

电力系统

基于实时数字仿真器的模块化多电平换流器的建模

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摘要:

模块化多电平换流器(modular multilevel converter, MMC)主电路的搭建和仿真可以在实时数据仿真器(real time digital simulator, RTDS)的小步长环境下完成, 由于目前的RTDS处理器计算容量不足以进行多达200电平的MMC仿真, 为了尽可能在现有处理器运算情况下进行更大规模的MMC仿真, 提出了在小步长环境下将MMC每相电路分别封装, 然后利用小步长线路模型进行互联的建模方法。与三相封装一起同等规模的MMC进行了对比实验, 并对小步长线路模型首尾的电动势以及换流器交直流电压进行了详细的对比测量, 仿真结果表明, 将MMC分相封装并用小步长线路模型互联的建模方法是可行的, 不仅能在一定程度上扩大仿真容量, 而且不会对电路中的电气量造成明显影响。

关键词: 模块化多电平换流器 实时数字仿真器 电压源型换流器直流输电 小步长建模

Modeling of Modular Multilevel Converter Based on Real-Time Digital Simulator

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Abstract:

The building and simulation of main circuit of modular multilevel converter (MMC) can be completed by real time digital simulator (RTDS) under small-step environment. Due to the condition that the insufficient computing power of processors for existing RTDS cannot undertake the simulation of MMC with levels up to the amount of 200, to perform larger-scale simulation by existing computing power of RTDS processors a modeling method is proposed, namely, the MMC models of each phase are packaged individually in small-step environment, then the packaged small-step circuit models of three phases are interconnected to form a whole MMC. Contrast experiments for individually packaged MMC and integrally packaged MMC with the same scale as the former are carried out, and detailed contrast measurement of EMS at both terminals of each small-step model and that of AC and DC voltages of converter are conducted. Simulation results show that the proposed modeling method is feasible, not only the simulation capability can be enlarged, but also the electric quantities in the circuits will not be obviously affected.

Keywords: modular multilevel converter (MMC) real time digital simulator (RTDS) voltage source converter based HVDC (VSC-HVDC) small-step modeling

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