

S01-10 “Advanced HVDC Technology for International Interconnection”

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Abstract

High Voltage Direct Current (HVDC) Transmission System is one of the best alternatives in case of connecting the power systems between countries where the electric networks are operated independently. Asynchronous ties enable the connection of both power systems with minimum interaction.

There are two frequency regions in Japan, 50 Hz in the East and 60 Hz in the West. Also, Hokkaido island and Shikoku island are physically separated from the Main island by channels, thus cable transmission is required for electric network connection. Therefore, the needs for HVDC have been high since an early stage, and many research and development works have been carried out between utility companies and manufacturers in Japan.

Since the world first directly light triggered thyristor (LTT) valves for HVDC were commissioned at Shin-Shinano Frequency Converter Station (300 MW) in 1992, five HVDC systems with LTT valves have been installed in Japan, and all of them have proven the superiority of LTT valves in terms of high reliability and easier maintenance. DC-GIS technologies were commercialized in the Kii Channel HVDC system (1400 MW) in 2000. Special attention is required for DC-GIS which is different from AC-GIS. The outline for those technologies will be explained in this paper.

Voltage-sourced converters are a very attractive new technology. The reliance on the strength of AC systems is quite reduced compared with the conventional HVDC using line-commutated converters. It is possible to supply the power to the system without an AC voltage source. The flexibility for DC network configuration is also improved as compared with the conventional type HVDC. Requirement for the communication systems is significantly reduced too. The Japanese government supported the development of the technologies required for the voltage-sourced converter based HVDC systems. Newly developed multi-terminal HVDC control systems and VSCs were successfully field tested in Shin-Shinano in 1999. The outline of these technologies will also be explained.