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电力电子与电力传动

网压非对称条件下双馈风电系统的 PS-VS及NS-VR综合控制分析

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摘要：

当前诸多文献研究了电网电压对称跌落状态下双馈风力发电系统的穿越控制策略，但是电网发生非对称跌落的概率约占网压跌落事件数的80%。该文提出一种电网电压非对称条件下的双馈系统优化动态综合控制策略。分别建立了正序电压支撑(positive sequence voltage support，PS-VS)及负序电压抑制(negative sequence voltage restrain，NS-VR)的控制模型，并且在变流器的输出电压中将正序电压控制分量与负序电压控制分量给予合成。此控制策略实现了电网电压不对称故障条件下风电场电网公共接入点电压质量的显著提升。论文研究了根据电网电压跌落幅度对PS-VS 子功能与NS-VR子功能的容量分配算法。通过Matlab/Simulink对PS-VS控制及NS-VR控制的综合控制仿真结果表明，该控制策略实现了风电场电网电压非对称状态下双馈风力发电系统并网条件的明显提升。

关键词： 双馈感应电机 电网电压不对称 电网公共接入点 正序电压支撑 负序电压抑制

Optimal Synthetic Control of PS-VS and NS-VR Functions for DFIG Controlling Under Unbalanced Grid Conditions

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Abstract:

The ride-through control of doubly-fed induction generator (DFIG) for balanced voltage sag on wind farms has been reported by many literatures, but the ratio of unbalanced voltage sag in all the grid voltage dip conditions is approximately 80%. This paper presented a strategy of the optimal synthetic control under unbalanced network condition. The models of positive sequence voltage support (PS-VS) and negative sequence voltage restrain (NS-VR) were established respectively, and the output voltage of converter was synthesized both in positive and negative sequence. Besides the voltage quality was optimized at the point of common coupling (PCC), the optimal dynamic capability allocation between the PS-VS and NS-VR function was analyzed according to the rated capacity of the DFIG system. The simulation model for both PS-VS and NS-VR functions in Matlab/Simulink was presented, and the results shows that the proposed strategy can enhance the voltage quality of PCC at the wind farm while capturing wind energy.

Keywords: doubly-fed induction generator unbalanced grid condition point of common coupling (PCC) positive sequence voltage support negative sequence voltage restrain

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