

Recent Advances in Medium/High-Power Energy Conversion Systems

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Date: 23rd November 2017

Tim: 5:00-6:30pm

Location: McMaster University, ITBA 113

Abstract:

The continuously increasing demand for electric power and the need for efficient grid integration and transmission of remote large-scale renewable energy resources have revived the interest in High-Voltage Direct Current (HVDC) systems. The HVDC systems based on the Voltage-Sourced Converter (VSC) are a promising technology for (i) expansion of the power networks for large cities, (ii) grid integration of renewable energy resources, i.e., hydropower and offshore wind farms, (iii) long-distance bulk power transmission, (iv) interconnection of asynchronous power grids, and (v) electrification of isolated loads, islands, and oil and gas stations.

The key enabling technology for VSC-HVDC systems is efficient, scalable, and fault-tolerant high-power VSCs. The Modular Multilevel Converter (MMC) topology is a newly introduced VSC which, conceptually, does not have the drawbacks of the existing high-power VSCs. The emergence of the MMC has opened up a new avenue for research and development of not only the VSC-HVDC systems but also for other emerging applications including interfacing energy storage devices to the utility grid, collection systems of offshore wind farms, and medium-voltage high-power adjustable speed drives.

The first part of this presentation provides an overview of the MMC-HVDC systems and current research challenges that need to be addressed. In the second part of this presentation, other emerging application spaces of the MMCs along with their technical challenges/issues are introduced and discussed. The speaker's research activities on addressing those challenges will be presented.

The Speaker:

Maryam Saedifard received the Ph.D. degree in electrical engineering from the University of Toronto, in 2008. Since January 2014, she has been with the School of Electrical and Computer Engineering at Georgia Institute of Technology, where she is currently as associate professor. Prior to joining Georgia Tech, she was an assistant professor at Purdue University (2010-2013) and a research scientist with the Power Electronic Systems Group, ABB Corporate Research Center, Switzerland (2007-2009). She is the recipient of the Richard M. Bass Award Outstanding Young Power Electronic Engineer Award of the IEEE Power Electronic Society in 2010, and Excellence in Research from of the Office of Vice President for Research of Purdue University in 2011 and 2012. Her research interests include power electronics and its applications in power systems and vehicular electrification.

