IEEE NSW SECTION Joint presentation with Energy Australia.

Recent Advances in High-Voltage Direct-Current Power Transmission Systems

Date: 9th October 2007
Time: 12:15pm for 12:30pm start
Cost: no charge
Venue: Ground Floor Auditorium *(entry beside the police station)*
Energy Australia
570 George Street, SYDNEY

- *all welcome*
- *short walk from TOWN HALL rail station.*

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Summary

The ever-increasing progress of high-voltage high-power fully controlled semiconductor technology continues to have a significant impact on the development of advanced power electronic apparatus. These electronic systems can be effectively used to support optimised operations and efficient management of electrical grids, which in many cases are fully or partially deregulated networks.

Developments advance both the high-voltage direct-current (HVDC) power transmission and the flexible alternating current transmission system (FACTS) technologies. The fully controlled semiconductor devices available today for high voltage high-power converters can be either thyristors or transistors (Table 1). These devices can be used to build a voltage-source converter (VSC) with pulse width modulation (PWM), operating at frequencies higher than the line frequency. Typically, it is desirable that a VSC application generates PWM waveforms of higher frequency when compared to the thyristor-based counterparts. However, the operating frequency of the semiconductor devices is also determined by the losses and the design of the heat sink, both of which are related to the power through the device. Switching losses are one of the most serious issues that need to be dealt with in VSC-based power electronics systems applications.

In this seminar, an overview of the recent advances in the area of VSC-based HVDC technology will be given. Selected key multilevel converter topologies will be showcased. Key applications of VSC-based HVDC installations worldwide will be discussed along with the achievements of the technology progress in question. It is confirmed that the continuous development of power electronics presents cost-effective opportunities for the utilities to exploit and HVDC remains a key technology. In particular, VSC-HVDC can address not only conventional network issues, such as: bulk power transmission, asynchronous network interconnections, back-to-back AC system linking and voltage/stability support to mention a few, but also niche markets, such as, the integration of large scale renewable energy sources with the grid (onshore and offshore wind farms and solar parks) and become the backbone of medium to low voltage city and network grid configurations of the future.

Table 1: Summary of fully controlled high-power semiconductors.

Acronym	Type	Full Name
IGBT	Transistor	Insulated Gate Bipolar Transistor
IEGT	Transistor	Injection Enhanced Gate Transistor
GTO	Thyristor	Gate Turn-off Thyristor
IGCT	Thyristor	Integrated Gate Commutated Thyristor
GCT	Thyristor	Gate Commutated Turn-off Thyristor

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