

# Coordinated Reactive Power Control for Hybrid Cascaded HVDC Links in Weak AC Grids

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June 27, 2023

## Abstract

The hybrid cascaded high-voltage direct-current (HC-HVDC) links is recently introduced for ultra-high voltage bulky power transmissions. However, as wind power becomes more prevalent, the grid is gradually weakened and will faces voltage stability issues. This paper proposes a coordinated reactive power control strategy for HC-HVDC links to enhance the voltage stability of AC bus. Firstly, the impact of HC-HVDC on the static voltage stability of the AC bus is studied by the voltage sensitivity coefficient. Then, the limitation of reactive power capability of modular multilevel converter (MMC) in the hybrid cascaded structure is identified. Based on the analysis results, a coordinated reactive power control strategy based on adaptive voltage droop is proposed. In the strategy, the DC voltage ratio is regulated according to the fluctuation degree of the AC bus voltage to adjust the reactive power of HC-HVDC, which realized the dynamic voltage support for the AC bus. Finally, electromagnetic simulations in PSCAD/EMTDC are performed, and the results validate the theoretical findings and the effectiveness of the control strategy.

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