development project to revise, or develop a standard or definition.

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[FERC Order No. 901](#)

[NERC Standards Development Work Plan in Response to FERC Order No. 901](#)

[Inverter-Based Resource Activities, Quick Reference Guide](#)

[Distributed Energy Resource Activities, Quick Reference Guide](#)

[IBR Registration Initiative, Quick Reference Guide](#)

Are there any related standards or SARs that should be assessed for impact as a result of this proposed project? If so, which standard(s) or project number(s)?

1. SARs:
 - a. SAR titled: Federal Energy Regulatory Commission (FERC) Order No. 901 – Milestone 3, Part 1: Modeling and Data Sharing Requirements
 - b. SAR titled: Federal Energy Regulatory Commission (FERC) Order No. 901 – Milestone 3, Part 3: IBR Modeling Revision
2. Active Reliability Standards Projects:
 - a. 2020-06 Verifications of Models and Data for Generators (NERC Standards Development recommends assigning the SAR to this active project)
 - b. 2021-01 Modifications to MOD-025 and PRC-019
 - c. 2022-02 Modifications to TPL-001-5.1 and MOD-032-1
 - d. 2022-04 EMT Modeling
 - e. 2023-05 Modifications to FAC-001 and FAC-002
 - f. 2023-08 Modifications of MOD-031 Demand and Energy Data

Are there alternatives (e.g., guidelines, white paper, alerts, etc.) that have been considered or could meet the objectives? If so, please list the alternatives with the benefits of using them.

Reliability Principles

Does this proposed standard development project support at least one of the following Reliability Principles ([Reliability Interface Principles](#))? Please check all those that apply.

<input checked="" type="checkbox"/>	1. Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
<input type="checkbox"/>	2. The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
<input checked="" type="checkbox"/>	3. Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably.
<input type="checkbox"/>	4. Plans for emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained and implemented.
<input checked="" type="checkbox"/>	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk power systems.
<input type="checkbox"/>	6. Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions.

Reliability Principles	
<input type="checkbox"/>	7. The security of the interconnected bulk power systems shall be assessed, monitored and maintained on a wide area basis.
<input type="checkbox"/>	8. Bulk power systems shall be protected from malicious physical or cyber attacks.

Market Interface Principles	
Does the proposed standard development project comply with all of the following Market Interface Principles ?	Enter (yes/no)
1. A reliability standard shall not give any market participant an unfair competitive advantage.	yes
2. A reliability standard shall neither mandate nor prohibit any specific market structure.	yes
3. A reliability standard shall not preclude market solutions to achieving compliance with that standard.	yes
4. A reliability standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards.	yes

Identified Existing or Potential Regional or Interconnection Variances	
Region(s)/ Interconnection	Explanation
<i>e.g.</i> , NPCC	Unknown at this time.

For Use by NERC Only

SAR Status Tracking (Check off as appropriate).	
<input checked="" type="checkbox"/> Draft SAR reviewed by NERC Staff	<input type="checkbox"/> Final SAR endorsed by the SC
<input type="checkbox"/> Draft SAR presented to SC for acceptance	<input type="checkbox"/> SAR assigned a Standards Project by NERC
<input type="checkbox"/> DRAFT SAR approved for posting by the SC	<input type="checkbox"/> SAR denied or proposed as Guidance document
Risk Tracking.	
<input type="checkbox"/> Grid Transformation	<input type="checkbox"/> Energy Policy
<input type="checkbox"/> Resilience/Extreme Events	<input type="checkbox"/> Critical Infrastructure Interdependencies
<input type="checkbox"/> Security Risks	

Version History

Version	Date	Owner	Change Tracking
1	June 3, 2013		Revised

1	August 29, 2014	Standards Information Staff	Updated template
2	January 18, 2017	Standards Information Staff	Revised
2	June 28, 2017	Standards Information Staff	Updated template
3	February 22, 2019	Standards Information Staff	Added instructions to submit via Help Desk
4	February 25, 2020	Standards Information Staff	Updated template footer
5	August 14, 2023	Standards Development Staff	Updated template as part of Standards Process Stakeholder Engagement Group