

智能电网

模块化多电平换流器HVDC直流双极短路子模块过电流分析

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摘要:

模块化多电平换流器直流输电(modular multilevel converter HVDC, MMC-HVDC)系统直流双极短路故障时的子模块过电流应力是研究子模块电气特性的重要内容之一。按照换流器闭锁前和闭锁后2个阶段分析直流双极短路的故障机制, 建立2个阶段中子模块过电流分析的电路模型, 推导出过电流应力的解析方程, 并对子模块过电流应力作较为全面深入的分析, 得到各电路参数变化时过电流应力的变化情况, 总结其中的关键因素, 为子模块元件电气设计提供依据。研究表明: 闭锁前子模块的电流是交流系统馈入的三相短路电流与子模块电容器放电电流的叠加; 闭锁后子模块的电流是短路电流与阀电抗器续流电流的叠加。计算和仿真结果表明, 分析方法是可行的, 并且具有较高的精确度。

关键词: 模块化多电平换流器直流输电系统 直流双极短路故障 子模块过电流

Analysis of Submodule Overcurrent Caused by DC Pole-to-pole Fault in Modular Multilevel Converter HVDC System

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Abstract:

Submodule overcurrent caused by DC pole-to-pole fault in modular multilevel converter HVDC (MMC-HVDC) system is one of the important research objects about its electrical characteristics. In this paper, the fault mechanism before and after the converter blocked was analyzed respectively and the circuit model for the analysis of submodule overcurrent was explored. The analytic equation for overcurrent calculation was deduced and a detailed analysis was also performed. The changes of submodule overcurrent stress with different circuit parameters were obtained and the key issues were also summed up. The results indicate that the submodule overcurrent is the AC system three-phase short-circuit current superposed the discharging current before the converter blocked, and the submodule overcurrent is the AC system three-phase short-circuit current superposed the valve reactor freewheeling current after the converter blocked. From the computation and simulation results, it is concluded that the analytical method is feasible and its calculation results are comparatively precise.

Keywords: modular multilevel converter HVDC (MMC-HVDC) DC pole-to-pole fault submodule overcurrent

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