

电力电子与电力传动

电压源换流器高压直流输电装置中IGBT的过电流失效机制

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摘要: 为满足电压源换流器高压直流输电(voltage source converter high voltage direct current, VSC-HVDC)装置可靠性及其试验方法和试验等效机制研究的需要, 重点研究了该装置中绝缘栅双极型晶体管(insulated gate bipolar transistor, IGBT)阀在过电流故障状态下的失效机制。介绍了VSC- HVDC系统及其阀的结构, 将IGBT阀过电流故障分为3种不同的类型, 分析IGBT阀在不同过电流故障状态下的电压和电流应力及其在故障应力下的内部物理过程。最终得到了IGBT阀在3种过电流故障下的失效机制。

关键词: 电压源换流器高压直流输电装置 绝缘栅双极型晶体管阀 过电流 失效机制

Over-current Failure Mechanism of IGBT Within Voltage Source Converter Based High Voltage Direct Current

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Abstract: The over-current failure mechanism of insulated gate bipolar transistor (IGBT) valves within voltage sourced converter based high voltage direct current (VSC-HVDC) equipment was investigated for the purpose of enhancing the reliability of the VSC-HVDC equipment and for researching the test methods and test equivalence mechanism of the IGBT valves. VSC-HVDC system and valve structure were introduced, and then the over-current faults of IGBT valves were classified into three types. Basing on the classification, the voltage and current stresses as well as the inner physical processes of the valves under different over-current faults were analyzed. Eventually the failure mechanism of IGBT valves subjecting to three different overcurrent faults was revealed.

Keywords: voltage source converter based high voltage direct current equipment (VSC-HVDC) insulated gate bipolar transistor (IGBT) over-current failure mechanism

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