

OVERVIEW OF VSC TRANSMISSION TECHNOLOGY

Since its introduction in the early 1950s, LCC HVDC technology has undergone continuous development, particularly in the areas of converter switches and controls. Today LCC HVDC schemes provide reliable, efficient and cost effective solutions for many applications. The use of modern techniques have made it possible to obtain stable operation for LCC HVDC schemes connected to much weaker ac networks than was previously possible.

Other fields of power electronics, such as industrial drives, have tended to determine the development of new semiconductor devices, because the quantity of devices produced each year for these applications can be many times the number required for HVDC schemes. Motor drives have, over the years, moved on from using line commutated converters to the use of voltage sourced converters (VSC) with pulse width modulation (PWM) control, which results in compact and more controllable drives. Usually such drives operate at relatively low ac and dc voltage and do not use series-connected semiconductors.

The 3-MW Hellsjön VSC transmission installation put into service in Sweden in 1997 was an extension of modern motor drive technology. To reach a transmission voltage of 10 kVdc, however, series-connected semiconductors were required. The trial installation proved the feasibility of the technology and demonstrated its superior technical capability when compared to LCC HVDC. Subsequently, more schemes have been installed, with the largest in service at the end of 2004 having a rating of 330 MW and ± 150 kVdc. CIGRÉ has given this new type of dc transmission the name VSC Transmission.

VSC Transmission has a number of technical features that are superior to those of LCC HVDC schemes and make it especially attractive for the following applications:

- Feeding into passive networks
- Transmission to/from weak ac systems
- Enhancement of an ac system
- Land cable systems
- Supply of offshore loads
- Connection to wind farms (on-shore or off-shore) or wave power generation
- In-feeds to city centres
- Multi-terminal systems

Continuing developments in semiconductors and VSC Transmission technology are likely to make VSC Transmission attractive in an increasing number of applications as research and development efforts continue to bring down the capital cost and power losses of the converters.