



2022 PSERC Summer Tutorial

High-Voltage DC Transmission Systems: Converter Stations, Control and Protection

Maryam Saedifard
Georgia Institute of Technology

High Voltage DC (HVDC) transmission is a long-standing technology with many installations around the world. Over the past few years, significant breakthroughs in the voltage-sourced converter technology along with their attractive features have made the HVDC technology even more promising in providing enhanced reliability and functionality and reducing cost and power losses. Concomitantly, significant changes in generation, transmission, and loads such as (i) integration and tapping renewable energy generation in remote areas, (ii) need for relocation or bypassing older conventional and/or nuclear power plants, (iii) increasing transmission capacity, and (iv) urbanization and the need to feed the large cities have emerged. These new trends have called for more HVDC lines and even Multi-Terminal DC (MTDC) systems, which when embedded inside the AC grid, can enhance stability, reliability, and efficiency of the present power grid. The strategic importance of MVDC and HVDC grids is evidenced by the number of worldwide projects currently in their advanced planning stage, e.g., European “Supergrids” and the Baltic Sea project along with several projects in China.

This tutorial is first focused on introducing the state-of-the-art HVDC converter stations, along with their basics of operation and control for point-to-point and back-to-back HVDC systems. Then, protection against DC-side faults, which is one of the major technical challenges of the HVDC systems, is discussed and corresponding protection measures are introduced.

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2:00 – 3:30 P.M. EDT

(11:00 - 12:30 P.M. PDT)

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 and holds a Dean’s professorship. 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 an IEEE Fellow and is currently serving as a Co-Editor-in-Chief of IEEE Trans. on Power Electronics. Her research interests include power electronics and its applications in terrestrial and mobile power systems.

