

WECC Power System Stabilizer Design and Performance Criteria

Purpose of PSS

Power System Stabilizers (PSS) are designed to enhance damping of power system oscillations in order to extend power transfer limits of the system and maintain reliable operation of the grid.

Type of PSS

WECC recommends a dual input integral of accelerating power type of PSS (IEEE Type PSS2A).

Electric power type PSS are not acceptable in the WECC system because they are ineffective in damping interarea modes of oscillations.

Minimum Performance Requirements of PSS

The minimum acceptable performance of PSS is to provide a compensated frequency response of the excitation system and synchronous machine such that through the frequency range from 0.1 Hertz to 1.0 Hertz the phase will not exceed ± 30 degrees.

PSS output limits shall be at least $\pm 5\%$ of the synchronous machine terminal voltage.

PSS gain shall be set to provide a gain margin of least 6 dB and no more than 10 dB.

PSS washout time constant shall be set as low as possible while maintaining the compensated phase criteria.

Performance verification requirements

Performance verification reports shall include a minimum of the following:

Description of facility:

- Unit type (including ratings).
- Excitation system and AVR type.
- PSS type, inputs, and available setting ranges for adjustable parameters. Include description of PSS failure detection system if provided.
- PSS modifications required to provide final settings.

List of final settings, including:

- A description of test methodology and rationale for final settings.
- Output limit settings.
- Gain.
- Lead and lag time constants.
- Washout time constant.
- Other filtering parameters (fixed or settable).

Models (per IEEE standard 421.5)

- PSS model and parameters.
- Excitation model and parameters.

Bode plots

- Excitation response with unit connected to electrical system without PSS in service. (See Figure 7 in WECC PSS Tuning Guidelines.)
- PSS response alone. (See Figure 8 in WECC PSS Tuning Guidelines.)
- Excitation response with PSS in service and unit connected to electrical system. This plot can be either via test or calculated based on previous two plots.

Simulations

If settings are developed through simulations, provide actual excitation responses, on and off line step and/or frequency responses, versus excitation model responses used in simulation. Step responses shall include generator terminal voltage, field voltage, and field current as well as exciter field voltage and current, if applicable.

Time plots

Step response showing generator terminal voltage, field voltage, field current, power, PSS output, AVR output with PSS in service and out of service. (See Figure 5 in WECC PSS Tuning Guidelines.)

Related documents:

WECC PSS Policy Statement
WECC PSS Tuning Guidelines
WECC Tutorial on PSS
IEEE Standards 421 series

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