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Accurate Impedance Modeling and Control Strategy for Improving the Stability of DC System in Multiterminal MMC-Based DC Grid

This project proposes an accurate dc-side impedance modeling method of Modular Multilevel Converter (MMC) and a control strategy for improving the stability of the dc system in MMC-based DC grid. First, the impedance modeling method based on harmonic linearization is adopted to establish the dc-side small signal impedance model of MMC, which considers the internal multi harmonic coupling characteristics and the complete control system. Second, an equivalent model is established to analyze the frequency impedance characteristics of the DC ports in MMC-based dc grid, and the stability of dc ports is further analyzed based on the impedance-based stability criterion. Then, considering both the dynamic characteristics and stability of the dc system, a specific design method of controller parameter optimization and additional virtual damping controller is proposed. Based on MATLAB/Simulink, a detailed time-domain simulation model of MMC-based DC grid is established. The simulation results prove the accuracy of the proposed impedance modeling method and the validity of the proposed control strategy.

Domain: Power Systems _ HVDC
Technology: Electrical