Design, Control, and Application of Modular Multilevel Converters for HVDC Transmission Systems

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**DESCRIPTION**

*Design, Control and Application of Modular Multilevel Converters for HVDC Transmission Systems* is a comprehensive guide to semiconductor technologies applicable for MMC design, component sizing control, modulation, and application of the MMC technology for HVDC transmission.

Separated into three distinct parts, the first offers an overview of MMC technology, including information on converter component sizing, Control and Communication, Protection and Fault Management, and Generic Modelling and Simulation. The second covers the applications of MMC in offshore WPP, including planning, technical and economic requirements and optimization options, fault management, dynamic and transient stability. Finally, the third chapter explores the applications of MMC in HVDC transmission and Multi Terminal configurations, including Supergrids.

Key features:

- Unique coverage of the offshore application and optimization of MMC-HVDC schemes for the export of offshore wind energy to the mainland.

- Comprehensive explanation of MMC application in HVDC and MTDC transmission technology.

- Detailed description of MMC components, control and modulation, different modeling approaches, converter dynamics under steady-state and fault contingencies including application and housing of MMC in HVDC schemes for onshore and offshore.
• Analysis of DC fault detection and protection technologies, system studies required for the integration of HVDC terminals to offshore wind power plants, and commissioning procedures for onshore and offshore HVDC terminals.

• A set of self-explanatory simulation models for HVDC test cases is available to download from the companion website.

This book provides essential reading for graduate students and researchers, as well as field engineers and professionals who require an in-depth understanding of MMC technology.

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**ABOUT THE AUTHOR**

**Kamran Sharifabadi, Power Grid & Regulatory Affairs, Statoil, Norway** Kamran has twenty-five years of international experience in the field of HVDC technology projects. He started out as a research engineer in ABB and Siemen, worked as a consultant for five years, then became a manager at the Norwegian TSO. He is currently a senior technology advisor for Statoil’s HVDC projects, a guest lecturer in the topics of VSC HVDC, Wind power generation technologies at NTNU and at various different universities in central Europe. Kamran is an active member of the Cigre B4 (HVDC) working group and the leader of the steering committee for a European research project on DC grids.

**Remus Teodorescu, Aalborg University, Denmark** Remus is an Associate Professor at the Institute of Technology, teaching courses in power electronics and electrical energy system control. He has authored over 80 journal and conference papers and two books. He is the founder and coordinator of the Green Power Laboratory at Aalborg University, and is co-recipient of the Technical Committee Prize Paper Award at IEEE Optim 2002.

**Hans Peter Nee, KTH, Sweden** Hans is Professor of Power Electronics in the Department of Electrical Engineering. He has supervised and examined ten finalized doctor’s projects, and was awarded the Elforsk Scholarship in 1997. He has served on the board of the IEEE Sweden Section for many years and was Chairman during 2002 and 2003. He is also a member of EPE and serves in the Executive Council and in the International Steering Committee.

**Lennart Harnefors, ABB, Västerås, Sweden** Lennart is currently with ABB Power Systems – HVDC, Ludvika, Sweden as an R&D Project Manager and Principal Engineer, and with KTH as an Adjunct Professor of power electronics. Between 2001 and 2005, he was a part-time Visiting Professor of electrical drives with Chalmers University of Technology, Sweden. He is an Associate Editor of the IEEE Transactions on Industrial Electronics, on the Editorial Board of IET Electric Power Applications, and a member of the Executive Council and the International Scientific Committee of the European Power Electronics and Drives Association.
Staffan Norrga, KTH, Sweden Between 1994 and 2011, Staffan worked as a Development Engineer at ABB in Västerås, Sweden, in various power-electronics-related areas such as railway traction systems and converters for HVDC power transmission systems. In 2000, he returned to the Department of Electric Machines and Power Electronics of the Royal Institute of Technology, where he is an associate professor. He is the inventor or co-inventor of 11 granted patents and 14 patents pending and has authored more than 35 scientific papers.