1. Cooperative Optimal Droop Control for VSC-MTDC System with Quasi Non-error DC Voltage Regulation

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Abstract: The droop control is widely used in the engineering practice of voltage source converter based multi-terminal high voltage direct current (VSC-MTDC) system by virtue of its advantages of multi-station coordination to undertake the unbalanced power. Its essence is to redistribute the DC power flow by changing the DC voltage for the unbalanced power accommodation, but the deviation of DC voltage will threaten the safety and economy of the system. Based on the theoretical analysis of the infeasibility of the non-error regulation of DC voltage in the droop control mode, this paper proposes a cooperative optimal droop control strategy of VSC-MTDC system with "quasi non-error" regulation ability of DC voltage to handle the DC voltage deviation caused by unbalanced power consumption. An additional DC voltage controller is designed to automatically adjust the active power reference value, which improves the DC voltage in the dynamic process. In order to obtain the minimum active power variation of the voltage source converter and the nearest DC voltage to the initial value, the reference value increment of droop control is optimized to implement the DC voltage recovery. Simulation results show that the improved strategy can smoothly perform the global optimal regulation of DC voltage at the cost of minimum power variation of multiple voltage source converters, and complete the "quasi non-error" regulation of DC voltage. © 2022 Automation of Electric Power Systems Press.
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