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Wed-Mo-Po3.09-11 [73]: Application Study of a Flux-Coupling-Type SFCL for Low-Voltage Ride-Through Operation of a Virtual Synchronous Generator

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In order to effectively solve the low-voltage ride-through (LVRT) issue of a virtual synchronous generator (VSG) under severe grid fault, this paper proposes and studies the application of a flux-coupling-type superconducting fault current limiter (SFCL). Since the magnetic flux of the SFCL has a high controllability and its current path can be flexibly adjusted to cause the quench of high temperature superconductor (HTS), the SFCL is able to rapidly show its current-limiting impedance to better fault transient behaviors. In the study, the SFCL is installed at the point of common coupling (PCC) of the VSG, and it will combine with the virtual impedance controller of the VSG to limit fault current and compensate voltage sag. Using the MATLAB software, the voltage-current fluctuations of the VSG and the flux linkage variation of the SFCL are evaluated, and different configuration ratios of the virtual impedance and the SFCL impedance are simulated. Based on the simulation results, we obtain a proper parameter scheme of the coupling transformer (CT) and superconducting component (SC) in the SFCL, whose current-limiting and magnetizing characteristics are verified to satisfy the LVRT requirements of the VSG. Meanwhile, it is found that the proposed approach enables to provide multiple contributions, such as reducing the voltage loss, increasing the synchronizing power and accelerating the fault recovery. In summary, the application potential of the SFCL for reinforcing the robustness of the VSG is well demonstrated.

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