



Multi-terminal Direct-Current Grids: Modeling, Analysis, and Control

Nilanjan Chaudhuri, Balarko Chaudhuri, Rajat Majumder, Amirnaser Yazdani

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A generic DC grid model that is compatible with the standard AC system stability model is presented and used to analyse the interaction between the DC grid and the host AC systems.

A multi-terminal DC (MTDC) grid interconnecting multiple AC systems and offshore energy sources (e.g. wind farms) across the nations and continents would allow effective sharing of intermittent renewable resources and open market operation for secure and cost-effective supply of electricity. However, such DC grids are unprecedented with no operational experience. Despite lots of discussions and specific visions for setting up such MTDC grids particularly in Europe, none has yet been realized in practice due to two major technical barriers:

- Lack of proper understanding about the interaction between a MTDC grid and the surrounding AC systems.
- Commercial unavailability of efficient DC side fault current interruption technology for conventional voltage sourced converter systems

This book addresses the first issue in details by presenting a comprehensive modeling, analysis and control design framework. Possible methodologies for autonomous power sharing and exchange of frequency support across a MTDC grid and their impact on overall stability is covered. An overview of the state-of-the-art, challenges and on-going research and development initiatives for DC side fault current interruption is also presented.



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