

Sub-Synchronous Resonance (SSR) Analysis and Mitigation Studies Using DSATools™

The potential for detrimental SSR interaction is usually assessed by the following three criteria:

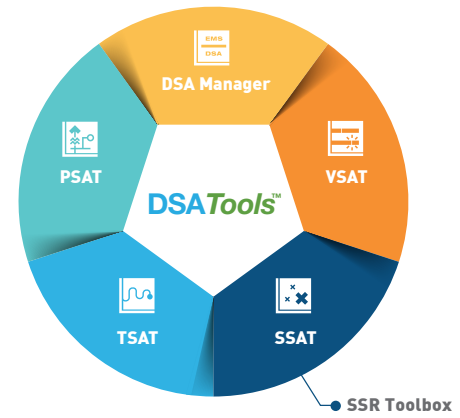
- **Induction Generator Effect:** This is indicated if the net resistance of the system is negative at the series resonance of the system impedance as viewed from the generator neutral.
- **Torsional Interaction Effect:** This is indicated if the un-damping ratio is greater than 1.0 within ± 1 Hz of a torsional mode frequency of the generator.
- **Transient Torque Amplification:** This is indicated if a "reactance dip" calculated using a local maximum reactance and a local minimum reactance that occurs within ± 3.0 Hz of a torsional mode frequency of the generator is greater than 5%.

Powertech's SSR Toolbox and Small-signal Stability Analysis Tool (SSAT) of DSATools™ software package can compute the above quantities through frequency response and eigenvalue computations. Proper parts of the network will be represented by state-space dynamic modeling, which also includes the applicable series capacitors. Furthermore, frequency responses may be conducted for each nearby renewable plant to investigate potential Sub-Synchronous Control Interactions (SSCI). The rest of the system is automatically represented by original phasor model injections without requiring any prior system reduction.

The above analysis may further be complimented by testing various mitigation plans, which may include a Thyristor-Controlled Series Capacitor (TCSC) as a portion of the series compensation. Such a capability exists in SSAT which contains a state-of-the-art TCSC model that represents the internal control effects of this equipment for leading manufacturers, as well as a user-defined model for its external controls.

Analysis Features

- Induction generator effect assessment.
- Torsional interaction effect screening and eigenvalue computation.
- Torsional torque amplification index calculations.
- Potential SSCI assessment of nearby power electronic equipment and renewable plants.
- Examination of various mitigation plans which may include TCSC.
- Eliminating the need for any prior system reduction irrespective of the network size.
- Offering a high degree of efficiency for analysis under various contingencies.
- Providing for efficient assessments repetitions under various operating conditions.

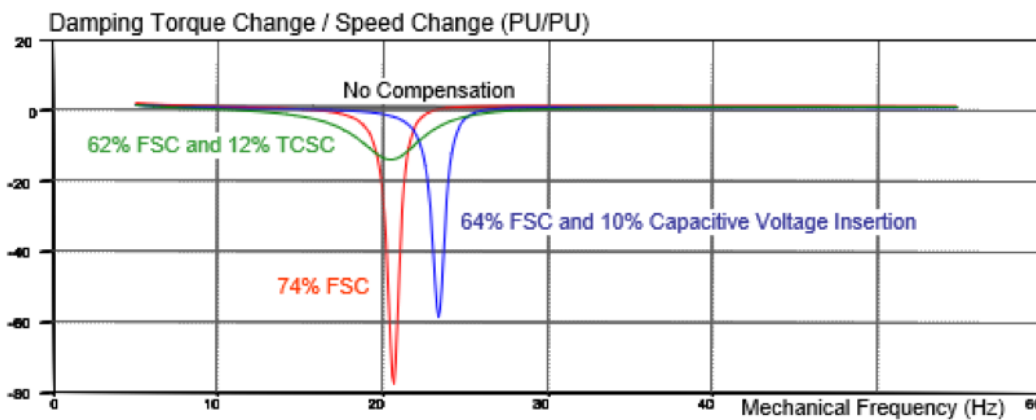


ABOUT POWERTECH LABS:

Powertech Labs Inc. is one of the largest testing and research laboratories in North America, situated in beautiful British Columbia, Canada. Our 11-acre facility offers 15 different testing labs for a one-stop-shop approach to managing electrical utilities, and testing gas components, pressure vessels and systems.

Outside of the utilities industry, Powertech provides routine testing capabilities, product development, research and consulting services to support an array of industrial-type operations, electrical equipment manufacturers and automotive original equipment manufacturers.

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