Sasaram HVDC Project 
Closing the Loop in India's National Grid

The Power Grid Corporation of India needed to fully integrate their regional systems to avoid network failures and meet demands. The Sasaram project completes the loop between the regions, delivering a fully connected and integrated network.
Customer Challenges

The Power Grid Corporation of India is the largest transmission utility on the sub-continent and transmits generating capacity through its networks across the country. Its mission is the establishment and operation of power grids to allow the transfer of power between and across the regions safely, reliably and on an economical basis, thus balancing supply with the differing regional demands.

The Need for Integration

The project is the fifth in a series of initiatives set up to connect the different regional asynchronous electrical grids using High Voltage Direct Current (HVDC) back-to-back connectors. The project will allow the hydro-electric-rich north and south regions to connect with the thermal-powered regions of the east and west. Sasaram will complete the loop between the regions, delivering a fully connected and integrated network.

The need to fully integrate the regional systems was driven by the network’s regular failure to meet demand. The network had an installed capacity of almost 110,000 MW, but due to breakdowns and maintenance downtime, it typically could only access 75% of the capacity at any given time. The system’s structure also meant that while one region was experiencing a power shortage, another power station just a few kilometres away might be shut down.

Key Benefits of HVDC

- Efficient transmission of electricity through insulated cable over long distances
- Fast, accurate, fully-controllable and measurable power flow
- Generation from remote source may be injected directly where needed
- HVDC converter station presents lower environmental impact compared to generation plant

Project Overview

Country: India  
Project: Sasaram  
Customer: Power Grid Corporation of India  
Technology: High Voltage Direct Current (HVDC) Line Commutated Converter (LCC) Turnkey solution consisting of a back-to-back link comprising a 500 MW pole operating at 205 kVdc, 2,475 A, along with conventional switch-yards at each end of the link.  
Ratings: 500 MW, ±205 kVDC  
Operation Date: 2006

Above: “Quadrivalve” tower inside the valve hall  
Left: AC filter yard components
GE Solution

At Sasaram, GE supplied a turnkey solution consisting of a back-to-back link comprising a 500 MW pole operating at 205 kVdc, 2,475 A, along with conventional switch-yards at each end of the link.

The heart of the power electronics link consists of the thyristor valves, which controls the level and direction of power flow between the two regions. To operate at the required voltage and current levels, it is necessary to connect many thyristors in series. Fifty thyristors form a valve and four valves stacked vertically form a 'quadrivlave' tower.

The 100 mm diameter silicon wafer thyristors are clamped in pairs between high efficiency water-cooled heatsinks which, together with their local voltage grading and thyristor triggering circuits, form the basic building block of the valve: the 'thyristor level'.

The quadrivalves are arranged in the valve hall with space around them for maintenance access, electrical clearance and connections. The valve hall is designed to provide a temperature and humidity controlled environment and the screened walls are constructed to contain the radio frequency interference generated by the valves.

Key Benefits

Return-on-Investment

With a minimum 30-year design life, the new converter station will continue to provide stable and flexible resource sharing between India’s regions well into the future and will deliver an ongoing high-value return on investment.

Shared Resources

The hydroelectric-rich north and south regions of India are now connected with the western and eastern regions, which have substantial coal reserves. This integrated network now allows shared regional power generation while safeguarding local resources during times of seasonal shortages.

Partners in Power

Building on the existing good working relationship with POWERGRID and through the timely and successful completion of this project, GE demonstrated the validity of its enviable track record in the delivery of quality-proven solutions.