The biggest FACTS project worldwide -
The FSC and TCSC Purnea Gorakhpur Project in India was put into commercial operation in 2006

The 400 kV Series Compensation projects at Purnea and Gorakhpur (Figure 1) Substations are part of Power Grid Corporation of India’s efforts to enhance their east to west power transfer (Further information on: India – Perspectives of Grid Developments). Power generated in the Tala hydroelectric power plant (located in Bhutan) is transmitted via a newly built 400 kV double circuit transmission line from the power plant to Gorakhpur substation. There the line is connected to the existing 400 kV network, and feeds into the northern industrialized region around the capital New Delhi. From the intermediate substation along the line, India’s north eastern region also gains form economic hydro power.

In May 2004 Siemens received the turnkey contract for four series capacitors (two for each substation). To improve system stability of the intermeshed long distance power transmission, series capacitors are installed in the double circuit lines at Purnea and Gorakhpur Substations. Each series capacitor consists of a fixed (FSC) and a thyristor-controlled (TCSC) series capacitor segment.

The fixed series capacitors (FSC) compensate 40 % of the line impedance, reduce transmission losses, and contribute to steady state and dynamic stability of the system. Thyristor-controlled series capacitors (TCSC) have been determined as the solution to provide sufficient stability for the increasing power transfer. Each of the TCSC are designed to compensate 6 % of the line impedance during state operation, and to vary the impedance in a range between 5 and 15%. This allows acting against power oscillations as they may occur during and after system disturbances.

The rated line current of 3200 A imposed severe requirements on thyristor valve design to control the TCSC impedance over the required range. With more than 700 Mvar for each FSC segment, and about 110 Mvar for the TCSCs this project is one of the biggest FACTS projects of this kind worldwide.

The turnkey contracts were splitted into the off-shore supply part, executed by Siemens Germany, the on-shore supply part, and the on-shore service part, which included civil works, installation and commissioning. The contracts were executed by a joint project team of PTD Siemens Germany and Siemens Ltd. India team members. Thus local technical competence in FACTS technology offers direct service to our customers for future projects.

Early 2006 the project was completed and put into commercial operation.