

## Comment Report

**Project Name:** 2020-02 Transmission-connected Resources | Standard Authorization Request  
Comment Period Start Date: 3/30/2020  
Comment Period End Date: 5/13/2020  
Associated Ballots:

There were 39 sets of responses, including comments from approximately 118 different people from approximately 100 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 SAR 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
DTE Energy - Detroit Edison Company	Adrian Raducea	3,4,5		DTE Energy - DTE Electric	Karie Barczak	DTE Energy - Detroit Edison Company	3	RF
					Daniel Herring	DTE Energy - Detroit Edison Company	4	RF
					Adrian Raducea	DTE Energy - Detroit Edison	5	RF
MRO	Dana Klem	1,2,3,4,5,6	MRO	MRO NSRF	Joseph DePoorter	Madison Gas & Electric	3,4,5,6	MRO
					Larry Heckert	Alliant Energy	4	MRO
					Michael Brytowski	Great River Energy	1,3,5,6	MRO
					Jodi Jensen	Western Area Power Administration	1,6	MRO
					Andy Crooks	SaskPower Corporation	1	MRO
					Bryan Sherrow	Kansas City Board of Public Utilities	1	MRO
					Bobbi Welch	Omaha Public Power District	1,3,5,6	MRO
					Jeremy Voll	Basin Electric Power Cooperative	1	MRO
					Bobbi Welch	Midcontinent ISO	2	MRO
					Douglas Webb	Kansas City Power & Light	1,3,5,6	MRO
					Fred Meyer	Algonquin Power Co.	1	MRO
					John Chang	Manitoba Hydro	1,3,6	MRO
					James Williams	Southwest Power Pool, Inc.	2	MRO
Jamie Monette	Minnesota Power / ALLETE	1	MRO					

					Jamison Cawley	Nebraska Public Power	1,3,5	MRO
					Sing Tay	Oklahoma Gas & Electric	1,3,5,6	MRO
					Terry Harbour	MidAmerican Energy	1,3	MRO
					Troy Brumfield	American Transmission Company	1	MRO
Westar Energy	Douglas Webb	1,3,5,6	MRO,SPP RE	Westar-KCPL	Doug Webb	Westar	1,3,5,6	MRO
					Doug Webb	KCP&L	1,3,5,6	MRO
ACES Power Marketing	Jodirah Green	1,3,4,5,6	MRO,NA - Not Applicable,RF,SERC,Texas RE,WECC	ACES Standard Collaborations	Bob Solomon	Hoosier Energy Rural Electric Cooperative, Inc.	1	SERC
					Kevin Lyons	Central Iowa Power Cooperative	1	MRO
					Bill Hutchison	Southern Illinois Power Cooperative	1	SERC
					Amber Skillern	East Kentucky Power Cooperative	1	SERC
					Ben Engelby	Arizona Electric Power Cooperative, Inc.	1	WECC
					Steven Myers	North Carolina EMC	3,4,5	SERC
					Meredith Dempsey	Brazos Electric Cooperative	1,5	Texas RE
					Ryan Strom	Buckeye Power, Inc.	5	RF
					Calvin Wheatley	Wabash Valley Power Association	1	RF
					Kylee Kropp	Sunflower Electric Power Corporation	1	MRO
Duke Energy	Kim Thomas	1,3,5,6	FRCC,RF,SERC	Duke Energy	Laura Lee	Duke Energy	1	SERC
					Dale Goodwine	Duke Energy	5	SERC

					Greg Cecil	Duke Energy	6	RF
Northern California Power Agency	Marty Hostler	3,4,5,6		NCPA	Michael Whitney	Northern California Power Agency	3	WECC
					Scott Tomashefsky	Northern California Power Agency	4	WECC
					Dennis Sismaet	Northern California Power Agency	6	WECC
					Marty	Northern California Power Agen	5	WECC
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
					William D. Shultz	Southern Company Generation	5	SERC
					Ron Carlsen	Southern Company - Southern Company Generation	6	SERC
Eversource Energy	Quintin Lee	1,3		Eversource Group	Sharon Flannery	Eversource Energy	3	NPCC
					Quintin Lee	Eversource Energy	1	NPCC
NPCC	Ruida Shu	1,2,3,4,5,6,7,8,9,10	NPCC	NPCC Regional Standards Committee	Guy V. Zito	Northeast Power Coordinating Council	10	NPCC
					Randy MacDonald	New Brunswick Power	2	NPCC
					Glen Smith	Entergy Services	4	NPCC
					Alan Adamson	New York State	7	NPCC

	Reliability Council		
David Burke	Orange & Rockland Utilities	3	NPCC
Michele Tondalo	UI	1	NPCC
Helen Lainis	IESO	2	NPCC
John Pearson	ISO-NE	2	NPCC
David Kiguel	Independent	7	NPCC
Paul Malozewski	Hydro One Networks, Inc.	3	NPCC
Nick Kowalczyk	Orange and Rockland	1	NPCC
Joel Charlebois	AESI - Acumen Engineered Solutions International Inc.	5	NPCC
Mike Cooke	Ontario Power Generation, Inc.	4	NPCC
Salvatore Spagnolo	New York Power Authority	1	NPCC
Shivaz Chopra	New York Power Authority	5	NPCC
Deidre Altobell	Con Ed - Consolidated Edison	4	NPCC
Dermot Smyth	Con Ed - Consolidated Edison Co. of New York	1	NPCC
Peter Yost	Con Ed - Consolidated Edison Co. of New York	3	NPCC
Cristhian Godoy	Con Ed - Consolidated Edison Co. of New York	6	NPCC

Nicolas Turcotte	Hydro-Qu?bec TransEnergie	1	NPCC
Chantal Mazza	Hydro Quebec	2	NPCC
Sean Bodkin	Dominion - Dominion Resources, Inc.	6	NPCC
Nurul Abser	NB Power Corporation	1	NPCC
Randy MacDonald	NB Power Corporation	2	NPCC
Jim Grant	NY-ISO	2	NPCC
Quintin Lee	Eversource Energy	1	NPCC
Silvia Parada Mitchell	NextEra Energy, LLC	4	NPCC
Michael Ridolfino	Central Hudson Gas and Electric	1	NPCC
Vijay Puran	NYSPS	6	NPCC
ALAN ADAMSON	New York State Reliability Council	10	NPCC
John Hasting	National Grid USA	1	NPCC
Michael Jones	National Grid USA	1	NPCC
Sean Cavote	PSEG - Public Service Electric and Gas Co.	1	NPCC
Brian Robinson	Utility Services	5	NPCC

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.

**Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF**

**Answer** No

**Document Name**

**Comment**

These comments represent the MRO NSRF membership as a whole but would not preclude members from submitting individual comments".  
The NSRF agrees with the intent of the SAR but please see our main objection in question 2, a definition of Essential Reliable Service is required.

Likes 0

Dislikes 0

**Response**

**Richard Jackson - U.S. Bureau of Reclamation - 1,5**

**Answer** No

**Document Name**

**Comment**

To minimize churn among standard versions, Reclamation recommends the SAR drafting team coordinate changes with other existing drafting teams for related standards; specifically, MOD-032, Project 2017-07, and the Standards Efficiency Review Phase 2.

Likes 0

Dislikes 0

**Response**

**LaTroy Brumfield - American Transmission Company, LLC - 1**

**Answer** No

**Document Name**

**Comment**

ATC generally agrees with the proposed scope and purpose of the SAR. However, the SAR should be modified to more clearly identify the BES nature of the equipment that is in scope and whether it qualifies as "transmission connected." The term "transmission connected" is ambiguous since many regions have different definitions for what is considered transmission. The SAR should be clarified to address this ambiguity.

Additionally, “transmission connected” does not indicate if the dynamic reactive resource itself must be classified as BES, in accordance with NERC’s definition, to be within the SAR’s scope or if the dynamic reactive resource must simply be connected to an existing BES element to be within the SAR’s scope. ATC believes that non-BES devices should not fall within the scope of the standards affected (MOD-025, MOD-026, MOD-027, PRC-019, and PRC-024) such that a device connected to distribution facilities or other non-BES facilities (e.g. DERs or 69 kV bus) would not fall within the scope of the SAR.

ATC believes the scope of the SAR should only focus on BES dynamic reactive resources similar in nature to the existing BES definition and scope of the existing standards.

Likes 0

Dislikes 0

## Response

**Thomas Foltz - AEP - 3,5**

**Answer**

No

**Document Name**

**Comment**

AEP objects to the SAR’s scope as currently proposed and find it to be far too open-ended, as typified by the inclusion of “all *varieties* of transmission-connected dynamic reactive resources that are utilized in providing ERS in the BES.” While we acknowledge that new technologies in this regard continue to emerge, more specificity is needed within the SAR to enable industry to provide meaningful feedback.

The final paragraph on page 7 of the Whitepaper expresses concern regarding an apparent “significant inconsistency” between the intent of MOD-025-2 to “ensure that accurate information on generator...capability is available for planning models used to assess Bulk Electric System (BES) reliability” and the actual results obtained during testing. The authors of the White Paper believe that misconceptions regarding generator maximum achievable reactive capability may be causing the provision of incorrect data for the purposes of MOD-032-1, driven by the requirements of MOD-025. The SAR would presumably require more robust testing on transmission-connected dynamic reactive resources, and it must be understood and acknowledged by the SDT that such testing would differ greatly from that of the generation resources currently in scope. We have provided feedback below regarding how we believe such testing impacts the standards that are in scope for this project.

MOD-026: While initial testing is reasonable, it is not realistic to perform any ongoing dynamic testing of FACTS devices after they are installed on the system. FACTS devices are dynamically tested on a RTDS simulator in the lab before field commissioning, and against the actual system during field commissioning. Results of these tests are used to validate the models provided. It is not expected that dynamic response would change on an inverter based system after initial design, thereby making subsequent tests irrelevant.

MOD-027: This standard does not apply to FACTS voltage control equipment, though it could apply to HVDC tie equipment. Frequency response and power flow contingency settings are an optional characteristic available in most manufacturers’ control systems and is not be utilized by all entities. These power flow and frequency response capabilities are tested as part of the factory testing before the unit is commissioned to insure that the capability performs correctly. No further verification is needed on HVDC equipment unless the frequency response capability is turned on and put into production.

PRC-019: Initial factory testing is sufficient, and no ongoing field testing is necessary. Factory coordination of protection elements and controls is a basic part of the design of a FACTS device. When possible, FACTS devices are tested to the full range of operation during commissioning, otherwise such testing is always performed on the RTDS during factory testing. Test results are then compiled and made available to show compliance with specifications. If changes are made in the field, then coordination studies would be required to update the documentation.

PRC-024: Once again, initial factory testing is sufficient, and no ongoing field testing is necessary. Protective relays are coordinated with the operation of the FACTS device during the design phase. The FACTS control system is operated against the RTDS model of the system during factory testing to insure that all specified transient phenomena are properly handled by the device. Many tests are run at varying voltages and frequencies to prove that the device is robust and meets standards. Test results are compiled and made available to show compliance with specifications. If changes are made in the field then coordination studies would be required to update the documentation.

Mod-025: The testing of a FACTS reactive resource may potentially (though obviously unintentionally) introduce risk to the system to which it is connected. Operating the system outside reasonable parameters is not acceptable for the purposes of testing. Testing of a FACTS reactive resource will be limited due to the constraints of the system at the time the testing is performed. It is quite possible that full output may not be obtained in either the capacitive or inductive direction (or both). Testing cannot require the disruption of the power system in the vicinity of the FACTS device, nor can it put that system at any risk due to the testing. The reason for the termination of the test at any output level should be documented in the test results with no further requirements due for further testing. As mentioned in the last paragraph of the white paper, an early termination of a test due to system constraints at the time of the test should not be construed to mean that the unit will always be limited to that maximum output. Any resulting limitation of the FACTS device in planning models would need to be determined after analysis of the cause of the limitation in the test results.

In summary, while AEP agrees (at least in part) with what the SAR seeks to achieve, we do not see a true reliability-driven need for standards on these suggested devices, certainly not to the extent as for independent generators. The existence and usage of these additional devices, by their very nature, requires their owners to perform reliability studies, calculations, and take other necessary measures to verify both their proper operation and modeling. As a result, we do not believe that adding obligations for these devices would perceptibly enhance the reliability of the BES, and would primarily be administrative in nature. We do not believe a “reliability parity” exists between the newly-suggested devices and those already within the scope of these standards, and do not believe that the standards should be revised to include these additional devices. However, if the SDT does indeed pursue such changes, we believe the SDT should revise the SAR to address the following a) pursue device-specific obligations for the newly-proposed non-generation devices, b) ensure that Violation Severity Levels for any new obligations are less than those associated with the existing obligation for Facilities comprising generation resources and c) ensure that the periodicity associated with the obligations on the additional devices are less burdensome as well.

Likes	0
Dislikes	0
<b>Response</b>	
<b>Andy Fuhrman - Minnkota Power Cooperative Inc. - 1 - MRO</b>	
<b>Answer</b>	No
<b>Document Name</b>	
<b>Comment</b>	

MPC supports comments from the MRO NERC Standards Review Forum (NSRF).

Likes 0

Dislikes 0

### Response

**Jodirah Green - ACES Power Marketing - 1,3,4,5,6 - MRO,WECC,Texas RE,SERC,RF, Group Name** ACES Standard Collaborations

**Answer**

No

**Document Name**

### Comment

ACES has three main concerns with the proposed SAR:

1. The definition of Essential Reliability Services (ERS) is not consistent amongst the SAR, the White Paper, and other previous resources.

- The SAR states the following: Dynamic reactive resources used to provide Essential Reliability Services (ERS) in the BES include generation resources (rotating machine and inverter-based) as well as transmission connected dynamic reactive resources (power-electronics based).
- The SAMS White Paper states the following: ... essential reliability services (ERS) such as voltage control, frequency control, and ramping/balancing capability.
- The Essential Reliability Services "Tutorial" form 2014 explains Essential Reliability Services as an integral part of reliable operations to assure the protection of equipment and are the elemental "reliability building blocks" provided by generation. That includes voltage support and frequency support.

Therefore, use of "ERS" requires a NERC-approved definition to avoid any inconsistencies.

2- The Assessment of Applicability in Reliability Standards White Paper that has been supplied as a basis for this SAR is in a draft form. The submission of this SAR should be deferred until the final White Paper is published.

3- The SAR states that the Cost Impact Assessment is unknown. Cost Impacts are an important aspect to be studied. Company budget cycles are requested to be measured as a consideration in the time-extension decisions.

Likes 0

Dislikes 0

### Response

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

**Answer**

No

**Document Name**

### Comment

AZPS proposes the scope be modified to include “BES” connected dynamic reactive devices instead of “transmission” connected reactive devices as not all devices connected at the transmission level are applicable to the BES. In addition, there are cases where devices connected at 69kV may be considered BES.

AZPS does not agree with all of the conclusions in the February 2019 NERC SAMS White Paper. For example, on Page 2, Table 1: Applicability of Relevant NERC Reliability Standards to Dynamic Reactive Resources, APS does not agree with the conclusion that LCC HVDC is applicable to MOD-027 or that VSC HVDC is applicable to MOD-025, MOD-026 or MOD-027. The intent of MOD-026 is to verify excitation system model and the intent of MOD-027 is to verify turbine generator model. Application of these standards to HVDC will not be appropriate. If the intent is to verify HVDC dynamic models as used in powerflow and stability studies, AZPS asserts that there should be a separate SAR for that requirement.

On Page 7, Other Considerations, Item 2 of the NERC SAMS White Paper additional complications of MOD-025 are discussed.

“NERC SAMS and the NERC Power Plant Modeling and Verification Task Force (PPMVTF) have both identified a significant inconsistency between the intent of MOD-025-2 to “ensure that accurate information on generator and synchronous condenser reactive power capability is available for planning models used to assess Bulk Electric System (BES) reliability” and the actual results obtained during testing. MOD-025-2 does not require the full (maximum achievable) reactive capability of the resource to be reached via test. This is warranted because the testing conditions likely will limit the resource from reaching its full (maximum achievable) reactive capability before other limits are reached such as system voltage, generator terminal voltage, or auxiliary bus voltage limits. While this is reasonable for testing, the standard does not require calculations to be performed to prove that the resource could reach its full (maximum achievable) reactive capability under more favorable operating conditions (i.e. when that full reactive capability is needed for maintaining voltage schedule). Therefore, there is a significant misconception in the industry that the testing results should be used as the same data submitted for MOD-032-1 for capability of the machine. This misconception is likely leading to incorrect data being supplied for the purposes of MOD-032-1 and is driven by the requirements in MOD-025-2.”

AZPS asserts that it is not prudent to modify MOD-025 to include new devices when there are other issues that need to be addressed.

AZPS further notes that there is a discrepancy in the NERC SAMS White Paper as follows: On Page 2, Table 1 indicates that LCC HVDC is recommended to be applicable to PRC-024 but on Page 6, the Technical Basis for Applicability in the White Paper indicates that it should NOT be applicable to PRC-024. AZPS recommends the table should be corrected to have a N/A value.

Likes 0

Dislikes 0

## Response

**Glenn Barry - Los Angeles Department of Water and Power - 1,3,5,6**

**Answer**

No

**Document Name**

**Comment**

The added benefit to reliability might not be significant to justify the inclusion of these transmission-connected resources. Reliability for these resources is currently addressed by Standards such as PRC-004, which requires Misoperations to be analyzed and reported and the development of Corrective Action Plans to remediate issues. In addition, the protection and control systems found in these transmission-connected reactive resources are not easily modified and typically are proprietary, requiring assistance from the manufacturer to change settings and test certain systems. Modifying existing protection and control systems affects warranty and is not recommended. Therefore, there is no need to retest/compare when no modifications are being made to the system. With the loss of a FACTS device, the Power System should not completely fall apart. There may be issues with voltage stability for short periods of time, such as power flow, but the system should not collapse.

Likes 0

Dislikes 0

**Response**

**Marty Hostler - Northern California Power Agency - 3,4,5,6, Group Name NCPA**

**Answer** No

**Document Name**

**Comment**

NO, NCPA does not support this SAR as written.

NCPA feels the SAR needs to clearly state that GO/GOPs will not be subject to any changes to MOD-025, 26, 27 and PRC 19 and 24 Standards due to this Project 2020-02. If the SAR drafting team disagrees please state exactly why members are willing to imply it doesn't impact GO/GOPs but are unwilling to back it up by excluding GO/GOP from the SAR and future subject standards new/modified requirement(s).

As written the SAR seems straight forward. For instance it mentions (non-generation) transmission connected reactive resources, which looks like it excludes GO/GOPs. But from our experience with FERC, NERC, and WECC, unless the SAR or the Standard specifically states it is not applicable to GO/GOPs we are going to have to annually provide documentation/evidence proving that we don't own/operate transmission connected resources and compile evidence, or null evidence letters, annually proving compliance or non-applicability of the standard. This is simply another cost and time burden on NCPA, our investors, members, and customers, with zero reliability benefit.

Likes 0

Dislikes 0

**Response**

**Stephen Stafford - Georgia Transmission Corporation - 1 - SERC**

**Answer** No

**Document Name**

**Comment**

It does not appear that the SAMS seriously considered a Reliability Guideline to address the issues identified in the White Paper. GTC believes that a Reliability Guideline would be a better initial step to address the needs identified in the White Paper without adding the administrative burden/cost of record keeping and documentation for audit purposes; therefore, GTC does not believe that a SAR is necessary at this time.

Likes 0

Dislikes 0

**Response**

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

<b>Answer</b>	No
<b>Document Name</b>	
<b>Comment</b>	
<p>Dynamic reactive power resources have nothing to do with frequency control, which is a direct consequence of the balance of real power balances between generation and load. We believe that the inclusion of MOD-027 in the list of standards in the SAR is out of order.</p> <p>PRC-019 already applies to TO-owned synchronous condensers. PRC-019 was originally deemed necessary due to miscoordination of the protection elements embedded in automatic voltage regulating system with the process control limiters which may exist in the controls. Does this miscoordination exist in the additional "all varieties of dynamic reactive resources" scope proposed? In other words, for the additional scoped elements, are the tripping elements tripping before the limiting elements limit? The driving source of need and the impetus for increasing the scope of the PRC-019 applicability is not justified in the SAR.</p> <p>The detailed description does not provide sufficient detail as to the proposed extent of the modifications to existing requirements, nor does it provide insight into possible function of new requirements. It is suggested that this detail be added to direct a standard drafting team towards the specific concern to be addressed.</p> <p>MOD-025 already applies to TO-owned synchronous condensers. Proportionately, are there substantial numbers of additional transmission connected reactive power resources that, if modelled, would significantly enhance the validity of a planning model? The driving source of need and the impetus for increasing the scope of the MOD-025 applicability is not justified in the SAR. Additionally, the operational limitations observed during the first 5 years of the MOD-025 testing which yielded test results that did not prove the actual reactive capabilities of the machines under test raise valid questions regarding its value - what is to say that expanding the applicability to additional equipment will yield valuable information on reactive capabilities?</p> <p>The MVA applicability thresholds for MOD-026 were chosen so that approximately 80% of the connected generation in each interconnection would be drawn into the scope of the applicability. Are there sufficient quantities of other transmission connected reactive power resources whose inclusion in the applicability would significantly impact and enhance the validity of planning models?</p> <p>It is suggested that the Project Scope statement be modified to limit the applicable resources to those specifically identified by the SAMs white paper. Including a statement such as "all variety of transmission connected dynamic resources is unbounded and could create confusion as to what resources are applicable.</p>	
Likes	0
Dislikes	0
<b>Response</b>	
<p><b>Sandra Shaffer - Berkshire Hathaway - PacifiCorp - 6</b></p>	
<b>Answer</b>	Yes

<b>Document Name</b>	
<b>Comment</b>	
<p>PacifiCorp supports the proposed Standards Authorization Request to revise the “Applicability – Facilities” and “Applicability-Functional Entities” sections in the MOD-025, MOD-026, MOD-027, PRC-019 and PRC-024 reliability standards to include (non-generation) transmission-connected dynamic reactive resources. PacifiCorp also would like to submit a comment for the team members to consider that for MOD-025, testing the full range of large non-generation transmission-connected dynamic reactive devices may not be possible under normal operating conditions. Data from actual disturbances may need to be used to verify the reactive capability of these devices including high speed switching of any associated switched shunt capacitors and/or reactors that are incorporate to extend the range of the dynamic reactive device.</p>	
Likes	0
Dislikes	0
<b>Response</b>	
<b>Laura Nelson - IDACORP - Idaho Power Company - 1</b>	
<b>Answer</b>	Yes
<b>Document Name</b>	
<b>Comment</b>	
<p>Idaho Power (IPCO) supports the proposed modifications listed in the SAR for NERC Project 2020-02.</p> <p>Impact to Idaho Power with regard to including synchronous condensers as applicable resources for MOD-026 is anticipated to be minimal. IPCO has performed dynamic system model validation for IPCO-owned synchronous condensers under the WECC Model Validation and Testing Policy. IPCO has PMU and DFR monitoring equipment installed on the IPCO-owned synchronous condensers; thus, model validation for MOD-026 can potentially be performed using disturbance recording data since all the machines have already under gone baseline testing.</p> <p>Anticipated impact for the addition of synchronous condensers as applicable resources for PRC-024 is minimal to IPCO.</p> <p>IPCO supports inclusion of the non-generation dynamic reactive resources listed in Table 1 of the NERC SAMS White Paper.</p>	
Likes	0
Dislikes	0
<b>Response</b>	
<b>John Pearson - ISO New England, Inc. - 2 - NPCC</b>	
<b>Answer</b>	Yes
<b>Document Name</b>	
<b>Comment</b>	

With increasing installations of transmission-connected dynamic reactive resources, it is necessary to obtain accurate models of equipment as actually installed and configured to plan and operate the BES.

Likes 0

Dislikes 0

**Response**

**Kim Thomas - Duke Energy - 1,3,5,6 - SERC,RF, Group Name Duke Energy**

**Answer**

Yes

**Document Name**

**Comment**

None.

Likes 0

Dislikes 0

**Response**

**Adrian Raducea - DTE Energy - Detroit Edison Company - 3,4,5, Group Name DTE Energy - DTE Electric**

**Answer**

Yes

**Document Name**

**Comment**

Accurate models are required for all transmission connected resources.

Likes 1

DTE Energy - Detroit Edison Company, 3, Barczak Karie

Dislikes 0

**Response**

**Spencer Tacke - Modesto Irrigation District - 3,4,6**

**Answer**

Yes

**Document Name**

**Comment**

1. As far as adding other reactive or real power source model verification requirements to the NERC MOD Standards, I am OK with that. But I would like to add an expansion of the scope of the existing requirements to include generating resources with less than a 75 MVA rating, and connected at less than 100 KV, per the explanation below.

1. Based on WECC's experience since the Aug. 10, 1996 WSCC (now WECC) System Wide Outage, I would like to suggest that as part of this SAR, we include the expansion of the scope of those generating resources that need to have their dynamic models verified via MOD-026 & MOD-027, to include those single generating units 10 MVA or larger (or an aggregate facility rating of 20 MVA or larger), and connected at 60 kV and above.

The detailed analysis of the Aug. 10, 1996 WSCC System Wide Outage demonstrated the real significance that the smaller generators have in their impact to the transient stability of the WECC Interconnected System. During that Outage, it wasn't until the smaller U.S. Army Corps of Engineers McNary Hydroelectric Generators (each of the 13 units were smaller than 75 MVA) in the Pacific Northwest ran into excitation limits and tripped off-line causing a further and critical voltage sag, that the voltage oscillations on the 500 kV system started, and which eventually led to the complete voltage collapse and blackout of a major portion of the Pacific and Pacific Northwest System. Their excitation systems were modeled incorrectly at the time, and that is why the initial simulation analysis did not predict the actual response of the Interconnected System that occurred (see Transactions on Power Systems, Vol. 14, No. 3, August 1996; "Model Validation for the August 10, 1996 WSCC System Outage"). For this reason, WSCC (WECC) invoked the mandatory Generating Testing and Model Validation Policy, requiring testing of all generators connected at 60 kV and above, and rated at 10 MVA and above (or an aggregate facility rating of 20 MVA or larger). The effectiveness of this Policy was demonstrated by the analysis of subsequent system wide disturbances that demonstrated good matches between the simulated responses and the actual systems response during the disturbances (see "Generating Unit Model Validation: WECC Lessons and Moving Forward" ; 2009 IEEE Power and Energy Society Meeting, Calgary, AB, Canada, July 26-July 30, 2009). This definitely demonstrated the effectiveness of having accurate generator models for all generators 10 MVA and larger (or an aggregate facility rating of 20 MVA or larger), and connected at 60 kV and above.

In addition, a final and nearly exact match did not occur for the 1996 Outage simulations until the load of the WECC Interconnected System (typically placed on 69 kV and below modeled busses) was more accurately modeled by introducing a 20% induction motor load, along with the traditional static load previously modeled. This fact also demonstrated the extreme importance the lower voltage connected models have on the overall system response of the WECC high voltage (i.e., greater than or equal to 100 kV) Interconnected System.

And in recent years with the very large influx of renewable generation (many thousands of MWs) in California being added to the WECC System at the lower levels of 20 MVA and connected at 69 kV and below, it is even more incumbent on us to include in model testing and validation, these smaller size generating units.

Thank you.

Sincerely,

Spencer Tacke

Senior Electrical Engineer

Modesto Irrigation District

1231 11th Street, Modesto, CA 95354

Likes 0

Dislikes 0

### Response

**Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC**

<b>Answer</b>	Yes
<b>Document Name</b>	
<b>Comment</b>	
Please see comments submitted by Edison Electric Institute.	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Robert Ganley - Long Island Power Authority - 1</b>	
<b>Answer</b>	Yes
<b>Document Name</b>	
<b>Comment</b>	
<p>It is recommended that the drafting team consider working with industry vendors of transmission connected nonsynchronous sources (i.e. FACTS, HVDC) to ensure that the standard requirements can be benchmarked with actual and realistic resource testing capabilities and modeling capabilities. As mentioned in the White Paper, controls for nonsynchronous sources are different based on the types of equipment technologies used in the different devices.</p> <p>In terms of dynamic simulation modeling of nonsynchronous sources (i.e. FACTS, HVDC), it is expected that such dynamic models would be developed by and provided by the device vendor. It is encouraged that the applicable standards promote the development of, and use of, standardized "off the shelf" dynamic simulation software models.</p> <p>It is likely that many Transmission Owners (TOs) rely on the services of the nonsynchronous resource (i.e. FACTS, HVDC) vendor for capability testing, protection coordination and model verification – due to the specialized nature of these resources. The proposed standards development envisioned by this SAR would likely increase a TO's reliance on support services from their nonsynchronous resource vendors, with a corresponding increase in costs.</p>	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Douglas Webb - Westar Energy - 1,3,5,6 - MRO, Group Name Westar-KCPL</b>	
<b>Answer</b>	Yes
<b>Document Name</b>	
<b>Comment</b>	

Westar Energy and Kansas City Power & Light, Evergy companies, incorporate by reference and support the Edison Electric Institute (EEI) response to Question 1.

Likes 0

Dislikes 0

### Response

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

**Answer**

Yes

**Document Name**

**Comment**

EEI supports the proposed changes contained in the Project 2020-02 SAR. The SAR, which is supported by a comprehensive white paper developed by the System Analysis and Modeling Subcommittee (SAMS), identifies a gap in the existing body of Reliability Standards that has been created by the changing resource mix and changes in technology and transmission connected devices that are needed to support BES reliability. EEI agrees with SAMS that both rotating machines and power-electronics based resources that are capable of supporting Essential Reliability Services (ERS) should do so in a consistent manner.

Likes 0

Dislikes 0

### Response

**Daniel Gacek - Exelon - 1,3,5,6**

**Answer**

Yes

**Document Name**

**Comment**

Exelon agrees with the proposed scope as described in the SAR and concurs with the comment submitted by EEI.

Likes 0

Dislikes 0

### Response

**Quintin Lee - Eversource Energy - 1,3, Group Name Eversource Group**

**Answer**

Yes

**Document Name**

**Comment**

The applicability of NERC standards to battery energy storage resources should be considered as some large projects are in development now. The applicability of the NERC standards needs to be noted for both storing and releasing energy.

Likes 0

Dislikes 0

**Response****David Jendras - Ameren - Ameren Services - 1,3,6**

**Answer**

Yes

**Document Name**

**Comment**

Ameren agrees with and supports EEI comments.

Likes 0

Dislikes 0

**Response****Bruce Reimer - Manitoba Hydro - 1,3,5,6**

**Answer**

Yes

**Document Name**

**Comment**

I agree with the recommendation. Dynamic reactive resources, including generation resources such as rotating machinery as well as transmission connected dynamic reactive resources, both in the form of rotating machinery such as synchronous condensers, and power-electronics based devices such as SVC's and STATCOMS, affect the transmission voltages, power transfer levels and hence the reliability of the power system due to their ability to generate and absorb Mvars dynamically and in the steady state. In many cases the MVA rating of these devices can be larger than single generating units. As such the accurate representation and capability testing of such devices will contribute to the overall reliability of the BES.

Likes 0

Dislikes 0

**Response**

**Ruida Shu - NPCC - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name NPCC Regional Standards Committee**

**Answer** Yes

**Document Name**

**Comment**

Please consider revising the proposed scope to only include the transmission-connected dynamic reactive resources that are referenced in the SAMs white paper. This suggested revision would align with the detailed description of the SAR.

Likes 0

Dislikes 0

**Response**

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

**Answer** Yes

**Document Name**

**Comment**

BPA believes this is a timely and much needed effort to ensure transmission-connected reactive resources have validated dynamic models, and appropriate system performance.

The Western Interconnection is undergoing significant transformation with its generation mix. Many of the large coal-fired and nuclear power plants have retired or are scheduled to retire. These generators are replaced with renewable plants, which are usually smaller in size. Current 75 MW threshold represented 80% of generating capacity in the Western Interconnection in 2007. However, with the retirement of large synchronous generators and addition of smaller renewable plants, the threshold is now lower.

As such, BPA requests the drafting team to revisit the applicability threshold in MOD-026/27 Reliability Standards for the Western Interconnection as additional scope to this SAR.

Likes 0

Dislikes 0

**Response**

**Brandon Gleason - Electric Reliability Council of Texas, Inc. - 2**

**Answer** Yes

**Document Name**

**Comment**

ERCOT generally supports the concept described in the SAR. Regarding PRC-024 only, ERCOT agrees that the standard should be revised to prohibit tripping of GO-owned reactive devices outside certain defined parameters, as suggested by the SAMS whitepaper, but does *not* agree that the standard should be revised to prohibit tripping of TO-owned reactive devices. This is because, to the extent tripping of such devices outside of PRC-024's defined parameters can foreseeably cause a reliability issue, that issue should be identified in a TP's or PC's annual Planning Assessment and resolved through a Corrective Action Plan (CAP). To the extent the tripping of a TO-owned reactive device does not result in a violation of planning criteria, then requiring the TO to prevent the tripping of that device in conformance with the settings of PRC-024 would not be necessary or cost-effective.

Likes 0

Dislikes 0

### Response

**Jennie Wike - Tacoma Public Utilities (Tacoma, WA) - 1,3,4,5,6 - WECC**

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

### Response

**Leonard Kula - Independent Electricity System Operator - 2**

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

### Response

**Kevin Conway - Public Utility District No. 1 of Pend Oreille County - 1,3,5,6**

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

**Response**

**Anthony Jablonski - ReliabilityFirst - 10**

**Answer**

Yes

**Document Name**

**Comment**

Likes 0

Dislikes 0

**Response**

**Carl Pineault - Hydro-Qu?bec Production - 1,5**

**Answer**

Yes

**Document Name**

**Comment**

Likes 0

Dislikes 0

**Response**

**Colleen Campbell - AES - Indianapolis Power and Light Co. - 3**

**Answer**

Yes

**Document Name**

**Comment**

Likes 0

Dislikes 0

**Response**

**Maryanne Darling-Reich - Black Hills Corporation - Black Hills Power - 1,3,5,6 - MRO,WECC**

Answer	Yes
Document Name	
<b>Comment</b>	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Teresa Cantwell - Lower Colorado River Authority - 1,5</b>	
Answer	Yes
Document Name	
<b>Comment</b>	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Dennis Chastain - Tennessee Valley Authority - 1,3,5,6 - SERC</b>	
Answer	Yes
Document Name	
<b>Comment</b>	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Bobbi Welch - Midcontinent ISO, Inc. - 2</b>	
Answer	
Document Name	
<b>Comment</b>	
MISO supports comments submitted by the MRO NERC Standards Review Forum (NSRF).	

MISO supports the intent of the SAR to augment the applicability of existing reliability standards for verifying the capability, modeling and performance of dynamic reactive resources to include (non-generation) transmission-connected reactive resources; however, as written the scope of the SAR relies on the definition of Essential Reliability Services (ERS) and the definition of ERS is unclear.

Likes 0

Dislikes 0

### Response

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Texas RE appreciates the SAR drafting team's efforts in addressing reliability and issues we have seen as a contributing cause to past events (e.g. STATCOM tripping off during voltage excursion during July 2015 event). Texas RE noticed, however, that the scope of the SAR focuses on "transmission-connected resources", but does not clearly address how these reactive devices will be addressed when owned by the Generator Owner (GO). This is especially pertinent for dispersed power producing resources where synchronous condensers, SVCs, and STATCOMs are frequently located behind the GSU and used to supplement the Reactive Power output of the individual generating units.

For example, Footnote 4 of PRC-024-2 states "*For voltage protective relays associated with dispersed power producing resources identified through Inclusion 14 of the Bulk Electric System definition, this requirement applies to voltage protective relays applied on the individual generating unit of the dispersed power producing resources, as well as voltage protective relays applied on equipment from the individual generating unit of the dispersed power producing resource up to the point of interconnection.*" Since the language in this footnote only addresses generating units, a synchronous condenser, SVC, or STATCOM owned by the GO is not applicable to the currently effective version of the Standard. **Texas RE recommends clarifying the SAR to ensure the modifications to applicability include GO dynamic reactive devices.**

Likes 0

Dislikes 0

### Response

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

**Ruida Shu - NPCC - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name** NPCC Regional Standards Committee

**Answer**

**Document Name**

**Comment**

The SAR drafting team should consider an implementation plan specifically for BES dynamic reactive resources initial MOD/PRC testing and reporting.

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**

The industry need section of the SAR needs is confusing in listing the GO-owned rotating-machine and inverter-based generating facilities that are already subject to the MOD and PRC standards listed in the SAR title. It is suggested that the need be focused only on the missing elements in the focus of the concern of this SAR. It is unclear what the term non-generation means.

It is suggested that the detailed description section of the SAR provide only details of what is being proposed to be changed in the list of standard. The basis and justification references pointing to the SAMS white paper, in our opinion, do not belong in the detailed description section of what is being proposed. More specificity is suggested: e.g."modify the applicability sections to include..., modify requirements, if needed, to address these additional facility types..., modify/create new requirements to achieve specific objectives..., add glossary terms, if needed ...".

Likes 0

Dislikes 0

**Response**

**Bruce Reimer - Manitoba Hydro - 1,3,5,6**

<b>Answer</b>	
<b>Document Name</b>	
<b>Comment</b>	
<p>1. MH believes that it is important to verify voltage and frequency ride through capability of LCC HVDC links. Given these links are large, loss of the links can be impactful to reliability – especially frequency support. Therefore, PRC-024 should be applicable to LCC links.</p> <p>While the SAR is clearly focused on “reactive power resources” they’re missing an important contribution of LCC HVDC to frequency stability. The scope of the SAR should clearly address both voltage and frequency.</p> <p>On page 6 of the NERC SAMS White paper it says the following for PRC-024:</p> <p>“The LCC HVDC would be expected to ride through grid voltage and frequency excursion events to provide continuity of service (i.e. maintaining MW output). Therefore, PRC-024 should not be applicable to LCC HVDC”.</p> <p>This statement contradicts with the SAMS recommendation in Table-1 to include LCC HVDC in PRC-024. NERC should revise this White Paper to ensure that PRC-024 is applicable to LCC HVDC.</p> <p>2. MH believes MOD-25 should be applicable to LCC HVDC as well. From model verification point of view, it is important to know the behavior (MW/MVAr) over the range of operation at the inverter bus.</p>	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Dennis Chastain - Tennessee Valley Authority - 1,3,5,6 - SERC</b>	
<b>Answer</b>	
<b>Document Name</b>	
<b>Comment</b>	
<p>As more utilities begin to use PV plants as dynamic reactive power sources at night when real power is zero, it is increasingly important that this unique mode of operation is considered as the subject reliability standards are revised. In particular, MOD-025 should have provisions for reactive power capability at zero power for inverter-based resources that are capable of such operation.</p>	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>David Jendras - Ameren - Ameren Services - 1,3,6</b>	
<b>Answer</b>	
<b>Document Name</b>	

**Comment**

Ameren agrees with and supports EEI comments.

Likes 0

Dislikes 0

**Response**

**Quintin Lee - Eversource Energy - 1,3, Group Name** Eversource Group

**Answer**

**Document Name**

**Comment**

Additionally the NERC standards applicability to all energy storage (compressed air, flywheel, gravitational, etc.) methodologies should be considered. The applicability of the NERC standards needs to be noted for both storing and releasing energy.

Likes 0

Dislikes 0

**Response**

**Rachel Coyne - Texas Reliability Entity, Inc. - 10**

**Answer**

**Document Name**

**Comment**

There appears to be a typo on page 6 where the SAR states: "Therefore, PRC-024 should not be applicable to LCC HVDC." Table 1 of the document indicates the SAMS recommendation is for PRC-024 to be applicable to LCC HVDC, and the statement on page 6 that "The LCC HVDC would be expected to ride through grid voltage and frequency excursion events to provide continuity of service" indicates the intent of the SAR is for PRC-024 to be applicable to LCC HVDC.

Likes 0

Dislikes 0

**Response**

**Daniel Gacek - Exelon - 1,3,5,6**

**Answer**

**Document Name**

**Comment**

Exelon concurs with the comment submitted by EEI.

Likes 0

Dislikes 0

**Response**

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

**Answer****Document Name****Comment**

While EEI supports the proposed SAR, we offer the following suggestions to ensure the project is appropriately bounded.

1. EEI suggests that the Project Scope statement be modified to limit the applicable resources to those specifically identified by the SAMs white paper.
2. While EEI supports and agrees with the finding of the SAMs white paper identified in the Consensus Building Activity section of the SAR, we disagree that the white paper qualifies as a “consensus” report given it was not vetted broadly by the Industry EEI suggest this statement be removed.

EEI also offer the following non-substantive comments for the SAR:

1. EEI suggests modifying the title of this SAR to “Modification of MOD-025, MOD-026, MOD-027, PRC-019 and PRC-024 to include Dynamic Reactive Resources.”
2. In the section that identifies Standards and SARs that should be referenced, EEI suggests that the PRC-024 SAR reference should be changed to include a reference to the BOT approved PRC-024-3 Reliability Standard. Additionally, since the PRC-019 SAR has not yet been approved by the Standards Committee, EEI suggests this reference be removed.

Likes 0

Dislikes 0

**Response**

**Bobbi Welch - Midcontinent ISO, Inc. - 2**

**Answer****Document Name****Comment**

MISO supports comments submitted by the MRO NSRF and recommends the following clarifications to the scope of the SAR:

**Implementation Plan** – include the development of an implementation Plan for the initial testing and reporting of dynamic reactive resources newly introduced under the applicability of revised standards.

**Definition of Essential Reliability Services (ERS)** – define Essential Reliability Services (ERS) as the description of ERS has varied over time and includes some definitions which limit the focus to generation and demand resources. Examples provided below.

· The Essential Reliability Services Task Force (ERSTF) Scope Document approved by the NERC Planning and Operating Committees on March 5, 2014 defines Essential Reliability Services as “the elemental ‘reliability building blocks’ from resources (generation and demand) necessary to maintain Bulk Power System (BPS) reliability. ERS are operational attributes from conventional generation, such as providing reactive power to maintain system voltages and physical inertia to maintain system frequency, necessary to reliably operate the BPS.”

[http://www.nerc.com/comm/Other/essntlrbltysrvdstskfrcdl/Scope\\_ERSTF\\_Final.pdf](http://www.nerc.com/comm/Other/essntlrbltysrvdstskfrcdl/Scope_ERSTF_Final.pdf)

· The October 2014 NERC Essential Reliability Services Task Force White Paper “*A Concept Paper on Essential Reliability Services that Characterizes Bulk Power System Reliability*” explains Essential Reliability Services as: “ERSs are an integral part of reliable operations to assure the protection of equipment, and are the elemental “reliability building blocks” provided by generation” including voltage support and frequency support.

· The February 2019 NERC SAMS White Paper, “*Transmission Connected Dynamic Reactive Resources and HVDC Equipment – Assessment of Applicability in Reliability Standards*,” referenced in the SAR states: “...essential reliability services (ERS) such as (emphasis added) voltage control, frequency control, and ramping/balancing capability.”

Likes 0

Dislikes 0

## Response

**Douglas Webb - Westar Energy - 1,3,5,6 - MRO, Group Name Westar-KCPL**

**Answer**

**Document Name**

**Comment**

Westar Energy and Kansas City Power & Light, Evergy companies, incorporate by reference and support the Edison Electric Institute (EEI) response to Question 2.

Likes 0

Dislikes 0

## Response

**Teresa Cantwell - Lower Colorado River Authority - 1,5**

**Answer**

**Document Name**

**Comment**

None.

Likes 0

Dislikes 0

**Response**

**Stephen Stafford - Georgia Transmission Corporation - 1 - SERC**

**Answer**

**Document Name**

**Comment**

If the SAR is to be accepted, GTC recommends the scope be modified as follows to address the specific concern of non-generation, transmission-connected dynamic reactive resources:

Revise the "Applicability – Facilities" section, "Applicability – Functional Entities" section, and Requirements (including applicable attachments) in MOD-025, MOD-026, MOD-027, PRC-019 and PRC-024 reliability standards to comprehensively address all varieties of **(non-generation)** transmission-connected dynamic reactive resources that are utilized in providing ERS in the BES.

Likes 0

Dislikes 0

**Response**

**Marty Hostler - Northern California Power Agency - 3,4,5,6, Group Name NCPA**

**Answer**

**Document Name**

**Comment**

None

Likes 0

Dislikes 0

**Response**

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

**Answer**

**Document Name****Comment**

AZPS recommends defining what qualifies as a “dynamic reactive resource” within the Glossary of Terms Used in NERC Reliability Standards. AZPS believes that without a definition there could be a gap in the applicability of the standard. AZPS suggests that the criteria listed on Slide 12 of “Dynamic vs. Static Resources” from the March 2017 Industry Webinar for Reactive Power Planning, NERC System Analysis and Modeling Subcommittee (SAMS) should be used as a starting point for the development of the definition.

Dynamic reactive resources:

- Adjust reactive power output automatically in real-time over a continuous range within a specified voltage bandwidth in response to grid voltage changes
- Maintain set point voltage or operate in voltage droop mode
- Many are power electronics ballasts
- Can respond within electrical cycles using fast-acting controls.

AZPS suggests that the drafting team review the periodic performance of each device type within MOD-025 and recommends that the frequency be no more than every ten years.

Likes 0

Dislikes 0

**Response**

**Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC**

**Answer****Document Name****Comment**

Please see comments submitted by Edison Electric Institute.

Likes 0

Dislikes 0

**Response**

**Jodirah Green - ACES Power Marketing - 1,3,4,5,6 - MRO,WECC,Texas RE,SERC,RF, Group Name ACES Standard Collaborations**

**Answer****Document Name****Comment**

Thank you for the opportunity to provide comments.

Likes 0

Dislikes 0

## Response

### Spencer Tacke - Modesto Irrigation District - 3,4,6

#### Answer

#### Document Name

#### Comment

1. Based on WECC's experience since the Aug. 10, 1996 WSCC (now WECC) System Wide Outage, I would like to suggest that as part of this SAR, we include the expansion of the scope of those generating resources that need to have their dynamic models verified via MOD-026 & MOD-027, to include those single generating units 10 MVA or larger (or an aggregate facility rating of 20 MVA or larger), and connected at 60 kV and above.

The detailed analysis of the Aug. 10, 1996 WSCC System Wide Outage demonstrated the real significance that the smaller generators have in their impact to the transient stability of the WECC Interconnected System. During that Outage, it wasn't until the smaller U.S. Army Corps of Engineers McNary Hydroelectric Generators (each of the 13 units were smaller than 75 MVA) in the Pacific Northwest ran into excitation limits and tripped off-line causing a further and critical voltage sag, that the voltage oscillations on the 500 kV system started, and which eventually led to the complete voltage collapse and blackout of a major portion of the Pacific and Pacific Northwest System. Their excitation systems were modeled incorrectly at the time, and that is why the initial simulation analysis did not predict the actual response of the Interconnected System that occurred (see Transactions on Power Systems, Vol. 14, No. 3, August 1996; "Model Validation for the August 10, 1996 WSCC System Outage"). For this reason, WSCC (WECC) invoked the mandatory Generating Testing and Model Validation Policy, requiring testing of all generators connected at 60 kV and above, and rated at 10 MVA and above (or an aggregate facility rating of 20 MVA or larger). The effectiveness of this Policy was demonstrated by the analysis of subsequent system wide disturbances that demonstrated good matches between the simulated responses and the actual systems response during the disturbances (see "Generating Unit Model Validation: WECC Lessons and Moving Forward" ; 2009 IEEE Power and Energy Society Meeting, Calgary, AB, Canada, July 26-July 30, 2009). This definitely demonstrated the effectiveness of having accurate generator models for all generators 10 MVA and larger (or an aggregate facility rating of 20 MVA or larger), and connected at 60 kV and above.

In addition, a final and nearly exact match did not occur for the 1996 Outage simulations until the load of the WECC Interconnected System (typically placed on 69 kV and below modeled busses) was more accurately modeled by introducing a 20% induction motor load, along with the traditional static load previously modeled. This fact also demonstrated the extreme importance the lower voltage connected models have on the overall system response of the WECC high voltage (i.e., greater than or equal to 100 kV) Interconnected System.

And in recent years with the very large influx of renewable generation (many thousands of MWs) in California being added to the WECC System at the lower levels of 20 MVA and connected at 69 kV and below, it is even more incumbent on us to include in model testing and validation, these smaller size generating units.

Thank you.

Sincerely,

Spencer Tacke

Senior Electrical Engineer

Modesto Irrigation District

1231 11th Street, Modesto, CA 95354

Likes 0

Dislikes 0

**Response**

**Andy Fuhrman - Minnkota Power Cooperative Inc. - 1 - MRO**

**Answer**

**Document Name**

**Comment**

MPC supports comments from the MRO NERC Standards Review Forum (NSRF).

Likes 0

Dislikes 0

**Response**

**Kim Thomas - Duke Energy - 1,3,5,6 - SERC,RF, Group Name Duke Energy**

**Answer**

**Document Name**

**Comment**

None.

Likes 0

Dislikes 0

**Response**

**LaTroy Brumfield - American Transmission Company, LLC - 1**

**Answer**

**Document Name**

**Comment**

The Standard Draft Team should consider and implement a MVAR/MVA size threshold for validation of the dynamic reactive resources along with clarifying the BES/Non-BES discussion above.

Likes 0

Dislikes 0

**Response**

**Richard Jackson - U.S. Bureau of Reclamation - 1,5**

**Answer**

**Document Name**

**Comment**

Reclamation recommends the SAR drafting team thoughtfully assess the cost impacts associated with this SAR to effect changes in a cost-effective manner. The SAR proposes a significant increase in the scope of the affected standards, which will have a substantial impact on affected entities and should not be taken without appropriate consideration.

Likes 0

Dislikes 0

**Response**

**Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF**

**Answer**

**Document Name**

**Comment**

These comments represent the MRO NSRF membership as a whole but would not preclude members from submitting individual comments”.

The use of the wording “Essential Reliability Services (ERS)” requires a NERC approved definition. There are many different pseudo explanations of what Essential Reliability Services are.

- From the 3 Nov 2014 Essential Reliability Services “Tutorial” which explains Essential Reliability Services as ERSs are an integral part of reliable operations to assure the protection of equipment and are the elemental “reliability building blocks” provided by generation. That include voltage support and frequency support.
- The SAMS White Paper states (within this SAR) “...essential reliability services (ERS) such as (emphasis added) voltage control, frequency control, and ramping/balancing capability”.
- This SAR states “Dynamic reactive resources used to provide Essential Reliability Services (ERS) in the BES include generation resources (rotating machine and inverter-based) as well as transmission connected dynamic reactive resources (power-electronics based).

With the above inconsistency of what ERS is, the SAR should include the development of an Essential Reliability Services definition.

Likes 0

Dislikes 0

**Response**

**John Pearson - ISO New England, Inc. - 2 - NPCC**

<b>Answer</b>	
<b>Document Name</b>	
<b>Comment</b>	
The SAR drafting team should consider an implementation plan specifically for BES dynamic reactive resources initial MOD/PRC testing and reporting.	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Carl Pineault - Hydro-Quebec Production - 1,5</b>	
<b>Answer</b>	
<b>Document Name</b>	
<b>Comment</b>	
N/A	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Kevin Conway - Public Utility District No. 1 of Pend Oreille County - 1,3,5,6</b>	
<b>Answer</b>	
<b>Document Name</b>	
<b>Comment</b>	
None	
Likes 0	
Dislikes 0	
<b>Response</b>	
<b>Leonard Kula - Independent Electricity System Operator - 2</b>	
<b>Answer</b>	
<b>Document Name</b>	

**Comment**

The SAR drafting team should consider an implementation plan specifically for BES dynamic reactive resources initial MOD/PRC testing and reporting.

Likes 0

Dislikes 0

**Response**