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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

North American Electric Reliability Corporation	**)**	**Docket No. _____**
	)	

JOINT PETITION OF THE NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION AND WESTERN ELECTRICITY COORDINATING COUNCIL FOR APPROVAL OF PROPOSED REGIONAL RELIABILITY STANDARD VAR-501-WECC-4

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December 15, 2023

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Pursuant to Section 215(d)(1) of the Federal Power Act ("FPA")[1] and Section 39.5 of the regulations of the Federal Energy Regulatory Commission ("FERC" or "Commission"),[2] the North American Electric Reliability Corporation ("NERC")[3] and the Western Electricity Coordinating Council ("WECC") hereby submit proposed Regional Reliability Standard VAR-501-WECC-4 – Power System Stabilizer for Commission approval ("Joint Petition"). Proposed Regional Reliability Standard VAR-501-WECC-4 establishes the performance criteria for power system stabilizers to help ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions. NERC requests that the Commission approve proposed Regional Reliability Standard VAR-501-WECC-4 (**Exhibit A**) and find that the proposed Regional Reliability Standard is just, reasonable, not unduly discriminatory or preferential, and in the public interest.

NERC also requests approval of the associated elements, including the effective date and the Violation Risk Factors and Violation Severity Levels (which are unchanged from the currently

[1] 16 U.S.C. § 824o.
[2] 18 C.F.R. § 39.5 (2023).
[3] The Commission certified NERC as the electric reliability organization ("ERO") in accordance with Section 215 of the FPA. *N. Am. Elec. Reliability Corp.*, 116 FERC ¶ 61,062 (2006) [hereinafter ERO Certification Order].

effective standard) (**Exhibit A)**, and the retirement of currently-effective Regional Reliability Standard VAR-501-WECC-3.1.

As required by Section 39.5(a) of the Commission's regulations,[4] this petition presents the technical basis and purpose of the proposed Regional Reliability Standard, and a summary of the development history (**Exhibit B**). The proposed Regional Reliability Standard continues to meet the criteria for Commission approval as set forth in Order No. 672 as demonstrated in the last major revision.[5] The NERC Board of Trustees adopted the proposed Regional Reliability Standard on December 12, 2023.

I. SUMMARY

Power system stabilizers damp oscillations that can occur between geographic areas within the Western Interconnection and play an important role in the stability of the Western Interconnection. Over the past several decades, WECC and related working groups have developed policies and guidelines, conducted studies, and approved a Regional Reliability Standard to help manage power system stabilizer use within the Western Interconnection. With the development of proposed Regional Reliability Standard VAR-501-WECC-4, WECC seeks to make Non-Substantive Changes[6] as a part of a five-year review of the currently effective Regional Reliability Standard VAR-501-WECC-3.1.

The purpose of proposed Regional Reliability Standard VAR-501-WECC-4 is to ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal

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[4] 18 C.F.R. § 39.5(a).

[5] *Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards,* Order No. 672, 114 FERC ¶ 61,104, order on reh'g, Order No. 672-A, 114 FERC ¶ 61,328 (2006) [hereinafter Order No. 672].

[6] Under WECC's regional standards development procedure, "Non-Substantive Changes" are revisions that do not change the scope, applicability, or intent of any requirement, including correcting the numbering of a requirement, correcting references, changes to document styles and templates, correcting the spelling of a word, adding an obviously missing word, or rephrasing a requirement for improved clarity. *See infra* n. 25.

conditions by establishing the performance criteria for power system stabilizers. Proposed Regional Reliability Standard VAR-501-WECC-4 improves upon the existing standard by (1) updating the document template, numbering, and template sections as provided by NERC, (2) removing antiquated language from the Effective Date, removing redundant language from Measure M4, (3) updating syntax, and (4) correcting language such as "[s]tandard" to "[S]tandard" and from "dampen" to "damp" in the Rationale and Guidance section. These changes will improve the readability of the Regional Reliability Standard.

In this Joint Petition, NERC and WECC respectfully request the Commission approve proposed Regional Reliability Standard VAR-501-WECC-4, the associated VRFs and VSLs, and the retirement of the existing Regional Reliability Standard VAR-501-WECC-3.1. The following Joint Petition presents the justification for approval and supporting documentation.

II. NOTICES AND COMMUNICATIONS

Notices and communications with respect to this filing may be addressed to the following:[7]

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III. BACKGROUND

The following background information is provided below: (1) an explanation of the regulatory framework for NERC; (2) a description of the WECC Regional Reliability Standards

[7] NERC respectfully requests a waiver of Rule 203 of the Commission's regulations, 18 C.F.R. § 385.203 (2023), to allow the inclusion of more than two persons on the service list in this proceeding.

Development Procedure; (3) a discussion of the need for power system stabilizers in the Western Interconnection; and (4) the history of Project WECC-0148 VAR-501-WECC-4 Power System Stabilizer, Five-year Review.

a. Regulatory Framework

By enacting the Energy Policy Act of 2005,[8] Congress entrusted the Commission with the duties of approving and enforcing rules to ensure the reliability of the Bulk-Power System, and with the duty of certifying an ERO that would be charged with developing and enforcing mandatory Reliability Standards, subject to Commission approval. Section 215(b)(1) of the FPA states that all users, owners, and operators of the Bulk-Power System in the United States will be subject to Commission-approved Reliability Standards.[9] Section 215(d)(5) of the FPA authorizes the Commission to order the ERO to submit a new or modified Reliability Standard.[10] Section 39.5(a) of the Commission's regulations requires the ERO to file for Commission approval each Reliability Standard that the ERO proposes should become mandatory and enforceable in the United States, and each modification to a Reliability Standard that the ERO proposes to make effective.[11]

The Commission has the regulatory responsibility to approve Reliability Standards that protect the reliability of the Bulk-Power System and to ensure that such Reliability Standards are just, reasonable, not unduly discriminatory or preferential, and in the public interest. Pursuant to Section 215(d)(2) of the FPA and Section 39.5(c) of the Commission's regulations, the

8 16 U.S.C. § 824o.
9 *Id.* § 824o(b)(1).
10 *Id.* § 824o(d)(5).
11 18 C.F.R. § 39.5(a).

Commission will give due weight to the technical expertise of the ERO with respect to the content of a Reliability Standard.[12]

Similarly, the Commission approves regional differences proposed by Regional Entities, such as Regional Reliability Standards and Variances, if the regional difference is just, reasonable, not unduly discriminatory or preferential, and in the public interest.[13] In addition, Commission Order No. 672 requires further criteria for regional differences. A regional difference from a continent-wide Reliability Standard must either be: (1) more stringent than the continent-wide Reliability Standard, including a regional difference that addresses matters that the continent-wide Reliability Standard does not; or (2) necessitated by a physical difference in the Bulk-Power System.[14] The Commission must give due weight to the technical expertise of a Regional Entity, like WECC, that is organized on an Interconnection-wide basis, with respect to a regional difference to be applicable within that Interconnection.[15]

b. <u>WECC Reliability Standards Development Procedure</u>

The proposed Regional Reliability Standard was developed in an open and fair manner and in accordance with the Commission-approved WECC Reliability Standards Development Procedures ("RSDP").[16] WECC's RSDP provides for reasonable notice and opportunity for public comment, due process, openness, and a balance of interests in developing Reliability Standards and thus addresses several of the Commission's criteria for approving Reliability Standards. The

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12 16 U.S.C. § 824o(d)(2); 18 C.F.R. § 39.5(c)(1).

13 16 U.S.C. § 824o(d)(2); 18 C.F.R. § 39.5(a).

14 Order No. 672 at P 291.

15 *Id*. at P 344.

16 The currently effective WECC RSDP was approved by the Commission on September 13, 2021 S*ee N. Am. Elec. Reliability Corp.*, Docket No. RR21-4-000 (Sept. 13, 2021) (approving revised WECC Reliability Standards Development Procedures) [hereinafter WECC RSDP]. The WECC Reliability Standards Development Procedures are available at: https://www.wecc.org/Reliability/WECC%20Reliability%20Standards%20Development%20Procedures%20-%20FERC%20Approved%2009-13-2021.pdf.

development process is open to any person or entity that is an interested stakeholder. WECC considers the comments of all stakeholders, and a vote of stakeholders and the WECC Board of Directors is required to approve a WECC Regional Reliability Standard.[17] NERC posts each regional Variance developed by a Regional Entity for an additional comment period. The NERC Board of Trustees must adopt the regional Variance before it is submitted to the Commission for approval.

c. Need for a Power System Stabilizer Standard in the Western Interconnection

As NERC and WECC noted in previous filings,[18] power system stabilizers play an important role in the stability of the Western Interconnection. Power system stabilizers are part of the automatic voltage regulation system of a generator and are designed to add or subtract torque to a generator with the goal of damping oscillations on the Western Interconnection's Bulk Electric System ("BES") that otherwise would be amplified if the automatic voltage regulator is operated alone. Power system stabilizers within WECC were developed in the 1960s in response to power system oscillations on the Pacific Intertie within the Western Interconnection. These oscillations occur at very low frequencies (<1 Hertz), are very lightly dampened, and became known as "inter-area modes" of oscillation because they occur when real power is transferred from one Western Interconnection geographic region to another (such as between the Pacific Northwest and the Southwest). These modal oscillations are the result of a combination of many machines on one part of the Western Interconnection BES whose voltage support response to system fluctuations is not in phase with the response of machines on another part of the Western Interconnection BES.

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[17] *Id.* at 12, Treatment of Non-Substantive Changes (providing that approval by the WECC Board of Directors is not required when the WECC Standards Committee has approved the Non-Substantive Changes, which is the case for proposed Regional Reliability Standard VAR-501-WECC-4).

[18] NERC, *Joint Petition of the North American Electric Reliability Corporation and Western Electricity Coordinating Council for Approval of Proposed Regional Reliability Standard VAR-501-WECC-3,* Docket No. RD17-5-000 (March 10, 2017).

Moreover, as the Commission recognized, the Western Interconnection possesses particular physical characteristics that justify interconnection-specific requirements.[19] In Order No. 740, the Commission stated:

> [I]n the Western Interconnection a significant number of transmission paths are voltage or frequency stability-limited, in contrast to other regions of the [BES] where transmission paths more often are thermally-limited. Disturbances resulting in a stability-limited transmission path overload, generally, must be responded to in a shorter time frame than a disturbance that results in a thermally-limited transmission path overload. [FERC has also noted] its understanding that this physical difference is one of the reasons for the need for certain provisions of Regional Reliability Standards in the Western Interconnection.[20]

As a result of the Western Interconnection physical characteristics, WECC developed a Regional Reliability Standard, policies, and guidelines that address power system stabilizers. Proposed Regional Reliability Standard VAR-501-WECC-4 will continue to address the unique characteristics of the Western Interconnection in one set of requirements that incorporate WECC's long history with power system stabilizers, consistent with the currently effective version of the Regional Reliability Standard.

The Commission approved the last major revision VAR-501-WECC-3, in 2017.[21] Shortly thereafter in 2017, the Commission approved the currently effective version, VAR-501-WECC-3.1, which reflected an erratum in the VSL by replacing the term "Transmission Planner" with "Transmission Operator".[22]

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[19] *Version One Regional Reliability Standard for Resource and Demand Balancing,* Order No. 740, 133 FERC ¶ 61,063 at P 23 (2010).

[20] *Id.*

[21] *N. Am. Elec. Reliability Corp.*, Docket No. RD17-5-000 (April 28, 2017) (delegated letter order approving VAR-501-WECC-3).

[22] *N. Am. Elec. Reliability Corp.*, Docket No. RD17-7-000 (Sep. 26, 2017) (delegated letter order approving errata to Voltage and Reactive Control Reliability Standards).

d. Development of the Proposed Reliability Standard

As further described in **Exhibit B** hereto, proposed Regional Reliability Standard VAR-501-WECC-4 was developed as part of a five-year review of the currently effective Regional Reliability Standard in accordance with the WECC RSDP.[23] The project was titled, Project WECC-0148 VAR-501-WECC-4 Power System Stabilizer, Five-year Review. On July 1, 2022, the drafting team unanimously agreed that there would be no Substantive Changes[24] to the proposed Regional Reliability Standard, and on July 16, 2022, posted a list of Non-Substantive Changes.[25] The WECC Standards Committee ("WSC") approved the Non-Substantive Changes on December 6, 2022.[26] NERC posted the standard for a 45-day comment period from August 16, 2023 through September 29, 2023. Commenters expressed no concerns regarding the proposed Regional Reliability Standard.

The NERC Board of Trustees adopted the proposed Regional Reliability Standard on December 12, 2023.

IV. JUSTIFICATION FOR APPROVAL

Approval of proposed Regional Reliability Standard VAR-501- WECC-4 – Power System Stabilizer is just, reasonable, not unduly discriminatory or preferential, and in the public interest. As described more fully herein, the VAR-501-WECC Regional Reliability Standard provides

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23 WECC RSDP at 21.

24 *Id*. at 3. ("Substantive Change: A change that alters the scope, applicability, required actions, or intent of the document.").

25 *See e.g. Id*. at 3 ("Non-Substantive Change: Revisions that do not change the scope, applicability, or intent of any requirement, including correcting the numbering of a requirement, correcting references, changes to document styles and templates, correcting the spelling of a word, adding an obviously missing word, or rephrasing a requirement for improved clarity."); *see also Id.* at 12 ("Non-Substantive Changes do not require a posting/comment/response cycle.")

26 *Id*. at 12. ("If a Non-Substantive Change to an RRS is required at any time after a WECC ballot window opens, the proposed change shall be presented to the WSC with a request for approval. If the WSC agrees that the correction of the error does not change the scope or intent of the associated RRS, and agrees that the correction has no material impact on the applicable entities, then the correction shall be filed for approval with NERC and applicable governmental authorities as appropriate.").

reliability benefits for the Bulk-Power System in the WECC region. The purpose of proposed Regional Reliability Standard VAR-501-WECC-4, like the currently effective version, is to ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for power system stabilizers. Consistent with the currently effective version, the provisions of the proposed standard would continue to provide mandatory performance requirements for power system stabilizers in the Western Interconnection based on long-held policy in the WECC region.

This section of the petition discusses the Non-Substantive modifications reflected in proposed Regional Reliability Standard VAR-501-WECC-4 which improve the readability of the standard.

a. Summary of Modifications

The proposed Regional Reliability Standard VAR-501-WECC-4 was developed as part of a five-year review of currently effective Regional Reliability Standard VAR-501-WECC-3.1. The proposed Regional Reliability Standard VAR-501-WECC-4 revisions were deemed as Non-Substantive Changes and, under WECC's RSDP, were approved by the WSC.

The standard would continue to be applicable to (1) Generator Operators in the Western Interconnection that operate synchronous generators, connected to the BES, that meet the definition of Commercial Operation; and (2) Generator Owners in the Western Interconnection that own synchronous generators, connected to the BES, that meet the definition of Commercial Operation.[27]

[27] "Commercial Operation" is a WECC Regional Term and is defined as "[a]chievement of this designation indicates that the Generator Operator or Transmission Operator of the synchronous generator or synchronous condenser has received all approvals necessary for operation after completion of initial start-up testing." *Glossary of Terms Used in NERC Reliability Standards*, available at https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf.

The Non-Substantive Changes to the Proposed Regional Reliability Standards are:

1. Updates to the document template, numbering, and template sections as provided by NERC,
2. Removal of antiquated language from Effective Date, removal of redundant language from Measure M4,
3. Updates to syntax, and
4. Correction of language such as "[s]tandard" to [S]tandard" and from "dampen" to "damp" in the Rationale and Guidance section.

The proposed changes are shown in redline in **Exhibit A-1**. The proposed changes show a five-year review of the Regional Reliability standard occurred in compliance with the WECC RSDP, and will improve readability by modernizing the template and removing redundant and outdated language. No Substantive changes to the Regional Reliability Standard are proposed.

b. Enforceability of Proposed Regional Reliability Standard

The proposed Regional Reliability Standard includes VRFs and VSLs. The VRFs and VSLs provide guidance on the way that NERC will enforce the requirements of the proposed Reliability Standard. The VRFs and VSLs are substantively unchanged from the currently effective version of the Regional Reliability Standard. As such, they continue to comport with NERC and Commission guidelines related to their assignment.

In addition, the proposed Regional Reliability Standard also includes measures that support each requirement by clearly identifying what is required and how the ERO will enforce the requirement. These measures help ensure that the requirements will be enforced in a clear,

consistent, and non-preferential manner and without prejudice to any party.[28] The measures are substantively unchanged from the currently effective version of the Regional Reliability Standard.

V. EFFECTIVE DATE

NERC respectfully requests that the Commission approve the proposed Regional Reliability Standard to become effective on the first day of the first calendar quarter following regulatory approval of the proposed Regional Reliability Standard. The proposed effective date is consistent with ERO Enterprise practice to have new versions of Reliability Standards become effective on the first day of a first calendar quarter for administrative efficiency.

[28] Order No. 672 at P 327.

VI. CONCLUSION

For the reasons set forth above, NERC respectfully requests that the Commission approve:

- Proposed Regional Reliability Standard VAR-501-WECC-4, and associated elements included in **Exhibit A**, effective as proposed herein.
- The retirement of Regional Reliability Standard VAR-501-WECC-3.1 effective as proposed herein.

Respectfully submitted,

/s/ Alain Rigaud

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Date: December 15, 2023

Exhibit A

Proposed Regional Reliability Standard VAR-501-WECC-4 – Power System Stabilizer

Exhibit A-1

Proposed Regional Reliability Standard VAR-501-WECC-4 – Power System Stabilizer (Redline)

A. ~~A.~~ Introduction

1. **Title:** Power System Stabilizer (PSS)
2. **Number:** VAR-501-WECC-~~3.1~~4
3. **Purpose:** To ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for WECC power system stabilizers.
4. **Applicability:**

   4.1 Generator Operator

   4.2 Generator Owner
5. **Facilities:** This standard applies to synchronous generators, connected to the Bulk Electric System, ~~that meet~~meeting the definition of Commercial Operation.
6. **Effective Date:** The first day of the first quarter following regulatory approval~~, except for Requirement R3~~.

   ~~For units placed in first-time service after regulatory approval, Requirement R3 is effective the first day of the first quarter following final regulatory approval.~~

   ~~For units placed in service prior to final regulatory approval, Requirement R3 is effective the first day of the first quarter that is five years after regulatory approval.~~

~~B.~~

B. Requirements and Measures

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner's written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events: *[Violation Risk Factor: Low] [Time Horizon: Planning Horizon]*

- The effective date of this standard;
- The PSS's Commercial Operation date; or
- Any changes to the PSS operating specifications.

M1. Each Generator Owner will have documented evidence that it provided to its Transmission Operator, within the time allotted as described in the procedures required under Requirement R1, written Operating Procedures or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the AVR.

For auditing purposes, because Requirement R1 conditions are intended to be unchanged unless the Transmission Operator is otherwise notified, the Generator Owner only needs to provide the documentation to the Transmission Operator one time, or whenever the operating specifications change.

For auditing purposes, if a PSS is in service but is not providing an active signal to the AVR as described in Requirement R1, the disabled period does not count against the Requirement R2 mandate to be in service except as otherwise allowed.

R2. Each Generator Operator shall have its PSS in service while synchronized, except during any of the following: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

- Component failure
- Testing of a Bulk Electric System Element affecting or affected by the PSS
- Maintenance
- As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

M2. Each Generator Operator will have documentation of each claimed exception specified in Requirement R2. Documentation may include, but is not limited to:

- A written explanation covering the bulleted exception that describes the circumstances of the exception as allowed in Requirement R2.
- Documented evidence that the Generator Operator and the Transmission Operator agreed the PSS would not be operating during a specified set of circumstances, where the exception is claimed under the last bullet of Requirement R2.

For auditing purposes, the presumption is that the PSS was in service unless otherwise exempted in Requirement R2. Evidence need only be provided to prove the circumstances during which the PSS was not in service for periods in excess of 30 minutes.

R3. Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

3.1. PSS shall be set to provide the measured, simulated, or calculated compensated Vt/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

3.2. PSS output limits shall be set to provide at least ±5% of the synchronous machine's nominal terminal voltage.

3.3. PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

3.4. PSS washout time constant shall be no greater than 30 seconds.

3.5. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

M3. Each Generator Owner will have documented evidence that its PSS was tuned to meet the specifications of Requirement R3.

If the exception under Requirement R3, Part 3.5, is claimed, the Generator Owner will have documented evidence describing: 1) the conditions that render the PSS incapable of meeting the tuning requirements, and 2) the date the voltage regulator was last replaced or retrofitted.

R4. Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events: *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

- The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
- The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

M4. Each Generator Owner will have evidence that it installed and completed start-up testing of a PSS on its generator within 180 days of either of the conditions described in Requirement R4, and when those conditions occur after the Effective Date of this standard.

~~For auditing purposes~~ The first bullet of Requirement R4~~, bullet one~~ only applies to equipment on its initial (first energization) connection to the BES.

R5. Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3. *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

M5. Each Generator Owner will have evidence that it repaired or replaced its PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications of Requirement R3. Evidence may include, but is not limited to, documentation of the date the PSS became incapable of meeting the Requirement R3 tuning specifications, and the date the PSS was returned to service, demonstrating that the span of time between the two events was less than 24 months.

~~C. Compliance~~

C. Compliance

1. Compliance Monitoring Process

1.1 Compliance Enforcement Authority

: "Compliance Enforcement Authority" means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2 ~~Compliance Monitoring and Assessment Processes~~

- ~~Compliance Audits~~
- ~~Self-Certifications~~
- ~~Spot Checking~~
- ~~Compliance Investigations~~
- ~~Self-Reporting~~
- ~~Complaints~~

~~1.3~~ . Evidence Retention

: The following evidence retention ~~periods~~period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full-~~-~~time period since the last audit.~~-~~

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- Each Generator Operator shall keep evidence for all Requirements of the document for a period of three years plus calendar current.

~~1.4 Additional Compliance Information~~

~~None~~

~~D. Regional Differences~~

~~None~~

~~**Table of Compliance Elements**~~

1.3 Compliance Monitoring and Enforcement Program: As defined in the NERC Rules of Procedure, "Compliance Monitoring and Enforcement Program" refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

R	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	NA	NA	NA	The Generator Owner failed to provide its PSS operating specifications to the Transmission Operator as required in Requirement R1.
R2	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 30 minutes but less than 60 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 60 minutes but less than 120 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 120 minutes but less than 180 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 180 minutes.
R3	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, two times or fewer during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, three times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, four times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, five times or more during the audit period.
R4	NA	NA	NA	The Generator Owner failed to install on its generator a PSS, as required in Requirement R4.
R5	NA	NA	NA	The Generator Owner failed to repair or replace a non-operational PSS as required in Requirement R5.

VAR-501-WECC-~~43.1~~ – Power System Stabilizer

D. Regional Variances

None.

E. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking
1	April 16, 2008	Permanent Replacement Standard for VAR-STD-002b-1	
1	October 28, 2008	Adopted by NERC Board of Trustees	
1	April 21, 2011	FERC Order issued approving VAR-501-WECC-1 (FERC approval effective June 27, 2011; Effective Date July 1, 2011)	
2	November 13, 2014	Adopted by NERC Board of Trustees	
2	March 3, 2015	FERC letter order approved VAR-501-WECC-2	
3	February 9, 2017	Adopted by NERC Board of Trustees	
3	April 28, 2017	FERC letter order approved VAR-501-WECC-3	
3.1	August 10, 2017	Adopted by the NERC Board of Trustees	Errata
3.1	~~TBD~~September 26, 2017	~~TBD~~FERC letter order issued approving VAR-501-WECC-3.1	
4	December 6, 2022	WECC Standards Committee accepted a “no change “ recommendation followed by	Non-substantive changes were approved by the

		an information-only filing to NERC.	WECC Standards Committee as allowed in the WECC Reliability Standards Development Procedures. An information-only filing provided to NERC reflects the following: 1) updates to the template and syntax, 2) removal of stale-dated language from the Effective Date, 3) deletion of "For auditing purposes of…" from M4, 4) in the Guidance section, "dampen" was replaced with "damp", and syntax was addressed deleting "still", "of those", "of the", and "to ensure" was replaced with "ensuring", and "wash out" was replaced with "washout."

Guideline and Technical Basis

PSS systems are used to minimize real power oscillations by rapidly adjusting the field of the generator to ~~dampen~~damp the low-frequency oscillations.

It is necessary for large numbers of PSS devices to be in operation in the Western Interconnection to provide the required system damping while ~~still~~ allowing for some ~~of these~~ units to be out of service whenever necessary.

Mandate to Install a PSS

Nothing in this Regional Reliability Standard (RSS) should be construed to require installation of a PSS *solely because* a PSS is not currently installed as of the Effective Date of this RRS. Rather, installation is only mandated on the occurrence of either ~~of the~~ triggering ~~events~~event described in Requirement R4, Bullet 1 or Bullet 2, after the Effective Date of the RRS.

It should be noted that a PSS is neither Transmission nor generation.

Requirement R1

Requirement R1 addresses normal operating conditions.

Requirement R1 recognizes that PSS systems have varying states, such as on, off, active, and non-active. As long as the PSS is operating in accordance with the documentation provided to the Transmission Operator, this is not considered a status change for purposes of this ~~standard~~Standard.

This Requirement eliminates the requirement to count hours as required in the previous version of this ~~standard~~Standard while also allowing the Generator Owner to create a unit-specific operating plan.

The intent of Requirement R1 is to provide the Transmission Operator, the PSS operating zone in which the PSS is “active” providing damping to the power system. Some PSS may be programmed to become “active” at a specified megawatt loading level and above while others may be programmed to be “active” in a particular band of megawatt loading levels and are “non-active” only when passing through the “rough zone” or some other band. A “rough zone” is a megawatt loading band in which the generator-turbine system could contribute to system instability.

Requirement R2

This Requirement only applies when the PSS is out of service for a period greater than 30 minutes.

Unlike Requirement R1, Requirement R2 addresses exceptions to normal operation.

The intent of Requirement R2 is to remove the previous requirement to log hours for PSS in service. In this ~~standard's~~Standard's previous version, the logged hours were totaled quarterly to meet the 98% in-service requirement. Instead of documenting the number of hours excluded, this Requirement simplifies the process by allowing the Generator Operator to communicate to the Transmission Operator the circumstances that render the PSS unavailable to the Transmission Operator (such as component failure, maintenance, and testing).

Requirement R3

Nothing in this RSS should be construed to mandate the design criteria for the *equipment* used to produce the tuning output of the PSS. Rather, Requirement R3 is intended to address the design criteria for the *tuning output* of the PSS.

Unlike the language in Requirement R5 that looks *backward* to address units that were once operating but are no longer capable of operating, Requirement R3 looks *forward*, requiring that units be tuned to the specified parameters.

The PSS transfer function should compensate the phase characteristics of the generator, exciter, and power (GEP) system transfer function so the compensated transfer function ((PSS(s) * GEP(s)) has a phase characteristic of ± 30 degrees in the frequency range.

The GEP(s) transfer function is a theoretical transfer function, and its phase characteristic cannot be directly measured during field tests (only via simulation). Thus, the Requirement recognizes the practical approach of measuring the frequency response between voltage reference set point and terminal voltage (Et/Vref) and using the phase characteristic of such frequency response as being the phase characteristic of GEP(s). The phase characteristic of Et/Vref is a better approximation to the phase characteristic of GEP(s) when the frequency response Et/Vref is obtained with the generator synchronized to the grid at its minimum stable power output.

In an effort to allow for reasonable ~~wash-out~~washout time constants, the Requirement specifies 0.2 Hz as the applicable threshold. The 0.2 Hz threshold more closely aligns with the observed oscillation frequencies.

A properly tuned PSS should provide positive damping to the local mode of oscillation, which typically has a frequency higher than 1.0 Hz.

This Requirement modifies the requirement associated with the adjustment of the PSS gain. The standard no longer defines the PSS gain in terms of gain margin but instead requires the final PSS gain to be between 1/3 (10 dB) and 1/2 (6 dB) of the maximum practical gain that could be achieved during PSS commissioning. The maximum practical gain might be associated with the excessive noise or raised higher-frequency oscillations in the closed loop response (exciter mode) or any other form if there is inadequate closed-loop performance, as determined during PSS commissioning. It is now part of Measure M3 to show the field test results that led to the determination of the maximum practical gain.

Requirement R4

Requirement R4 requires a Generator Owner to install a PSS on new applicable units or when excitation systems are replaced or retrofitted on existing applicable units. This Requirement applies to new excitation systems and not to existing systems that do not have PSS. The Requirement also allows a reasonable amount of time for the commissioning of new PSS.

Requirement R5

Unlike the language in Requirement R3 that looks forward ~~to ensure~~ensuring that a unit is tuned, Requirement R5 looks *backward.* Specifically, the language in Requirement R5, "becoming incapable," indicates the unit was previously capable of meeting the tuning requirements in Requirement R3, but is no longer capable. Restated, Requirement R5 addresses units that were previously working but are now no longer working.

The intent of Requirement R5 is to remove the "tiered" approach to PSS repair/replacement following a failure. A simple, streamlined approach to allow the Generator Owner sufficient time to repair or replace a broken PSS has been written. Consideration has been given for the need to procure parts or new equipment, schedule an equipment/unit outage, and install and test the repaired or replaced PSS. It is recognized that in some instances, it may require (1) replacement of an AVR, and (2) the existence of a PSS, or both the AVR and the PSS may need to be replaced to achieve a functioning system.

The 24-month time frame is sufficient to return a functional, operating PSS to service.

*** FOR INFORMATIONAL PURPOSES ONLY ***

Enforcement Dates: Standard VAR-501-WECC-3 — Power System Stabilizer

United States

Standard	Requirement	Enforcement Date	Inactive Date
VAR-501-WECC-3	TBD	TBD	

Exhibit A-2

Proposed Regional Reliability Standard VAR-501-WECC-4 – Power System Stabilizer (Clean)

A. Introduction

1. **Title:** Power System Stabilizer (PSS)
2. **Number:** VAR-501-WECC-4
3. **Purpose:** To ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for WECC power system stabilizers.
4. **Applicability:**
   - **4.1** Generator Operator
   - **4.2** Generator Owner
5. **Facilities:** This standard applies to synchronous generators, connected to the Bulk Electric System, meeting the definition of Commercial Operation.
6. **Effective Date:** The first day of the first quarter following regulatory approval.

B. Requirements and Measures

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner's written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events: *[Violation Risk Factor: Low] [Time Horizon: Planning Horizon]*

- The effective date of this standard;
- The PSS's Commercial Operation date; or
- Any changes to the PSS operating specifications.

M1. Each Generator Owner will have documented evidence that it provided to its Transmission Operator, within the time allotted as described in the procedures required under Requirement R1, written Operating Procedures or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the AVR.

For auditing purposes, because Requirement R1 conditions are intended to be unchanged unless the Transmission Operator is otherwise notified, the Generator Owner only needs to provide the documentation to the Transmission Operator one time, or whenever the operating specifications change.
For auditing purposes, if a PSS is in service but is not providing an active signal to the AVR as described in Requirement R1, the disabled period does not count against the Requirement R2 mandate to be in service except as otherwise allowed.

R2. Each Generator Operator shall have its PSS in service while synchronized, except during any of the following: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

- Component failure

- Testing of a Bulk Electric System Element affecting or affected by the PSS
- Maintenance
- As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

M2. Each Generator Operator will have documentation of each claimed exception specified in Requirement R2. Documentation may include, but is not limited to:

- A written explanation covering the bulleted exception that describes the circumstances of the exception as allowed in Requirement R2.
- Documented evidence that the Generator Operator and the Transmission Operator agreed the PSS would not be operating during a specified set of circumstances, where the exception is claimed under the last bullet of Requirement R2.

For auditing purposes, the presumption is that the PSS was in service unless otherwise exempted in Requirement R2. Evidence need only be provided to prove the circumstances during which the PSS was not in service for periods in excess of 30 minutes.

R3. Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

3.1. PSS shall be set to provide the measured, simulated, or calculated compensated Vt/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

3.2. PSS output limits shall be set to provide at least ±5% of the synchronous machine's nominal terminal voltage.

3.3. PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

3.4. PSS washout time constant shall be no greater than 30 seconds.

3.5. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

M3. Each Generator Owner will have documented evidence that its PSS was tuned to meet the specifications of Requirement R3.

If the exception under Requirement R3, Part 3.5, is claimed, the Generator Owner will have documented evidence describing: 1) the conditions that render the PSS incapable of meeting the tuning requirements, and 2) the date the voltage regulator was last replaced or retrofitted.

R4. Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events: *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

- The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
- The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

M4. Each Generator Owner will have evidence that it installed and completed start-up testing of a PSS on its generator within 180 days of either of the conditions described in Requirement R4, and when those conditions occur after the Effective Date of this standard.

The first bullet of Requirement R4 only applies to equipment on its initial (first energization) connection to the BES.

R5. Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3. *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

M5. Each Generator Owner will have evidence that it repaired or replaced its PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications of Requirement R3. Evidence may include, but is not limited to, documentation of the date the PSS became incapable of meeting the Requirement R3 tuning specifications, and the date the PSS was returned to service, demonstrating that the span of time between the two events was less than 24 months.

C. Compliance

1. **Compliance Monitoring Process**

1.1 Compliance Enforcement Authority: "Compliance Enforcement Authority" means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2. Evidence Retention: The following evidence retention period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full-time period since the last audit.

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- Each Generator Operator shall keep evidence for all Requirements of the document for a period of three years plus calendar current.

1.3 Compliance Monitoring and Enforcement Program: As defined in the NERC Rules of Procedure, "Compliance Monitoring and Enforcement Program" refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

R	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	NA	NA	NA	The Generator Owner failed to provide its PSS operating specifications to the Transmission Operator as required in Requirement R1.
R2	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 30 minutes but less than 60 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 60 minutes but less than 120 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 120 minutes but less than 180 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 180 minutes.
R3	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, two times or fewer during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, three times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, four times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, five times or more during the audit period.
R4	NA	NA	NA	The Generator Owner failed to install on its generator a PSS, as required in Requirement R4.
R5	NA	NA	NA	The Generator Owner failed to repair or replace a non-operational PSS as required in Requirement R5.

D. Regional Variances

None.

E. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking
1	April 16, 2008	Permanent Replacement Standard for VAR-STD-002b-1	
1	October 28, 2008	Adopted by NERC Board of Trustees	
1	April 21, 2011	FERC Order issued approving VAR-501-WECC-1 (FERC approval effective June 27, 2011; Effective Date July 1, 2011)	
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3.1	August 10, 2017	Adopted by the NERC Board of Trustees	Errata
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		an information-only filing to NERC.	WECC Standards Committee as allowed in the WECC Reliability Standards Development Procedures. An information-only filing provided to NERC reflects the following: 1) updates to the template and syntax, 2) removal of stale-dated language from the Effective Date, 3) deletion of "For auditing purposes of…" from M4, 4) in the Guidance section, "dampen" was replaced with "damp", and syntax was addressed deleting "still", "of those", "of the", and "to ensure" was replaced with "ensuring", and "wash out" was replaced with "washout."
4	TBD		

Guideline and Technical Basis

PSS systems are used to minimize real power oscillations by rapidly adjusting the field of the generator to damp the low-frequency oscillations.

It is necessary for large numbers of PSS devices to be in operation in the Western Interconnection to provide the required system damping while allowing for some units to be out of service whenever necessary.

Mandate to Install a PSS

Nothing in this Regional Reliability Standard (RSS) should be construed to require installation of a PSS *solely because* a PSS is not currently installed as of the Effective Date of this RRS. Rather, installation is only mandated on the occurrence of either triggering event described in Requirement R4, Bullet 1 or Bullet 2, after the Effective Date of the RRS.

It should be noted that a PSS is neither Transmission nor generation.

Requirement R1

Requirement R1 addresses normal operating conditions.

Requirement R1 recognizes that PSS systems have varying states, such as on, off, active, and non-active. As long as the PSS is operating in accordance with the documentation provided to the Transmission Operator, this is not considered a status change for purposes of this Standard.

This Requirement eliminates the requirement to count hours as required in the previous version of this Standard while also allowing the Generator Owner to create a unit-specific operating plan.

The intent of Requirement R1 is to provide the Transmission Operator, the PSS operating zone in which the PSS is “active” providing damping to the power system. Some PSS may be programmed to become “active” at a specified megawatt loading level and above while others may be programmed to be “active” in a particular band of megawatt loading levels and are “non-active” only when passing through the “rough zone” or some other band. A “rough zone” is a megawatt loading band in which the generator-turbine system could contribute to system instability.

Requirement R2

This Requirement only applies when the PSS is out of service for a period greater than 30 minutes.

Unlike Requirement R1, Requirement R2 addresses exceptions to normal operation.

The intent of Requirement R2 is to remove the previous requirement to log hours for PSS in service. In this Standard's previous version, the logged hours were totaled quarterly to meet the 98% in-service requirement. Instead of documenting the number of hours excluded, this Requirement simplifies the process by allowing the Generator Operator to communicate to the Transmission Operator the circumstances that render the PSS unavailable to the Transmission Operator (such as component failure, maintenance, and testing).

Requirement R3

Nothing in this RSS should be construed to mandate the design criteria for the *equipment* used to produce the tuning output of the PSS. Rather, Requirement R3 is intended to address the design criteria for the *tuning output* of the PSS.

Unlike the language in Requirement R5 that looks *backward* to address units that were once operating but are no longer capable of operating, Requirement R3 looks *forward*, requiring that units be tuned to the specified parameters.

The PSS transfer function should compensate the phase characteristics of the generator, exciter, and power (GEP) system transfer function so the compensated transfer function ((PSS(s) * GEP(s)) has a phase characteristic of ± 30 degrees in the frequency range.

The GEP(s) transfer function is a theoretical transfer function, and its phase characteristic cannot be directly measured during field tests (only via simulation). Thus, the Requirement recognizes the practical approach of measuring the frequency response between voltage reference set point and terminal voltage (Et/Vref) and using the phase characteristic of such frequency response as being the phase characteristic of GEP(s). The phase characteristic of Et/Vref is a better approximation to the phase characteristic of GEP(s) when the frequency response Et/Vref is obtained with the generator synchronized to the grid at its minimum stable power output.

In an effort to allow for reasonable washout time constants, the Requirement specifies 0.2 Hz as the applicable threshold. The 0.2 Hz threshold more closely aligns with the observed oscillation frequencies.

A properly tuned PSS should provide positive damping to the local mode of oscillation, which typically has a frequency higher than 1.0 Hz.

This Requirement modifies the requirement associated with the adjustment of the PSS gain. The standard no longer defines the PSS gain in terms of gain margin but instead requires the final PSS gain to be between 1/3 (10 dB) and 1/2 (6 dB) of the maximum practical gain that could be achieved during PSS commissioning. The maximum practical gain might be associated with the excessive noise or raised higher-frequency oscillations in the closed loop response (exciter mode) or any other form if there is inadequate closed-loop performance, as determined during PSS commissioning. It is now part of Measure M3 to show the field test results that led to the determination of the maximum practical gain.

Requirement R4

Requirement R4 requires a Generator Owner to install a PSS on new applicable units or when excitation systems are replaced or retrofitted on existing applicable units. This Requirement applies to new excitation systems and not to existing systems that do not have PSS. The Requirement also allows a reasonable amount of time for the commissioning of new PSS.

Requirement R5

Unlike the language in Requirement R3 that looks forward ensuring that a unit is tuned, Requirement R5 looks *backward.* Specifically, the language in Requirement R5, "becoming incapable," indicates the unit was previously capable of meeting the tuning requirements in Requirement R3, but is no longer capable. Restated, Requirement R5 addresses units that were previously working but are now no longer working.

The intent of Requirement R5 is to remove the "tiered" approach to PSS repair/replacement following a failure. A simple, streamlined approach to allow the Generator Owner sufficient time to repair or replace a broken PSS has been written. Consideration has been given for the need to procure parts or new equipment, schedule an equipment/unit outage, and install and test the repaired or replaced PSS. It is recognized that in some instances, it may require (1) replacement of an AVR, and (2) the existence of a PSS, or both the AVR and the PSS may need to be replaced to achieve a functioning system.

The 24-month time frame is sufficient to return a functional, operating PSS to service.

*** FOR INFORMATIONAL PURPOSES ONLY ***

Enforcement Dates: Standard VAR-501-WECC-3 — Power System Stabilizer

United States

Standard	Requirement	Enforcement Date	Inactive Date
VAR-501-WECC-3	TBD	TBD	

Exhibit B

Summary of Development History and Complete Record of Development

Electric Reliability and Security for the West

Attachment E
Project Roadmap
WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Informational Only Filing

Project Roadmap

Actions		Completed
1.	Standard Authorization Request (SAR) Filed	March 9, 2022
2.	WECC Standards Committee (WSC) approved the SAR	March 16, 2022
3.	Drafting Team (DT) Solicitation	March 30, 2022
4.	DT Meeting	June 21, 2022
5.	DT Meeting	June 28, 2022
6.	Notice to Standard Email List for Proposed Non-Substantive Changes – No Substantive Changes Proposed	July 11, 2022
7.	Posting 1 for Information Only – Comment/Response not Required	July 16, 2022
8.	Posting 1 Letter to WSC for Proposed Non-Substantive Changes	July 16, 2022
9.	WSC Approved Non-Substantive Changes	December 6, 2022
10.	WECC Board of Directors—Approved	Not Required
11.	Informational Filing pending at NERC	TBD
12.	NERC Board of Trustees Approves	TBD

WECC
Electric Reliability and Security for the West

Standard Authorization Request
WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Five-year Review

Overview

This Standard Authorization Request (SAR) was received March 7, 2022, and deemed complete the same day. The WECC Standards Committee (WSC) vetted this SAR on March 16, 2022.

This SAR can be reviewed on the WECC-0148 project page at the Standard Authorization Request accordion. If you have questions regarding this SAR, please contact W. Shannon Black at (503) 307-5782.

Introduction

This is a request for five-year review of WECC Regional Reliability Standard VAR-501-WECC-3.1 Power System Stabilizer.[1]

Requester Information

Primary contact

- First name: W. Shannon
- Last name: Black
- Email: sblack@wecc.org
- Phone: (503) 307-5782
- Organization name: Western Electricity Coordinating Council (WECC)

Alternate

- First name: Donovan
- Last name: Crane
- Email: dcrane@wecc.org
- Phone:

[1] Per the WECC Reliability Standards Procedures, Maintenance of RRSs and CRTs: 'The WSC shall ensure that each…RRS is reviewed at least once every five years from the effective date of the most recent version of the document under review. If the review identifies needed changes, the WSC shall cause a remedial SAR to be filed. If the review does not identify needed changes, no further action is required."

Type of Request

This is a request for five-year review of a WECC Regional Reliability Standard.

Create, Modify, Retire or Review a Document

Requested Action (Select one)

- This is a request for a five-year review of a WECC Regional Reliability Standard (RRS).

Document Type (Select one)

- WECC Regional Reliability Standard

Issue

This project is assigned WECC Tracking Number WECC-0148.

This a request for a five-year review mandated per the WECC Reliability Standards Development Procedures (Procedures).

Proposed Remedy

This request will review and update the entire document, as needed. No specific concerns have been identified. The drafting team is authorized to recommend "no change" after reviewing the document.

Applicable Entities

Each function will be reviewed if affected. A dropdown will be provided. Check all applicable blocks.

4. Functional Entities:

    4.1. Generator Operator

    4.2. Generator Owner

Detailed Description

This request will review and update the entire document, as needed. No specific concerns have been identified.

Affected Reliability Principles

- **Reliability Principle 1** — Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.

Document Information

NA

Reference Uploads

Provide Additional Comments (if needed).

NA

WECC
Electric Reliability and Security for the West

WECC Standards Committee
Meeting Agenda
Virtual

Virtual meeting link | Dial-in Number: 1-415-655-0003, Attendee Access Code: 2456 527 7931

1. Welcome, Call to Order—James Avery

2. Review WECC Antitrust Policy—Steven Rueckert

WECC Antitrust Policy.

Please contact WECC legal counsel if you have any questions.

3. Approve Agenda—James Avery

4. Review and Approve Previous Meeting Minutes—James Avery

Approval Item: December 7, 2021, minutes

5. Review of Previous Action Items—W. Shannon Black

Standards Voting Segment Representatives; Drafting Team Nominees; Charter and Glossary Review

6. Request to Approve Standard Authorization Request

WECC-0148 VAR-501-WECC-4, Power System Stabilizer, Five-year Review

7. Request to Approve Drafting Nominations—W. Shannon Black

WECC-0146 TPL-001-WECC-CRT-4, Transmission System Planning Performance

WECC-0147 BAL-004-WECC-3, ATEC Five-year Review with Focus on Requirement R1

8. Standard Voting Segment Criteria Application—W. Shannon Black

9. Reports—Various

SVS 6 welcomes Tim Kelley to the WSC

10. Action Without a Meeting—W. Shannon Black

No report

11. Public Comment

12. Review of New Action Items—W. Shannon Black

13. Review Upcoming Meetings

To Be Determined..... TBD

14. Adjourn

Black, Shannon

From: Black, Shannon
Sent: Wednesday, 30 March, 2022 10:50 AM
Subject: WECC-0148 VAR-501-WECC-4 Notice of Drafting Team Solicitation

WECC-0148 VAR-501-WECC-4 Power System Stabilizer – Five-year Review

Drafting Team nominations are being solicited for the following project:

- WECC-0148 VAR-501-WECC-4 Power System Stabilizer - Five-year Review

This project will complete a five-year review mandated per the WECC Reliability Standards Development Procedures (Procedures). This request will review and update the entire document, as needed. No specific concerns have been identified. The drafting team is authorized to recommend "no change" after reviewing the document.

If you have an interest in participating on this drafting team, please submit a "DT Nomination Form" found on the Standards Under Development Page. From the Tracking Number drop down menu, please select "WECC-0148."

Nominations will be addressed at the next scheduled WECC Standards Committee (WSC) meeting.

W. Shannon Black, JD
WECC Consultant, Standards Processes
(503) 307-5782
sblack@wecc.org

Electric Reliability and Security for the West

WECC-0148

VAR-501-WECC-4

Power System Stabilizer

Drafting Team Meeting Agenda

Virtual

Webinar Link | Password: WECC | Dial-in Number: 1-415-655-0003, Attendee Access Code: 2456 499 7510

June 21, 2022, 10:00 a.m. to 12:00 p.m.

1. Welcome, Call to Order, Introductions—W. Shannon Black

2. Review WECC Antitrust Policy—W. Shannon Black

WECC Antitrust Policy.

Please contact WECC legal counsel if you have any questions.

3. Approve Agenda

4. Review and Approve Previous Meeting Minutes

Approval Item: No Previous Minutes

5. Review of Previous Action Items—W. Shannon Black

6. Drafting—W. Shannon

Standard Authorization/Scope Review; Review of Development Principles

7. Public Comment

8. Review of New Action Items

9. Review Upcoming Meetings

June 28, 2022, 10:00 a.m. to 12:00 p.m. .....Virtual

TBD, 10:00 a.m. to 12:00 p.m. .....Virtual

All DT meeting announcements are for Mountain Time.

10. Adjourn

WECC-0148 VAR-501-WECC-4 PSS Drafting Team Meeting

Virtual

10:00 a.m.—12:00 p.m. Mountain Time, Tuesday, June 28, 2022

Learn More

Black, Shannon

From: Black, Shannon
Sent: Monday, July 11, 2022 4:05 PM
Subject: WECC-0148 VAR-501-WECC-4 – No Substantive Changes Recommended

WECC-0148 VAR-501-WECC-4 – No Substantive Changes Recommended

Recommendation

The WECC-0148 VAR-501-WECC-4 (VAR), Power System Stabilizer, Drafting Team (DT) is recommending that no changes be made to the Standard. If the WECC Standards Committee (WSC) accepts that recommendation, an information-only filing at NERC is recommended.

Overview

On June 21, 2022, the DT began a five-year review of the Standard as required by the WECC Reliability Standards Development Procedures (Procedures). On July 1, 2022, after reviewing the entire document during multiple public meetings, the DT unanimously agreed that no Substantive Changes should be made to the Standard.

Non-Substantive Changes

The DT is recommending the following Non-Substantive Changes:

- Updates to the document template, numbering, and boilerplate sections as provided by NERC
- Removal of stale-dated verbiage included in the Effective Date
- Removal of the redundant phrase, "[F]or auditing purposes…." From Measure M4
- Updates to syntax
- Correction of "[s]tandard" to "[S]tandard"
- Correction of "dampen" to "damp" in the Rationale and Guidance section

For more information, a redlined version showing the Non-Substantive Changes will be posted to the WECC-0148 Home Page, on the Posting 1 For Comment accordion. If you have comments or concerns regarding the recommendation, please contact W. Shannon Black.

W. Shannon Black, JD
WECC Consultant, Standards Processes
(503) 307-5782
sblack@wecc.org

Electric Reliability and Security for the West

Response to Comments
Posting 1—45-Day at NERC
August 16 through September 29, 2023

WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Information Only Filing

Posting 1—45-Day NERC

The WECC-0148 VAR-501-WECC-4, Power System Stabilizer Drafting Team (DT) thanks everyone who submitted comments on the proposed project. WECC-0148 is an information-only filing proposing no Substantive changes. [1]

Posting

This project was posted for comment by NERC from August 16, 2023, through September 29, 2023.

NERC distributed notice for the posting on August 16, 2023.

NERC asked stakeholders to provide feedback on the proposed project through a standardized electronic template.

NERC reported there "were 9 sets of responses, including comments from approximately 14 different people from approximately 9 companies representing 4 of the Industry Segments."

After review of the NERC-provided document, WECC found responses from seven organizations (some with member organization subcomponents), and 13 persons identified in the following Table of Respondents.

Location of Comments

All comments provided to WECC by NERC can be reviewed in their original format on the WECC-0148 project page under the "Submit and Review Comments" accordion.

Changes in Response to Comment

After consideration of all comments received, no further changes were made to this project.

Final from Tech

[1] The terms Substantive and Non-Substantive are defined terms found in the WECC Relibaility Standards Development Procedures. https://www.wecc.org/Reliability/WECC%20Reliability%20Standards%20Development%20Procedures%20-%20FERC%20Approved%2009-13-2021.pdf

Minority View

No minority views were raised.

Proposed Effective Date

The proposed Standard can be implemented immediately upon receipt of final regulatory approval.

Information Only—No Substantive Changes

This project represents an "Information Only" filing with no Substantive changes.

Per the WECC Relibaility Standards Development Procedures (Procedures), if no Substantive changes are requested to a Regional Standard, no further due process is required. Specifically, WECC Board of Directors (Board) approval is not required.

On July 11, 2022, a list[2] of proposed Non-Substantive changes was distributed to the Standards Email List (SEL) inviting comments or concerns to be forwarded to WECC Standards staff. A redline and a clean version of the project was posted on the WECC-0148, Posting 1 for Comment accordion. No comments were received.

On July 16, 2022, WECC posted a letter[3] to the WSC informing the WSC of its scope and authority to address an information only filing. The letter was published to the WECC-0148 home page on the Posting 1 for Comment accordion.

On December 6, 2022, during a duly noticed WSC meeting, the WSC reviewed the letter from July 16, 2022, and was briefed on the WSC's Procedural authority to approve the project with no further due process, so long as all changes were deemed Non-Substantive.

The WSC concurred[4] that all proposed changes were Non-Substantive. Because the proposed changes are all Non-Substantive, the WSC also concurred that neither a posting for comment, ballot, Board approval, nor an Implementation Plan were required per the Procedures.

Table of Respondents

	Organization	
1	ACES Power Marketing (ACES)	Bob Soloman, Jodirah Green, Kris Carper
2	Arizona Public Service Company (APS)	Daniel Atanasovski
3	Avista Corporation	Glen Farmer, Mike Magruder, Robert Follini

[2] https://www.wecc.org/Administrative/WECC-0148%20Notice%20of%20No%20Substantive%20Change.pdf
[3] https://www.wecc.org/Reliability/WECC-0148%20VAR-501-WECC-3.1%20-%20Letter%20to%20WSC%20Requesting%20Information%20Only%20Filing%20-%20FINAL.docx
[4] https://www.wecc.org/Administrative/2022-03-16%20WSC%20Proposed%20Meeting%20Minutes%20for%20approval%202022-12-06-2022%20-%20FINAL%20FROM%20TECH.docx

	Organization	
4	BC Hydro and Power Authority (BC)	Adrian Andreoiu, Helen Hamilton Harding, Hootan Jarollahi
5	Bonneville Power Administration (BPA)	Andrea Jessup
6	Salt River Project (SRP)	Israel Perez
7	United States Bureau of Reclamation (USB)	Richard Jackson

Contacts and Appeals

If you feel your comment has been omitted or overlooked, please contact W. Shannon Black, WECC Consultant, at (503) 307-5782. In addition, there is a WECC Reliability Standards appeals process.

Final from Tech

Index to NERC-provided Questions, Comments, and Responses

Question

1) Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?
2) Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?
3) Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?
4) Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?
5) Does the proposed Regional Reliability Standard meet at least one of the following criteria
    a. The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.
    b. The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.
    c. The proposed regional difference is necessitated by a physical difference in the Bulk Power System.

Final from Tech

Comment Summary. For proposed changes and avenues forward, please see the preamble. 1) *Question 1*—Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?	
Commenter	**Comment or Response**
ACES	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Mike Magruder	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Robert Follini	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
BC	Yes
Response	

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
BPA	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
SRP	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
USB	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Final fro

Comment Summary. For proposed changes and avenues forward, please see the preamble.

1) *Question 2*— **Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?**

Commenter	Comment or Response
ACES	No

Response

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
APS	No

Response

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
Avista – Glen Farmer	No

Response

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
Avista - Mike Magruder	No

Response

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
Avista - Robert Follini	No

Response

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
BC	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
BPA	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
SRP	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
USB	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Comment Summary. For proposed changes and avenues forward, please see the preamble. 1) *Question 3*— Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?	
Commenter	**Comment or Response**
ACES	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Mike Magruder	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Robert Follini	No
Response	

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
BC	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
BPA	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
SRP	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
USB	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Comment Summary. For proposed changes and avenues forward, please see the preamble. 1) *Question 4*— Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?	
Commenter	**Comment or Response**
ACES	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	No.
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Mike Magruder	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Robert Follini	No
Response	

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
BC	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
BPA	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
SRP	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
USB	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Comment Summary. For proposed changes and avenues forward, please see the preamble.

1) Question 5—Does the proposed Regional Reliability Standard meet at least one of the following criteria:

- d. The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.
- e. The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.
- f. The proposed regional difference is necessitated by a physical difference in the Bulk Power System.

Commenter	Comment or Response
ACES	Yes. Thank you for the opportunity to comment.
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	No
Response	
The WECC-0148 Drafting Team (DT) appreciates Avista's negative response; however, Avista has failed to explain their response, identify any issues, or suggest any proposed changes. As such, the DT can neither identify nor remedy Avista's concern.	
Commenter	**Comment or Response**
Avista - Mike Magruder	No
Response	
The WECC-0148 Drafting Team (DT) appreciates Avista's negative response; however, Avista has failed to explain their response, identify any issues, or suggest any proposed changes. As such, the DT can neither identify nor remedy Avista's concern.	
Commenter	**Comment or Response**
Avista - Robert Follini	No
Response	

The WECC-0148 Drafting Team (DT) appreciates Avista's negative response; however, Avista has failed to explain their response, identify any issues, or suggest any proposed changes. As such, the DT can neither identify nor remedy Avista's concern.

Commenter	Comment or Response
BC	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
BPA	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
SRP	Yes. While there are regional and physical differences, the changes proposed are mainly grammatical and all are minor.
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
USB	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Final

WECC
Electric Reliability and Security for the West

Letter to WSC Requesting Information-Only Filing

Recommendation

The WECC-0148 VAR-501-WECC-4 (VAR), Power System Stabilizer, Drafting Team (DT) is recommending that no changes be made to the Standard. If the WECC Standards Committee (WSC) accepts that recommendation, an information-only filing at NERC is recommended.

Overview

On May 2, 2016, a WECC Ballot Pool approved VAR-501-WECC-3, Power System Stabilizer, after eight postings for comment. On April 28, 2017, FERC approved the Standard via letter order followed by Version 3.1 errata on September 26, 2017. Between 2016 and 2022, no known concerns were raised regarding the text the of the Standard.

On June 21, 2022, the DT began a five-year review of the Standard as required by the Procedures. On July 1, 2022, after reviewing the entire document during multiple public meetings, the DT unanimously agreed that no Substantive Changes[1] should be made to the Standard. A straw poll from non-DT members in attendance concurred with the DT's conclusion.

Non-Substantive Changes

The DT is recommending the following Non-Substantive Changes:

- Updates to the document template, numbering, and boilerplate sections as provided by NERC
- Removal of stale-dated verbiage included in the Effective Date
- Removal of the redundant phrase, "[F]or auditing purposes…." From Measure M4
- Updates to syntax
- Correction of "[s]tandard" to "[S]tandard"
- Correction of "dampen" to "damp" in the Rationale and Guidance section

[1] Definitions, Procedures.

FINAL

Standard of Review

Per the WECC Standards Committee (WSC) Charter, the WSC administers the Procedures. Per the Procedures, each of the above proposed changes is a Non-Substantive Change[2], and does not require a posting for comment.[3] Although the Procedures require a ballot to make Non-Substantive Changes *after a posting for comment*[4], the Procedures are silent where a DT recommends only Non-Substantive Changes, which require neither a posting nor a ballot.

For guidance, the Procedures provide that if the WSC identifies a Non-Substantive Change after comments are received, and/or after a ballot has opened, the "correction shall be filed for approval with NERC", as appropriate.[5] Further, implementing "updated document styles, templates, or standardized language…is explicitly within the purview of staff and does not require further approval."[6] Finally, as a matter of precedence, the WSC has previously accepted a "no change" recommendation regarding a WECC Criterion that had neither been posted nor balloted.[7]

In light of the above, the DT requests the WSC exercise its discretion by approving the proposed Non-Substantive Changes: 1) without a posting, 2) without a ballot, 3) followed by an information-only filing at NERC.

FINAL

[2] Non-Substantive Changes, Definitions, Procedures, are those changes: "that do not change the scope, applicability, or intent of any requirement, including correcting the numbering of a requirement, correcting references, changes to document styles and templates, correcting the spelling of a word, adding an obviously missing word, or rephrasing a requirement for improved clarity."

[3] "Non-Substantive Changes do not require a posting/comment/response cycle." Treatment of Non-Substantive Changes, Procedures, page 12.

[4] Treatment of Substantive Changes, Procedures, pages 11-12.

[5] "[T]he WSC agrees that the correction of the error does not change the scope or intent of the associated [Standard], and agrees that the correction has no material impact on the applicable entities, then the correction shall be filed for approval with NERC and applicable governmental authorities as appropriate." Treatment of Non-Substantive Changes, Regional Reliability Standards, Procedures, page 12.

[6] Procedures, page 12.

[7] In December 2016, the WSC approved WECC-0112, COM-001-WECC-CRT-2.1, Digital Circuits Synchronization, a WECC Criterion.

WECC
Electric Reliability and Security for the West

WECC Standards Committee
Meeting Minutes
December 6, 2022
Virtual

1. Welcome, Call to Order

James Avery, WECC Standards Committee (WSC) Chair, called the meeting to order at 1:00 p.m. on December 6, 2022. A quorum was established. A list of attendees is attached as Exhibit A.

2. Review WECC Antitrust Policy

Steven Rueckert, WECC Director of Standards, read aloud the WECC Antitrust Policy statement. The meeting agenda included a link to the posted policy.

3. Approve Agenda

Mr. Avery introduced the proposed meeting agenda.

On a motion by Dana Cabbell, the WSC approved the agenda.

4. Review and Approve Previous Meeting Minutes

The WSC approved the June 14, 2022, meeting minutes. The WSC did not hold a meeting in September 2022. A report on the Action Without a Meeting concluding on September 29, 2022, is included below.

On a motion by Mr. Avery, the WSC approved the minutes.

5. Review of Previous Action Items

W. Shannon Black reviewed action items carried over from previous meetings of the WSC.

- Staff was asked to seek WECC Legal counsel on whether the Western Interconnection Regional Advisory Body (WIRAB) qualifies for service in Standards Voting Segment (SVS) 9. Consultation with Chris Albrecht, WECC Legal, concluded that WIRAB does not meet the criteria for service in SVS 9; however, the WSC recognized the value provided by WIRAB when networking for that segment. This action is complete.

6. WECC-0149 Table Revision Project—Request for Ballot

On October 18, 2022, the WECC-0149 Table Revision Process Drafting Team (WECC-0149 DT) agreed by majority vote to forward the project to the WSC with a request for ballot.

The project is a continuation of WECC-0141 FAC-501-WECC-3, Transmission Maintenance. The project is designed to streamline implementation of WECC-0141 by shifting implementation away from NERC and back to WECC.

On a motion by Mr. Avery, the WSC approved WECC-0149 Table Revision Process for ballot.

7. WECC-0150—PRC-001-WECC-CRT-3 Governor Droop—SAR Request—Convene a Drafting Team

On October 18, 2022, Standard Authorization Request (SAR) WECC-0150 PRC-001-WECC-CRT-3, Governor Droop, Five-year Review was received and deemed complete.

The SAR can be reviewed on the WECC-0150 on the SAR Form accordion.

The SAR is a request for five-year review per the Procedures. No issues have been identified. After review, the drafting team is authorized to recommend "no change" if changes are deemed unnecessary. This document was last reviewed as WECC-0125.

On a motion by Mr. Avery, the WSC approved Standard Authorization Request PRC-001-WECC-CRT-3, Governor Droop, Five-year Review.

The WSC instructed staff to solicit a drafting team.

8. WECC-0148 VAR-501-WECC-4—Power System Stabilizer/No Change—Information Only Filing

"No Substantive Change"—Informational Filing Only

On June 21, 2022, the WECC-0148 drafting team (WECC-0148 DT) began a five-year review of VAR-501-WECC-4, Power System Stabilizer, as required by the Procedures.

On July 1, 2022, after reviewing the entire document during multiple public meetings, the DT unanimously agreed that no Substantive Changes should be made to the Standard.

On July 11, 2022, a list of proposed non-substantive changes was distributed to the Standards Email List (SEL) inviting comments or concerns to be forwarded to WECC Standards staff. A redline and a clean version of the project was posted on the WECC-0148, Posted for Comment accordion. No comments were received.

Non-substantive changes do not require a posting for comment.[1]

[1] "Non-Substantive Changes do not require a posting/comment/response cycle. Non-Substantive errors discovered prior to the opening of a WECC ballot on either an RRS or a CRT may be corrected by WECC staff." Treatment of Non-Substantive Changes, Procedures, page 12.

The WSC was briefed on its procedural authority to approve the project with no further due process, so long as all changes were deemed non-substantive. (See Attachment A, Request for Information Filing.)

On a motion by Ms. Cabbell, the WSC accepted WECC-0148 VAR-501-WECC-4 (VAR), Power System Stabilizer as presented with only non-substantive changes.

The WSC instructed staff to prepare an information-only filing for NERC. Per the Procedures, no further due process is required for this project.

9. WECC-0151 INT-007-WECC-CRT-4—Processing of Emergency Requests for Interchange (RFI)/SAR Approval Recommending No Change

"No Substantive Change"—No Further Action Required

The INT suite of WECC Criteria: 1) was originally drafted by and for the use of the subject matter experts (SME) of the Interchange Scheduling and Accounting Subcommittee (ISAS). WECC-0151 is due for a five-year review per the Procedures.

On July 15, 2022, Standards staff requested that WECC Staff Liaison, Layne Brown, ask the ISAS to review WECC-0151 to determine whether the document required substantive changes.

On August 8, 2022, Danielle Smith (Sacramento Municipal Utility District and chair of the ISAS) reported to Standards staff that members of the ISAS had reviewed the document and were recommending that no substantive changes be made.[2]

The following non-substantive change was requested:

- Change the footnote from "See Guidance section" to "See Guidance, under Rationale section."

On November 1, 2022, a recommendation of "no substantive change" was dispatched to the SEL inviting comments or concerns to be forwarded to WECC Standards staff. No comments were received.

On a motion by Mr. Avery, the WSC accepted WECC-0151 INT-007-WECC-CRT-4—Processing of Emergency Requests for Interchange (RFI) as presented with only non-substantive changes.

[2] The leadership of ISAS reviewed WECC-0151 and WECC-0152. Review included the current and out-going chair, plus the incoming vice-Chair. After individual review, the cohort held a conference reaching consensus on the proposed non-substantive changes.

This action completes the five-year review required per the Procedures. An updated version of the WECC Criterion will be published.

10. WECC-0152 INT-016-WECC-CRT-4—Data Submittal/SAR Approval Recommending No Change

"No Substantive Change"—No Further Action Required

The INT suite of WECC Criteria: 1) was originally drafted by and for the use of the SMEs of the ISAS. WECC-0152 is due for a five-year review per the Procedures.

On July 15, 2022, Standards requested that WECC Staff Liaison, Layne Brown, ask the ISAS to review WECC-0151 to determine whether the document required substantive changes.

On August 8, 2022, Danielle Smith (Sacramento Municipal Utility District and chair of the ISAS) reported to Standards staff that members of the ISAS had reviewed the document and were recommending that no substantive changes be made.[3]

The following non-substantive changes were requested:

- In the Rationale section, in the first paragraph of "The Generic use of "Interchange Software," replace, "[t]he interchange software currently falls under the purview of Peak Reliability" with "[t]he interchange software currently falls under the purview of the ATFWG and under contract with Reliability Coordinator West (RC West)."

On November 1, 2022, a recommendation of "no substantive change" was dispatched to the SEL inviting comments or concerns to be forwarded to WECC Standards staff. No comments were received.

On a motion by Mr. Rueckert, the WSC accepted WECC-0152 INT-016-WECC-CRT-4—Data Submittal as presented with only non-substantive changes.

This action completes the five-year review required per the Procedures. An updated version of the WECC Criterion will be published.

11. WECC Glossary of Terms and Naming Conventions—Annual Review

Annual Review—WECC Glossary

[3] The leadership of ISAS reviewed WECC-0150 and WECC-0151. Review included the current and out-going chair, plus the incoming vice chair. After individual review, the cohort held a conference reaching consensus on the proposed non-substantive changes.

Per the WSC Charter, the WSC is required to annually review the WECC Glossary of Terms and Naming Conventions (WECC Glossary). The WECC Glossary only contains terms developed per the Procedures and used in active WECC Criteria.

Because WECC uses NERC's numbering and naming nomenclature, much of the WECC Glossary content duplicates that posted on the NERC website. To streamline the document, redundancies to the NERC website were deleted from the WECC Glossary and replaced with references to the NERC source documents.

On a motion by Mr. Rueckert, the WSC approved the annual review of the WECC Glossary of Terms and Naming Conventions, accepting proposed elimination of redundant language and changing the document name to WECC Glossary of Terms Used in WECC Criteria.

12. Annual Election of WSC Vice Chair

On December 7, 2021, Gary Nolan was elected as the WSC Vice Chair. On December 6, 2022, Mr. Nolan was nominated and affirmed to continue in that role. The WSC thanked Mr. Nolan for his continued dedication to the Standards development process.

13. WSC Charter and SVS 9 Application

The WSC reviews its charter annually in December.

On March 16, 2022, the WSC concluded that municipal utilities could be included in SVS 9 – Government. To ensure this finding is applied in future SVS solicitations, staff suggested adding the following footnote to the WSC Charter, Committee Composition and Governance, 1b. Membership Eligibility:

- "On March 16, 2022, the WSC approved municipal utilities for inclusion in SVS 9."

Although the footnote was approved for addition, later in the March 16, 2022, meeting, the WSC rescinded that approval opting instead for further discussion informed by a report by WECC legal counsel.

After further discussion, the WSC concluded that SVS 9 was tailored to include entities not otherwise subject to the requirements of a Standard/WECC Criterion. This approach provides a modicum of checks and balances not otherwise afforded by inclusion of municipalities.

Updates were made to the WSC Charter conforming meeting notice and posting requirements to those currently administered by WECC support staff.

On a motion by Mr. Avery, the WSC approved changes to the WSC Charter as presented.

The revised WSC Charter will be presented to the WECC Board of Directors during the 2023 Annual Meeting.

14. Reports

Standard Voting Segments—Full Cadre

Mr. Black reported that, on June 30, 2022, and July 19, 2022, WECC dispatched a request for volunteers to serve in Standard Voting Segments (SVS) 2, 3, 5, 6, and 10 with terms of service terminating coincident with the close of the WECC Annual Meeting in September 2022.

A single nominee for each SVS was received from each incumbent. Per the WSC Charter, a ballot was waived, and each nominee was deemed elected. The roster was forwarded to the WECC Board of Directors for informational purposes.

WECC-0149 DT Change

On July 12, 2022, W. Shannon Black was informed that Christopher Fecke-Stoudt had accepted employment at Salt River Project and would no longer be serving on the WECC-0149 project. Six members remain on the team.

WECC-0142 Retire BAL-002-WECC-X Contingency Reserve

The WECC-0142 project has not met for 18 months. Their current task is to create technical justification for the retirement of BAL-002-WECC-X, Contingency Reserve. The WECC-0142 DT requested to remain active until it creates an actionable work product.

Mr. Avery asked staff to request the WECC-0142 Drafting Team Chair provide a project update to the WSC at the March 3, 2023 meeting.

15. Action Without a Meeting

On September 15, 2022, the WECC-0146, TPL-001-WECC-CRT-3, Transmission System Planning Performance Drafting Team (DT) forwarded the project to the WSC with a request for ballot. Because the next duly noticed WSC meeting was not scheduled until December 6, 2022, Mr. Avery approved an Action Without a Meeting (AWM) per the WSC Charter, for the sole purpose of approving the project for ballot.

On September 29, 2022, the AWM concluded with unanimous support approving the project for ballot. Balloting on the project is currently scheduled to conclude on December 16, 2022.

16. Public Comment

Mr. Avery invited public comment.

Alice Ireland, Proven Compliance Solutions, suggested that a due process procedure should be discussed to address stalled projects. Ms. Ireland suggested that a self-executing approach to project termination may not be the best approach. The concept was tabled for further development at the March 2023 meeting.

17. Review of New Action Items

Mr. Black reviewed action items carried over from this and previous meetings of the WSC.

- WECC-0142
  - Mr. Avery asked staff to request the WECC-0142 Drafting Team Chair provide a project update to the WSC at the March 3, 2023, meeting. On December 13, 2022, the request was sent to the WECC-0142 email exploder.
- WECC-0148 VAR-501-WECC-4, Power System Stabilizer
  - Forward an information-only filing to NERC.
- WECC-0149 Table Revision Project
  - Ballot the project.
- WECC-0150 PRC-001-WECC-CRT-3, Governor Droop
  - Solicit a drafting team.
- WECC-0151 INT-007-WECC-CRT-4 , Processing of Emergency RFI
  - Publish an updated version, no further due process required.
- WECC-0152 INT-016-WECC-CRT-4, Data Submittal
  - Publish an updated version, no further due process required.
- WECC Glossary
  - Update and publish the Glossary to include a note explaining that WECC uses the same naming and numbering nomenclature as that used by NERC.
- WSC Charter
  - Update for presentation to the Board in September 2023.

18. Upcoming Meetings

March 3, 2023, TBD ..... Salt Lake City, UT

June 13, 20223, TBD ..... Salt Lake City, UT

December 5, 2023, TBD ..... Salt Lake City, UT

19. Adjourn

Mr. Avery adjourned the meeting without objection at 9:40 a.m.

Exhibit A: Attendance List[4]

Members in Attendance

Matthew Harward, Southwest Power Pool ..... SVS 2 RTO/ISO

Dana Cabbell, Southern California Edison ..... SVS 3 LSE

Gary Nolan, Arizona Public Service (Proxy Jessica Lopez) ..... SVS 5 Generators[5]

Tim Kelley, Sacramento Municipal Utility District ..... SVS 6 Broker/Aggregator/Marketers

Crystal Musselman, Proven Compliance Solutions (Proxy Alice Ireland) ... SVS 8 Small Electricity Users[6]

Steven Rueckert, WECC ..... SVS 10 Regional Entities

James Avery, Chair ..... Non-Affiliated Director

Members not in Attendance

Ron Sporseen, Bonneville Power Administration ..... SVS 1 Transmission

Marty Hostler, Northern California Power Agency ..... SVS 4 TDU

Caitlin Liotiris, Utah Association of Energy Users ..... SVS 7 Large Electricity End Users

Chris McLean, California Energy Commission ..... SVS 9 Gov. Entities

[4] Terms of Service for SVSs:
Terms of Service for SVSs 1, 4, 7, 8, and 9 conclude at the close of the 2023 WECC Annual Meeting.
Terms of Service for SVSs 2, 3, 5, 6, and 10 conclude at the close of the 2022 WECC Annual Meeting.

[5] On December 5, 2022, Mr. Nolan assigned Ms. Jessica Lopez as proxy for the December 6, 2022, meeting.

[6] On November 28, 2022, Ms. Musselman assigned Ms. Alice Ireland as proxy for the December 6, 2022, meeting.

Attachment A

Request for Information-Only Filing

Recommendation

The WECC-0148 VAR-501-WECC-4 (VAR), Power System Stabilizer, Drafting Team (WECC-0148 DT) is recommending that no substantive changes be made to the Standard. If the WECC Standards Committee (WSC) accepts that recommendation, an information-only filing at NERC is recommended.[7]

Overview

On May 2, 2016, a WECC Ballot Pool approved VAR-501-WECC-3, Power System Stabilizer, after eight postings for comment. On April 28, 2017, FERC approved the Standard via letter order followed by Version 3.1 errata on September 26, 2017. Between 2016 and 2022, no known concerns were raised regarding the text the of the Standard.

On June 21, 2022, the WECC-0148 DT began a five-year review of the Standard as required by the Procedures. On July 1, 2022, after reviewing the entire document during multiple public meetings, the DT unanimously agreed that no Substantive Changes[8] should be made to the Standard. This position was reinforced when the project posted for a 30-day comment period and received zero comments for consideration.

Non-Substantive Changes

The WECC-0148 DT is recommending the following Non-Substantive changes:

- Updates to the template and syntax;
- Removal of stale-dated language from the Effective Date;
- Deletion of "For auditing purposes of…" from M4;
- In the Guidance section:
  - "dampen" was replaced with "damp,"
  - Syntax was addressed deleting "still," "of those," "of the,"
  - "[t]o ensure" was replaced with "ensuring,"
  - "[w]ash out" was replaced with "washout."

[7] If "[t]he WSC agrees that the correction of the error does not change the scope or intent of the associated [project] and agrees that the correction has no material impact on the applicable entities, then the correction shall be filed for approval with NERC and applicable governmental authorities as appropriate." Treatment of Non-Substantive Changes, Regional Reliability Standards, Procedures, page 12.

[8] Definitions, Procedures.

Standard of Review

Per the WSC Charter, the WSC administers the Procedures. Per the Procedures, each of the proposed changes is a Non-Substantive change.[9] Non-Substantive changes do not require a posting for comment.[10]

Additionally, implementing "updated document styles, templates, or standardized language…is explicitly within the purview of staff and does not require further approval."[11] Finally, as a matter of precedence, the WSC has previously accepted a "no change" recommendation regarding a WECC Criterion that had neither been posted nor balloted.[12]

In light of the above, the WEC-0148 DT requests the WSC exercise its discretion by approving the proposed Non-Substantive Changes: 1) without a posting, 2) without a ballot, 3) followed by an information-only filing at NERC.

[9] Non-Substantive Changes, Definitions, Procedures, are those changes: "that do not change the scope, applicability, or intent of any requirement, including correcting the numbering of a requirement, correcting references, changes to document styles and templates, correcting the spelling of a word, adding an obviously missing word, or rephrasing a requirement for improved clarity."

[10] "Non-Substantive Changes do not require a posting/comment/response cycle. Non-Substantive errors discovered prior to the opening of a WECC ballot on either an RRS or a CRT may be corrected by WECC staff." Treatment of Non-Substantive Changes, Procedures, page 12.

[11] Procedures, page 12.

[12] In December 2016, the WSC approved WECC-0112, COM-001-WECC-CRT-2.1, Digital Circuits Synchronization, a WECC Criterion.

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Type	Title	Modified▲
	(1) WECC-0148 VAR-501-WECC-3.1 PSS Info Filing - Attachment B -Clean as Approved by NERC	2023-07-13
	(2) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment A SAR	2023-07-13
	(3) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment E -Project Roadmap	2023-07-13
	(4) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment D -Redline	2023-07-13
	(5) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment C - WSC Approved	2023-07-13
	(6) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment L -Drafting Team Roster	2023-07-13
	(7) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment T -Additional Supporting Documentation	2023-07-13
	(8) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment Q - WSC Roster 12-06-2022	2023-07-13
	(9) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Attachment J - RRS Submittal Request	2023-07-20
	(10) WECC-0148 VAR-501-WECC-4 PSS Info Filing - Cover Letter and Checklist	2023-07-24

A. Introduction

1. **Title:** Power System Stabilizer (PSS)
2. **Number:** VAR-501-WECC-3.1
3. **Purpose:** To ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for WECC power system stabilizers.
4. **Applicability:**
   - **4.1** Generator Operator
   - **4.2** Generator Owner
5. **Facilities:** This standard applies to synchronous generators, connected to the Bulk Electric System, that meet the definition of Commercial Operation.
6. **Effective Date:** The first day of the first quarter following regulatory approval, except for Requirement R3.

   For units placed in first-time service after regulatory approval, Requirement R3 is effective the first day of the first quarter following final regulatory approval.

   For units placed in service prior to final regulatory approval, Requirement R3 is effective the first day of the first quarter that is five years after regulatory approval.

B. Requirements and Measures

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner's written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events: *[Violation Risk Factor: Low] [Time Horizon: Planning Horizon]*

- The effective date of this standard;
- The PSS's Commercial Operation date; or
- Any changes to the PSS operating specifications.

M1. Each Generator Owner will have documented evidence that it provided to its Transmission Operator, within the time allotted as described in the procedures required under Requirement R1, written Operating Procedures or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the AVR.

For auditing purposes, because Requirement R1 conditions are intended to be unchanged unless the Transmission Operator is otherwise notified, the Generator Owner only needs to provide the documentation to the Transmission Operator one time, or whenever the operating specifications change.

For auditing purposes, if a PSS is in service but is not providing an active signal to the AVR as described in Requirement R1, the disabled period does not count against the Requirement R2 mandate to be in service except as otherwise allowed.

R2. Each Generator Operator shall have its PSS in service while synchronized, except during any of the following: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

- Component failure
- Testing of a Bulk Electric System Element affecting or affected by the PSS
- Maintenance
- As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

M2. Each Generator Operator will have documentation of each claimed exception specified in Requirement R2. Documentation may include, but is not limited to:

- A written explanation covering the bulleted exception that describes the circumstances of the exception as allowed in Requirement R2.
- Documented evidence that the Generator Operator and the Transmission Operator agreed the PSS would not be operating during a specified set of circumstances, where the exception is claimed under the last bullet of Requirement R2.

For auditing purposes, the presumption is that the PSS was in service unless otherwise exempted in Requirement R2. Evidence need only be provided to prove the circumstances during which the PSS was not in service for periods in excess of 30 minutes.

R3. Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

3.1. PSS shall be set to provide the measured, simulated, or calculated compensated Vt/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

3.2. PSS output limits shall be set to provide at least ±5% of the synchronous machine’s nominal terminal voltage.

3.3. PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

3.4. PSS washout time constant shall be no greater than 30 seconds.

3.5. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

M3. Each Generator Owner will have documented evidence that its PSS was tuned to meet the specifications of Requirement R3.

If the exception under Requirement R3, Part 3.5, is claimed, the Generator Owner will have documented evidence describing: 1) the conditions that render the PSS incapable of meeting the tuning requirements, and 2) the date the voltage regulator was last replaced or retrofitted.

R4. Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events: *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

- The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
- The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

M4. Each Generator Owner will have evidence that it installed and completed start-up testing of a PSS on its generator within 180 days of either of the conditions described in Requirement R4, and when those conditions occur after the Effective Date of this standard.

For auditing purposes of Requirement R4, bullet one only applies to equipment on its initial (first energization) connection to the BES.

R5. Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3. *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

M5. Each Generator Owner will have evidence that it repaired or replaced its PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications of Requirement R3. Evidence may include, but is not limited to, documentation of the date the PSS became incapable of meeting the Requirement R3 tuning specifications, and the date the PSS was returned to service, demonstrating that the span of time between the two events was less than 24 months.

C. Compliance

1. Compliance Monitoring Process

1.1 Compliance Enforcement Authority

NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2 Compliance Monitoring and Assessment Processes

- Compliance Audits
- Self-Certifications
- Spot Checking
- Compliance Investigations
- Self-Reporting
- Complaints

1.3 Evidence Retention

The following evidence retention periods identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

Each Generator Operator shall keep evidence for all Requirements of the document for a period of three years plus calendar current.

1.4 Additional Compliance Information

None

D. Regional Differences

None

Table of Compliance Elements

R	Time Horizon	VRF	Violation Severity Levels			
			Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	Planning Horizon	Low	NA	NA	NA	The Generator Owner failed to provide its PSS operating specifications to the Transmission Operator as required in Requirement R1.
R2	Operations Assessment	Medium	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 30 minutes but less than 60 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 60 minutes but less than 120 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 120 minutes but less than 180 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 180 minutes.
R3	Operations Assessment	Medium	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, two times or fewer during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, three times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, four times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, five times or more during the audit period.

VAR-501-WECC-3.1 – Power System Stabilizer

R	Time Horizon	VRF	Violation Severity Levels			
			Lower VSL	Moderate VSL	High VSL	Severe VSL
R4	Operational Assessment	Medium	NA	NA	NA	The Generator Owner failed to install on its generator a PSS, as required in Requirement R4.
R5	Operational Assessment	Medium	NA	NA	NA	The Generator Owner failed to repair or replace a non-operational PSS as required in Requirement R5.

Version History

Version	Date	Action	Change Tracking
1	April 16, 2008	Permanent Replacement Standard for VAR-STD-002b-1	
1	October 28, 2008	Adopted by NERC Board of Trustees	
1	April 21, 2011	FERC Order issued approving VAR-501-WECC-1 (FERC approval effective June 27, 2011; Effective Date July 1, 2011)	
2	November 13, 2014	Adopted by NERC Board of Trustees	
2	March 3, 2015	FERC letter order approved VAR-501-WECC-2	
3	February 9, 2017	Adopted by NERC Board of Trustees	
3	April 28, 2017	FERC letter order approved VAR-501-WECC-3	
3.1	August 10, 2017	Adopted by the NERC Board of Trustees	Errata
3.1	September 26, 2017	FERC letter order issued approving VAR-501-WECC-3.1	

Guideline and Technical Basis

PSS systems are used to minimize real power oscillations by rapidly adjusting the field of the generator to dampen the low-frequency oscillations.

It is necessary for large numbers of PSS devices to be in operation in the Western Interconnection to provide the required system damping while still allowing for some of these units to be out of service whenever necessary.

Mandate to Install a PSS

Nothing in this Regional Reliability Standard (RSS) should be construed to require installation of a PSS *solely because* a PSS is not currently installed as of the Effective Date of this RRS. Rather, installation is only mandated on the occurrence of either of the triggering events described in Requirement R4, Bullet 1 or Bullet 2, after the Effective Date of the RRS.

It should be noted that a PSS is neither Transmission nor generation.

Requirement R1

Requirement R1 addresses normal operating conditions.

Requirement R1 recognizes that PSS systems have varying states, such as on, off, active, and non-active. As long as the PSS is operating in accordance with the documentation provided to the Transmission Operator, this is not considered a status change for purposes of this standard.

This Requirement eliminates the requirement to count hours as required in the previous version of this standard while also allowing the Generator Owner to create a unit-specific operating plan.

The intent of Requirement R1 is to provide the Transmission Operator, the PSS operating zone in which the PSS is “active” providing damping to the power system. Some PSS may be programmed to become “active” at a specified megawatt loading level and above while others may be programmed to be “active” in a particular band of megawatt loading levels and are “non-active” only when passing through the “rough zone” or some other band. A “rough zone” is a megawatt loading band in which the generator-turbine system could contribute to system instability.

Requirement R2

This Requirement only applies when the PSS is out of service for a period greater than 30 minutes.

Unlike Requirement R1, Requirement R2 addresses exceptions to normal operation.

The intent of Requirement R2 is to remove the previous requirement to log hours for PSS in service. In this standard’s previous version, the logged hours were totaled quarterly to meet the

98% in-service requirement. Instead of documenting the number of hours excluded, this Requirement simplifies the process by allowing the Generator Operator to communicate to the Transmission Operator the circumstances that render the PSS unavailable to the Transmission Operator (such as component failure, maintenance, and testing).

Requirement R3

Nothing in this RSS should be construed to mandate the design criteria for the *equipment* used to produce the tuning output of the PSS. Rather, Requirement R3 is intended to address the design criteria for the *tuning output* of the PSS.

Unlike the language in Requirement R5 that looks *backward* to address units that were once operating but are no longer capable of operating, Requirement R3 looks *forward*, requiring that units be tuned to the specified parameters.

The PSS transfer function should compensate the phase characteristics of the generator, exciter, and power (GEP) system transfer function so the compensated transfer function ((PSS(s) * GEP(s)) has a phase characteristic of ± 30 degrees in the frequency range.

The GEP(s) transfer function is a theoretical transfer function and its phase characteristic cannot be directly measured during field tests (only via simulation). Thus, the Requirement recognizes the practical approach of measuring the frequency response between voltage reference set point and terminal voltage (Et/Vref) and using the phase characteristic of such frequency response as being the phase characteristic of GEP(s). The phase characteristic of Et/Vref is a better approximation to the phase characteristic of GEP(s) when the frequency response Et/Vref is obtained with the generator synchronized to the grid at its minimum stable power output.

In an effort to allow for reasonable wash-out time constants, the Requirement specifies 0.2 Hz as the applicable threshold. The 0.2 Hz threshold more closely aligns with the observed oscillation frequencies.

A properly tuned PSS should provide positive damping to the local mode of oscillation, which typically has a frequency higher than 1.0 Hz.

This Requirement modifies the requirement associated with the adjustment of the PSS gain. The standard no longer defines the PSS gain in terms of gain margin but instead requires the final PSS gain to be between 1/3 (10 dB) and 1/2 (6 dB) of the maximum practical gain that could be achieved during PSS commissioning. The maximum practical gain might be associated with the excessive noise or raised higher-frequency oscillations in the closed loop response (exciter mode) or any other form if there is inadequate closed-loop performance, as determined during PSS commissioning. It is now part of Measure M3 to show the field test results that led to the determination of the maximum practical gain.

Requirement R4

Requirement R4 requires a Generator Owner to install a PSS on new applicable units or when excitation systems are replaced or retrofitted on existing applicable units. This Requirement applies to new excitation systems and not to existing systems that do not have PSS. The Requirement also allows a reasonable amount of time for the commissioning of new PSS.

Requirement R5

Unlike the language in Requirement R3 that looks *forward* to ensure that a unit is tuned, Requirement R5 looks *backward.* Specifically, the language in Requirement R5, "becoming incapable," indicates the unit was previously capable of meeting the tuning requirements in Requirement R3, but is no longer capable. Restated, Requirement R5 addresses units that were previously working but are now no longer working.

The intent of Requirement R5 is to remove the "tiered" approach to PSS repair/replacement following a failure. A simple, streamlined approach to allow the Generator Owner sufficient time to repair or replace a broken PSS has been written. Consideration has been given for the need to procure parts or new equipment, schedule an equipment/unit outage, and install and test the repaired or replaced PSS. It is recognized that in some instances, it may require (1) replacement of an AVR, and (2) the existence of a PSS, or both the AVR and the PSS may need to be replaced to achieve a functioning system.

The 24-month time frame is sufficient to return a functional, operating PSS to service.

*** FOR INFORMATIONAL PURPOSES ONLY ***

Enforcement Dates: Standard VAR-501-WECC-3 — Power System Stabilizer

United States

Standard	Requirement	Enforcement Date	Inactive Date
VAR-501-WECC-3	TBD	TBD	

Attachment A
Standard Authorization Request
WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Information Only Filing

WECC
Electric Reliability and Security for the West

Overview

This Standard Authorization Request (SAR) was received March 7, 2022, and deemed complete the same day. The WECC Standards Committee (WSC) vetted this SAR on March 16, 2022.

This SAR can be reviewed on the WECC-0148 project page at the Standard Authorization Request accordion. If you have questions regarding this SAR, please contact W. Shannon Black at (503) 307-5782.

Introduction

This is a request for five-year review of WECC Regional Reliability Standard VAR-501-WECC-3.1 Power System Stabilizer.[1]

Requester Information

Primary contact

- First name: W. Shannon
- Last name: Black
- Email: sblack@wecc.org
- Phone: (503) 307-5782
- Organization name: Western Electricity Coordinating Council (WECC)

Alternate

- First name: Donovan
- Last name: Crane
- Email: dcrane@wecc.org
- Phone: (801) 883-6843

[1] Per the WECC Reliability Standards Procedures, Maintenance of RRSs and CRTs: 'The WSC shall ensure that each…RRS is reviewed at least once every five years from the effective date of the most recent version of the document under review. If the review identifies needed changes, the WSC shall cause a remedial SAR to be filed. If the review does not identify needed changes, no further action is required."

Type of Request

This is a request for five-year review of a WECC Regional Reliability Standard.

Create, Modify, Retire or Review a Document

Requested Action (Select one)

- This is a request for a five-year review of a WECC Regional Reliability Standard (RRS).

Document Type (Select one)

- WECC Regional Reliability Standard

Issue

This project is assigned WECC Tracking Number WECC-0148.

This a request for a five-year review mandated per the WECC Reliability Standards Development Procedures (Procedures).

Proposed Remedy

This request will review and update the entire document, as needed. No specific concerns have been identified. The drafting team is authorized to recommend "no change" after reviewing the document.

Applicable Entities

Each function will be reviewed if affected. A dropdown will be provided. Check all applicable blocks.

4. Functional Entities:

4.1. Generator Operator

4.2. Generator Owner

Detailed Description

This request will review and update the entire document, as needed. No specific concerns have been identified.

Affected Reliability Principles

- **Reliability Principle 1** — Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.

Document Information

NA

Reference Uploads

Provide Additional Comments (if needed).

NA

Electric Reliability and Security for the West

Attachment E
Project Roadmap
WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Informational Only Filing

Project Roadmap

Actions		Completed
1.	Standard Authorization Request (SAR) Filed	March 9, 2022
2.	WECC Standards Committee (WSC) approved the SAR	March 16, 2022
3.	Drafting Team (DT) Solicitation	March 30, 2022
4.	DT Meeting	June 21, 2022
5.	DT Meeting	June 28, 2022
6.	Notice to Standard Email List for Proposed Non-Substantive Changes – No Substantive Changes Proposed	July 11, 2022
7.	Posting 1 for Information Only – Comment/Response not Required	July 16, 2022
8.	Posting 1 Letter to WSC for Proposed Non-Substantive Changes	July 16, 2022
9.	WSC Approved Non-Substantive Changes	December 6, 2022
10.	WECC Board of Directors—Approved	Not Required
11.	Informational Filing pending at NERC	TBD
12.	NERC Board of Trustees Approves	TBD

A. ~~A.~~ Introduction

1. **Title:** Power System Stabilizer (PSS)
2. **Number:** VAR-501-WECC-~~3.1~~4
3. **Purpose:** To ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for WECC power system stabilizers.
4. **Applicability:**
   - **4.1** Generator Operator
   - **4.2** Generator Owner
5. **Facilities:** This standard applies to synchronous generators, connected to the Bulk Electric System, ~~that meet~~meeting the definition of Commercial Operation.
6. **Effective Date:** The first day of the first quarter following regulatory approval~~, except for Requirement R3~~.

   ~~For units placed in first-time service after regulatory approval, Requirement R3 is effective the first day of the first quarter following final regulatory approval.~~

   ~~For units placed in service prior to final regulatory approval, Requirement R3 is effective the first day of the first quarter that is five years after regulatory approval.~~

~~B.~~

B. Requirements and Measures

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner's written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events: *[Violation Risk Factor: Low] [Time Horizon: Planning Horizon]*

- The effective date of this standard;
- The PSS's Commercial Operation date; or
- Any changes to the PSS operating specifications.

M1. Each Generator Owner will have documented evidence that it provided to its Transmission Operator, within the time allotted as described in the procedures required under Requirement R1, written Operating Procedures or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the AVR.

For auditing purposes, because Requirement R1 conditions are intended to be unchanged unless the Transmission Operator is otherwise notified, the Generator Owner only needs to provide the documentation to the Transmission Operator one time, or whenever the operating specifications change.

For auditing purposes, if a PSS is in service but is not providing an active signal to the AVR as described in Requirement R1, the disabled period does not count against the Requirement R2 mandate to be in service except as otherwise allowed.

R2. Each Generator Operator shall have its PSS in service while synchronized, except during any of the following: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

- Component failure
- Testing of a Bulk Electric System Element affecting or affected by the PSS
- Maintenance
- As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

M2. Each Generator Operator will have documentation of each claimed exception specified in Requirement R2. Documentation may include, but is not limited to:

- A written explanation covering the bulleted exception that describes the circumstances of the exception as allowed in Requirement R2.
- Documented evidence that the Generator Operator and the Transmission Operator agreed the PSS would not be operating during a specified set of circumstances, where the exception is claimed under the last bullet of Requirement R2.

For auditing purposes, the presumption is that the PSS was in service unless otherwise exempted in Requirement R2. Evidence need only be provided to prove the circumstances during which the PSS was not in service for periods in excess of 30 minutes.

R3. Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

3.1. PSS shall be set to provide the measured, simulated, or calculated compensated Vt/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

3.2. PSS output limits shall be set to provide at least ±5% of the synchronous machine's nominal terminal voltage.

3.3. PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

3.4. PSS washout time constant shall be no greater than 30 seconds.

3.5. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

M3. Each Generator Owner will have documented evidence that its PSS was tuned to meet the specifications of Requirement R3.

If the exception under Requirement R3, Part 3.5, is claimed, the Generator Owner will have documented evidence describing: 1) the conditions that render the PSS incapable of meeting the tuning requirements, and 2) the date the voltage regulator was last replaced or retrofitted.

R4. Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events: *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

- The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
- The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

M4. Each Generator Owner will have evidence that it installed and completed start-up testing of a PSS on its generator within 180 days of either of the conditions described in Requirement R4, and when those conditions occur after the Effective Date of this standard.

~~For auditing purposes~~ The first bullet of Requirement R4~~, bullet one~~ only applies to equipment on its initial (first energization) connection to the BES.

R5. Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3. *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

M5. Each Generator Owner will have evidence that it repaired or replaced its PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications of Requirement R3. Evidence may include, but is not limited to, documentation of the date the PSS became incapable of meeting the Requirement R3 tuning specifications, and the date the PSS was returned to service, demonstrating that the span of time between the two events was less than 24 months.

~~C. Compliance~~

C. Compliance

1. Compliance Monitoring Process

1.1 Compliance Enforcement Authority

: "Compliance Enforcement Authority" means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2 ~~Compliance Monitoring and Assessment Processes~~

- ~~Compliance Audits~~
- ~~Self-Certifications~~
- ~~Spot Checking~~
- ~~Compliance Investigations~~
- ~~Self-Reporting~~
- ~~Complaints~~

~~1.3~~ . Evidence Retention

: The following evidence retention ~~periods~~period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full-time period since the last audit.

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- Each Generator Operator shall keep evidence for all Requirements of the document for a period of three years plus calendar current.

~~1.4 Additional Compliance Information~~

~~None~~

~~D. Regional Differences~~

~~None~~

~~Table of Compliance Elements~~

1.3 Compliance Monitoring and Enforcement Program: As defined in the NERC Rules of Procedure, "Compliance Monitoring and Enforcement Program" refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

R	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	NA	NA	NA	The Generator Owner failed to provide its PSS operating specifications to the Transmission Operator as required in Requirement R1.
R2	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 30 minutes but less than 60 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 60 minutes but less than 120 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 120 minutes but less than 180 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 180 minutes.
R3	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, two times or fewer during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, three times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, four times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, five times or more during the audit period.
R4	NA	NA	NA	The Generator Owner failed to install on its generator a PSS, as required in Requirement R4.
R5	NA	NA	NA	The Generator Owner failed to repair or replace a non-operational PSS as required in Requirement R5.

VAR-501-WECC-~~43.1~~ – Power System Stabilizer

VAR-501-WECC-~~3.1~~4 – Power System Stabilizer

D. Regional Variances

None.

E. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking
1	April 16, 2008	Permanent Replacement Standard for VAR-STD-002b-1	
1	October 28, 2008	Adopted by NERC Board of Trustees	
1	April 21, 2011	FERC Order issued approving VAR-501-WECC-1 (FERC approval effective June 27, 2011; Effective Date July 1, 2011)	
2	November 13, 2014	Adopted by NERC Board of Trustees	
2	March 3, 2015	FERC letter order approved VAR-501-WECC-2	
3	February 9, 2017	Adopted by NERC Board of Trustees	
3	April 28, 2017	FERC letter order approved VAR-501-WECC-3	
3.1	August 10, 2017	Adopted by the NERC Board of Trustees	Errata
3.1	~~TBD~~September 26, 2017	~~TBD~~FERC letter order issued approving VAR-501-WECC-3.1	
4	December 6, 2022	WECC Standards Committee accepted a “no change “ recommendation followed by	Non-substantive changes were approved by the

		an information-only filing to NERC.	WECC Standards Committee as allowed in the WECC Reliability Standards Development Procedures. An information-only filing provided to NERC reflects the following: 1) updates to the template and syntax, 2) removal of stale-dated language from the Effective Date, 3) deletion of "For auditing purposes of…" from M4, 4) in the Guidance section, "dampen" was replaced with "damp", and syntax was addressed deleting "still", "of those", "of the", and "to ensure" was replaced with "ensuring", and "wash out" was replaced with "washout."

Guideline and Technical Basis

PSS systems are used to minimize real power oscillations by rapidly adjusting the field of the generator to ~~dampen~~damp the low-frequency oscillations.

It is necessary for large numbers of PSS devices to be in operation in the Western Interconnection to provide the required system damping while ~~still~~ allowing for some ~~of these~~ units to be out of service whenever necessary.

Mandate to Install a PSS

Nothing in this Regional Reliability Standard (RSS) should be construed to require installation of a PSS *solely because* a PSS is not currently installed as of the Effective Date of this RRS. Rather, installation is only mandated on the occurrence of either ~~of the~~ triggering ~~events~~event described in Requirement R4, Bullet 1 or Bullet 2, after the Effective Date of the RRS.

It should be noted that a PSS is neither Transmission nor generation.

Requirement R1

Requirement R1 addresses normal operating conditions.

Requirement R1 recognizes that PSS systems have varying states, such as on, off, active, and non-active. As long as the PSS is operating in accordance with the documentation provided to the Transmission Operator, this is not considered a status change for purposes of this ~~standard~~Standard.

This Requirement eliminates the requirement to count hours as required in the previous version of this ~~standard~~Standard while also allowing the Generator Owner to create a unit-specific operating plan.

The intent of Requirement R1 is to provide the Transmission Operator, the PSS operating zone in which the PSS is “active” providing damping to the power system. Some PSS may be programmed to become “active” at a specified megawatt loading level and above while others may be programmed to be “active” in a particular band of megawatt loading levels and are “non-active” only when passing through the “rough zone” or some other band. A “rough zone” is a megawatt loading band in which the generator-turbine system could contribute to system instability.

Requirement R2

This Requirement only applies when the PSS is out of service for a period greater than 30 minutes.

Unlike Requirement R1, Requirement R2 addresses exceptions to normal operation.

The intent of Requirement R2 is to remove the previous requirement to log hours for PSS in service. In this ~~standard's~~Standard's previous version, the logged hours were totaled quarterly to meet the 98% in-service requirement. Instead of documenting the number of hours excluded, this Requirement simplifies the process by allowing the Generator Operator to communicate to the Transmission Operator the circumstances that render the PSS unavailable to the Transmission Operator (such as component failure, maintenance, and testing).

Requirement R3

Nothing in this RSS should be construed to mandate the design criteria for the *equipment* used to produce the tuning output of the PSS. Rather, Requirement R3 is intended to address the design criteria for the *tuning output* of the PSS.

Unlike the language in Requirement R5 that looks *backward* to address units that were once operating but are no longer capable of operating, Requirement R3 looks *forward*, requiring that units be tuned to the specified parameters.

The PSS transfer function should compensate the phase characteristics of the generator, exciter, and power (GEP) system transfer function so the compensated transfer function ((PSS(s) * GEP(s)) has a phase characteristic of ± 30 degrees in the frequency range.

The GEP(s) transfer function is a theoretical transfer function, and its phase characteristic cannot be directly measured during field tests (only via simulation). Thus, the Requirement recognizes the practical approach of measuring the frequency response between voltage reference set point and terminal voltage (Et/Vref) and using the phase characteristic of such frequency response as being the phase characteristic of GEP(s). The phase characteristic of Et/Vref is a better approximation to the phase characteristic of GEP(s) when the frequency response Et/Vref is obtained with the generator synchronized to the grid at its minimum stable power output.

In an effort to allow for reasonable ~~wash-out~~washout time constants, the Requirement specifies 0.2 Hz as the applicable threshold. The 0.2 Hz threshold more closely aligns with the observed oscillation frequencies.

A properly tuned PSS should provide positive damping to the local mode of oscillation, which typically has a frequency higher than 1.0 Hz.

This Requirement modifies the requirement associated with the adjustment of the PSS gain. The standard no longer defines the PSS gain in terms of gain margin but instead requires the final PSS gain to be between 1/3 (10 dB) and 1/2 (6 dB) of the maximum practical gain that could be achieved during PSS commissioning. The maximum practical gain might be associated with the excessive noise or raised higher-frequency oscillations in the closed loop response (exciter mode) or any other form if there is inadequate closed-loop performance, as determined during PSS commissioning. It is now part of Measure M3 to show the field test results that led to the determination of the maximum practical gain.

Requirement R4

Requirement R4 requires a Generator Owner to install a PSS on new applicable units or when excitation systems are replaced or retrofitted on existing applicable units. This Requirement applies to new excitation systems and not to existing systems that do not have PSS. The Requirement also allows a reasonable amount of time for the commissioning of new PSS.

Requirement R5

Unlike the language in Requirement R3 that looks forward ~~to ensure~~ensuring that a unit is tuned, Requirement R5 looks *backward.* Specifically, the language in Requirement R5, "becoming incapable," indicates the unit was previously capable of meeting the tuning requirements in Requirement R3, but is no longer capable. Restated, Requirement R5 addresses units that were previously working but are now no longer working.

The intent of Requirement R5 is to remove the "tiered" approach to PSS repair/replacement following a failure. A simple, streamlined approach to allow the Generator Owner sufficient time to repair or replace a broken PSS has been written. Consideration has been given for the need to procure parts or new equipment, schedule an equipment/unit outage, and install and test the repaired or replaced PSS. It is recognized that in some instances, it may require (1) replacement of an AVR, and (2) the existence of a PSS, or both the AVR and the PSS may need to be replaced to achieve a functioning system.

The 24-month time frame is sufficient to return a functional, operating PSS to service.

*** FOR INFORMATIONAL PURPOSES ONLY ***

Enforcement Dates: Standard VAR-501-WECC-3 — Power System Stabilizer

United States

Standard	Requirement	Enforcement Date	Inactive Date
VAR-501-WECC-3	TBD	TBD	

A. Introduction

1. **Title:** Power System Stabilizer (PSS)
2. **Number:** VAR-501-WECC-4
3. **Purpose:** To ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for WECC power system stabilizers.
4. **Applicability:**
   - **4.1** Generator Operator
   - **4.2** Generator Owner
5. **Facilities:** This standard applies to synchronous generators, connected to the Bulk Electric System, meeting the definition of Commercial Operation.
6. **Effective Date:** The first day of the first quarter following regulatory approval.

B. Requirements and Measures

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner's written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events: *[Violation Risk Factor: Low] [Time Horizon: Planning Horizon]*

- The effective date of this standard;
- The PSS's Commercial Operation date; or
- Any changes to the PSS operating specifications.

M1. Each Generator Owner will have documented evidence that it provided to its Transmission Operator, within the time allotted as described in the procedures required under Requirement R1, written Operating Procedures or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the AVR.

For auditing purposes, because Requirement R1 conditions are intended to be unchanged unless the Transmission Operator is otherwise notified, the Generator Owner only needs to provide the documentation to the Transmission Operator one time, or whenever the operating specifications change.
For auditing purposes, if a PSS is in service but is not providing an active signal to the AVR as described in Requirement R1, the disabled period does not count against the Requirement R2 mandate to be in service except as otherwise allowed.

R2. Each Generator Operator shall have its PSS in service while synchronized, except during any of the following: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

- Component failure

- Testing of a Bulk Electric System Element affecting or affected by the PSS
- Maintenance
- As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

M2. Each Generator Operator will have documentation of each claimed exception specified in Requirement R2. Documentation may include, but is not limited to:

- A written explanation covering the bulleted exception that describes the circumstances of the exception as allowed in Requirement R2.
- Documented evidence that the Generator Operator and the Transmission Operator agreed the PSS would not be operating during a specified set of circumstances, where the exception is claimed under the last bullet of Requirement R2.

For auditing purposes, the presumption is that the PSS was in service unless otherwise exempted in Requirement R2. Evidence need only be provided to prove the circumstances during which the PSS was not in service for periods in excess of 30 minutes.

R3. Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

3.1. PSS shall be set to provide the measured, simulated, or calculated compensated Vt/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

3.2. PSS output limits shall be set to provide at least ±5% of the synchronous machine's nominal terminal voltage.

3.3. PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

3.4. PSS washout time constant shall be no greater than 30 seconds.

3.5. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

M3. Each Generator Owner will have documented evidence that its PSS was tuned to meet the specifications of Requirement R3.

If the exception under Requirement R3, Part 3.5, is claimed, the Generator Owner will have documented evidence describing: 1) the conditions that render the PSS incapable of meeting the tuning requirements, and 2) the date the voltage regulator was last replaced or retrofitted.

R4. Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events: *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

- The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
- The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

M4. Each Generator Owner will have evidence that it installed and completed start-up testing of a PSS on its generator within 180 days of either of the conditions described in Requirement R4, and when those conditions occur after the Effective Date of this standard.

The first bullet of Requirement R4 only applies to equipment on its initial (first energization) connection to the BES.

R5. Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3. *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

M5. Each Generator Owner will have evidence that it repaired or replaced its PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications of Requirement R3. Evidence may include, but is not limited to, documentation of the date the PSS became incapable of meeting the Requirement R3 tuning specifications, and the date the PSS was returned to service, demonstrating that the span of time between the two events was less than 24 months.

C. Compliance

1. **Compliance Monitoring Process**

1.1 Compliance Enforcement Authority: "Compliance Enforcement Authority" means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2. Evidence Retention: The following evidence retention period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full-time period since the last audit.

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- Each Generator Operator shall keep evidence for all Requirements of the document for a period of three years plus calendar current.

1.3 Compliance Monitoring and Enforcement Program: As defined in the NERC Rules of Procedure, "Compliance Monitoring and Enforcement Program" refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

VAR-501-WECC-4 – Power System Stabilizer

R	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	NA	NA	NA	The Generator Owner failed to provide its PSS operating specifications to the Transmission Operator as required in Requirement R1.
R2	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 30 minutes but less than 60 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 60 minutes but less than 120 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 120 minutes but less than 180 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 180 minutes.
R3	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, two times or fewer during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, three times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, four times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, five times or more during the audit period.
R4	NA	NA	NA	The Generator Owner failed to install on its generator a PSS, as required in Requirement R4.
R5	NA	NA	NA	The Generator Owner failed to repair or replace a non-operational PSS as required in Requirement R5.

D. Regional Variances

None.

E. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking
1	April 16, 2008	Permanent Replacement Standard for VAR-STD-002b-1	
1	October 28, 2008	Adopted by NERC Board of Trustees	
1	April 21, 2011	FERC Order issued approving VAR-501-WECC-1 (FERC approval effective June 27, 2011; Effective Date July 1, 2011)	
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2	March 3, 2015	FERC letter order approved VAR-501-WECC-2	
3	February 9, 2017	Adopted by NERC Board of Trustees	
3	April 28, 2017	FERC letter order approved VAR-501-WECC-3	
3.1	August 10, 2017	Adopted by the NERC Board of Trustees	Errata
3.1	September 26, 2017	FERC letter order issued approving VAR-501-WECC-3.1	
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		an information-only filing to NERC.	WECC Standards Committee as allowed in the WECC Reliability Standards Development Procedures. An information-only filing provided to NERC reflects the following: 1) updates to the template and syntax, 2) removal of stale-dated language from the Effective Date, 3) deletion of "For auditing purposes of…" from M4, 4) in the Guidance section, "dampen" was replaced with "damp", and syntax was addressed deleting "still", "of those", "of the", and "to ensure" was replaced with "ensuring", and "wash out" was replaced with "washout."

Guideline and Technical Basis

PSS systems are used to minimize real power oscillations by rapidly adjusting the field of the generator to damp the low-frequency oscillations.

It is necessary for large numbers of PSS devices to be in operation in the Western Interconnection to provide the required system damping while allowing for some units to be out of service whenever necessary.

Mandate to Install a PSS

Nothing in this Regional Reliability Standard (RSS) should be construed to require installation of a PSS *solely because* a PSS is not currently installed as of the Effective Date of this RRS. Rather, installation is only mandated on the occurrence of either triggering event described in Requirement R4, Bullet 1 or Bullet 2, after the Effective Date of the RRS.

It should be noted that a PSS is neither Transmission nor generation.

Requirement R1

Requirement R1 addresses normal operating conditions.

Requirement R1 recognizes that PSS systems have varying states, such as on, off, active, and non-active. As long as the PSS is operating in accordance with the documentation provided to the Transmission Operator, this is not considered a status change for purposes of this Standard.

This Requirement eliminates the requirement to count hours as required in the previous version of this Standard while also allowing the Generator Owner to create a unit-specific operating plan.

The intent of Requirement R1 is to provide the Transmission Operator, the PSS operating zone in which the PSS is “active” providing damping to the power system. Some PSS may be programmed to become “active” at a specified megawatt loading level and above while others may be programmed to be “active” in a particular band of megawatt loading levels and are “non-active” only when passing through the “rough zone” or some other band. A “rough zone” is a megawatt loading band in which the generator-turbine system could contribute to system instability.

Requirement R2

This Requirement only applies when the PSS is out of service for a period greater than 30 minutes.

Unlike Requirement R1, Requirement R2 addresses exceptions to normal operation.

The intent of Requirement R2 is to remove the previous requirement to log hours for PSS in service. In this Standard's previous version, the logged hours were totaled quarterly to meet the 98% in-service requirement. Instead of documenting the number of hours excluded, this Requirement simplifies the process by allowing the Generator Operator to communicate to the Transmission Operator the circumstances that render the PSS unavailable to the Transmission Operator (such as component failure, maintenance, and testing).

Requirement R3

Nothing in this RSS should be construed to mandate the design criteria for the *equipment* used to produce the tuning output of the PSS. Rather, Requirement R3 is intended to address the design criteria for the *tuning output* of the PSS.

Unlike the language in Requirement R5 that looks *backward* to address units that were once operating but are no longer capable of operating, Requirement R3 looks *forward*, requiring that units be tuned to the specified parameters.

The PSS transfer function should compensate the phase characteristics of the generator, exciter, and power (GEP) system transfer function so the compensated transfer function ((PSS(s) * GEP(s)) has a phase characteristic of ± 30 degrees in the frequency range.

The GEP(s) transfer function is a theoretical transfer function, and its phase characteristic cannot be directly measured during field tests (only via simulation). Thus, the Requirement recognizes the practical approach of measuring the frequency response between voltage reference set point and terminal voltage (Et/Vref) and using the phase characteristic of such frequency response as being the phase characteristic of GEP(s). The phase characteristic of Et/Vref is a better approximation to the phase characteristic of GEP(s) when the frequency response Et/Vref is obtained with the generator synchronized to the grid at its minimum stable power output.

In an effort to allow for reasonable washout time constants, the Requirement specifies 0.2 Hz as the applicable threshold. The 0.2 Hz threshold more closely aligns with the observed oscillation frequencies.

A properly tuned PSS should provide positive damping to the local mode of oscillation, which typically has a frequency higher than 1.0 Hz.

This Requirement modifies the requirement associated with the adjustment of the PSS gain. The standard no longer defines the PSS gain in terms of gain margin but instead requires the final PSS gain to be between 1/3 (10 dB) and 1/2 (6 dB) of the maximum practical gain that could be achieved during PSS commissioning. The maximum practical gain might be associated with the excessive noise or raised higher-frequency oscillations in the closed loop response (exciter mode) or any other form if there is inadequate closed-loop performance, as determined during PSS commissioning. It is now part of Measure M3 to show the field test results that led to the determination of the maximum practical gain.

Requirement R4

Requirement R4 requires a Generator Owner to install a PSS on new applicable units or when excitation systems are replaced or retrofitted on existing applicable units. This Requirement applies to new excitation systems and not to existing systems that do not have PSS. The Requirement also allows a reasonable amount of time for the commissioning of new PSS.

Requirement R5

Unlike the language in Requirement R3 that looks forward ensuring that a unit is tuned, Requirement R5 looks *backward.* Specifically, the language in Requirement R5, "becoming incapable," indicates the unit was previously capable of meeting the tuning requirements in Requirement R3, but is no longer capable. Restated, Requirement R5 addresses units that were previously working but are now no longer working.

The intent of Requirement R5 is to remove the "tiered" approach to PSS repair/replacement following a failure. A simple, streamlined approach to allow the Generator Owner sufficient time to repair or replace a broken PSS has been written. Consideration has been given for the need to procure parts or new equipment, schedule an equipment/unit outage, and install and test the repaired or replaced PSS. It is recognized that in some instances, it may require (1) replacement of an AVR, and (2) the existence of a PSS, or both the AVR and the PSS may need to be replaced to achieve a functioning system.

The 24-month time frame is sufficient to return a functional, operating PSS to service.

*** FOR INFORMATIONAL PURPOSES ONLY ***

Enforcement Dates: Standard VAR-501-WECC-3 — Power System Stabilizer

United States

Standard	Requirement	Enforcement Date	Inactive Date
VAR-501-WECC-3	TBD	TBD	

WECC
Electric Reliability and Security for the West

Attachment L
Drafting Team Roster
WECC-0148 VAR-501-WECC-4
Five-year Review

Drafting Team Roster

Below please find a brief biography for each member of the WECC-0148 VAR-501-WECC-4, Power System Stabilizer, Five-year Review Drafting Team.

Name	Qualifications
Greg Anderson, Southern California Edison	Mr. Anderson is the subject matter expert for generation and excitation systems for the Southern California Edison Company. He has over 33 years of experience in the utility industry, with responsibilities for coordinating WECC testing of generation assets. He has been a WECC participant since 1997 and a member of the Control Work Group since 2003.
Joel Anthes, **Pacific Gas and Electric**	Mr. Anthes is a Senior Electrical Engineer with Pacific Gas and Electric Company's Power Generation organization. Mr. Anthes has more than 16 years of experience in the electrical and power generation industries. Over the past nine years, he has led the development of multiple technical programs related to electrical generation and excitation system protection, control system tuning and modeling, and generator electrical ratings. Mr. Anthes is a registered professional engineer in the state of California and plays an active role in the development of industry best practices and regulatory standards for NERC. Recent experience includes: • Member of the drafting team for NERC Project 2020-02 Transmission-connected Dynamic Reactive Resources. • Power system stabilizer (PSS) tuning and validation. • Development of tools for numerical calculation of generator field current. Performs generator heat runs to prove safe increase of electrical rating beyond existing nameplate. • Development of program for dynamic modeling of generators, voltage regulators, governors, and power system stabilizers. Development of associated programs for NERC regulatory compliance.

	• Developed custom tools for determining generator electrical characteristics, impedances, time constants, phase response, and capability curves for synchronous generators. Oversees training of other engineers in the proper implementation of these tools. • Commissions and tests excitation systems, voltage regulators, and power system stabilizers. • Performs Root Cause Analyses using industry standard methodologies for operational safety incidents and major equipment failures. • Developed recommendations for corrective actions to effectively prevent the recurrence of equipment failure and human performance errors.
Shane Kronebusch, L&S Electric, Inc.	Mr. Kronebusch is the Lead Electrical Engineer and subject matter expert for generation and excitation systems for L&S Electric, Inc. He has over 31 years of experience in the utility industry, including: • Developing the LS-AES excitation system. • Designing, installing, and commissioning exciters and governors across a wide range of units. • Performing of testing and model validation reports for NERC MOD-025, -026, & -027. • Coordinating and preforming WECC testing of generation assets as an employee of BC Hydro Generation Engineering and Maintenance Services before joining L&S Electric, Inc. in 2010. • Participating as a member of the WECC Control Work Group since 2006 and drafting team member of WECC-0099/0107.
Matthew McDonald, Arizona Public Service	Mr. McDonald is a Senior Electrical Engineer in the Technical Projects Engineering department with 15 years of experience in the utility industry. He holds a Bachelor of Science from Pennsylvania State University as well as a professional engineering license. His expertise and experience include the following: • 13 years' hands-on experience installing, troubleshooting, commissioning, and tuning excitation systems and generator protection relays. • Five years of experience performing generator, excitation, and PSS model validation via simulation and live testing.

Draft

	• Excitation system subject matter expert for Arizona Public Service for the past four years. • NERC/WECC compliance lead for VAR-501-3, PRC-19-2, PRC-002, PRC-27-1 and PRC-25-2. • Other responsibilities and roles have included generator excitation instructor, improvisational field testing, synchro-phasor and digital fault recorder commissioning.
Kimberly Turco, Constellation Energy	Ms. Turco has worked for Constellation Energy Generation (CEG) for 10 years, with the last two years in NERC compliance and supporting ISO compliance. CEG is actively involved in NERC's Standards Under Development process and would like to take this opportunity for direct involvement in the review of VAR-501-WECC. Kim comes with a wide background in energy and compliance that would be an asset in the standards review process. Kim's background: • Worked as a subject matter expert in AESO in day-ahead bidding and electronic transaction systems (ETS). • Drafted CEG's Grande Prairie Generation generating station's Transmission Must Run Contract. • A barred attorney. • NERC compliance SME and compliance contact for CEG's WECC and Alberta generating facilities. • Lead on historical submittal of Automatic Voltage Regulator and Power System Stabilizer Outage reporting. Kim has the full support of CEG's NERC Compliance Group and will be able to dedicate the time and resources demanded of a member of the Standards Drafting Team.

Draft 1

Electric Reliability and Security for the West

Attachment T
Additional Supporting Documentation
WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Non-Substantive Change / Information Only Filing

Letter to WSC Requesting
Information-Only Filing

Preamble

On July 16 2022, the following letter was posted on the WECC-0148 VAR-501-WECC-4, Power System Stabilizer home page at the Posting 1 accordion. It was also provided to the WECC Standards Committee (WSC) for its consideration during the December 6, 2022, WSC meeting.

Recommendation

The WECC-0148 VAR-501-WECC-4 (VAR), Power System Stabilizer, Drafting Team (DT) is recommending that no changes be made to the Standard. If the WECC Standards Committee (WSC) accepts that recommendation, an information-only filing at NERC is recommended.

Overview

On May 2, 2016, a WECC Ballot Pool approved VAR-501-WECC-3, Power System Stabilizer, after eight postings for comment. On April 28, 2017, FERC approved the Standard via letter order followed by Version 3.1 errata on September 26, 2017. Between 2016 and 2022, no known concerns were raised regarding the text the of the Standard.

On June 21, 2022, the DT began a five-year review of the Standard as required by the Procedures. On July 1, 2022, after reviewing the entire document during multiple public meetings, the DT unanimously agreed that no Substantive Changes[1] should be made to the Standard. A straw poll from non-DT members in attendance concurred with the DT's conclusion.

Non-Substantive Changes

The DT is recommending the following Non-Substantive Changes:

- Updates to the document template, numbering, and boilerplate sections as provided by NERC
- Removal of stale-dated verbiage included in the Effective Date

[1] Definitions, Procedures.

- Removal of the redundant phrase, "[F]or auditing purposes…." From Measure M4
- Updates to syntax
- Correction of "[s]tandard" to "[S]tandard"
- Correction of "dampen" to "damp" in the Rationale and Guidance section

Standard of Review

Per the WECC Standards Committee (WSC) Charter, the WSC administers the Procedures. Per the Procedures, each of the above proposed changes is a Non-Substantive Change[2], and does not require a posting for comment.[3] Although the Procedures require a ballot to make Non-Substantive Changes *after a posting for comment*[4], the Procedures are silent where a DT recommends only Non-Substantive Changes, which require neither a posting nor a ballot.

For guidance, the Procedures provide that if the WSC identifies a Non-Substantive Change after comments are received, and/or after a ballot has opened, the "correction shall be filed for approval with NERC", as appropriate.[5] Further, implementing "updated document styles, templates, or standardized language…is explicitly within the purview of staff and does not require further approval."[6] Finally, as a matter of precedence, the WSC has previously accepted a "no change" recommendation regarding a WECC Criterion that had neither been posted nor balloted.[7]

In light of the above, the DT requests the WSC exercise its discretion by approving the proposed Non-Substantive Changes: 1) without a posting, 2) without a ballot, 3) followed by an information-only filing at NERC.

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[2] Non-Substantive Changes, Definitions, Procedures, are those changes: "that do not change the scope, applicability, or intent of any requirement, including correcting the numbering of a requirement, correcting references, changes to document styles and templates, correcting the spelling of a word, adding an obviously missing word, or rephrasing a requirement for improved clarity."

[3] "Non-Substantive Changes do not require a posting/comment/response cycle." Treatment of Non-Substantive Changes, Procedures, page 12.

[4] Treatment of Substantive Changes, Procedures, pages 11-12.

[5] "[T]he WSC agrees that the correction of the error does not change the scope or intent of the associated [Standard], and agrees that the correction has no material impact on the applicable entities, then the correction shall be filed for approval with NERC and applicable governmental authorities as appropriate." Treatment of Non-Substantive Changes, Regional Reliability Standards, Procedures, page 12.

[6] Procedures, page 12.

[7] In December 2016, the WSC approved WECC-0112, COM-001-WECC-CRT-2.1, Digital Circuits Synchronization, a WECC Criterion.

Subsequent Entry

On December 6, 2022, the WSC approved the requested Non-Substantive Changes and instructed staff to provide NERC with an information-only filing.

Electric Reliability and Security for the West

Attachment Q

WECC Standards Committee Roster
WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Non-Substantive Change / Information Only Filing

WECC Standards Committee Roster

The following individuals are those assigned to the WECC Standards Committee as of December 6, 2022.

Ron Sporseen, Bonneville Power Administration .....SVS 1 Transmission

Matthew Harward, Southwest Power Pool .....SVS 2 RTO/ISO

Dana Cabbell, Southern California Edison .....SVS 3 LSE

Marty Hostler, Northern California Power Agency .....SVS 4 TDU

Gary Nolan, Arizona Public Service .....SVS 5 Generators

Tim Kelley, Sacramento Municipal Utility District .....SVS 6 Broker/Aggregator/Marketers

Caitlin Liotiris, Utah Association of Energy Users .....SVS 7 Large Electricity End Users

Crystal Musselman, Proven Compliance Solutions .....SVS 8 Small Electricity Users

Chris McLean, California Energy Commission.....SVS 9 Gov. Entities

Steven Rueckert, WECC .....SVS 10 Regional Entities

James Avery, Chair.....Non-Affiliated Director

Regional Reliability Standard Submittal Request
Attachment J

Region:	**Western Electricity Coordinating Council**
Regional Standard Number:	**VAR-501-WECC-4**[1]
Regional Standard Title:	**Power System Stabilizer**
Date Submitted:	**July 20, 2023**
Regional Contact Name:	**Steven Rueckert**
Regional Contact Title:	**Director of Standards**
Regional Contact Telephone Number:	**(801) 883-6878**

Request (check all that apply):

- ☐ Retirement of WECC Regional Reliability Standard
- ☐ Interpret an Existing Standard
- ☐ Approval of a new standard
- ☒ Modification of Existing WECC Regional Standard VAR-501-WECC-4 – Information Only
- ☐ Withdrawal of an existing standard
- ☐ Urgent Action

Has this action been approved by your Board of Directors:

- ☒ No
- ☐ Yes

(If no, please indicate date standard action is expected along with the current status (e.g., third comment period with anticipated board approval on mm/dd/year)):

Per the WECC Reliability Standards Development Procedures (Procedures), approval of Non-Substantive Changes to a Regional Reliability Standard (RRS) do not require WECC Board of Director (Board) approval.

[1] Numbering is subject to NERC assignment.

The WECC Standards Committee (WSC) is empowered by the Procedures to address Non-Substantive changes without Board review.

Excerpt from December 6, 2022, WECC Standards Committee minutes:

Item 8:
WECC-0148 VAR-501-WECC-4 – Power System Stabilizer / No Change – Information Only Filing

"No Substantive Change"- Informational Filing Only

On June 21, 2022, the WECC-0148 drafting team (WECC-0148 DT) began a five-year review of VAR-501-WECC-3.1, Power System Stabilizer, as required by the Procedures.

On July 1, 2022, after reviewing the entire document during multiple public meetings, the DT unanimously agreed that no Substantive Changes should be made to the Standard.

On July 11, 2022, a list of proposed Non-Substantive Changes was distributed to the Standards Email List (SEL) inviting comments or concerns to be forwarded to WECC Standards staff. A redline and a clean version of the project was posted on the WECC-0148, Posted for Comment 1 accordion. No comments were received.

Non-Substantive changes do not require a posting for comment.[2]

The WSC was briefed on its Procedural authority to approve the project with no further due process, so long as all changes were deemed Non-Substantive. (See Attachment A, Request for Information Filing.)

On a motion by Ms. Cabbell, the WSC accepted WECC-0148 VAR-501-WECC-4 (VAR), Power System Stabilizer as presented with only non-substantive changes.

The WSC instructed staff to prepare an information-only filing for NERC. Per the Procedures, no further due process is required for this project.

[Note: The purpose of the remaining questions is to provide NERC with the information needed to file the regional standard(s) with FERC. The information provided may to a large degree be used verbatim. It is extremely important for the entity submitting this form to provide sufficient detail that clearly delineates the scope and justification of the request.]

Not Used.

[2] "Non-Substantive Changes do not require a posting/comment/response cycle. Non-Substantive errors discovered prior to the opening of a WECC ballot on either an RRS or a CRT may be corrected by WECC staff." Treatment of Non-Substantive Changes, Procedures, page 12.

Concise statement of the basis and purpose (scope) of request:	This request makes Non-Substantive Changes to VAR-501-WECC-3.1, Power System Stabilizer. Non-Substantive Changes approved by the WECC Standards Committee (WSC) do not require a Posting/Comment/Response cycle nor further due process at WECC. Non-Substantive Changes were approved by the WSC on December 6, 2022. This listing of WSC-approved Non-Substantive Changes appears in the VAR-501-WECC-4, Power System Stabilizer Version History Table: "An information-only filing provided to NERC reflects the following: 1) Updates to the template and syntax, 2) Removal of stale-dated language from the Effective Date, 3) Deletion of "For auditing purposes of…" from M4, 4) In the Guidance section, "dampen" was replaced with "damp", and syntax was addressed deleting "still", "of those", "of the", and "to ensure" was replaced with "ensuring", and "wash out" was replaced with "washout."
Concise statement of the justification of the request:	See WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing – Attachment T – Supporting Documentation

Steven Rueckert
WECC Director of Standards
July 20, 2023

Ms. Kimberlin Harris

NERC Reliability Standards Department

North American Electric Reliability Corporation
3353 Peachtree Rd. NE, North Tower – Suite 600
Atlanta, GA 30326

Subject: VAR-501-WECC-4, Power System Stabilizer
Non-Substantive Changes/Informational Filing Only

Dear Kimberlin,

Per the WECC Reliability Standards Development Procedures (Procedures), the WECC Standards Committee (WSC) ensures each Regional Reliability Standard undergoes a substantive review at least once every five years.[1]

VAR-501-WECC-3, Power System Stabilizer became due for review in September 2022.

On July 1, 2022, after reviewing the entire document during multiple public meetings, a drafting team of subject matter experts unanimously agreed that no Substantive Changes should be made to the Standard.[2]

On July 11, 2022, a list of proposed Non-Substantive changes was distributed to the WECC Standards Email List (SEL) inviting comments or concerns to be forwarded to WECC Standards staff regarding the proposed Non-Substantive changes.[3] No comments were received.

Non-Substantive changes do not require a posting for comment. Approval of Non-Substantive changes is within the purview of the WSC.[4]

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[1] Maintenance of RRSs and CRTs, Procedures, page 21. FERC approved September 13, 2021.
[2] Substantive Change: A change that alters the scope, applicability, required actions, or intent of the document. Definitions, Procedures, page 3.
[3] Non-Substantive Change: Revisions that do not change the scope, applicability, or intent of any requirement, including correcting the numbering of a requirement, correcting references, changes to document styles and templates, correcting the spelling of a word, adding an obviously missing word, or rephrasing a requirement for improved clarity. Definitions, Procedures, page 3.
[4] Treatment of Non-Substantive Changes, Procedures, page 12.

On December 6, 2022, the WSC approved Non-Substantive changes to the Standard with instructions that an information-only filing be provided to NERC.[5]

Attached please find:

- A redline of the as-approved Standard showing WSC-approved Non-Substantive changes. A list of the approved changes is included in the version table of the Standard.
- A clean version of VAR-501-WECC-4, Power System Stabilizer.

Because the WSC-approved changes do not affect application of the Standard, an implementation plan is not needed.

This filing concludes WECC's required due process per the Procedures. Please update the NERC-controlled version of the Standard.

If you have questions, please feel free to contact me.

Sincerely,

Steven Rueckert

WECC Director of Standards

[5] Loc. Cit. See also WSC Minutes for December 6, 2022.

For documentation support, please contact W. Shannon Black at (503) 307-5782.

WECC-0148 VAR-501-WECC-4 – Power System Stabilizer / No Change – Information Only Filing	**QR**	**BOT**	**Gov't Auth.***
SAR – Standard Authorization Request Attachment A			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing - Attachment A SAR			
Regional Reliability Standard(s) (Clean Existing) Attachment B			
File Name: WECC-0148 VAR-501-WECC-3.1 Power System Stabilizer Informational Filing - Attachment B - Clean as Approved by NERC			
Regional Reliability Standard(s) (Clean Proposed) Attachment C			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing - Attachment C – WSC Approved			
Regional Reliability Standard(s) (Existing redlined to Proposed) Attachment D			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing- Attachment D – Redline			
Project Roadmap Attachment E			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing- Attachment E Project Roadmap			
Implementation Plan Attachment F			
File Name: Not Used			
Technical Justification Attachment G			
File Name: Not Used			
VRF & VSL Justification Attachment H			
File Name: Not Used			
Issue Table and Mapping Document Attachment I – Optional			
File Name: Not Used			

Regional Reliability Standard Submittal Request Attachment J			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing - Attachment J Regional Reliability Standard Submittal Request			
Order 672 Criteria Attachment K			
File Name: Not Used			
Drafting Team Roster with Biographies Attachment L			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing - Attachment L - Drafting Team Roster			
Ballot Pool Members Attachment M			
File Name: Not Used			
Final Ballot Results Attachment N			
File Name: Not Used			
Guidance Document Attachment O – Optional			
File Name: Not Used			
Minority Issues Attachment P			
File Name: Not Used			
WECC Standards Committee Roster Attachment Q			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing - Attachment Q – WSC Roster 12-06-2022			
Responses to Comments – WECC Attachment R			
File Name: Not Used			
FERC Issues Table Attachment S – Optional			
File Name: Not Used			
Additional Supporting Documentation Attachment T			
File Name: WECC-0148 VAR-501-WECC-4 Power System Stabilizer Informational Filing - Attachment T – Supporting Documentation			
Petition Filing (FERC) Attachment U – Optional			

File Name: Not Used
*Applicable governmental authorities in the United States, Canada, and Mexico
To be provided by NERC.

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

(1) Info

VAR-501-WECC-4

(2) Clean | **(3)** Redline

(4) Unofficial Comment Form (Word)

(5) Submit Comments

(6) Comments Received

(7) Response to Comments

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Regional Reliability Standards Announcement

Western Electricity Coordinating Council
VAR-501-WECC-4

Comment Period Open through September 29, 2023

Now Available

Western Electricity Coordinating Council (WECC) requested that NERC post **Regional Reliability Standard VAR-501-WECC-4 (Power System Stabilizer)** for industry review and comment in accordance with the NERC Rules of Procedure.

Background

Proposed Regional Reliability Standard VAR-501-WECC-4 – Power System Stabilizer modifies the currently effective regional standard VAR-501-WECC-3.1 as follows:

- Updates to the document template, numbering, and template sections as provided by NERC
- Removal of stale-dated verbiage included in the Effective Date
- Removal of the redundant phrase, "[F]or auditing purposes…." From Measure M4
- Updates to syntax
- Correction of "[s]tandard" to "[S]tandard"
- Correction of "dampen" to "damp" in the Rationale and Guidance section

The WECC Board of Directors approved the proposed regional standard on June 14, 2023.

Commenting

Use the Standards Balloting and Commenting System (SBS) to submit comments. Comments must be submitted by **8 p.m. Eastern, Friday, September 29, 2023.** An unofficial Word version of the comment form is posted on the Regional Reliability Standards Under Development page.

- *Contact NERC IT support directly at https://support.nerc.net/ (Monday – Friday, 8 a.m. - 5 p.m. Eastern) for problems regarding accessing the SBS due to a forgotten password, incorrect credential error messages, or system lock-out.*
- *Passwords expire every **6 months** and must be reset.*
- *The SBS **is not** supported for use on mobile devices.*

- *Please be mindful of ballot and comment period closing dates. We ask to **allow at least 48 hours** for NERC support staff to assist with inquiries. Therefore, it is recommended that users try logging into their SBS accounts **prior to the last day** of a comment/ballot period.*

Regional Reliability Standards Development Process

Section 300 of NERC's Rules of Procedures of the Electric Reliability Organization governs the regional reliability standards development process. Although the technical aspects of this Regional Reliability Standard have been vetted through WECC Regional Standards development process, the final approval process for a Regional Reliability Standard requires NERC publicly to notice and request comment on the criteria outlined in the unofficial comment form.

Documents and information about this project are available on the Western Electricity Coordinating Council (WECC) Standards page.

For more information or assistance, contact Reliability Standards Analyst, Kimberlin Harris (via email) or at (404) 446-9794.

North American Electric Reliability Corporation
3353 Peachtree Rd, NE
Suite 600, North Tower
Atlanta, GA 30326
404-446-2560 | www.nerc.com

A. Introduction

1. **Title:** Power System Stabilizer (PSS)
2. **Number:** VAR-501-WECC-4
3. **Purpose:** To ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for WECC power system stabilizers.
4. **Applicability:**
   - **4.1** Generator Operator
   - **4.2** Generator Owner
5. **Facilities:** This standard applies to synchronous generators, connected to the Bulk Electric System, meeting the definition of Commercial Operation.
6. **Effective Date:** The first day of the first quarter following regulatory approval.

B. Requirements and Measures

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner's written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events: *[Violation Risk Factor: Low] [Time Horizon: Planning Horizon]*

- The effective date of this standard;
- The PSS's Commercial Operation date; or
- Any changes to the PSS operating specifications.

M1. Each Generator Owner will have documented evidence that it provided to its Transmission Operator, within the time allotted as described in the procedures required under Requirement R1, written Operating Procedures or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the AVR.

For auditing purposes, because Requirement R1 conditions are intended to be unchanged unless the Transmission Operator is otherwise notified, the Generator Owner only needs to provide the documentation to the Transmission Operator one time, or whenever the operating specifications change.
For auditing purposes, if a PSS is in service but is not providing an active signal to the AVR as described in Requirement R1, the disabled period does not count against the Requirement R2 mandate to be in service except as otherwise allowed.

R2. Each Generator Operator shall have its PSS in service while synchronized, except during any of the following: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

- Component failure

- Testing of a Bulk Electric System Element affecting or affected by the PSS
- Maintenance
- As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

M2. Each Generator Operator will have documentation of each claimed exception specified in Requirement R2. Documentation may include, but is not limited to:

- A written explanation covering the bulleted exception that describes the circumstances of the exception as allowed in Requirement R2.
- Documented evidence that the Generator Operator and the Transmission Operator agreed the PSS would not be operating during a specified set of circumstances, where the exception is claimed under the last bullet of Requirement R2.

For auditing purposes, the presumption is that the PSS was in service unless otherwise exempted in Requirement R2. Evidence need only be provided to prove the circumstances during which the PSS was not in service for periods in excess of 30 minutes.

R3. Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

3.1. PSS shall be set to provide the measured, simulated, or calculated compensated Vt/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

3.2. PSS output limits shall be set to provide at least ±5% of the synchronous machine's nominal terminal voltage.

3.3. PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

3.4. PSS washout time constant shall be no greater than 30 seconds.

3.5. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

M3. Each Generator Owner will have documented evidence that its PSS was tuned to meet the specifications of Requirement R3.

If the exception under Requirement R3, Part 3.5, is claimed, the Generator Owner will have documented evidence describing: 1) the conditions that render the PSS incapable of meeting the tuning requirements, and 2) the date the voltage regulator was last replaced or retrofitted.

R4. Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events: *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

- The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
- The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

M4. Each Generator Owner will have evidence that it installed and completed start-up testing of a PSS on its generator within 180 days of either of the conditions described in Requirement R4, and when those conditions occur after the Effective Date of this standard.

The first bullet of Requirement R4 only applies to equipment on its initial (first energization) connection to the BES.

R5. Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3. *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

M5. Each Generator Owner will have evidence that it repaired or replaced its PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications of Requirement R3. Evidence may include, but is not limited to, documentation of the date the PSS became incapable of meeting the Requirement R3 tuning specifications, and the date the PSS was returned to service, demonstrating that the span of time between the two events was less than 24 months.

C. Compliance

1. **Compliance Monitoring Process**

1.1 Compliance Enforcement Authority: "Compliance Enforcement Authority" means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2. Evidence Retention: The following evidence retention period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full-time period since the last audit.

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- Each Generator Operator shall keep evidence for all Requirements of the document for a period of three years plus calendar current.

1.3 Compliance Monitoring and Enforcement Program: As defined in the NERC Rules of Procedure, "Compliance Monitoring and Enforcement Program" refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

R	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	NA	NA	NA	The Generator Owner failed to provide its PSS operating specifications to the Transmission Operator as required in Requirement R1.
R2	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 30 minutes but less than 60 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 60 minutes but less than 120 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 120 minutes but less than 180 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 180 minutes.
R3	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, two times or fewer during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, three times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, four times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, five times or more during the audit period.
R4	NA	NA	NA	The Generator Owner failed to install on its generator a PSS, as required in Requirement R4.
R5	NA	NA	NA	The Generator Owner failed to repair or replace a non-operational PSS as required in Requirement R5.

D. Regional Variances

None.

E. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking
1	April 16, 2008	Permanent Replacement Standard for VAR-STD-002b-1	
1	October 28, 2008	Adopted by NERC Board of Trustees	
1	April 21, 2011	FERC Order issued approving VAR-501-WECC-1 (FERC approval effective June 27, 2011; Effective Date July 1, 2011)	
2	November 13, 2014	Adopted by NERC Board of Trustees	
2	March 3, 2015	FERC letter order approved VAR-501-WECC-2	
3	February 9, 2017	Adopted by NERC Board of Trustees	
3	April 28, 2017	FERC letter order approved VAR-501-WECC-3	
3.1	August 10, 2017	Adopted by the NERC Board of Trustees	Errata
3.1	September 26, 2017	FERC letter order issued approving VAR-501-WECC-3.1	
4	December 6, 2022	WECC Standards Committee accepted a “no change “ recommendation followed by	Non-substantive changes were approved by the

		an information-only filing to NERC.	WECC Standards Committee as allowed in the WECC Reliability Standards Development Procedures. An information-only filing provided to NERC reflects the following: 1) updates to the template and syntax, 2) removal of stale-dated language from the Effective Date, 3) deletion of "For auditing purposes of…" from M4, 4) in the Guidance section, "dampen" was replaced with "damp", and syntax was addressed deleting "still", "of those", "of the", and "to ensure" was replaced with "ensuring", and "wash out" was replaced with "washout."
4	TBD		

Guideline and Technical Basis

PSS systems are used to minimize real power oscillations by rapidly adjusting the field of the generator to damp the low-frequency oscillations.

It is necessary for large numbers of PSS devices to be in operation in the Western Interconnection to provide the required system damping while allowing for some units to be out of service whenever necessary.

Mandate to Install a PSS

Nothing in this Regional Reliability Standard (RSS) should be construed to require installation of a PSS *solely because* a PSS is not currently installed as of the Effective Date of this RRS. Rather, installation is only mandated on the occurrence of either triggering event described in Requirement R4, Bullet 1 or Bullet 2, after the Effective Date of the RRS.

It should be noted that a PSS is neither Transmission nor generation.

Requirement R1

Requirement R1 addresses normal operating conditions.

Requirement R1 recognizes that PSS systems have varying states, such as on, off, active, and non-active. As long as the PSS is operating in accordance with the documentation provided to the Transmission Operator, this is not considered a status change for purposes of this Standard.

This Requirement eliminates the requirement to count hours as required in the previous version of this Standard while also allowing the Generator Owner to create a unit-specific operating plan.

The intent of Requirement R1 is to provide the Transmission Operator, the PSS operating zone in which the PSS is “active” providing damping to the power system. Some PSS may be programmed to become “active” at a specified megawatt loading level and above while others may be programmed to be “active” in a particular band of megawatt loading levels and are “non-active” only when passing through the “rough zone” or some other band. A “rough zone” is a megawatt loading band in which the generator-turbine system could contribute to system instability.

Requirement R2

This Requirement only applies when the PSS is out of service for a period greater than 30 minutes.

Unlike Requirement R1, Requirement R2 addresses exceptions to normal operation.

The intent of Requirement R2 is to remove the previous requirement to log hours for PSS in service. In this Standard's previous version, the logged hours were totaled quarterly to meet the 98% in-service requirement. Instead of documenting the number of hours excluded, this Requirement simplifies the process by allowing the Generator Operator to communicate to the Transmission Operator the circumstances that render the PSS unavailable to the Transmission Operator (such as component failure, maintenance, and testing).

Requirement R3

Nothing in this RSS should be construed to mandate the design criteria for the *equipment* used to produce the tuning output of the PSS. Rather, Requirement R3 is intended to address the design criteria for the *tuning output* of the PSS.

Unlike the language in Requirement R5 that looks *backward* to address units that were once operating but are no longer capable of operating, Requirement R3 looks *forward*, requiring that units be tuned to the specified parameters.

The PSS transfer function should compensate the phase characteristics of the generator, exciter, and power (GEP) system transfer function so the compensated transfer function ((PSS(s) * GEP(s)) has a phase characteristic of ± 30 degrees in the frequency range.

The GEP(s) transfer function is a theoretical transfer function, and its phase characteristic cannot be directly measured during field tests (only via simulation). Thus, the Requirement recognizes the practical approach of measuring the frequency response between voltage reference set point and terminal voltage (Et/Vref) and using the phase characteristic of such frequency response as being the phase characteristic of GEP(s). The phase characteristic of Et/Vref is a better approximation to the phase characteristic of GEP(s) when the frequency response Et/Vref is obtained with the generator synchronized to the grid at its minimum stable power output.

In an effort to allow for reasonable washout time constants, the Requirement specifies 0.2 Hz as the applicable threshold. The 0.2 Hz threshold more closely aligns with the observed oscillation frequencies.

A properly tuned PSS should provide positive damping to the local mode of oscillation, which typically has a frequency higher than 1.0 Hz.

This Requirement modifies the requirement associated with the adjustment of the PSS gain. The standard no longer defines the PSS gain in terms of gain margin but instead requires the final PSS gain to be between 1/3 (10 dB) and 1/2 (6 dB) of the maximum practical gain that could be achieved during PSS commissioning. The maximum practical gain might be associated with the excessive noise or raised higher-frequency oscillations in the closed loop response (exciter mode) or any other form if there is inadequate closed-loop performance, as determined during PSS commissioning. It is now part of Measure M3 to show the field test results that led to the determination of the maximum practical gain.

Requirement R4

Requirement R4 requires a Generator Owner to install a PSS on new applicable units or when excitation systems are replaced or retrofitted on existing applicable units. This Requirement applies to new excitation systems and not to existing systems that do not have PSS. The Requirement also allows a reasonable amount of time for the commissioning of new PSS.

Requirement R5

Unlike the language in Requirement R3 that looks forward ensuring that a unit is tuned, Requirement R5 looks *backward.* Specifically, the language in Requirement R5, "becoming incapable," indicates the unit was previously capable of meeting the tuning requirements in Requirement R3, but is no longer capable. Restated, Requirement R5 addresses units that were previously working but are now no longer working.

The intent of Requirement R5 is to remove the "tiered" approach to PSS repair/replacement following a failure. A simple, streamlined approach to allow the Generator Owner sufficient time to repair or replace a broken PSS has been written. Consideration has been given for the need to procure parts or new equipment, schedule an equipment/unit outage, and install and test the repaired or replaced PSS. It is recognized that in some instances, it may require (1) replacement of an AVR, and (2) the existence of a PSS, or both the AVR and the PSS may need to be replaced to achieve a functioning system.

The 24-month time frame is sufficient to return a functional, operating PSS to service.

*** FOR INFORMATIONAL PURPOSES ONLY ***

Enforcement Dates: Standard VAR-501-WECC-3 — Power System Stabilizer

United States

Standard	Requirement	Enforcement Date	Inactive Date
VAR-501-WECC-3	TBD	TBD	

A. ~~A.~~ Introduction

1. **Title:** Power System Stabilizer (PSS)
2. **Number:** VAR-501-WECC-~~3.1~~4
3. **Purpose:** To ensure the Western Interconnection is operated in a coordinated manner under normal and abnormal conditions by establishing the performance criteria for WECC power system stabilizers.
4. **Applicability:**

   4.1 Generator Operator

   4.2 Generator Owner
5. **Facilities:** This standard applies to synchronous generators, connected to the Bulk Electric System, ~~that meet~~meeting the definition of Commercial Operation.
6. **Effective Date:** The first day of the first quarter following regulatory approval~~, except for Requirement R3~~.

   ~~For units placed in first-time service after regulatory approval, Requirement R3 is effective the first day of the first quarter following final regulatory approval.~~

   ~~For units placed in service prior to final regulatory approval, Requirement R3 is effective the first day of the first quarter that is five years after regulatory approval.~~

~~B.~~

B. Requirements and Measures

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner's written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events: *[Violation Risk Factor: Low] [Time Horizon: Planning Horizon]*

- The effective date of this standard;
- The PSS's Commercial Operation date; or
- Any changes to the PSS operating specifications.

M1. Each Generator Owner will have documented evidence that it provided to its Transmission Operator, within the time allotted as described in the procedures required under Requirement R1, written Operating Procedures or other document(s) describing those known circumstances during which the Generator Owner's PSS will not be providing an active signal to the AVR.

For auditing purposes, because Requirement R1 conditions are intended to be unchanged unless the Transmission Operator is otherwise notified, the Generator Owner only needs to provide the documentation to the Transmission Operator one time, or whenever the operating specifications change.

For auditing purposes, if a PSS is in service but is not providing an active signal to the AVR as described in Requirement R1, the disabled period does not count against the Requirement R2 mandate to be in service except as otherwise allowed.

R2. Each Generator Operator shall have its PSS in service while synchronized, except during any of the following: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

- Component failure
- Testing of a Bulk Electric System Element affecting or affected by the PSS
- Maintenance
- As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

M2. Each Generator Operator will have documentation of each claimed exception specified in Requirement R2. Documentation may include, but is not limited to:

- A written explanation covering the bulleted exception that describes the circumstances of the exception as allowed in Requirement R2.
- Documented evidence that the Generator Operator and the Transmission Operator agreed the PSS would not be operating during a specified set of circumstances, where the exception is claimed under the last bullet of Requirement R2.

For auditing purposes, the presumption is that the PSS was in service unless otherwise exempted in Requirement R2. Evidence need only be provided to prove the circumstances during which the PSS was not in service for periods in excess of 30 minutes.

R3. Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below: *[Violation Risk Factor: Medium] [Time Horizon: Operating Assessment]*

3.1. PSS shall be set to provide the measured, simulated, or calculated compensated Vt/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

3.2. PSS output limits shall be set to provide at least ±5% of the synchronous machine's nominal terminal voltage.

3.3. PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

3.4. PSS washout time constant shall be no greater than 30 seconds.

3.5. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

M3. Each Generator Owner will have documented evidence that its PSS was tuned to meet the specifications of Requirement R3.

If the exception under Requirement R3, Part 3.5, is claimed, the Generator Owner will have documented evidence describing: 1) the conditions that render the PSS incapable of meeting the tuning requirements, and 2) the date the voltage regulator was last replaced or retrofitted.

R4. Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events: *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

- The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
- The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

M4. Each Generator Owner will have evidence that it installed and completed start-up testing of a PSS on its generator within 180 days of either of the conditions described in Requirement R4, and when those conditions occur after the Effective Date of this standard.

~~For auditing purposes~~ The first bullet of Requirement R4~~, bullet one~~ only applies to equipment on its initial (first energization) connection to the BES.

R5. Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3. *[Violation Risk Factor: Medium] [Time Horizon: Operational Assessment]*

M5. Each Generator Owner will have evidence that it repaired or replaced its PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications of Requirement R3. Evidence may include, but is not limited to, documentation of the date the PSS became incapable of meeting the Requirement R3 tuning specifications, and the date the PSS was returned to service, demonstrating that the span of time between the two events was less than 24 months.

C. Compliance

C. Compliance

1. Compliance Monitoring Process

1.1 Compliance Enforcement Authority

: "Compliance Enforcement Authority" means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2 Compliance Monitoring and Assessment Processes

- Compliance Audits
- Self-Certifications
- Spot Checking
- Compliance Investigations
- Self-Reporting
- Complaints

1.3 . Evidence Retention

: The following evidence retention periodsperiod(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full--time period since the last audit.-

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- Each Generator Operator shall keep evidence for all Requirements of the document for a period of three years plus calendar current.

1.4 Additional Compliance Information

None

D. Regional Differences

None

~~Table of Compliance Elements~~

1.3 Compliance Monitoring and Enforcement Program: As defined in the NERC Rules of Procedure, "Compliance Monitoring and Enforcement Program" refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

R	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	NA	NA	NA	The Generator Owner failed to provide its PSS operating specifications to the Transmission Operator as required in Requirement R1.
R2	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 30 minutes but less than 60 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 60 minutes but less than 120 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 120 minutes but less than 180 minutes.	Each Generator Operator not having its PSS in service while synchronized in accordance with Requirement R2, for more than 180 minutes.
R3	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, two times or fewer during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, three times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, four times during the audit period.	The Generator Owner's PSS failed to meet any of the required performances in Requirement R3, five times or more during the audit period.
R4	NA	NA	NA	The Generator Owner failed to install on its generator a PSS, as required in Requirement R4.
R5	NA	NA	NA	The Generator Owner failed to repair or replace a non-operational PSS as required in Requirement R5.

VAR-501-WECC-~~43.1~~ – Power System Stabilizer

VAR-501-WECC-~~3~~.14 – Power System Stabilizer

D. Regional Variances

None.

E. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking
1	April 16, 2008	Permanent Replacement Standard for VAR-STD-002b-1	
1	October 28, 2008	Adopted by NERC Board of Trustees	
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3.1	August 10, 2017	Adopted by the NERC Board of Trustees	Errata
3.1	~~TBD~~September 26, 2017	~~TBD~~FERC letter order issued approving VAR-501-WECC-3.1	
4	December 6, 2022	WECC Standards Committee accepted a “no change “ recommendation followed by	Non-substantive changes were approved by the

		an information-only filing to NERC.	WECC Standards Committee as allowed in the WECC Reliability Standards Development Procedures. An information-only filing provided to NERC reflects the following: 1) updates to the template and syntax, 2) removal of stale-dated language from the Effective Date, 3) deletion of "For auditing purposes of…" from M4, 4) in the Guidance section, "dampen" was replaced with "damp", and syntax was addressed deleting "still", "of those", "of the", and "to ensure" was replaced with "ensuring", and "wash out" was replaced with "washout."

Guideline and Technical Basis

PSS systems are used to minimize real power oscillations by rapidly adjusting the field of the generator to ~~dampen~~damp the low-frequency oscillations.

It is necessary for large numbers of PSS devices to be in operation in the Western Interconnection to provide the required system damping while ~~still~~ allowing for some ~~of these~~ units to be out of service whenever necessary.

Mandate to Install a PSS

Nothing in this Regional Reliability Standard (RSS) should be construed to require installation of a PSS *solely because* a PSS is not currently installed as of the Effective Date of this RRS. Rather, installation is only mandated on the occurrence of either ~~of the~~ triggering ~~events~~event described in Requirement R4, Bullet 1 or Bullet 2, after the Effective Date of the RRS.

It should be noted that a PSS is neither Transmission nor generation.

Requirement R1

Requirement R1 addresses normal operating conditions.

Requirement R1 recognizes that PSS systems have varying states, such as on, off, active, and non-active. As long as the PSS is operating in accordance with the documentation provided to the Transmission Operator, this is not considered a status change for purposes of this ~~standard~~Standard.

This Requirement eliminates the requirement to count hours as required in the previous version of this ~~standard~~Standard while also allowing the Generator Owner to create a unit-specific operating plan.

The intent of Requirement R1 is to provide the Transmission Operator, the PSS operating zone in which the PSS is “active” providing damping to the power system. Some PSS may be programmed to become “active” at a specified megawatt loading level and above while others may be programmed to be “active” in a particular band of megawatt loading levels and are “non-active” only when passing through the “rough zone” or some other band. A “rough zone” is a megawatt loading band in which the generator-turbine system could contribute to system instability.

Requirement R2

This Requirement only applies when the PSS is out of service for a period greater than 30 minutes.

Unlike Requirement R1, Requirement R2 addresses exceptions to normal operation.

The intent of Requirement R2 is to remove the previous requirement to log hours for PSS in service. In this ~~standard's~~Standard's previous version, the logged hours were totaled quarterly to meet the 98% in-service requirement. Instead of documenting the number of hours excluded, this Requirement simplifies the process by allowing the Generator Operator to communicate to the Transmission Operator the circumstances that render the PSS unavailable to the Transmission Operator (such as component failure, maintenance, and testing).

Requirement R3

Nothing in this RSS should be construed to mandate the design criteria for the *equipment* used to produce the tuning output of the PSS. Rather, Requirement R3 is intended to address the design criteria for the *tuning output* of the PSS.

Unlike the language in Requirement R5 that looks *backward* to address units that were once operating but are no longer capable of operating, Requirement R3 looks *forward*, requiring that units be tuned to the specified parameters.

The PSS transfer function should compensate the phase characteristics of the generator, exciter, and power (GEP) system transfer function so the compensated transfer function ((PSS(s) * GEP(s)) has a phase characteristic of ± 30 degrees in the frequency range.

The GEP(s) transfer function is a theoretical transfer function, and its phase characteristic cannot be directly measured during field tests (only via simulation). Thus, the Requirement recognizes the practical approach of measuring the frequency response between voltage reference set point and terminal voltage (Et/Vref) and using the phase characteristic of such frequency response as being the phase characteristic of GEP(s). The phase characteristic of Et/Vref is a better approximation to the phase characteristic of GEP(s) when the frequency response Et/Vref is obtained with the generator synchronized to the grid at its minimum stable power output.

In an effort to allow for reasonable ~~wash-out~~washout time constants, the Requirement specifies 0.2 Hz as the applicable threshold. The 0.2 Hz threshold more closely aligns with the observed oscillation frequencies.

A properly tuned PSS should provide positive damping to the local mode of oscillation, which typically has a frequency higher than 1.0 Hz.

This Requirement modifies the requirement associated with the adjustment of the PSS gain. The standard no longer defines the PSS gain in terms of gain margin but instead requires the final PSS gain to be between 1/3 (10 dB) and 1/2 (6 dB) of the maximum practical gain that could be achieved during PSS commissioning. The maximum practical gain might be associated with the excessive noise or raised higher-frequency oscillations in the closed loop response (exciter mode) or any other form if there is inadequate closed-loop performance, as determined during PSS commissioning. It is now part of Measure M3 to show the field test results that led to the determination of the maximum practical gain.

Requirement R4

Requirement R4 requires a Generator Owner to install a PSS on new applicable units or when excitation systems are replaced or retrofitted on existing applicable units. This Requirement applies to new excitation systems and not to existing systems that do not have PSS. The Requirement also allows a reasonable amount of time for the commissioning of new PSS.

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Unlike the language in Requirement R3 that looks forward ~~to ensure~~ensuring that a unit is tuned, Requirement R5 looks *backward.* Specifically, the language in Requirement R5, "becoming incapable," indicates the unit was previously capable of meeting the tuning requirements in Requirement R3, but is no longer capable. Restated, Requirement R5 addresses units that were previously working but are now no longer working.

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The 24-month time frame is sufficient to return a functional, operating PSS to service.

*** FOR INFORMATIONAL PURPOSES ONLY ***

Enforcement Dates: Standard VAR-501-WECC-3 — Power System Stabilizer

United States

Standard	Requirement	Enforcement Date	Inactive Date
VAR-501-WECC-3	TBD	TBD	

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Unofficial Comment Form

Regional Reliability Standard
VAR-501-WECC-4

DO NOT use this form for submitting comments. Use the electronic form to submit comments on the proposed modifications to **Regional Reliability Standard**, **VAR-501-WECC-4 (Power System Stabilizer)**. The electronic form must be submitted by **8 p.m. Eastern, Friday, September 29, 2023.**

Documents and information about this project are available on the WECC's Standards page. If you have questions, contact Reliability Standards Analyst, Kimberlin Harris (via email) or at (404) 446-9794.

Background Information
The WECC Regional Reliability Standard Drafting Team ensures each Regional Reliability Standard undergoes a substantive review at least once every five years. During the most recent review, the following changes to WECC's Regional Reliability Standard VAR-501-WECC-3.1 Power System Stabilizer were proposed:

1. Updates to the document template, numbering, and template sections as provided by NERC
2. Removal of stale-dated verbiage included in the Effective Date
3. Removal of the redundant phrase, "[F]or auditing purposes…." From Measure M4
4. Updates to syntax
5. Correction of "[s]tandard" to "[S]tandard"
6. Correction of "dampen" to "damp" in the Rationale and Guidance section

The WECC Board of Directors approved the proposed regional standard on June 14, 2023.

NERC Criteria for Developing or Modifying a Regional Reliability Standard
Each regional difference (i.e. Regional Reliability Standard or Variance) shall be: (1) is more stringent than the continent-wide Reliability Standard, including a regional difference that addresses matters that the continent-wide reliability standard does not; or (2) necessitated by a physical difference in the bulk power system. Regional Reliability Standards and Variances shall provide for as much uniformity as possible with Reliability Standards across the interconnected bulk power system of the North American continent. Regional Reliability Standards and Variances, when approved by FERC and applicable authorities in Mexico and Canada, shall be made part of the body of NERC Reliability Standards and shall be enforced upon all applicable Bulk Power System owners, operators, and users within the applicable area, regardless of membership in the region.

The approval process for a proposed Regional Reliability Standard or Variance, or the retirement of an existing standard or Variance, requires NERC to publicly notice and request comment. Comments shall be

permitted only on the following criteria (technical aspects of the standard are vetted through the regional standards development process):

Unfair or Closed Process – The Regional Reliability Standard was not developed in a fair and open process that provided an opportunity for all interested parties to participate. Although a NERC-approved Regional Reliability Standards development procedure shall be presumed to be fair and open, objections could be raised regarding the implementation of the procedure.

Adverse Reliability or Commercial Impact on Other Interconnections – The Regional Reliability Standard would have a significant adverse impact on reliability or commerce in other interconnections.

Deficient Standard – The Regional Reliability Standard fails to provide a level of reliability of the Bulk Power System such that the Regional Reliability Standard would be likely to cause a serious and substantial threat to public health, safety, welfare, or national security.

Adverse Impact on Competitive Markets within the Interconnection – The Regional Reliability Standard would create a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability.

Questions

1. Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?

   ☐ Yes
   ☐ No

   Comments:

2. Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?

   ☐ Yes
   ☐ No

   Comments:

3. Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?

   ☐ Yes
   ☐ No

   Comments:

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

4. Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?

   ☐ Yes
   ☐ No

   Comments:

5. Does the proposed Regional Reliability Standard meet at least one of the following criteria?

   - The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.
   - The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.
   - The proposed regional difference is necessitated by a physical difference in the Bulk Power System.

   ☐ Yes
   ☐ No

   Comments:

Document Accession #: 20231215-5322 Filed Date: 12/15/2023

REAL-TIME COMMENTS

This comment form is no longer interactive because the comment period is closed.

Regional Reliability Standard (WECC) | VAR-501-WECC-4 – Power System Stabilizer

Description:

Start Date: 08/16/2023
End Date: 09/29/2023

Associated Ballots:

Ballot Name	Project	Standard	Pool Open	Pool Close	Voting Start	Voting End

Filter: None Filter

Q:
1. Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?

Hot Answers

A: Yes (.a-b-78564)

Israel Perez, **On Behalf of:** Salt River Project - WECC - Segments 1, 3, 5, 6

- 0 - 0

A: Yes (.a-b-78559)

ACES Collaborators, Segment(s) 1, 9/29/2023

- 0 - 0

Other Answers

A: Yes (.a-b-78351)

BC Hydro, Segment(s) 3, 5, 1, 12/18/2018

- 0 - 0

A: Yes (.a-b-78356)

Andrea Jessup, **On Behalf of:** Bonneville Power Administration, WECC, Segments 1, 5, 6

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👍 - 0 👎 - 0

A: Yes (.a-b-78370)

Robert Follini, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

👍 - 0 👎 - 0

A: Yes (.a-b-78380)

Glen Farmer, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

👍 - 0 👎 - 0

A: Yes (.a-b-78445)

Richard Jackson, **On Behalf of:** U.S. Bureau of Reclamation, , Segments 1, 5

👍 - 0 👎 - 0

A: Yes (.a-b-78526)

None

Daniela Atanasovski, **On Behalf of:** APS - Arizona Public Service Co., , Segments 1, 3, 5, 6

👍 - 0 👎 - 0

A: Yes (.a-b-78549)

Mike Magruder, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

👍 - 0 👎 - 0

Q:

2. Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?

Hot Answers

A: No (.a-b-78565)

Israel Perez, **On Behalf of:** Salt River Project - WECC - Segments 1, 3, 5, 6

👍 - 0 👎 - 0

A: No (.a-b-78560)

ACES Collaborators, Segment(s) 1, 9/29/2023

👍 - 0 👎 - 0

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Other Answers

A: No (.a-b-78352)

BC Hydro, Segment(s) 3, 5, 1, 12/18/2018

- 0 - 0

A: No (.a-b-78357)

Andrea Jessup, **On Behalf of:** Bonneville Power Administration, WECC, Segments 1, 5, 6

- 0 - 0

A: No (.a-b-78371)

Robert Follini, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: No (.a-b-78381)

NA

Glen Farmer, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: No (.a-b-78446)

Richard Jackson, **On Behalf of:** U.S. Bureau of Reclamation, , Segments 1, 5

- 0 - 0

A: No (.a-b-78527)

None

Daniela Atanasovski, **On Behalf of:** APS - Arizona Public Service Co., , Segments 1, 3, 5, 6

- 0 - 0

A: No (.a-b-78550)

Mike Magruder, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

Q:

3. Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?

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Hot Answers

A: No (.a-b-78566)

Israel Perez, **On Behalf of:** Salt River Project - WECC - Segments 1, 3, 5, 6

- 0 - 0

A: No (.a-b-78561)

ACES Collaborators, Segment(s) 1, 9/29/2023

- 0 - 0

Other Answers

A: No (.a-b-78353)

BC Hydro, Segment(s) 3, 5, 1, 12/18/2018

- 0 - 0

A: No (.a-b-78358)

Andrea Jessup, **On Behalf of:** Bonneville Power Administration, WECC, Segments 1, 5, 6

- 0 - 0

A: No (.a-b-78372)

Robert Follini, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: No (.a-b-78382)

Glen Farmer, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: No (.a-b-78447)

Richard Jackson, **On Behalf of:** U.S. Bureau of Reclamation, , Segments 1, 5

- 0 - 0

A: No (.a-b-78528)

None

Daniela Atanasovski, **On Behalf of:** APS - Arizona Public Service Co., , Segments 1, 3, 5, 6

- 0 - 0

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A: No (.a-b-78551)

Mike Magruder, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

Q:
4. Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?

Hot Answers

A: No (.a-b-78567)

Israel Perez, **On Behalf of:** Salt River Project - WECC - Segments 1, 3, 5, 6

- 0 - 0

A: No (.a-b-78562)

ACES Collaborators, Segment(s) 1, 9/29/2023

- 0 - 0

Other Answers

A: No (.a-b-78354)

BC Hydro, Segment(s) 3, 5, 1, 12/18/2018

- 0 - 0

A: No (.a-b-78359)

Andrea Jessup, **On Behalf of:** Bonneville Power Administration, WECC, Segments 1, 5, 6

- 0 - 0

A: No (.a-b-78373)

Robert Follini, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: No (.a-b-78383)

Glen Farmer, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: No (.a-b-78448)

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Richard Jackson, **On Behalf of:** U.S. Bureau of Reclamation, , Segments 1, 5

- 0 - 0

A: No (.a-b-78529)

None

Daniela Atanasovski, **On Behalf of:** APS - Arizona Public Service Co., , Segments 1, 3, 5, 6

- 0 - 0

A: No (.a-b-78552)

Mike Magruder, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

Q:

5. Does the proposed Regional Reliability Standard meet at least one of the following criteria?

- **The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.**
- **The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.**
- **The proposed regional difference is necessitated by a physical difference in the Bulk Power System.**

Hot Answers

A: Yes (.a-b-78568)

While there are regional and physical differences, the changes proposed are mainly grammatical and all are minor.

Israel Perez, **On Behalf of:** Salt River Project - WECC - Segments 1, 3, 5, 6

- 0 - 0

A: Yes (.a-b-78563)

Thank you for the opportunity to comment.

ACES Collaborators, Segment(s) 1, 9/29/2023

- 0 - 0

Other Answers

A: Yes (.a-b-78355)

BC Hydro, Segment(s) 3, 5, 1, 12/18/2018

- 0 - 0

A: Yes (.a-b-78360)

Andrea Jessup, **On Behalf of:** Bonneville Power Administration, WECC, Segments 1, 5, 6

- 0 - 0

A: No (.a-b-78374)

Robert Follini, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: No (.a-b-78384)

Glen Farmer, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

A: Yes (.a-b-78449)

Richard Jackson, **On Behalf of:** U.S. Bureau of Reclamation, , Segments 1, 5

- 0 - 0

A: Yes (.a-b-78530)

None

Daniela Atanasovski, **On Behalf of:** APS - Arizona Public Service Co., , Segments 1, 3, 5, 6

- 0 - 0

A: No (.a-b-78553)

Mike Magruder, **On Behalf of:** Avista - Avista Corporation, , Segments 1, 3, 5

- 0 - 0

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Comment Report

Project Name:	Regional Reliability Standard (WECC) | VAR-501-WECC-4 – Power System Stabilizer
Comment Period Start Date:	8/16/2023
Comment Period End Date:	9/29/2023
Associated Ballots:	

There were 9 sets of responses, including comments from approximately 14 different people from approximately 9 companies representing 4 of the Industry Segments as shown in the table on the following pages.

Questions

1. Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?

2. Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?

3. Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?

4. Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?

5. Does the proposed Regional Reliability Standard meet at least one of the following criteria?

- **The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.**
- **The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.**
- **The proposed regional difference is necessitated by a physical difference in the Bulk Power System.**

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
BC Hydro and Power Authority	Adrian Andreoiu	1,3,5	WECC	BC Hydro	Hootan Jarollahi	BC Hydro and Power Authority	3	WECC
					Helen Hamilton Harding	BC Hydro and Power Authority	5	WECC
					Adrian Andreoiu	BC Hydro and Power Authority	1	WECC
ACES Power Marketing	Jodirah Green	1	MRO,RF,SERC,Texas RE,WECC	ACES Collaborators	Bob Soloman	Hoosier Energy Electric Cooperative	1	RF
					Kris Carper	Arizona Electric Power Cooperative, Inc.	1	WECC

1. Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?

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

Answer	Yes
Document Name	
Comment	
None	
Likes 0	
Dislikes 0	
Response	

Adrian Andreoiu - BC Hydro and Power Authority - 1,3,5, Group Name BC Hydro

Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Andrea Jessup - Bonneville Power Administration - 1,5,6 - WECC

Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Robert Follini - Avista - Avista Corporation - 1,3,5

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Glen Farmer - Avista - Avista Corporation - 1,3,5	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Richard Jackson - U.S. Bureau of Reclamation - 1,5	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Mike Magruder - Avista - Avista Corporation - 1,3,5	
Answer	Yes
Document Name	
Comment	
Likes 0	

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Dislikes 0	
Response	
Jodirah Green - ACES Power Marketing - 1 - WECC, Group Name ACES Collaborators	
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	

Document Accession #: 20251215-5332 Filed Date: 12/15/2025

2. Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?

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

Answer	No
Document Name	

Comment

None

Likes 0	
Dislikes 0	

Response

Glen Farmer - Avista - Avista Corporation - 1,3,5

Answer	No
Document Name	

Comment

NA

Likes 0	
Dislikes 0	

Response

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

Answer	No
Document Name	

Comment

Likes 0	
Dislikes 0	

Response

Jodirah Green - ACES Power Marketing - 1 - WECC, Group Name ACES Collaborators

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Mike Magruder - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Richard Jackson - U.S. Bureau of Reclamation - 1,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Robert Follini - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Dislikes 0	
Response	
Andrea Jessup - Bonneville Power Administration - 1,5,6 - WECC	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Adrian Andreoiu - BC Hydro and Power Authority - 1,3,5, Group Name BC Hydro	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Document Accession #: 20251215-5332 Filed Date: 12/15/2025

3. Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?	
Daniela Atanasovski - APS - Arizona Public Service Co. - 1,3,5,6	
Answer	No
Document Name	
Comment	
None	
Likes 0	
Dislikes 0	
Response	
Adrian Andreoiu - BC Hydro and Power Authority - 1,3,5, Group Name BC Hydro	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Andrea Jessup - Bonneville Power Administration - 1,5,6 - WECC	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Robert Follini - Avista - Avista Corporation - 1,3,5	

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Glen Farmer - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Richard Jackson - U.S. Bureau of Reclamation - 1,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Mike Magruder - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Dislikes 0	
Response	
Jodirah Green - ACES Power Marketing - 1 - WECC, Group Name ACES Collaborators	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Israel Perez - Salt River Project - 1,3,5,6 - WECC	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Document Accession #: 20251215-5332 Filed Date: 12/15/2025

4. Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?

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

Answer	No
Document Name	
Comment	
None	
Likes 0	
Dislikes 0	
Response	

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

Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Jodirah Green - ACES Power Marketing - 1 - WECC, Group Name ACES Collaborators

Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Mike Magruder - Avista - Avista Corporation - 1,3,5

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Richard Jackson - U.S. Bureau of Reclamation - 1,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Glen Farmer - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Robert Follini - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	

Document Accession #: 20231215-5332 Filed Date: 12/15/2023

Dislikes 0	
Response	
Andrea Jessup - Bonneville Power Administration - 1,5,6 - WECC	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Adrian Andreoiu - BC Hydro and Power Authority - 1,3,5, Group Name BC Hydro	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Document Accession #: 20251215-5332 Filed Date: 12/15/2025

5. Does the proposed Regional Reliability Standard meet at least one of the following criteria?

- **The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.**
- **The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.**
- **The proposed regional difference is necessitated by a physical difference in the Bulk Power System.**

Robert Follini - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Glen Farmer - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Mike Magruder - Avista - Avista Corporation - 1,3,5	
Answer	No
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Daniela Atanasovski - APS - Arizona Public Service Co. - 1,3,5,6	
Answer	Yes
Document Name	
Comment	
None	
Likes 0	
Dislikes 0	
Response	
Jodirah Green - ACES Power Marketing - 1 - WECC, Group Name ACES Collaborators	
Answer	Yes
Document Name	
Comment	
Thank you for the opportunity to comment.	
Likes 0	
Dislikes 0	
Response	
Israel Perez - Salt River Project - 1,3,5,6 - WECC	
Answer	Yes
Document Name	
Comment	
While there are regional and physical differences, the changes proposed are mainly grammatical and all are minor.	
Likes 0	
Dislikes 0	
Response	
Adrian Andreoiu - BC Hydro and Power Authority - 1,3,5, Group Name BC Hydro	
Answer	Yes

Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Andrea Jessup - Bonneville Power Administration - 1,5,6 - WECC	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Richard Jackson - U.S. Bureau of Reclamation - 1,5	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

WECC
Electric Reliability and Security for the West

Response to Comments
Posting 1—45-Day at NERC
August 16 through September 29, 2023

WECC-0148 VAR-501-WECC-4
Power System Stabilizer
Information Only Filing

Posting 1—45-Day NERC

The WECC-0148 VAR-501-WECC-4, Power System Stabilizer Drafting Team (DT) thanks everyone who submitted comments on the proposed project. WECC-0148 is an information-only filing proposing no Substantive changes. [1]

Posting

This project was posted for comment by NERC from August 16, 2023, through September 29, 2023.

NERC distributed notice for the posting on August 16, 2023.

NERC asked stakeholders to provide feedback on the proposed project through a standardized electronic template.

NERC reported there "were 9 sets of responses, including comments from approximately 14 different people from approximately 9 companies representing 4 of the Industry Segments."

After review of the NERC-provided document, WECC found responses from seven organizations (some with member organization subcomponents), and 13 persons identified in the following Table of Respondents.

Location of Comments

All comments provided to WECC by NERC can be reviewed in their original format on the WECC-0148 project page under the "Submit and Review Comments" accordion.

Changes in Response to Comment

After consideration of all comments received, no further changes were made to this project.

Final from Tech

[1] The terms Substantive and Non-Substantive are defined terms found in the WECC Relibaility Standards Development Procedures. https://www.wecc.org/Reliability/WECC%20Reliability%20Standards%20Development%20Procedures%20-%20FERC%20Approved%2009-13-2021.pdf

Minority View

No minority views were raised.

Proposed Effective Date

The proposed Standard can be implemented immediately upon receipt of final regulatory approval.

Information Only—No Substantive Changes

This project represents an "Information Only" filing with no Substantive changes.

Per the WECC Relibaility Standards Development Procedures (Procedures), if no Substantive changes are requested to a Regional Standard, no further due process is required. Specifically, WECC Board of Directors (Board) approval is not required.

On July 11, 2022, a list[2] of proposed Non-Substantive changes was distributed to the Standards Email List (SEL) inviting comments or concerns to be forwarded to WECC Standards staff. A redline and a clean version of the project was posted on the WECC-0148, Posting 1 for Comment accordion. No comments were received.

On July 16, 2022, WECC posted a letter[3] to the WSC informing the WSC of its scope and authority to address an information only filing. The letter was published to the WECC-0148 home page on the Posting 1 for Comment accordion.

On December 6, 2022, during a duly noticed WSC meeting, the WSC reviewed the letter from July 16, 2022, and was briefed on the WSC's Procedural authority to approve the project with no further due process, so long as all changes were deemed Non-Substantive.

The WSC concurred[4] that all proposed changes were Non-Substantive. Because the proposed changes are all Non-Substantive, the WSC also concurred that neither a posting for comment, ballot, Board approval, nor an Implementation Plan were required per the Procedures.

Table of Respondents

	Organization	
1	ACES Power Marketing (ACES)	Bob Soloman, Jodirah Green, Kris Carper
2	Arizona Public Service Company (APS)	Daniel Atanasovski
3	Avista Corporation	Glen Farmer, Mike Magruder, Robert Follini

[2] https://www.wecc.org/Administrative/WECC-0148%20Notice%20of%20No%20Substantive%20Change.pdf
[3] https://www.wecc.org/Reliability/WECC-0148%20VAR-501-WECC-3.1%20-%20Letter%20to%20WSC%20Requesting%20Information%20Only%20Filing%20-%20FINAL.docx
[4] https://www.wecc.org/Administrative/2022-03-16%20WSC%20Proposed%20Meeting%20Minutes%20for%20approval%202022-12-06-2022%20-%20FINAL%20FROM%20TECH.docx

	Organization	
4	BC Hydro and Power Authority (BC)	Adrian Andreoiu, Helen Hamilton Harding, Hootan Jarollahi
5	Bonneville Power Administration (BPA)	Andrea Jessup
6	Salt River Project (SRP)	Israel Perez
7	United States Bureau of Reclamation (USB)	Richard Jackson

Contacts and Appeals

If you feel your comment has been omitted or overlooked, please contact W. Shannon Black, WECC Consultant, at (503) 307-5782. In addition, there is a WECC Reliability Standards appeals process.

Final from Tech

Index to NERC-provided Questions, Comments, and Responses

Question

1) Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?
2) Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?
3) Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?
4) Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?
5) Does the proposed Regional Reliability Standard meet at least one of the following criteria
    a. The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.
    b. The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.
    c. The proposed regional difference is necessitated by a physical difference in the Bulk Power System.

Final from Tech

Comment Summary. For proposed changes and avenues forward, please see the preamble. 1) *Question 1*—Do you agree the proposed Regional Reliability Standard was developed in a fair and open process, using the associated Regional Reliability Standards Development Procedure?	
Commenter	**Comment or Response**
ACES	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Mike Magruder	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Robert Follini	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
BC	Yes
Response	

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
BPA	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
SRP	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
USB	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Final fro

Comment Summary. For proposed changes and avenues forward, please see the preamble. 1) *Question 2*— **Does the proposed Regional Reliability Standard pose an adverse impact to reliability or commerce in a neighboring region or interconnection?**	
Commenter	**Comment or Response**
ACES	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Mike Magruder	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Robert Follini	No
Response	

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
BC	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
BPA	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
SRP	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
USB	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Comment Summary. For proposed changes and avenues forward, please see the preamble. 1) *Question 3*— Does the proposed Regional Reliability Standard pose a serious and substantial threat to public health, safety, welfare, or national security?	
Commenter	**Comment or Response**
ACES	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Mike Magruder	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Robert Follini	No
Response	

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
BC	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
BPA	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
SRP	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
USB	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Comment Summary. For proposed changes and avenues forward, please see the preamble.

1) ***Question 4*— Does the proposed Regional Reliability Standard pose a serious and substantial burden on competitive markets within the interconnection that is not necessary for reliability?**

Commenter	Comment or Response
ACES	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	No.
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Mike Magruder	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista - Robert Follini	No
Response	

The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.

Commenter	Comment or Response
BC	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
BPA	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
SRP	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Commenter	Comment or Response
USB	No
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Comment Summary. For proposed changes and avenues forward, please see the preamble.

1) Question 5—Does the proposed Regional Reliability Standard meet at least one of the following criteria:

d. The proposed Regional Reliability Standard has more specific criteria for the same requirements covered in a continent-wide standard.
e. The proposed Regional Reliability Standard has requirements that are not included in the corresponding continent-wide standard.
f. The proposed regional difference is necessitated by a physical difference in the Bulk Power System.

Commenter	Comment or Response
ACES	Yes. Thank you for the opportunity to comment.
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
APS	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
Avista – Glen Farmer	No
Response	
The WECC-0148 Drafting Team (DT) appreciates Avista's negative response; however, Avista has failed to explain their response, identify any issues, or suggest any proposed changes. As such, the DT can neither identify nor remedy Avista's concern.	
Commenter	**Comment or Response**
Avista - Mike Magruder	No
Response	
The WECC-0148 Drafting Team (DT) appreciates Avista's negative response; however, Avista has failed to explain their response, identify any issues, or suggest any proposed changes. As such, the DT can neither identify nor remedy Avista's concern.	
Commenter	**Comment or Response**
Avista - Robert Follini	No
Response	

The WECC-0148 Drafting Team (DT) appreciates Avista's negative response; however, Avista has failed to explain their response, identify any issues, or suggest any proposed changes. As such, the DT can neither identify nor remedy Avista's concern.

Commenter	Comment or Response
BC	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
BPA	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
SRP	Yes. While there are regional and physical differences, the changes proposed are mainly grammatical and all are minor.
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	
Commenter	**Comment or Response**
USB	Yes
Response	
The WECC-0148 Drafting Team (DT) appreciates each respondent's engagement in the Standards development process.	

Final

Exhibit C

Standard Drafting Team Roster for Project WECC-0148 Power System Stabilizer

WECC
Electric Reliability and Security for the West

Attachment L
Drafting Team Roster
WECC-0148 VAR-501-WECC-4
Five-year Review

Drafting Team Roster

Below please find a brief biography for each member of the WECC-0148 VAR-501-WECC-4, Power System Stabilizer, Five-year Review Drafting Team.

Name	Qualifications
Greg Anderson, Southern California Edison	Mr. Anderson is the subject matter expert for generation and excitation systems for the Southern California Edison Company. He has over 33 years of experience in the utility industry, with responsibilities for coordinating WECC testing of generation assets. He has been a WECC participant since 1997 and a member of the Control Work Group since 2003.
Joel Anthes, **Pacific Gas and Electric**	Mr. Anthes is a Senior Electrical Engineer with Pacific Gas and Electric Company's Power Generation organization. Mr. Anthes has more than 16 years of experience in the electrical and power generation industries. Over the past nine years, he has led the development of multiple technical programs related to electrical generation and excitation system protection, control system tuning and modeling, and generator electrical ratings. Mr. Anthes is a registered professional engineer in the state of California and plays an active role in the development of industry best practices and regulatory standards for NERC. Recent experience includes: • Member of the drafting team for NERC Project 2020-02 Transmission-connected Dynamic Reactive Resources. • Power system stabilizer (PSS) tuning and validation. • Development of tools for numerical calculation of generator field current. Performs generator heat runs to prove safe increase of electrical rating beyond existing nameplate. • Development of program for dynamic modeling of generators, voltage regulators, governors, and power system stabilizers. Development of associated programs for NERC regulatory compliance.

	• Developed custom tools for determining generator electrical characteristics, impedances, time constants, phase response, and capability curves for synchronous generators. Oversees training of other engineers in the proper implementation of these tools. • Commissions and tests excitation systems, voltage regulators, and power system stabilizers. • Performs Root Cause Analyses using industry standard methodologies for operational safety incidents and major equipment failures. • Developed recommendations for corrective actions to effectively prevent the recurrence of equipment failure and human performance errors.
Shane Kronebusch, L&S Electric, Inc.	Mr. Kronebusch is the Lead Electrical Engineer and subject matter expert for generation and excitation systems for L&S Electric, Inc. He has over 31 years of experience in the utility industry, including: • Developing the LS-AES excitation system. • Designing, installing, and commissioning exciters and governors across a wide range of units. • Performing of testing and model validation reports for NERC MOD-025, -026, & -027. • Coordinating and preforming WECC testing of generation assets as an employee of BC Hydro Generation Engineering and Maintenance Services before joining L&S Electric, Inc. in 2010. • Participating as a member of the WECC Control Work Group since 2006 and drafting team member of WECC-0099/0107.
Matthew McDonald, Arizona Public Service	Mr. McDonald is a Senior Electrical Engineer in the Technical Projects Engineering department with 15 years of experience in the utility industry. He holds a Bachelor of Science from Pennsylvania State University as well as a professional engineering license. His expertise and experience include the following: • 13 years' hands-on experience installing, troubleshooting, commissioning, and tuning excitation systems and generator protection relays. • Five years of experience performing generator, excitation, and PSS model validation via simulation and live testing.

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	• Excitation system subject matter expert for Arizona Public Service for the past four years. • NERC/WECC compliance lead for VAR-501-3, PRC-19-2, PRC-002, PRC-27-1 and PRC-25-2. • Other responsibilities and roles have included generator excitation instructor, improvisational field testing, synchro-phasor and digital fault recorder commissioning.
Kimberly Turco, Constellation Energy	Ms. Turco has worked for Constellation Energy Generation (CEG) for 10 years, with the last two years in NERC compliance and supporting ISO compliance. CEG is actively involved in NERC's Standards Under Development process and would like to take this opportunity for direct involvement in the review of VAR-501-WECC. Kim comes with a wide background in energy and compliance that would be an asset in the standards review process. Kim's background: • Worked as a subject matter expert in AESO in day-ahead bidding and electronic transaction systems (ETS). • Drafted CEG's Grande Prairie Generation generating station's Transmission Must Run Contract. • A barred attorney. • NERC compliance SME and compliance contact for CEG's WECC and Alberta generating facilities. • Lead on historical submittal of Automatic Voltage Regulator and Power System Stabilizer Outage reporting. Kim has the full support of CEG's NERC Compliance Group and will be able to dedicate the time and resources demanded of a member of the Standards Drafting Team.

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Document Content(s)

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