

电力系统运行与规划

特高压串补线路沿线电压分布及串补布置方案研究

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摘要:

提出一种基于传输线理论的特高压串补输电线路电压分布的快速算法。首先, 将线路的传输参数矩阵转化为两端口节点导纳矩阵, 得到P型等值模型集总参数。然后将其填入潮流计算软件, 对目标电网进行潮流计算。再将计算的结果作为末端边界条件, 用传输参数矩阵就可快速得出线路上的电压分布。该算法可精确计算特高压串补线路的沿线电压分布情况, 而且还可以计及线路两侧的无功补偿能力, 工程适用性很强。最后, 还从理论上研究特高压串补的集中/分散布置方案以及串补和高压电抗的相对布置位置, 指出高压电抗位于母线侧且串补分散布置的方案比高压电抗位于线路侧且串补集中布置的方案更有利于抑制工频稳态过电压, 为特高压输电工程规划给出了指导性建议。

关键词: 特高压线路 特高压串补 电压分布 配置方案

Voltage Distribution Along the Line and Disposition Scheme of Series Capacitors for UHV Transmission Lines With Series Capacitors

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Abstract:

The transmission-line theory based fast algorithm for voltage distribution along the ultra high voltage (UHV) transmission line with series capacitors (SCs) was proposed. Firstly, the two-port transmission parameter matrix of UHV transmission lines is transformed to the node admittance matrix, therefore, the lumped parameters of strict equivalent P model is obtained. Secondly, the parameters are filled into the commercial power flow software to calculate the power flow of the target grid which includes the UHV transmission lines with series capacitors. Thirdly, the power flow calculation results are regarded as the terminal conditions of the UHV lines with series capacitor, and the transmission parameter matrix is used to calculate the voltage distribution along the line rapidly. In the algorithm, the voltage distribution is obtained accurately; moreover, the reactive power supply capacities of both sides can be taken into account, which implies that the engineering applicability is very strong. At last, the relative disposition scheme of series capacitors and line shunt reactors as well as the centralized/distribution layout scheme of UHV series capacitors were investigated, and it was concluded that the 'shunt reactor at SC bus side' scheme and the distributed layout scheme of UHV SCs are incident to suppress the fundamental frequency steady overvoltage, compared with the 'shunt reactor at SC line side' scheme and the centralized layout scheme of UHV SCs. According to the proposed algorithm and the conclusions, the guidance suggestion was given for the planned UHV transmission projects.

Keywords: ultra high voltage (UHV) transmission lines UHV series capacitors voltage distribution disposition scheme

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