

电力系统

HVDC滤波换相换流器的阻抗频率特性

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摘要

高压直流输电(HVDC)换流器的阻抗频率特性是分析和解决谐波不稳定的一个重要因素, 滤波换相换流器(filter commutated converter, FCC)是一种具有阀侧谐波抑制兼无功功率补偿功能的换流器, 文章简要论述了FCC的接线方案和工作机理, 并基于开关函数法对计及换流器换相过程影响下的FCC交、直流等值阻抗计算式进行了理论推导。以直流输电开发平台为例, 对传统电网换相换流器(line commutated converter, LCC)与FCC的阻抗频率特性计算结果进行对比, 仿真结果表明换流器的阻抗频率特性对交流系统的谐振频率有着不可忽略的作用, FCC在一定程度上提高了交流系统强度, 改善了系统稳定性, 有效降低了系统谐振频率下的交流等值阻抗, 从而更好避免直流输电系统谐波不稳定现象的发生。

关键词 [阻抗频率特性](#); [高压直流输电](#); [滤波换相换流器](#); [谐波抑制](#); [开关函数法](#); [等值阻抗](#)

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Impedance-Frequency Characteristic of HVDC Filter Commutated Converter

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Abstract

The impedance-frequency characteristic of converters in HVDC power transmission is an important factor in the analysis and solution of harmonic instability. Filter commutated converter (FCC) is such a kind of converter that possesses both functions of harmonics suppression and reactive power compensation at the valve side, in this paper the wiring scheme and working mechanism of FCC are described in brief, and based on switching function method the theoretical derivation of calculation formula for AC and DC equivalent impedances of FCC is given while the impact of commutation process in the converter is taken into account. Taking the development platform of HVDC power transmission for example, the calculation result of impedance-frequency characteristic of traditional line commutated converter (LCC) and that of FCC are compared. Simulation results show that the impact of impedance-frequency characteristic of converter on the resonance frequency of AC system is not negligible, and FCC can enhance the strength of AC system in a certain extent, improve system stability and effectively reduce AC equivalent impedance under resonance frequency, thus the harmonic instability of HVDC power transmission system can be avoided.

Key words [impedance-frequency characteristic](#); [HVDC power transmission](#); [filter commutated converter](#); [harmonic suppression](#); [switching function method](#); [equivalent impedance](#)

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