

# **Bifurcation Analysis of Subsynchronous Resonance of The IEEE Second Benchmark Model with TCSC**

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## **Abstract**

This paper presents the bifurcation analysis of the IEEE second benchmark model of Subsynchronous Resonance (SSR) when the transmission line is compensated by Thyristor-Controlled Series Capacitor (TCSC). Varying the firing angle of the thyristors changes the equivalent capacitance, which in turn controls the compensation factor of the transmission line. The dynamics of damper windings, Automatic Voltage Regulator (AVR), Power System Stabilizer (PSS) and Turbine Governor (TG) are included. As the series compensation increases, the power transfer capability of the transmission line increases. However, the operating point of the system loses stability via supercritical Hopf bifurcation in case of conventional compensation. In this study, it is found that the operating point of the thyristor-controlled compensated system never loses stability at any realistic firing angle and therefore all bifurcations of the system are eliminated.