

Comment Report

Project Name: 2022-02 Uniform Modeling Framework for IBR | Standard Authorization Request
Comment Period Start Date: 5/17/2024
Comment Period End Date: 6/24/2024
Associated Ballots:

There were 34 sets of responses, including comments from approximately 113 different people from approximately 80 companies representing 10 of the Industry Segments as shown in the table on the following pages.

Questions

- 1. Do you agree with the proposed scope as described in the SAR? If you do not agree, or if you agree but have comments or suggestions for the project scope, please provide your recommendation and explanation.**
- 2. Provide any additional comments for the drafting team to consider, if desired.**

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
Midcontinent ISO, Inc.	Bobbi Welch	2	MRO,RF,SERC	ISO/RTO Council Standards Review Committee (SRC) Project 2022-02 IBR SAR	Kennedy Meier	Electric Reliability Council of Texas, Inc.	2	Texas RE
					Helen Lainis	Independent Electricity System Operator	2	NPCC
					John Pearson	ISO New England, Inc.	2	NPCC
					Bobbi Welch	MISO	2	RF
					Gregory Campoli	New York Independent System Operator	2	NPCC
					Elizabeth Davis	PJM	2	RF
					Charles Yeung	SPP	2	MRO
Exelon	Daniel Gacek	1,3		Exelon	Daniel Gacek	Exelon	1	RF
					Kinte Whitehead	Exelon	3	RF
Eversource Energy	Joshua London	1,3		Eversource	Joshua London	Eversource Energy	1	NPCC
					Vicki O'Leary	Eversource Energy	3	NPCC
Entergy	Julie Hall	1,3,6		Entergy	Oliver Burke	Entergy - Entergy Services, Inc.	1	SERC
					Jamie Prater	Entergy	5	SERC
MRO	Michelle Olson	1,2,3,4,5,6	MRO	MRO Group	Shonda McCain	Omaha Public Power District	1,3,5,6	MRO
					Michael Brytowski	Great River Energy	1,3,5,6	MRO
					Jamison Cawley	Nebraska Public Power District	1,3,5	MRO
					Jay Sethi	Manitoba Hydro (MH)	1,3,5,6	MRO
					Husam Al-Hadidi	Manitoba Hydro	1,3,5,6	MRO

						(System Provider)		
					Kimberly Bentley	Western Area Power Administration	1,6	MRO
					Jaimin Patal	Saskatchewan Power Corporation	1	MRO
					Angela Wheat	Southwestern Power Administration	1	MRO
					George Brown	Pattern Operators LP	5	MRO
					Larry Heckert	Alliant Energy	4	MRO
					Terry Harbor	MidAmerican Energy Company	1,3	MRO
					Dane Rogers	Oklahoma Gas and Electric	1,3,5,6	MRO
					Seth Shoemaker	Muscatine Power and Water	1,3,5,6	MRO
					Bobbi Welch	Midcontinent ISO, Inc.	2	MRO
					Michael Ayotte	ITC Holdings	1	MRO
					Andrew Coffelt	Board of Public Utilities-Kansas	1,3,5,6	MRO
DTE Energy - Detroit Edison Company	Mohamad Elhusseini	3,5		DTE Energy	Mohamad Elhusseini	DTE Energy	5	RF
					Patricia Ireland	DTE Energy	4	RF
					Marvin Johnson	DTE Energy - Detroit Edison Company	3	RF
Southern Company - Southern Company Services, Inc.	Pamela Hunter	1,3,5,6	SERC	Southern Company	Matt Carden	Southern Company - Southern Company Services, Inc.	1	SERC
					Joel Dembowski	Southern Company - Alabama Power Company	3	SERC

					Ron Carlsen	Southern Company - Southern Company Generation	6	SERC
					Leslie Burke	Southern Company - Southern Company Generation	5	SERC
Black Hills Corporation	Rachel Schuldt	1,3,5,6		Black Hills Corporation - All Segments	Micah Runner	Black Hills Corporation	1	WECC
					Josh Combs	Black Hills Corporation	3	WECC
					Rachel Schuldt	Black Hills Corporation	6	WECC
					Carly Miller	Black Hills Corporation	5	WECC
					Sheila Suurmeier	Black Hills Corporation	5	WECC
Northeast Power Coordinating Council	Ruida Shu	1,2,3,4,5,6,7,8,9,10	NPCC	NPCC RSC	Gerry Dunbar	Northeast Power Coordinating Council	10	NPCC
					Deidre Altobell	Con Edison	1	NPCC
					Michele Tondalo	United Illuminating Co.	1	NPCC
					Stephanie Ullah-Mazzuca	Orange and Rockland	1	NPCC
					Michael Ridolfino	Central Hudson Gas & Electric Corp.	1	NPCC
					Randy Buswell	Vermont Electric Power Company	1	NPCC
					James Grant	NYISO	2	NPCC
					Dermot Smyth	Con Ed - Consolidated Edison Co. of New York	1	NPCC
					David Burke	Orange and Rockland	3	NPCC
					Peter Yost	Con Ed - Consolidated	3	NPCC

	Edison Co. of New York		
Salvatore Spagnolo	New York Power Authority	1	NPCC
Sean Bodkin	Dominion - Dominion Resources, Inc.	6	NPCC
David Kwan	Ontario Power Generation	4	NPCC
Silvia Mitchell	NextEra Energy - Florida Power and Light Co.	1	NPCC
Sean Cavote	PSEG	4	NPCC
Jason Chandler	Con Edison	5	NPCC
Tracy MacNicoll	Utility Services	5	NPCC
Shivaz Chopra	New York Power Authority	6	NPCC
Vijay Puran	New York State Department of Public Service	6	NPCC
David Kiguel	Independent	7	NPCC
Joel Charlebois	AESI	7	NPCC
Joshua London	Eversource Energy	1	NPCC
Emma Halilovic	Hydro One Networks, Inc.	1,2	NPCC
Emma Halilovic	Hydro One Networks, Inc.	1,2	NPCC
Chantal Mazza	Hydro Quebec	1,2	NPCC
Emma Halilovic	Hydro One Networks, Inc.	1,2	NPCC
Chantal Mazza	Hydro Quebec	1,2	NPCC
Nicolas Turcotte	Hydro-Quebec (HQ)	1	NPCC
Jeffrey Streifling	NB Power Corporation	1,4,10	NPCC

					Jeffrey Streifling	NB Power Corporation	1,4,10	NPCC
					Jeffrey Streifling	NB Power Corporation	1,4,10	NPCC
					Joel Charlebois	AESI	7	NPCC
Southwest Power Pool, Inc. (RTO)	Shannon Mickens	2	MRO,SPP RE,WECC	SPP RTO	Shannon Mickens	Southwest Power Pool Inc.	2	MRO
					Mia Wilson	Southwest Power Pool Inc.	2	MRO
					Heather Harris	Southwest Power Pool Inc.	2	MRO
					Ashley Stringer	Southwest Power Pool Inc.	2	MRO
					Jim Williams	Southwest Power Pool Inc.	2	MRO
					Jeff McDiarmid	Southwest Power Pool Inc.	2	MRO
					Mason Favazza	Southwest Power Pool Inc.	2	MRO
					Tim Miller	Southwest Power Pool Inc.	2	MRO
					Margaret Quispe	Southwest Power Pool Inc.	2	MRO
					Scott Jordan	Southwest Power Pool Inc	2	MRO
					Charles Cates	Southwest Power Pool Inc.	2	MRO
					Daniel Baker	Southwest Power Pool Inc.	2	MRO
Western Electricity Coordinating Council	Steven Rueckert	10		WECC	Steve Rueckert	WECC	10	WECC
					Curtis Crews	WECC	10	WECC

1. Do you agree with the proposed scope as described in the SAR? If you do not agree, or if you agree but have comments or suggestions for the project scope, please provide your recommendation and explanation.

Thomas Foltz - AEP - 3,5,6

Answer No

Document Name

Comment

AEP does not agree with this proposed SAR and recommends that it not be pursued. Despite what modeling guidance may claim, standard library or generic models may not always be the best representation of IBRs or sufficient for use in interconnection-wide cases. Justification for use of equipment-specific or user-defined modeling should not be required. The decision between generic and user-defined models should be left to OEMs and Planning Coordinators / Transmission Planners per MOD-032 R1 data submittal documentation and not dictated in NERC standards. If equipment-specific models are supplied by OEMs and accepted by the PC and TP, it should not be necessary to also supply a generic model unless the PC and TP specify that in their model submittal documentation.

A fundamental problem that renewable generation has introduced at all levels (transmission, sub-transmission, and distribution) and one that these SARs are not truly acknowledging, is how to get verified and validated modeling in support of the interconnection study process such that the modeling studied prior to interconnection accurately represents the projects put into service. To do this verification and validation properly, which MOD-026-2 now under draft attempts to do only after projects are in service (and only BES interconnections), will require a similar process inserted into the interconnection timeline. Such an insertion is likely to extend project timelines and costs significantly. Not only that, we believe it is clear from the NERC disturbance reports that IBR ride-through performance is best evaluated by EMT modeling and simulation platforms given that the positive sequence phasor domain is limited in being able to represent all factors that can affect ride-through. The proposed SAR makes no mention of EMT.

A second problem that these SARs fail to acknowledge is that it is unknown how dynamic model estimation and aggregation of unregistered IBRs and DERs, which the SAR seeks to assign to TOs and DPs, is to be carried out. High-level assumptions must be made because, short of getting equipment-specific data and modeling these IBRs and DERs in individual detail (along with the subsystems to which they are connected, which detail is utterly impractical), there is no means to be certain what is out there and how it will behave in aggregate when put to the test. There have been previous attempts by SPIDER to impose DER modeling data requirements on TOs and DPs which were unsuccessful, at least in part because of the problematic nature of imposing compliance obligations on TOs and DPs to obtain data from unregistered entities. TPs and PCs, RCs and TOPs, TOs and DPs will all have to determine what assumptions to make (and those assumptions will have to be made to fulfill their existing obligations to system reliability as unregistered IBRs and DERs increase) however these functional entities should not be saddled with even more compliance obligations while trying to chart unknown methods of estimation and aggregation.

Likes 0

Dislikes 0

Response

Nazra Gladu - Manitoba Hydro - 1,3,5,6

Answer No

Document Name

Comment

The Detailed Description section includes a listing of all FERC 901 directives assigned to Milestone 3. However, this SAR is only Part 1 of four SARs related to Milestone 3. On page 3 of this SAR it says the project scope shall address all those directives listed. To be clear, can the directives be rearranged and aligned with each of the expected four parts so that it is clear which ones apply. This will help the future drafting team.

In Scope item 1, it is noted to modify MOD-032 to require the usage of the NERC-Approved model library. The requirement is not clear whether there is grace period if NERC makes changes to the Model Library. Once NERC declares a model unacceptable, for example, it could take more than one year for an acceptable model to be developed to replace the unacceptable model and get added to the interconnection-wide models.

This SAR contains excessive language that creates confusion as to what the scope and goal of this SAR encompasses.

This SAR is attempting to perform several different functions. Project management and Standards development.

Is this a FERC Order 901 standard development coordination project, ie. Project Management, or a standards development project to address a specific risk? The coordination (project management) of the 901 projects should be separated from the specifics of Modeling and Data sharing requirements.

From the NERC Work Plan, Milestone 3 – Part 1, Data Sharing

Overall Strategy: Collaborate between NERC Standards Development, Engineering, and the RSTC. The scope of this collaboration is to cross check active projects, draft SARs, and pending SARs from RSTC-associated work plans and identify which of those will address aspects of this milestone. Some revisions to draft SARs or active projects will be necessary to focus development on directives in Order No. 901.

This is project management. Multiple projects, standards, and objectives. This can be accomplished outside of a SAR.

1. 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).

2. This project is intended to serve as a data sharing center point for many of the revisions being established within all of the 901-related projects. Performance of IBR during an event (grid disturbance) are identified and corrected within the Standards Development projects pertaining to Milestone 2 of the Work Plan. However, any requisite changes to model data as a result of correcting IBR performance, must be communicated through a uniform model framework to assure all impacted entities and users of the approved models are adequately informed and provided updated models (as developed within this project). Similarly, revisions to model validation being drafted by the drafting team assigned the Milestone 3 Part 2 SAR, must also assure entities follow the uniform model framework established here.

3. NERC Modeling Guidance states that additional model types, namely manufacturer-specific user-written models, must be used for local reliability studies, during the interconnection process and following commissioning to validate as-built performance – as well as through ongoing validation of performance. The deficiencies within the current state of model quality are well documented. As required by FERC Order No. 901, the development of positive sequence models based on an approved (standard) library of model types must be built into Interconnection-wide cases.

4. The creation of a “NERC Approved Model Library” that allows the use of manufacturer-specific models in addition to standard library (generic) models in instances.

Additionally, MH requests coordination of this SAR and Project across all IBR/Order 901 Projects to ensure that all the projects collectively address the directives in FERC Order 901 without introducing duplication, overlap or contradictions between projects.

MH is concerned that the SAR does not appear to align with what’s in NERC’s [Dynamic Modeling Recommendations](#) whitepaper (see Figure 1).^[1]

^[1] [Dynamic Modeling Recommendations \(nerc.com\)](#)

Example #1

While the SAR (bottom of page 2) states that: “NERC Modeling Guidance 1 states that additional model types, namely manufacturer-specific user-written models, must be used for local reliability studies, during the interconnection process and following commissioning to validate as-built performance – as well as through ongoing validation of performance.”

NERC’s [Dynamic Modeling Recommendations](#) whitepaper, Figure 1 illustrates that both “**Recommended User Defined Models**” and “**Benchmarked (against UDM or EMT) Library Models Recommended**” can be used for “**Local Reliability Studies**” and “**Plant Interconnection Studies**.”

The SAR also appears to contain conflicts within itself as with the first bullet above (SAR, bottom of page 2) and this bullet (SAR, page 4, section 1.c.ii.):

“For local reliability studies (e.g. performance during the interconnection process, model quality validation), equipment-specific models should be used if generic models from the Model Library cannot accurately represent the IBR.”

Example #2

Likewise, there appears to be another conflict between NERC’s [Dynamic Modeling Recommendations](#) whitepaper and the SAR (page 2): “As required by FERC Order No. 901, the development of positive sequence models based on an approved (standard) library of model types must be built into Interconnection-wide cases.” Here again, the whitepaper illustrates that “Recommended User-Defined Models” are also acceptable.”

Likes 0

Dislikes 0

Response

Steven Rueckert - Western Electricity Coordinating Council - 10, Group Name WECC

Answer

No

Document Name

Comment

While beneficial in having all models in one location for use, the creation and maintenance of said Model Library will be significant. Should the RSTC be the owner of the library versus NERC? The FERC Order just directed “NERC to develop new or modified Reliability Standards that require the use of approved industry IBR models” which does not necessarily imply that NERC develops and maintains a Model Library. The SAR indicates that the development of the Model Library will be coordinated with the Drafting Team. Also, the Drafting Team may solicit feedback from industry on the NERC process. This assumes that the Model Library will be developed as the Standard is developed. It does not consider timing period beyond the life of the DT. Also, the comments from industry will be managed through what mechanism? What recourse is considered if the model does not exist in the Model Library? It appears the DT is creating a solution within the SAR and Standard Development efforts that are best left with NERC working with the RSTC when a Model Library is required by approved Standard language.

How will model changes be tracked (and by whom)?

How does this affect FAC-001 and FAC-002 in terms of using the Model Library as a consistent source for modeling?

Likes 0

Dislikes 0

Response

Andy Thomas - Duke Energy - 1,3,5,6 - SERC,RF

Answer	No
Document Name	
Comment	
<p>Reference 2022-02 Uniform Modeling Framework for IBR Standard Authorization Request, Project Scope section, Version 5, August 14, 2023, for the following Duke Energy recommendations (Questions 1 and 2):</p> <p>2.a.iii: Minimum threshold for unregistered and aggregate DER should be considered individually to ensure consistently.</p> <p>2.c: Duke Energy does not believe the PC, TP, RC, TO, TOP, BA have the expertise to approve additional model types. This review and approval process should be handled by an industry group.</p> <p>4.c: Estimation Methodology should include minimum threshold for modeling (e.g., Aggregate MWs or IBR-DER Penetration Percentage).</p>	
Likes	0
Dislikes	0
Response	
Mohamad Elhousseini - DTE Energy - Detroit Edison Company - 3,5, Group Name DTE Energy	
Answer	No
Document Name	
Comment	
<p>What criteria is to be used and by whom to determine if generic models cannot accurately represent the IBR?</p> <p>Item #3 under project scope notes that the GO and TO of IBRs must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for use of equipment specific models. What criteria is to be used to make the determination that an equipment specific model should be used?</p> <p>There is a disconnect between MOD-032 models and what is used as part of the interconnection process. There should be no difference on what models are used for both and MOD-032 should address the interconnection process models as well to eliminate confusion between the two processes.</p> <p>The SAR Detailed Description section does not provide detail on proposed deliverables to address the directives in FERC Order 901, but rather just restates the directives, which does not meet the intent of this section of the SAR.</p> <p>The SAR does not provide a clear direction for the industry to evaluate since it still notes several possible paths that need to be determined. Without knowing the path the SDT is taking, we cannot effectively evaluate the SAR.</p> <p>Allowing a TO or DP to estimate the unregistered IBRs or IBR-DERs that are on their systems does not align with the FERC Order 901 directive to accurately represent the dynamic performance of these facilities.</p> <p>DP's are not able to estimate unregistered IBR-DER to provide models that meet the level of accuracy required for the purpose of studying the impact of IBR's on the grid. There are also state regulations that may not allow DP's to ask for this type of modeling data. DP's also cannot estimate which</p>	

unregistered IBR_DER's can impact the grid. It is recommended for Nerc to work with the RTO's and with the state regulators to mandate this type of data to be supplied and to the extent possible, verified.

Requiring modeling for unregistered IBRs and IBR-DERs is going to be a large cost impact to the affected entities especially if equipment specific models are to be used. For a recent wind project, the initial modelling costs for the site was nearly \$500k for a 225MW site with two turbine OEMs and a plant level controller. Equipment specific models were used in this instance and will require on-going O&M costs with the respective OEMs to update the equipment specific models for new model versions and any changes to the site.

Likes 0

Dislikes 0

Response

Daniela Atanasovski - APS - Arizona Public Service Co. - 1,3,5,6

Answer

No

Document Name

Comment

AZPS supports the following comments that were submitted by EEI on behalf of its members:

Project Scope Comments: FERC directives identified in the Detail Description Section as Items 1, 2, 4, 6, 9, 12, 14, 16, 18, 19, 20, 22, 23 and 26 are sufficiently covered in this SAR, assuming adjustments are made in line with the proposed edits below. We further note that Items 3, 5, 8, and 10 do not appear as tasks within the proposed scope, however, all four were identified as directives and need to be addressed. (Noting the following)

Item 3: Consider AEU's and ACP/SEIA's suggested data sharing requirements when developing the framework, criteria and necessary data exchange.

Item 5: Consider CAISO's suggestion to require registered entities to provide additional IBR data points (e.g., telemetry collections or other automated platform integrations) to further enhance real-time visibility of Bulk-Power System operations.

Item 8: Consider new processes or mechanisms to provide Transmission Owners with modeling data and parameters.

Item 10: Consider new processes or mechanisms to provide Distribution Providers with modeling data and parameters.

And lastly, we read Items 11, 17, 21 and 24 to be NERC directed tasks and believe those activities should be removed from the Detailed Description section of this SAR and addressed separately by NERC. Beyond this we offer the following edits to the 5 Items identified in the SAR Project Scope.

Scope Item 1 Comments: Item 1 only contains one task that directly aligns to the work the DT will perform under this project. The rest of Item 1 describes the model library and its attributes and processes, all of which are NERC activities. While we have no concerns with NERC taking responsibility for the model library, it is critical that models contained in that library are compatible with all existing planning software currently available and changes to the model library are only allowed during prescribed intervals/time periods so as not to disrupt responsible entity planning compliance obligations and deadline causing unnecessary rework of planning studies. Given the model library will be done exclusively by NERC and not the DT, Item 1 should be revised to read as follows:

1. Modify MOD-032 to require the usage of a "NERC-Approved Model Library"

Item 2 Comments: EEI suggests removing the reference to NERC's Dynamic Modeling Requirements. While we do not object to using that document as a guide, such language potentially limits the DT from developing requirements that they believe better align with the directive contained in Order 901.

EEl also does not agree with mixing the modeling data requirements associated with MOD-032 with the data collection requirements of TOP-003 and IRO-010. The SAR will be clearer separating these DT tasks. To address these concerns, we offer the following edits to Item 2 below:

2a) Modify Reliability Standard MOD-032 or develop a new Reliability Standard that requires Planning Coordinators, Transmission Planners, Reliability Coordinators, Transmission Operators, and Balancing Authorities to use a uniform framework with modeling criteria for each interconnection. The DT should consider integrating appropriate element of NERC's Dynamic Modeling Recommendations as a guide. The revised or new Reliability Standard should contain:

d. Data specification for the data necessary to develop interconnection-wide models and models for other reliability studies;

i. Specifications must include provisions for new, modified, or changed equipment,

ii. Specifications must include provisions for changes to an approved equipment- specific models,

iii. Specifications must include provisions and a periodicity for exchanging estimated aggregated unregistered IBR and DER data.

e. Data exchange of generic models from the Model Library for interconnection-wide model creation that most accurately reflect the behavior of each IBR during steady state, short- circuit, and dynamic conditions;

f. Delete

g. Data exchange of aggregated data, estimation methods, and documented limitations of the availability of accurate data for unregistered IBR and DER as developed by Transmission Owners and Distribution Providers in Item 4.

2b: Modify TOP-003 and IRO-010 or develop new Reliability Standards for the collection of IBR specific models and data that align with the defined specifications as developed within the modified MOD-032 Reliability Standard or new Reliability Standard.

Item 3 Comments: EEl does not agree that MOD-032 is the proper Reliability Standard to require GOs to provide IBR models and data. And while TOs and DPs will be responsible for providing IBR models and data for unregistered IBRs and IBR-DERs in aggregate, TOs should have no part in providing IBR models or data for registered IBRs. To address our concern, we offer the following edits to Item 3:

3. Modify TOP-003 and IRO-010 to require Generator Owners (GO) to provide IBR models and data that conform to the specifications contained in MOD-032, or the new IBR Reliability Standard that meets the requirements identified in Item 2 above, specifically;

a. GO of registered IBR must provide generic models from the Model Library for interconnection- wide model creation that most accurately reflect the behavior of each IBR during steady state, short-circuit, and dynamic conditions;

b. GO of registered IBR must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for the use of additional equipment-specific models.

i. For instance, a Corrective Action Plan created by a planner or operator to address model quality due to exceeded performance criteria (reference Milestone 3 Part 2 SAR), may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

ii. For instance, studied discrepancies between generic model and performance or IBR demonstrated during the interconnection process may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

iii. For instance, discrepancies between the generic model and performance of the IBR during a disturbance (i.e. from a post-event analysis) may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

c. TOs who have unregistered IBRs and DPs who have IBR-DERs that have a material impact on the BPS must provide aggregated dynamic models that adequately represent the dynamic performance of those resources;

d. TOs who have unregistered IBR and DPs who have IBR-DERs that have a material impact on the BPS must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for the use of additional equipment-specific models if unable to gather data from the

affected aggregated resources that have a material impact on the Bulk-Power System, providing to the responsible planners and operators a dynamic model using estimated data for those resources.

Item 4 Comments: EEI does not agree that TOP-003 and IRO-010 are appropriate Reliability Standards to develop aggregation processes for TOs and DPs that have been notified by Transmission Planners that they have unregistered IBRs that materially impact, in aggregate, the reliability of the BPS. To address the Order 901 directives associated with identifying aggregated unregistered IBRs and IBR-DERs that have a material impacts on the BPS, the establishment and implementation of aggregation methods for unregistered IBRs and IBR-DERs that have been defined as having material impacts, and processes for developing and providing estimated data and identifying models for aggregated unregistered IBRs and IBR-DERs that adequately represent the dynamic performance of those resources we suggest the development of a new Reliability Standard. To address these concerns, we offer the following edits for consideration.

4. Develop a new Reliability Standard that:

a. Requires Transmission Planners to identify and notify responsible TOs and DPs when they have unregistered IBRs and IBR-DERs that are having a material impact on BPS reliability.

b. Requires Transmission Owners and Distribution Providers to establish and implement data aggregation methods for unregistered IBRs and IBR-DERs, when they have been notified by their Transmission Planner that these resources are having a material impact on BPS reliability. These processes must address:

- An estimate of the modeling data and parameters of IBR-DERs and unregistered IBRs in aggregate that account for the material impacts on the BPS,
- Selection of dynamic models that they determine to adequately represent the dynamic performance of the unregistered IBRs and IBR-DERs that are materially impacting the BPS,
- An explanation of the limitations of the availability of accurate data, and
- The method used for all estimations.

Item 5 Comments: EEI does not agree that this drafting team should be overseeing work done by other drafting teams. It is sufficient for this drafting team to coordinate with other drafting teams to ensure their work does not duplicate or otherwise overlap the work of other drafting teams. To address our concerns. We offer the following edits:

The drafting team shall coordinate with other drafting teams that have overlapping work, particularly those working on Order 901 directives in order to ensure that new or modified Reliability Standards related to Milestone 3 of the Work Plan are aligned and do not create a reliability gap.

Likes 0

Dislikes 0

Response

Kimberly Turco - Constellation - 5,6

Answer

No

Document Name

Comment

As explicitly stated, the intent of the uniform framework for data sharing and model development is to ensure all directive of FERC order 901 can be effectively met and all impacted parties/users of the approved models are informed and provided approved models as a result of any requisite changes due to correcting IBR performance. While Constellation agrees with the intent, we are not sure a new standard added is going to be effective in informing and guiding the industry. This will only be burdensome and likely drive confusions as too many processes are being created/revised in short amount of time.

Kimberly Turco on behalf of Segements 5 and 6

Likes 0

Dislikes 0

Response

Hillary Creurer - Allele - Minnesota Power, Inc. - 1

Answer

No

Document Name

Comment

Minnesota Power supports MRO's NERC Standards Review Forum's (NSRF) comments.

Likes 0

Dislikes 0

Response

Hayden Maples - Evergy - 1,3,5,6 - MRO

Answer

No

Document Name

Comment

Evergy supports and incorporates by reference the comments of the Edison Electric Institute (EEI) and Midwest Reliability Organization's NERC Standards Review Forum (MRO NSRF) on question 1

Likes 0

Dislikes 0

Response

Joshua London - Eversource Energy - 1,3, Group Name Eversource

Answer	No
Document Name	
Comment	
There needs to be part of the scope which specifies that the mechanism for royalty-free sharing of all required and allowed models will be documented.	
Likes 0	
Dislikes 0	
Response	
Wayne Sipperly - North American Generator Forum - 5 - MRO,WECC,Texas RE,NPCC,SERC,RF	
Answer	No
Document Name	
Comment	
<p>The NAGF does not agree with the proposed scope as described in the draft SAR for the following reasons:</p> <p>a. The NAGF recommends that the SAR identify actions to be performed by the Drafting Team. Including unapplicable/background narrative from FERC Order 901 directives in the SAR only adds confusion and uncertainty as to the actions to be performed by the DT.</p> <p>b. SAR Comment Form Background Information section (page 1) – The NAGF requests additional clarification regarding the statement “Assets to be included as part of the revisions to the Compliance Registry criteria (category 2 type assets) are considered “registered IBR” and not subject to the project objectives related to aggregated data or estimation methods”. The NAGF is unclear as to the reason that developed aggregated data or estimation methods would not apply to determining new category GO/GOPs (Category 2) IBRs that “contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA”.</p> <p>c. Project Scope comments:</p> <p>i. Item 1– The NAGF recommends that the NERC-Approved Model Library contain only the acceptable models. Including unacceptable models does not provide value.</p> <p>ii. Item 1a/b/c – The NAGF understands that NERC will be responsible for developing and maintaining the Model Library. However, it is unclear what work activities, if any, the Drafting Team will perform regarding the Model Library. Coordinating Model Library development with the DT is an administrative function that does not require specific DT work activities. Therefore, recommend removing Items 1a/b/c from the SAR Project Scope section.</p> <p>iii. Item 3. – The NAGF recommends using a process similar to that currently used for synchronous generation.</p> <p>d. Detailed Description Section:</p> <p>i. FERC Order 901 Directives Assigned to this SAR (page 5) – The paragraph states “As of April 1, 2024, this SAR will address the following FERC Order 901 directives, with the scope for this SAR emphasized in bold as appropriate:”. 26 sections of the FERC Order 901 directives are included in the Detailed Description Section of which only 3 are bolded (17, 24, and 25). It is unclear as to value of including the non-bolded narratives and it adds significant confusion to the SAR. Recommend removing the non-bolded FERC Order 901 directive narratives from this section or clearly identify DT work activities associated with these non-bolded narratives.</p>	

Likes 0

Dislikes 0

Response

Mark Gray - Edison Electric Institute - NA - Not Applicable - NA - Not Applicable

Answer

No

Document Name

Comment

Project Scope Comments: FERC directives identified in the Detail Description Section as Items 1, 2, 4, 6, 9, 12, 14, 16, 18, 19, 20, 22, 23 and 26 are sufficiently covered in this SAR, assuming adjustments are made in line with the proposed edits below. We further note that Items 3, 5, 8, and 10 do not appear as tasks within the proposed scope, however, all four were identified as directives and need to be addressed. (Noting the following)

- a. Item 3: Consider AEU's and ACP/SEIA's suggested data sharing requirements when developing the framework, criteria, and necessary data exchange.
- b. }Item 5: Consider CAISO's suggestion to require registered entities to provide additional IBR data points (e.g., telemetry collections or other automated platform integrations) to further enhance real-time visibility of Bulk-Power System operations.
- c. Item 8: Consider new processes or mechanisms to provide Transmission Owners with modeling data and parameters.
- d. Item 10: Consider new processes or mechanisms to provide Distribution Providers with modeling data and parameters.

And lastly, we read Items 11, 17, 21 and 24 to be NERC directed tasks and believe those activities should be removed from the Detailed Description section of this SAR and addressed separately by NERC. Beyond this we offer the following edits to the 5 Items identified in the SAR Project Scope. All of our edits are in boldface below:

Scope Item 1 Comments: Item 1 only contains one task that directly aligns to the work the DT will perform under this project. The rest of Item 1 describes the model library and its attributes and processes, all of which are NERC activities. While we have no concerns with NERC taking responsibility for the model library, it is critical that models contained in that library are compatible with all existing planning software currently available and changes to the model library are only allowed during prescribed intervals/time periods so as not to disrupt responsible entity planning compliance obligations and deadline causing unnecessary rework of planning studies. Given the model library will be done exclusively by NERC and not the DT, Item 1 should be revised as follows:

Modify MOD-032 to require the usage of a "NERC-Approved Model Library" **Item 2 Comments:** EEI suggests removing the reference to NERC's Dynamic Modeling Requirements. While we do not object to using that document as a guide, such language potentially limits the DT from developing requirements that they believe better align with the directive contained in Order 901. EEI also does not agree with mixing the modeling data requirements associated with MOD-032 with the data collection requirements of TOP-003 and IRO-010. The SAR will be clearer separating these DT tasks. To address these concerns, we offer the following edits to Item 2 below:

2a) Modify Reliability Standard MOD-032 **or develop a new Reliability Standard that** requires Planning Coordinators, Transmission Planners, Reliability Coordinators, Transmission Operators, and Balancing Authorities to **use** a uniform framework **with modeling criteria for each interconnection. The DT should consider integrating appropriate elements of** NERC's Dynamic Modeling Recommendations, **using this document as a guide. The revised or new Reliability Standard should contain:**

- a) Data specification for the data necessary to develop interconnection-wide models and models for other reliability studies;
- }i) Specifications must include provisions for new, modified, or changed equipment,

- ii) Specifications must include provisions for changes to an approved equipment-specific models,
- iii) Specifications must include provisions and a periodicity for exchanging estimated aggregated unregistered IBR and DER data.
- b) Data exchange of generic models from the Model Library for interconnection-wide model creation that most accurately reflect the behavior of each IBR during steady state, short-circuit, and dynamic conditions;
- c) Data exchange of aggregated data, estimation methods, and documented limitations of the availability of accurate data for unregistered IBR and DER as developed by Transmission Owners and Distribution Providers in Item 4.

2b: Modify TOP-003 and IRO-010 or develop new Reliability Standards for the collection of IBR specific models and data that align with the defined specifications as developed within the modified MOD-032 Reliability Standard or new Reliability Standard.

Item 3 Comments: EEI does not agree that MOD-032 is the proper Reliability Standard to require GOs to provide IBR models and data. And while TOs and DPs will be responsible for providing IBR models and data for unregistered IBRs and IBR-DERs in aggregate, TOs should have no part in providing IBR models or data for registered IBRs. To address our concern, we offer the following edits to Item 3:

3. Modify **TOP-003 and IRO-010** to require Generator Owners (GO) to **provide IBR models and data that conform to the specification for contained in MOD-032, or the new IBR Reliability Standard that meets the requirements identified in Item 2 above**, specifically;

a. GO of **registered** IBR must provide generic models from the Model Library for interconnection- wide model creation that most accurately reflect the behavior of each IBR during steady state, short-circuit, and dynamic conditions;

b. GO of **registered** IBR must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for the use of additional equipment-specific models.

i. For instance, a Corrective Action Plan created by a planner or operator to address model quality due to exceeded performance criteria (reference Milestone 3 Part 2 SAR), may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

ii. For instance, studied discrepancies between generic model and performance or IBR demonstrated during the interconnection process may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

iii. For instance, discrepancies between the generic model and performance of the IBR during a disturbance (i.e., from a post-event analysis) may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

c. **TOs who have unregistered IBRs and DPs who have IBR-DERs that have a material impact on the BPS must provide aggregated dynamic models that adequately represent the dynamic performance of those resources;**

d. **TOs who have unregistered IBR and DPs who have IBR-DERs that have a material impact on the BPS must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for the use of additional equipment-specific models if unable to gather data from the affected aggregated resources that have a material impact on the Bulk-Power System, providing to the responsible planners and operators a dynamic model using estimated data for those resources.**

Item 4 Comments: EEI does not agree that TOP-003 and IRO-010 are appropriate Reliability Standards to develop aggregation processes for TOs and DPs that have been notified by Transmission Planners that they have unregistered IBRs that materially impact, in aggregate, the reliability of the BPS. To address the Order 901 directives associated with identifying aggregated unregistered IBRs and IBR-DERs that have a material impacts on the BPS, the establishment and implementation of aggregation methods for unregistered IBRs and IBR-DERs that have been defined as having material impacts, and processes for developing and providing estimated data and identifying models for aggregated unregistered IBRs and IBR-DERs that adequately represent the dynamic performance of those resources we suggest the development of a new Reliability Standard. To address these concerns, we offer the following edits for consideration.

4. **Develop a new Reliability Standard that:**

a. **Requires Transmission Planners to identify and notify responsible TOs and DPs when they have unregistered IBRs and IBR-DERs that are having a material impact on BPS reliability.**

b. **Requires Transmission Owners and Distribution Providers to establish and implement data aggregation methods for unregistered IBRs and IBR-DERs, when they have been notified by their Transmission Planner that these resources are having a material impact on BPS reliability.**

These **processes** must address:

• An estimate of the modeling data and parameters of IBR-DERs and unregistered IBRs **in aggregate that account for the material impacts on the BPS,**

• **Selection of dynamic models that they determine to adequately represent the dynamic performance of the unregistered IBRs and IBR-DERs that are materially impacting the BPS,**

• An explanation of the limitations of the availability of accurate data, and

• The method used for all estimations.

Item 5 Comments: EEI does not agree that this drafting team should be overseeing work done by other drafting teams. It is sufficient for this drafting team to coordinate with other drafting teams to ensure their work does not duplicate or otherwise overlap the work of other drafting teams. To address our concerns. We offer the following edits:

The drafting team shall **coordinate with other drafting teams that have overlapping work, particularly those working on Order 901 directives in order to ensure that** new or modified Reliability Standards related to Milestone 3 of the Work Plan are aligned and do not create a reliability gap.

Likes 0

Dislikes 0

Response

Rachel Schuldt - Black Hills Corporation - 1,3,5,6, Group Name Black Hills Corporation - All Segments

Answer

No

Document Name

Comment

Black Hills Corporation agrees with EEI's comprehensive comments, included here:

Project Scope Comments: FERC directives identified in the Detail Description Section as Items 1, 2, 4, 6, 9, 12, 14, 16, 18, 19, 20, 22, 23 and 26 are sufficiently covered in this SAR, assuming adjustments are made in line with the proposed edits below. We further note that Items 3, 5, 8, and 10 do not appear as tasks within the proposed scope, however, all four were identified as directives and need to be addressed. (Noting the following)

a. Item 3: Consider AEU's and ACP/SEIA's suggested data sharing requirements when developing the framework, criteria and necessary data exchange.

b. Item 5: Consider CAISO's suggestion to require registered entities to provide additional IBR data points (e.g., telemetry collections or other automated platform integrations) to further enhance real-time visibility of Bulk-Power System operations.

- c. Item 8: Consider new processes or mechanisms to provide Transmission Owners with modeling data and parameters.
- d. Item 10: Consider new processes or mechanisms to provide Distribution Providers with modeling data and parameters.

And lastly, we read Items 11, 17, 21 and 24 to be NERC directed tasks and believe those activities should be removed from the Detailed Description section of this SAR and addressed separately by NERC. Beyond this we offer the following edits to the 5 Items identified in the SAR Project Scope. All of our edits are in boldface below:

Scope Item 1 Comments: Item 1 only contains one task that directly aligns to the work the DT will perform under this project. The rest of Item 1 describes the model library and its attributes and processes, all of which are NERC activities. While we have no concerns with NERC taking responsibility for the model library, it is critical that models contained in that library are compatible with all existing planning software currently available and changes to the model library are only allowed during prescribed intervals/time periods so as not to disrupt responsible entity planning compliance obligations and deadline causing unnecessary rework of planning studies. Given the model library will be done exclusively by NERC and not the DT, Item 1 should be revised as follows:

- 1) Modify MOD-032 to require the usage of a “NERC-Approved Model Library” *(remove: (Hereafter: “Model Library”) that contains acceptable (and unacceptable) models and recommendations to facilitate the exchange of neighboring entities’ respective planning and operation models and to be used in Interconnection-wide case creation and in other NERC Reliability Standards for IBR.*
 - a) *This Model Library will be developed and maintained by NERC. Updates on the Model Library development will be coordinated with the Drafting Team. The Drafting Team may solicit feedback comments of the NERC process from industry as needed.*
 - b) *The Model Library will be accessible to the general public. NERC will develop an open and transparent process for maintaining the library.*
 - c) *The Model Library will be consistent with NERC’s published Dynamic Modeling Recommendations, primarily:*
 - i) *Industry-approved library models are sufficient for use in Interconnection-wide base case creation and interconnection-wide studies; For local reliability studies (e.g. performance during the interconnection process, model quality validation), equipment-specific models should be used if generic models from the Model Library cannot accurately represent the IBR.)*

Item 2 Comments: EEI suggests removing the reference to NERC’s Dynamic Modeling Requirements. While we do not object to using that document as a guide, such language potentially limits the DT from developing requirements that they believe better align with the directive contained in Order 901. EEI also does not agree with mixing the modeling data requirements associated with MOD-032 with the data collection requirements of TOP-003 and IRO-010. The SAR will be clearer separating these DT tasks. To address these concerns, we offer the following edits to Item 2 below:

- 2a) Modify *(remove: applicable)* Reliability Standard *(remove: s (e.g.) MOD-032 (remove: , TOP-003, and IRO-010))* **or develop a new Reliability Standard that to** requires Planning Coordinators, Transmission Planners, Reliability Coordinators, Transmission Operators, and Balancing Authorities to *(remove: ensure usage of)* use a uniform framework **with modeling criteria for each interconnection.** *(remove: that includes modeling criteria consistent with)* **The DT should consider integrating appropriate element of** NERC’s Dynamic Modeling Recommendations *(remove: , a)* **as a guide.** *(remove: registered modeling designee, and necessary data exchange requirements.)* *(remove: framework must require)* **revised or new Reliability Standard should contain:**
 - d) Data specification *(remove: and notifications)* for the data necessary to develop interconnection-wide models and models for other reliability studies;
 - i) Specifications must include provisions for new, modified, or changed equipment,
 - ii) Specifications must include provisions for changes to an approved equipment-specific models,
 - iii) Specifications must include provisions and a periodicity for exchanging estimated aggregated unregistered IBR and DER data.

e) Data exchange of generic models from the Model Library for interconnection-wide model creation that most accurately reflect the behavior of each IBR during steady state, short-circuit, and dynamic conditions;

(remove: f) A review and approval process for additional model types from the Model Library (other than generic model types) for other reliability studies;)

g) Data exchange of aggregated data, estimation methods, and documented limitations of the availability of accurate data for unregistered IBR and DER as developed by Transmission Owners and Distribution Providers in Item 4.

2b: Modify TOP-003 and IRO-010 or develop new Reliability Standards for the collection of IBR specific models and data that align with the defined specifications as developed within the modified MOD-032 Reliability Standard or new Reliability Standard.

Item 3 Comments: EEI does not agree that MOD-032 is the proper Reliability Standard to require GOs to provide IBR models and data. And while TOs and DPs will be responsible for providing IBR models and data for unregistered IBRs and IBR-DERs in aggregate, TOs should have no part in providing IBR models or data for registered IBRs. To address our concern, we offer the following edits to Item 3:

3. Modify *(remove: MOD-032)* **TOP-003 and IRO-010** to require Generator Owners (GO) to **provide** *(remove: follow the uniform framework developed in)* **IBR models and data that conform to the specification for contained in MOD-032, or the new IBR Reliability Standard that meets the requirements identified in Item 2 above**, specifically;

a. GO *(remove: and TO)* of **registered** IBR must provide generic models from the Model Library for interconnection-wide model creation that most accurately reflect the behavior of each IBR during steady state, short-circuit, and dynamic conditions;

b. GO *(remove: and TO)* of **registered** IBR must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for the use of additional equipment-specific models.

i. For instance, a Corrective Action Plan created by a planner or operator to address model quality due to exceeded performance criteria (reference Milestone 3 Part 2 SAR), may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

ii. For instance, studied discrepancies between generic model and performance or IBR demonstrated during the interconnection process may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

iii. For instance, discrepancies between the generic model and performance of the IBR during a disturbance (i.e. from a post-event analysis) may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

c. **TOs who have unregistered IBRs and DPs who have IBR-DERs that have a material impact on the BPS must provide aggregated dynamic models that adequately represent the dynamic performance of those resources;**

d. **TOs who have unregistered IBR and DPs who have IBR-DERs that have a material impact on the BPS must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for the use of additional equipment-specific models if unable to gather data from the affected aggregated resources that have a material impact on the Bulk-Power System, providing to the responsible planners and operators a dynamic model using estimated data for those resources.**

Item 4 Comments: EEI does not agree that TOP-003 and IRO-010 are appropriate Reliability Standards to develop aggregation processes for TOs and DPs that have been notified by Transmission Planners that they have unregistered IBRs that materially impact, in aggregate, the reliability of the BPS. To address the Order 901 directives associated with identifying aggregated unregistered IBRs and IBR-DERs that have a material impacts on the BPS, the establishment and implementation of aggregation methods for unregistered IBRs and IBR-DERs that have been defined as having material impacts, and processes for developing and providing estimated data and identifying models for aggregated unregistered IBRs and IBR-DERs that adequately represent the dynamic performance of those resources we suggest the development of a new Reliability Standard. To address these concerns, we offer the following edits for consideration.

4. *(remove: Modify TOP-003 and IRO-010 to)* **Develop a new Reliability Standard that:**

a. **Requires Transmission Planners to identify and notify responsible TOs and DPs when they have unregistered IBRs and IBR-DERs that are having a material impact on BPS reliability.**

b. **Requires Transmission Owners and Distribution Providers to establish and implement data aggregation methods for unregistered IBRs and IBR-DERs, when they have been notified by their Transmission Planner that these resources are having a material impact on BPS reliability.** These (*remove: standards*) **processes** must address:

- • An estimate of the modeling data and parameters of IBR-DERs and unregistered IBRs **in aggregate that account for the material impacts on the BPS,**
- • **Selection of dynamic models that they determine to adequately represent the dynamic performance of the unregistered IBRs and IBR-DERs that are materially impacting the BPS,**
- • An explanation of the limitations of the availability of accurate data, and
- • The method used for all estimations.

Item 5 Comments: EEI does not agree that this drafting team should be overseeing work done by other drafting teams. It is sufficient for this drafting team to coordinate with other drafting teams to ensure their work does not duplicate or otherwise overlap the work of other drafting teams. To address our concerns. We offer the following edits:

The drafting team shall **coordinate with other drafting teams that have overlapping work, particularly those working on Order 901 directives in order to ensure that** (*remove: 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 (*remove: during implementation.*)

Likes	0
Dislikes	0

Response

Michelle Olson - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO Group

Answer No

Document Name

Comment

This SAR contains excessive language that creates confusion as to what the scope and goal of this SAR encompasses.

This SAR is attempting to perform several different functions. Project management and Standards development.

Is this a FERC Order 901 standard development coordination project, ie. Project Management, or a standards development project to address a specific risk? The coordination (project management) of the 901 projects should be separated from the specifics of Modeling and Data sharing requirements.

From the NERC Work Plan, Milestone 3 – Part 1, Data Sharing

Overall Strategy: Collaborate between NERC Standards Development, Engineering, and the RSTC. The scope of this collaboration is to cross check active projects, draft SARs, and pending SARs from RSTC-associated work plans and identify which of those will address aspects of this milestone. Some revisions to draft SARs or active projects will be necessary to focus development on directives in Order No. 901.

This is project management. Multiple projects, standards, and objectives. This can be accomplished outside of a SAR.

1. 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).

2. This project is intended to serve as a data sharing center point for many of the revisions being established within all of the 901-related projects. Performance of IBR during an event (grid disturbance) are identified and corrected within the Standards Development projects pertaining to Milestone 2 of the Work Plan. However, any requisite changes to model data as a result of correcting IBR performance, must be communicated through a uniform model framework to assure all impacted entities and users of the approved models are adequately informed and provided updated models (as developed within this project). Similarly, revisions to model validation being drafted by the drafting team assigned the Milestone 3 Part 2 SAR, must also assure entities follow the uniform model framework established here.

3. {C}NERC Modeling Guidance states that additional model types, namely manufacturer-specific user-written models, must be used for local reliability studies, during the interconnection process and following commissioning to validate as-built performance – as well as through ongoing validation of performance. The deficiencies within the current state of model quality are well documented. As required by FERC Order No. 901, the development of positive sequence models based on an approved (standard) library of model types must be built into Interconnection-wide cases.

4. The creation of a “NERC Approved Model Library” that allows the use of manufacturer-specific models in addition to standard library (generic) models in instances.

Additionally, MRO NSRF requests coordination of this SAR and Project across all IBR/Order 901 Projects to ensure that all the projects collectively address the directives in FERC Order 901 without introducing duplication, overlap or contradictions between projects.

MRO NSRF is concerned that the SAR does not appear to align with what’s in NERC’s [Dynamic Modeling Recommendations](#) whitepaper (see Figure 1).^[1]

Example #1

{C}· While the SAR (bottom of page 2) states that: “*NERC Modeling Guidance 1 states that additional model types, namely manufacturer-specific user-written models, must be used for local reliability studies, during the interconnection process and following commissioning to validate as-built performance – as well as through ongoing validation of performance.*”

{C}· {C}NERC's [Dynamic Modeling Recommendations](#) whitepaper, Figure 1 illustrates that both “Recommended User Defined Models” and “Benchmarked (against UDM or EMT) Library Models Recommended” can be used for “Local Reliability Studies” and “Plant Interconnection Studies.”

{C}· The SAR also appears to contain conflicts within itself as with the first bullet above (SAR, bottom of page 2) and this bullet (SAR, page 4, section 1.c.ii.):

“For local reliability studies (e.g. performance during the interconnection process, model quality validation), equipment-specific models should be used if generic models from the Model Library cannot accurately represent the IBR.”

Example #2

Likewise, there appears to be another conflict between NERC’s [Dynamic Modeling Recommendations](#) whitepaper and the SAR (page 2): “As required by FERC Order No. 901, the development of positive sequence models based on an approved (standard) library of model types must be built into Interconnection-wide cases.” Here again, the whitepaper illustrates that “Recommended User-Defined Models” are also acceptable.”

[\[1\] Dynamic Modeling Recommendations \(nerc.com\)](#)

Likes 0

Dislikes 0

Response

Christy Thompson - PPL - Louisville Gas and Electric Co. - 3,5,6 - SERC

Answer

No

Document Name

Comment

Louisville Gas and Electric Co. agrees generally with the EEI comments but would like to provide additional specific comments.

The section addressing potential BES risk incorrectly states that “NERC Modeling Guidance states that additional model types, namely manufacturer-specific user-written models, **must** be used for local reliability studies, during the interconnection process and following commissioning ...” This is an overstatement at best, as the referenced Modeling Guidance is 1) guidance, and 2) clearly says the suggested practice is “strongly recommended”. Further, the same document plainly says that with multiple models available, “GOs, TPs, and PCs should have enough information to use engineering judgement to determine which model is most appropriate for each study.”

Regarding item (1), FERC Order 901 states:

“Accordingly, we direct NERC to develop new or modified Reliability Standards that require the sole use of nation-wide approved component generic library models for system models to facilitate the exchange of neighboring entities’ respective planning and operation models and to build interconnection-wide models. One example of a way NERC could meet this directive would be to require an equivalent generic library model along with all submissions of user defined models so that the generic library model can be used when combining neighboring transmission system models and interconnection-wide models.”

The suggestion in item 1 of the SAR to utilize a “NERC-Approved Model Library” goes beyond the directive. The current practice of maintaining a list of unapproved models or models that have identified issues could be sufficient if paired with a requirement such as, “dynamic models utilized in interconnection-wide models must be compatible with the simulation software employed in the processes used to build such models.” Establishing a “NERC-Approved Model Library” (as opposed to the list of unapproved/problematic models) will only serve to slow industry adoption of updated or improved models. Once major software vendors have introduced such models into their standard model libraries, entities should be able to utilize those models without this additional hurdle.

Additionally, entities are likely to move very slowly in supporting the approval of new models into a “NERC-Approved Model Library” since new models typically require software updates, code/script changes, etc. Thus, this additional step will slow the adoption of improved generic models and decrease the incentive for entities to maintain automation and processes that is compatible with the latest version of industry standard analysis software.

Regarding item (1)(c)(ii), the SAR should be modified to align with the actual language of the Dynamic Modeling Recommendations, which is that 1) user-written models are recommended for this type of study, and 2) the TP/PC/GO should use engineering judgment to determine which model is appropriate.

Regarding item (2), the only modification necessary is the addition of explicit requirements that entities submitting data for interconnection-wide models utilize models that are compatible with the simulation software utilized to build such models. For example, if Siemens PTI PSS@E were to introduce a new IBR model type that was not supported by GE PSLF, entities should not utilize it for interconnection-wide cases as it would preclude GE PSLF users from using the models. However, if the model has been adopted by the major software vendors, no additional approval should be necessary (beyond the model verification that will already take place via MOD-026/027, etc.)

Regarding item (3)(a), the SAR should remove the requirement to “provide generic models from the Model Library” and instead reference only “generic models”. This comment is consistent with the comments above. The SAR must be modified to allow for an option other than the creation and maintenance of a “NERC-Approved Model Library”.

Likes 0

Dislikes 0

Response

Diana Aguas - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE

Answer No

Document Name

Comment

CenterPoint Energy Houston Electric, LLC (CEHE) does not support this project’s scope, particularly objective three of the SAR. CEHE supports the comments as submitted by the Edison Electric Institute (EEI), in particular, the issue around the statements requiring the TOs to provide the generic models, specifications, parameter information for these unregistered/registered IBRs and DERs. CEHE is a TO and does not own IBRs/DERs, therefore, does not have this data. CEHE believes GOs of IBRs should provide the documented information and equipment-specific models since the owner should be aware of the registered/unregistered IBR limitations, parameters, and performance information for their IBR equipment. In addition, unregistered/registered DERs are not modeled at transmission level in dynamic studies.

CEHE has additional concerns with scope objective four of the SAR. Even when unregistered DERs are modeled, it is not clear how a TP will be able to create a dynamic model for these unregistered IBRs/DERs.

Likes 0

Dislikes 0

Response

Scott Thompson - PNM Resources - 3,5 - WECC

Answer No

Document Name

Comment

PNM supports the comments as well as recommendatioins with EEI.

Likes 0

Dislikes 0

Response

Leslie Hamby - Southern Indiana Gas and Electric Co. - 3,5,6 - RF

Answer No

Document Name

Comment

Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South (SIGE) supports comments as submitted by CenterPoint Energy Houston Electric, LLC (CEHE).

Likes 0

Dislikes 0

Response

Allie Gavin - International Transmission Company Holdings Corporation - 1 - MRO,RF

Answer No

Document Name [2022-02_SAR_Unofficial_Comment_Form_05172024_ITC.docx](#)

Comment

See attached file, as copying from the unofficial comment form and trying to paste in SBS system would not account for strikethroughs.

Likes 0

Dislikes 0

Response

Bobbi Welch - Midcontinent ISO, Inc. - 2, Group Name ISO/RTO Council Standards Review Committee (SRC) Project 2022-02 IBR SAR

Answer No

Document Name [2022-02_SAR_Unofficial_Comment_Form_IRC SRC_06-24-24_FINAL.docx](#)

Comment

The ISO/RTO Council (IRC) Standards Review Committee (SRC)^[1] is concerned that the SAR does not appear to align with NERC's [Dynamic Modeling Recommendations](#) whitepaper (see Figure 1).^[2]

Example #1

- While the SAR (bottom of page 2) states that: *“NERC Modeling Guidance states that additional model types, namely manufacturer-specific user-written models, must be used for local reliability studies, during the interconnection process and following commissioning to validate as-built performance – as well as through ongoing validation of performance.”*
- NERC's [Dynamic Modeling Recommendations](#) whitepaper, Figure 1 illustrates that both **“Recommended User Defined Models”** and **“Benchmarked (against UDM or EMT) Library Models Recommended”** can be used for **“Local Reliability Studies”** and **“Plant Interconnection Studies.”**
- The SAR also appears to contain conflicts within itself. As noted above, the SAR (bottom of page 2) and the below bullet (from page 4, section 1.c.ii.) are contradictory. Page 2 of the SAR indicates only one type of model *“manufacturer-specific user-written models must be used”* whereas page 4 of the SAR indicates that equipment-specific models should be used if generic models are inaccurate. This would seem to indicate that more than one type of model (as indicated by the dark blue and light blue shading) is acceptable.
 - o SAR (page 4, section 1.c.ii.) states that: *“For local reliability studies (e.g. performance during the interconnection process, model quality validation), equipment-specific models should be used if generic models from the Model Library cannot accurately represent the IBR.”*

The SRC requests the SDT align the SAR with the [Dynamic Modeling Recommendations](#) whitepaper.

Example #2

Likewise, there appears to be another conflict between NERC's [Dynamic Modeling Recommendations](#) whitepaper and the SAR (page 2): *“As required by FERC Order No. 901, the development of positive sequence models based on an approved (standard) library of model types must be built into Interconnection-wide cases.”* Here again, the whitepaper allows for more flexibility in that Figure 1 illustrates “Recommended User-Defined Models” are also acceptable.

Recommendation:

The SRC recommends the SDT review the language in FERC Order 901, the SAR and NERC's [Dynamic Modeling Recommendations](#) whitepaper to ensure alignment across all three (3).

The SRC also has the following comments and concerns regarding the scope of the SAR:

§ Regarding Scope #2.a.iii, the SRC is concerned with the current language as it assumes a relationship among different industry entities that may not actually exist. More specifically, it is unclear how data collection and data validation can be audited and enforced for entities not registered with NERC. If this scope remains, the SRC requests that it be revised to give the PC flexibility in determining unregistered IBR and DER collection based on location and penetration thresholds.

§ Regarding Scope #3, based on the scope assumptions, it is not clear how an inaccurate model would be found and when a CAP would be needed. The SRC recommends revising the scope to include the TO in developing this framework.

§ Regarding Scope #4, the SRC agrees with the scope as written and requests the addition of an additional step: 4d. the transfer of data collected by the DPs and TOs to the PAs, PCs, and TOPs.

The SRC also requests coordination of this SAR and Project across the multiple IBR/Order 901 Projects. Specifically, the SRC requests assurance that SDTs will coordinate among each other.

Additionally, while the SRC agrees that there are benefits to having a standard modeling framework, the SAR is too restrictive in specifying the Model Library. Failure to utilize common models was not a significant factor in the unexpected performance events cited in the SAR. Inaccurate model performance was mostly associated with model parameterization rather than model selection (and in the cases where model selection was the primary issue, it was because a generic model was used instead of an equipment-specific model that may have been better able to reflect the actual performance of the unit). If the Model Library concept is maintained, it needs to include equipment-specific models and/or provide usability specifications for the development of equipment-specific models. Note that two of the cited FERC directives (items 13 and 14 in the SAR) refer to “approved industry” IBR models:

from item 13 “...Reliability Standards that require the use of approved industry IBR models that **accurately** reflect the behavior of all IBRs...” (emphasis added), and

from item 14 “...Reliability Standards that require the use of approved industry generic library IBR models that **accurately** reflect the behavior of IBRs...” (emphasis added).

Both items mention the need for accurate models, but only one mentions generic models. It seems that FERC would prioritize model accuracy over the use of generic models. The SAR should be clear on which path the SDT should pursue. If necessary, NERC should seek clarification from FERC before heading down a path of mandating the use of generic models and creating unnecessary barriers (red tape and documentation requirements) to the use of equipment-specific models.

Finally, the SAR should include a requirement for the drafting team to assign appropriate compliance obligations between model builders and model suppliers (Model Library). Because of the dual paths there could be uncertainty of compliance obligations if an Interconnection-wide case includes a model that is not in the Model Library. The SAR should clarify whether the responsibility rests with the case builders (PC/TP/RC/designee) or the model supplier (TO/GO). A very restrictive requirement as contemplated in the SAR would be difficult for the case builders to comply with because, as a practical matter, base cases need to get created/finalized with the data that is available, and case builders sometimes need to fill in gaps and make assumptions. Sometimes models, including generic models, and parameterization that look reasonable don’t initialize properly (despite troubleshooting efforts) and the best and most accurate option to meet a deadline may be to utilize a model that may not be on the approved list.

[1] For purposes of these comments, the IRC SRC includes the following entities: ERCOT, IESO, ISO-NE, MISO, NYISO, PJM and SPP.

[C]2] [Dynamic Modeling Recommendations \(nerc.com\)](https://www.nerc.com/dynamic-modeling-recommendations)

Likes	0
Dislikes	0
Response	
John Pearson - ISO New England, Inc. - 2	
Answer	No
Document Name	
Comment	

Regarding 1.c.i and 1.c.ii as shown below, Generator Owners should standardize equipment and configuration so that PCs and TPs can use industry-approved library models. User models might be used initially but should be migrated over time into standardized models.

c. The Model Library will be consistent with NERC's published Dynamic Modeling Recommendations, primarily:

i. Industry-approved library models are sufficient for use in Interconnection-wide base case creation and interconnection-wide studies;

ii. For local reliability studies (e.g. performance during the interconnection process, model quality validation), equipment-specific models should be used if generic models from the Model Library cannot accurately represent the IBR.

Suggested replacement language is

{C}i. "For interconnection studies, equipment-specific models should be used if generic models from the Model Library cannot accurately represent the IBR. As the interconnection studies are completed, generator manufacturers should work with power system software vendors to develop industry-approved library models for the equipment.

The existing wording will require obtaining two sets of models and then maintaining cases with two sets of models, potentially indefinitely.

Regarding 3.b.ii and 3.b.iii as shown below, where there are discrepancies between the provided models and equipment performance, Generator Owners should be expected to correct the discrepancy so that the performance matches the models that were provided.

c. Modify MOD-032 to require Generator Owners (GO) and Transmission Owners (TO) to follow the uniform framework developed in Item 2, specifically:

ii. For instance, studied discrepancies between the generic model and performance or the IBR demonstrated during the interconnection process may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

iii. For instance, discrepancies between the generic model and performance of the IBR during a disturbance (i.e. from a post-event analysis) may necessitate usage of an equipment-specific model instead of a generic model from the Model Library.

Suggested replacement language is:

{C}i. *For instance, discrepancies between the generic model and performance of the IBR during a disturbance (i.e. from a post-event analysis) may necessitate the Generator Owner correcting the performance of the facility so that it matches the model provided.*

Authors should also modify the scope to address another FERC Order 901 Directive Assigned to this SAR. For bullet 19,

"Further, we direct NERC to require distribution providers to provide to the planning coordinators, transmission planners, reliability coordinators, transmission operators, and balancing authorities aggregated dynamic models that adequately represent the dynamic performance of IBR-DERs on their systems that in the aggregate have a material impact on the Bulk-Power System, including momentary cessation and/or tripping, and all ride through behavior (e.g., IBR-DERs in the aggregate modeled by interconnection requirements performance to represent different steady-state and dynamic behavior)." (P141)

Scope should include defining what it means to "in the aggregate have a material impact on the Bulk-Power System" and defining all "momentary cessation and/or tripping, and all ride through behavior" or limits thereof.

Likes 0

Dislikes 0

Response

Daniel Gacek - Exelon - 1,3, Group Name Exelon

Answer No

Document Name

Comment

NERC plans to set up a “NERC-Approved Model Library” and have PCs/TPs/RCs/TOs/BAs use a “uniform modeling framework”, both huge tasks, it may be difficult if not possible to complete by the 901 deadline

Paragraph 4 of the project scope (see page 5) calls out for TO’s and DP’s to have methods to aggregate unregistered IBR’s. The standards will need to be very clear on how the TOs and DPs can do this or else demonstrating compliance might be difficult.

Paragraph 17 on page 8 also references TO’s needing to provide dynamic data for unregistered IBR’s. This might be even more difficult, An unregistered IBR cannot be compelled to provide data. While such requirements can be added into future interconnection agreements, TOs will not have the ability to compel currently connected unregistered IBRs to provide data.

Paragraph 24 on page 9 states that NERC will have to determine the appropriate registered entity to provide the data where a registered DP is not involved. Registered Entities will limited in the ability to collect data by the language of existing interconnection agreements.

Likes 0

Dislikes 0

Response

Alison MacKellar - Constellation - 5,6

Answer No

Document Name

Comment

As explicitly stated, the intent of the uniform framework for data sharing and model development is to ensure all directive of FERC order 901 can be effectively met and all impacted parties/users of the approved models are informed and provided approved models as a result of any requisite changes due to correcting IBR performance. While Constellation agrees with the intent, we are not sure a new standard added is going to be effective in informing and guiding the industry. This will only be burdensome and likely drive confusions as too many processes are being created/revised in short amount of time.

Alison Mackellar on behalf of Constellation Segments 5 and 6

Likes 0

Dislikes 0

Response

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer No

Document Name

Comment

Southern Company would like to offer the following comments:

• Additional scope should be limited to model acceptability, not anything to do with exchange of data among entities. There are sufficient requirements to allow TPs, PCs, RCs, BAs, TOPs to obtain/exchange all data that is necessary through MOD-032, TOP-003, IRO-10 data spec requirements.

• Only MOD-032 should be modified to require TPs/PCs to incorporate acceptable models (since it is a data spec and modeling standard)

• Any additional modification should incorporate significant flexibility in the operational planning models vs. planning models as they are very different and used for different purposes.

• Clarify intent of using registered modeling designee.

Likes 0

Dislikes 0

Response

Kennedy Meier - Electric Reliability Council of Texas, Inc. - 2

Answer No

Document Name

Comment

ERCOT joins the comments submitted by the ISO/RTO Council (IRC) Standards Review Committee (SRC) and adopts them as its own.

Likes 0

Dislikes 0

Response

Cain Braveheart - Bonneville Power Administration - 1,3,5,6 - WECC

Answer No

Document Name

Comment

From BPA's perspective, it appears that Project 2024-01's objective is to align the definitions of GO/GOP so they are required to provide models for "registered IBR" down to the 20MW threshold. Similarly, for unregistered-IBR and IBR-DER, the best practice to collect 'good' modeling data is if the entity that has knowledge of the generation is submitting the data. The DP/TO are the frontline entities that would have this data. Going up the NERC Compliance Registry Criteria hierarchy (DP->TO->TP->PC, etc.) will not hold much value as the TP and PC won't have the knowledge needed to produce good models.

BPA believes DPs and TOs will need to register under NERC's Compliance Registry so the PC can obtain accurate models. BPA suggests that a minimum threshold for the cumulative individual or DER inverter-based resources within an area be established that possibly determines DP (and/or TO) registration. BPA believes this would define a baseline and would also require those DP/TO entities to register when their managed areas exceed that baseline. Accurate models will be dependent on what is required of the DP/TO. If the DP/TO entities are registered, potential future modifications to MOD-032, TPL-001, or others, would be more effective.

Likes 0

Dislikes 0

Response

Kyle Thomas - Elevate Energy Consulting - NA - Not Applicable - NA - Not Applicable

Answer

No

Document Name

Comment

The SAR appears open-ended in terms of proposed revisions, detailed descriptions, and overlap with the other two modeling SARs (Project 2020-06 and Project 2021-01) – which are primarily text extracted from FERC Order 901. NERC, the NERC RSTC, the NERC Standards Committee, and industry have tended to avoid creating new standards projects with open-ended SARs as this shows insufficient supporting evidence and background to help a small SDT accomplish its mission. This seems particularly relevant given the massive scale, depth, and breadth of these proposed changes and do not believe this is the most effective/efficient SAR definition to address the directives and reliability risks, as it is unclear what the SARs are actually addressing from a reliability perspective. It also appears there are some FERC directives that are linked to a reliability risk that needs to be mitigated, but between this SAR and the other two it is unclear if they are being addressed or not – these risks should be mitigated between these SARs.

In the Purpose or Goal section, this SAR and the Project 2020-06 SAR both state the projects and SDTs will be a clearing house for the modeling work. It seems having two SARs act as a clearing house for modeling work is not necessary and should be clarified.

In the Project Scope, it is unclear which NERC entities have what roles for each of the IBR categories (registered IBRs, non-registered IBRs, and DERs) applicable to this SAR and the other two modeling related SARs.

In the Detailed Description section, repeating all FERC Order 901 directives in full and then only bolding the specific directives that this SAR addresses is confusing and inefficient. Recommend deleting all unrelated language and only keep the specific directives that this SAR is addressing to add clarity to this SAR.

It seems there has been insufficient attention given to the cost-benefit analysis for this SAR. NERC has simply stated "currently unknown" and "vary based on SDT outcome" and did not provide any additional analysis or consideration for costs and how to minimize such costs across all registered entities involved. The vast proposed revisions will significantly increase costs to registered entities, affecting business operations and costs to consumers. Therefore, more due diligence and consideration should be given to cost across all the proposed standards projects.

Likes 0

Dislikes 0

Response

Greg Sorenson - ReliabilityFirst - 10 - RF

Answer Yes

Document Name

Comment

In addition to the current SAR, the following issues should be addressed:

- a) For Scope Item 2d: Generally, the DPs (and perhaps some TOs performing more of an operations function) do not use PSLF or PSSE as their tool for modeling/aggregating unregistered IBR and DER. There may be data collection and aggregation issues if the specifications for the required data is not platform neutral.
- b) Consider as to whether non-compliance with proposed model data requirements should be required to be reported to the Regional Entity, instead of relying on the “complaint” process.
- c) For Scope Item 4: A large count (although smaller in size) of entities that serve load fall below the criteria to be registered as a DP. There may be gaps in the existing (or potentially modified) including, but not limited to TOP-003 and IRO-010 standards when trying to collect non-BPS data from un-registered entities, or when asking TOs to pass along data relating to non-jurisdictional entities, although these could be enforced via interconnection agreements.
- d) The SDT should consider how DER installed at voltages below 60kV (outside of proposed jurisdiction) will be modeled (ie large amounts of aggregated rooftop solar, etc.) to understand if this will just be included in load forecasting or via another method. Alternatively, the generic residential or commercial load models may need modification as well.

Likes 0

Dislikes 0

Response

Stephen Stafford - Georgia Transmission Corporation - 1 - SERC

Answer Yes

Document Name

Comment

The developers of the SAR did not answer the question: Are there alternatives (e.g. guidelines, white papers, alerts, etc.) that have been considered or could meet the objectives? The question should be answered. The answer should paraphrase the following:

Since the directives of FERC Order 901 instruct NERC to develop new or modified standards, there were no other alternatives considered.

Likes 0

Dislikes 0

Response

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - MRO,WECC, Group Name SPP RTO

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name NPCC RSC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Julie Hall - Entergy - 1,3,6, Group Name Entergy

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Israel Perez - Salt River Project - 1,3,5,6 - WECC

Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Jennifer Weber - Tennessee Valley Authority - 1,3,5,6 - SERC	
Answer	
Document Name	
Comment	
<p>We noted in our comments on an earlier SAR, which appears to remain unresolved, that a Distribution Provider may not always be the most practical source for the DER modeling data needed by the PC and TP. We recognize that the SDT has allowed for the flexibility of a Transmission Owner to also be a source for DER modeling data in Draft 1. However if the DP or TO is not directly affiliated with the DER owner, would their need to collect the DER model data from the entities that possess it not essentially mirror the PC and TP's need under R1? The DP and TO might need their own requirement(s) to develop steady-state, dynamics, and short circuit modeling data requirements and reporting procedures to obtain DER modeling data (potentially from unregistered entities that don't have an obligation to comply with NERC's Reliability Standards) that would subsequently be passed on to the PC and TP. A "DER data entity" could also be added to the applicability section (reference PRC-006-5 for precedent) with a broader range of registered entity options to fulfil that role (e.g., DP, UFLS-Only DP, TO, RP, GO).</p>	
Likes 0	
Dislikes 0	
Response	

2. Provide any additional comments for the drafting team to consider, if desired.

Israel Perez - Salt River Project - 1,3,5,6 - WECC

Answer

Document Name

Comment

Reliability Coordinator is listed twice on Page 10.

Likes 0

Dislikes 0

Response

Kyle Thomas - Elevate Energy Consulting - NA - Not Applicable - NA - Not Applicable

Answer

Document Name

Comment

We recommend that the SAR drafting team extend the comment period on this SAR and the other two modeling related SARs until after the July 10 NERC Webinar that will inform the industry further about these three SARs and have a question-and-answer period for attendees. This webinar seems like it will be very informative and helpful to the industry in understanding these three SARs, which would further support the comment period and balloting process for getting the SARs approved.

There should be a much clearer linkage to the EMT-related NERC projects and EMT modeling requirements in general, which are the best models and studies to evaluated IBR ride-through and other technical performance criteria. While FERC did not call out EMT requirements in Order 901, it did recommend continuing to pursue efforts and those efforts should be closely aligned with this SAR.

This SAR and the other two modeling related SARs should also: 1) acknowledge and work towards getting verified and validated modeling throughout the interconnection process from beginning to commissioning and energization. 2) acknowledge and supporting improvements in the dynamic model estimation and aggregation of unregistered IBRs and DERs, which requires significant assumptions to be made. Guidance and technical background should be part of this SAR to support the industry on the assumptions and modeling work that should go into this modeling estimation and aggregation of unregistered IBRs and DERs.

Likes 0

Dislikes 0

Response

Kennedy Meier - Electric Reliability Council of Texas, Inc. - 2

Answer

Document Name	
Comment	
ERCOT joins the comments submitted by the IRC SRC and adopts them as its own.	
Likes 0	
Dislikes 0	
Response	
Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company	
Answer	
Document Name	
Comment	
Southern Company asks that the drafting team give consideration to where these requirements could be covered by FAC-001/2.	
Likes 0	
Dislikes 0	
Response	
Alison MacKellar - Constellation - 5,6	
Answer	
Document Name	
Comment	
NERC needs to find a way to incorporate the intent of this standard into existing/future standards. Alison Mackellar on behalf of Constellation Segments 5 and 6	
Likes 0	
Dislikes 0	
Response	
John Pearson - ISO New England, Inc. - 2	
Answer	
Document Name	

Comment

Keeping the SAR title consistent with the project name or vice versa would be helpful when several SARs for similar projects are out for comment at the same time.

Likes 0

Dislikes 0

Response

Bobbi Welch - Midcontinent ISO, Inc. - 2, Group Name ISO/RTO Council Standards Review Committee (SRC) Project 2022-02 IBR SAR

Answer

Document Name

[2022-02_SAR_Unofficial_Comment_Form_IRC SRC_06-24-24_FINAL.docx](#)

Comment

The SAR states that “[t]he deficiencies within the current state of model quality are well documented,” but then goes on to require only the use of “an approved (standard) library of model types” or models included in a “NERC Approved Model Library.”

With evolving modeling practices, the SRC is concerned that a requirement to only use models that have gone through a NERC approval process would create a bottleneck by potentially delaying the use of more accurate models that are newly developed (perhaps reflecting new technologies) or would result in the use of less accurate models in the name of standardization. The result may very well be less accurate simulation results, which is the opposite of the intent of this SAR. To avoid this result, the SAR should direct the SDT to ensure that the standard clearly provides that any model deemed acceptable by a PC or TP is presumed to be included in the “NERC Approved Model Library” in advance of any formal process.

The SAR states that “[t]his Model Library will be developed and maintained by NERC. Updates on the Model Library development will be coordinated with the Drafting Team.”

This implies that the SDT has an ongoing obligation regarding updates to the model library. The SAR should be revised to clarify whether NERC intends to propose a process for updating the model library that the SDT will evaluate, potentially by soliciting industry comments.

The SAR states “industry-approved library models are sufficient for use in Interconnection-wide base case creation and interconnection-wide studies; ii. For local reliability studies (e.g. performance during the interconnection process, model quality validation), equipment-specific models should be used if generic models from the Model Library cannot accurately represent the IBR.”

It is unclear whether “industry approved library models” is synonymous with the “Model library,” and the SRC recommends that the SAR be revised to clarify this point.

Additionally, these statements imply that only generic models will be included in the Model Library and that these are (by default) sufficient for use in Interconnection-wide cases (even if they cannot accurately represent the IBR). In other words, the SAR appears to intentionally allow the use of inaccurate (or even less accurate) models in Interconnection-wide cases. **The SRC recommends that the SAR be revised to require that models accurately represent the IBR. This would allow for the use of a generic model that can accurately represent the IBR for both local studies and Interconnection-wide cases, while ensuring that entities are required to use an equipment-specific model for both local studies and Interconnection-wide cases if that is the only model that can accurately represent the IBR.**

Otherwise, the purpose of creating Interconnection-wide cases, namely, having a common dataset that is used for nearly all local studies, is defeated. Having to replace all of the inaccurate generic models in the local study area for every local study is like re-inventing the wheel for every local study. Further, this creates uncertainties and complications in every local study regarding the determination of the extent to which inaccurate generic

models allowed in the Interconnection-wide cases need to be replaced (recall that in the Odessa event, ride-through failures occurred hundreds of miles away from the fault location).

To help address this, section 3.a of the SAR scope should be revised to read: “GO and TO of IBR must provide models that accurately represent IBR performance (either generic models from the Model Library or equipment-specific models as needed) for interconnection-wide model creation....”

The Model Library (and Interconnection-wide cases) must be open for the inclusion of equipment-specific models (and not just generic models). Otherwise, this SAR is a step backward for modeling accuracy. The Model Library could include usability specifications or requirements for the acceptance of equipment-specific models.

The SAR states that “GO and TO of IBR must provide sufficient documentation regarding technical limitations and any inaccuracies as justification for the use of additional equipment-specific models.”

This statement is backwards, as it prioritizes standardization over modeling accuracy. Instead of requiring a justification for the use of an equipment-specific model, the SAR should require a demonstration that a generic model can accurately represent IBR performance before its use is allowed (though equipment-specific models, too, should be subject to a requirement for a demonstration that they accurately represent IBR performance).

Likes 0

Dislikes 0

Response

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - MRO,WECC, Group Name SPP RTO

Answer

Document Name

Comment

SPP has concerns about language mentioned in the Standards Authorization Request (SAR) pertaining to the Compliance Registry Criteria. The language suggests that FERC Order 901 should properly align with the revised Compliance Registry Criteria when it comes to the registering of the Inverter Based Resources (IBRs) and Distributed Energy Resources (DERs). However, it is not clear where this alignment takes place. From our perspective, the current posting of the Rules of Procedures (RoP-Appendix 5B Version 7) does not mention the registration and/or definition of the IBR or DER as well as the appropriate entities to register them.

In addition, SPP has a concern about the clarity of the rooftop IBRs being included in the FERC Order 901 efforts. At this point, it is not clear if rooftop IBR will be included in the FERC Order 901 alignment with the revised Compliance Registry Criteria.

Moreover, the SAR mentions modeling efforts and the use of the MOD-032 Standard in reference to data collection. From our perspective, there will be a need to include that data in the modeling process to ensure accuracy for the various analyses results that NERC is requiring applicable entities to conduct.

SPP recommends that NERC staff provide clarity on this topic by including language in the SAR discussing their expectations for all IBRs. Furthermore, it is important for NERC staff to understand that none of the resource issues can be addressed until the MOD-032 data collection project has resolved.

Finally, SPP has concerns about FERC Order directive number seventeen (17) and their expectations of the Generator Owner (GO) and Transmission Owner (TO) sharing dynamic model information for registered and unregistered IBRs. We feel that it will be a difficult task to have appropriate representation in the dynamic models when it comes to unregistered IBRs. Furthermore, the directive mentions addressing momentary cessation and

ride through behavior. At this point, NERC has not resolved their issues with the PRC-024 Standard from a performance perspective. From our observation, it will be difficult to align any FERC Order 901 effort with this directive.

SPP recommends that NERC staff provide clarity on the expectations for the unregistered IBRs as well as coordinating with Project 2020-02 drafting team from a ride through and momentary cessation point of view.

Likes 0

Dislikes 0

Response

Christy Thompson - PPL - Louisville Gas and Electric Co. - 3,5,6 - SERC

Answer

Document Name

Comment

The DT should keep in mind that most entities already use and effectively share generic models for IBRs. While user-written models may be prevalent in interconnection-wide models, correcting this issue does not require the establishment of an entire new process or library. Rather, the DT should consider how to shape careful adjustments to existing standards to achieve the relevant directives of FERC Order 901.

Likes 0

Dislikes 0

Response

Julie Hall - Entergy - 1,3,6, Group Name Entergy

Answer

Document Name

Comment

1. Will the subsequent SARs on model validation include consideration of comparison of simulation results among generic models used for interconnection-wide base cases and equipment-specific models used for interconnection studies? If so, a process is needed to rectify differences observed in the simulation results among generic vs. equipment-specific models.
2. It is unclear if the recommendation to use equipment-specific models in interconnection studies for all IBRs shall apply to existing IBRs as well as the new IBRs under study. It seems under this scenario PCs and TPs would have to continuously maintain two sets of dynamic modeling files --- one using generic models and one using equipment-specific models. Maintaining and troubleshooting an equipment-specific model dynamic file may become challenging as the number of user-defined models increases given that much of the code is concealed behind a DLL.
3. Item #2 describes the provisions that are associated with new, modified, or changed equipment. This should consider and/or reference provisions already developed regarding the FAC-002 Qualified Change.
4. Related to data exchange of models associated with steady-state, short-circuit, and dynamic conditions, EMT models should be included as well or a reference to the standards that are being considered relating to submission of EMT models for IBRs. However, EMT models for IBR-DER (particularly unregistered) should be precluded. Estimating parameters associated with a DER EMT model would be quite challenging and there are limited references with regards to estimated EMT models, particularly for DER facilities, for which a TO or TP could reference.
5. Item #3.b.i provides an example related to a TP identifying a CAP related to planning criteria violations which may have been triggered by the generic IBR model inaccuracies. A process should be developed which allows the TP/PC to request equipment-specific models and/or updates

to generic models if the TP/PC believes there may be an issue with the model (e.g. protection system settings in the VTGTPA model contradict settings in the REEC high voltage logic Vup/Vdip) and for the GO to provide a response in a timely manner such that the TP/PC can incorporate the updates in their reliability assessments and evaluate the necessity of the CAP.

6. Paragraph 3 of the SAR becomes confusing when noting that unregistered IBRs be considered as a registered IBR (is this the intent?) when identifying assets for the Compliance Registry. If they're unregistered, who, then, would take that ownership (either GO or GOP)? This seems problematic. Several items in the "Requested Information" section discuss this.
7. Subsequently, does #4 then put the onus for any reporting failures (of the data aggregation) of an unregistered IBR on the TO/DP?
8. Entergy has concerns related to obtaining detailed information as specified in item #3 given that the manufacturers treat this information as proprietary in nature.
9. Item 24 in the requested information discusses "materially impact the reliable operations of the BPS". It's unclear what "materially impact" means.

Likes 0

Dislikes 0

Response

Michelle Olson - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO Group

Answer

Document Name

Comment

The Risk, Purpose and Detailed Description should be evaluated to provide concise descriptions without the additional Order 901 language. (see below for example)

In the Project Scope, Item 1a/b/c, the NSRF understands that NERC will be responsible for developing and maintaining the Model Library. However, it is unclear what work activities, if any, the Drafting Team will perform regarding the Model Library. Coordinating Model Library development with the DT is an administrative function that does not require specific DT work activities. Therefore, we recommend removing Items 1a/b/c from the SAR Project Scope section.

Also, we recommend that the NERC-Approved Model Library contain only the acceptable models. Including unacceptable models does not provide value.

In the Project Scope, Item 3, the NSRF recommends using a process similar to that currently used for synchronous generation.

The NSRF does not agree with mixing the modeling data requirements associated with MOD-032 with the data collection requirements of TOP-003 and IRO-010. Data requirements are best handled in a single place, MOD-032. Eliminate references to IRO-010 and TOP-003. Otherwise there is the potential to review many neighboring entity data specs for differing data requirements.

Items 11, 17, 21 and 24 of the Detailed Description are NERC directed tasks and the NSRF believes those activities should be removed from this of this SAR and addressed separately by NERC.

Example:

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

FERC Order No. 901 – Milestone 3, Part 1: Modeling and Data Sharing Requirements addresses regulatory directives from the [NERC Standards Development Work Plan](#) to respond to FERC Order No. 901.

The current paradigm of modeling and data sharing leaves the bulk power system (BPS) at a higher than necessary risk for unexpected and undesired inverter-based resource (IBR) performance. Since 2016, approximately 15,000 MW of IBR have unexpectedly reduced output during NERC categorized disturbance events. None of the IBR facilities involved in these disturbances utilized models that could accurately represent the facility's performance during the disturbance event. These discrepancies between modeled and studied performance when compared to real-world performance are driven by current industry modeling practices and a dependence on generic IBR modeling throughout the lifecycle of the IBR facility.

The current Reliability Standards may not account for the material technological differences between the response of synchronous generation resources and the response of IBRs to the same disturbances on the Bulk-Power System.

2. 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 project is intended to establish new or revised Reliability Standards to ensure the usage of a uniform framework for data sharing and model development. This uniform framework is to ensure the directives of Order No. 901 can be effectively met to ensure usage of generic model types for IBR in the Interconnection-wide models.

Current Reliability Standards do not ensure that Bulk-Power System planners and operators have the necessary tools to plan for and reliably integrate IBRs into the Bulk-Power System or to plan for IBRs connected to the distribution system that in the aggregate have a material impact on the Bulk-Power System (IBR-DER). IBRs, individually and in the aggregate, and IBR-DERs in the aggregate can have a material impact on the reliable operation of the Bulk-Power System.

Additionally, the Reliability Standards do not contain performance requirements that are unique to IBRs and are necessary to ensure that IBRs operate in a predictable and reliable manner.

Revisions to data sharing expectations and the creation of a “NERC Approved Model Library” that allows the use of manufacturer-specific models in addition to standard library (generic) models in instances where generic modeling cannot represent the performance of the IBR are necessary to ensure BPS reliability through improvements to the inputs of current study practices.

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

The scope is seeking to modify MOD-032, IRO-010 and TOP-003 – I do not have additional comments.

4. 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 justification^[1] 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):

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:

However, the Project Scope states: “901 directives assigned to this SAR are outlined in the Detailed Description section below. The project scope shall address all those directives...”

There are 26 bulleted FERC directives listed in the Detailed Description. Is the intent of this SAR to address all 26 directives or just directives **17, 24 & 25**?

^[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.

Likes 0

Dislikes 0

Response

Rachel Schuldt - Black Hills Corporation - 1,3,5,6, Group Name Black Hills Corporation - All Segments

Answer

Document Name

Comment

Black Hills Corporation does not have any additional comments for the SAR drafting team to consider.

Likes 0

Dislikes 0

Response

Wayne Sipperly - North American Generator Forum - 5 - MRO,WECC,Texas RE,NPCC,SERC,RF

Answer

Document Name

Comment

The NAGF provides the following additional comments for consideration:

- a. IBR manufacturer-specific user written models are unique to each facility. These models require a significant investment of time and money to develop/test/validate and therefore sharing of such OEM proprietary models is unlikely. The NAGF proposes that NERC consider developing model specifications as a method for determining the most appropriate models for industry to use.
- b. The NAGF notes that current IBR models do not accurately represent momentary cessation/tripping and ride through behavior.

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name NPCC RSC

Answer

Document Name

Comment

NPCC RSC supports the SAR.

Likes 0

Dislikes 0

Response

Joshua London - Eversource Energy - 1,3, Group Name Eversource

Answer

Document Name

Comment

Manufacturer-specific models, if allowed or required by any portion of the revised NERC standards, must be provided by OEMs for industry use without restrictions on sharing of these models with TPs, TOs, PCs, and GOs.

Also, how will the Model Library be developed and maintained by NERC? Will the models be freely shared with software tool developers (GE, Siemens/PTI, Manitoba Hydro, PGSTech, ASPEN, Powertech, etc.)? How will NERC require inverter manufacturers provide the necessary information to implement models in the industry software tools before such inverters are connected to the grid going forward?

Some effort should be made to require automated model benchmark validation testing with a GO's specified parameters for their particular facility be provided within the industry software tools. This benchmark validation testing could be provided by the software tool vendors or by the NERC group responsible for the Model Library.

Likes 0

Dislikes 0

Response

Hayden Maples - Evergy - 1,3,5,6 - MRO

Answer

Document Name

Comment

Evergy supports and incorporates by reference the comments of the Midwest Reliability Organization's NERC Standards Review Forum (MRO NSRF) on question 2

Likes 0

Dislikes 0

Response

Greg Sorenson - ReliabilityFirst - 10 - RF

Answer

Document Name

Comment

o This SAR process is likely missing a Requirements Definition phase that captures all the specifications that are needed to run analysis (i.e. TPL-001), and then work backwards to determine how to model the DER. For example, certain needed studies may need different data:

a) To run a study where you want to see system performance when solar drops off and EV charging increases due to consumer behavior, it is likely that a time-of-day case is needed for hour-ending 19:00 vice peak hour.

b) To run a study showing the dynamic performance of IBR solar generation at system peak conditions, it is likely needed to have a case with increased dispatch of solar generation with either corresponding DER_A or Composite Load Models that include DER included in the dynamic data sets such as DYD in PSLF or DYR in PSSE.

The concept of modeling IBRs is to have extremely accurate data/models. There is no guidance for how to “make-up” an aggregate IBR model. Even in EMT studies, accuracy suffers when you try to “aggregate” modeling data from several different equipment manufacturers into one “blended” model. How can the framework account for the need to aggregate and/or blend data and still meet the accuracy needs of the modeling/analysis process? Are changes to the standard load model needed to allow for percentages of rooftop solar to be added on a substation level?

Likes 0

Dislikes 0

Response

Hillary Creurer - Allete - Minnesota Power, Inc. - 1

Answer

Document Name

Comment

Minnesota Power supports MRO's NERC Standards Review Forum's (NSRF) comments.

Likes 0

Dislikes 0

Response

Kimberly Turco - Constellation - 5,6

Answer

Document Name

Comment

NERC needs to find a way to incorporate the intent of this standard into existing/future standards.

m

Likes 0

Dislikes 0

Response

Daniela Atanasovski - APS - Arizona Public Service Co. - 1,3,5,6

Answer	
Document Name	
Comment	
None	
Likes 0	
Dislikes 0	

Response

Andy Thomas - Duke Energy - 1,3,5,6 - SERC,RF

Answer	
Document Name	
Comment	
3.b.ii: Clarify whether interconnection process refers to the Interconnection System Impact Study, Commissioning Phase, or other? Consider in the implementation of effective dates the requirement of dependency between requirements. For example, if GO needs to provide models and the TP and TOP need to use the models, then the GO requirement should become effective prior to the TP/TOP requirements, allowing the TP/TOP time to incorporate models in their process. Or, if the RC needs to build a methodology and the TOP needs to implement the methodology, the RC requirement should be effective prior to the TOP requirement, allowing the TOP time to implement the updated methodology.	
Likes 0	
Dislikes 0	

Response

Steven Rueckert - Western Electricity Coordinating Council - 10, Group Name WECC

Answer	
Document Name	
Comment	
WECC suggests that the SAR be reviewed and checked for capitalization of "Interconnection" as it varies throughout SAR and should be capitalized consistently.	
Likes 0	
Dislikes 0	

Response

Answer

Document Name

Comment

The Risk, Purpose and Detailed Description should be evaluated to provide concise descriptions without the additional Order 901 language.

Example:

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

FERC Order No. 901 – Milestone 3, Part 1: Modeling and Data Sharing Requirements addresses regulatory directives from the [NERC Standards Development Work Plan](#) to respond to FERC Order No. 901.

The current paradigm of modeling and data sharing leaves the bulk power system (BPS) at a higher than necessary risk for unexpected and undesired inverter-based resource (IBR) performance. Since 2016, approximately 15,000 MW of IBR have unexpectedly reduced output during NERC categorized disturbance events. None of the IBR facilities involved in these disturbances utilized models that could accurately represent the facility’s performance during the disturbance event. These discrepancies between modeled and studied performance when compared to real-world performance are driven by current industry modeling practices and a dependence on generic IBR modeling throughout the lifecycle of the IBR facility.

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Additionally, , the Reliability Standards do not contain performance requirements that are unique to IBRs and are necessary to ensure that IBRs operate in a predictable and reliable manner.

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3. 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 justification [\(C\)111\(C\)](#) 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):

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Likes 0

Dislikes 0

Response