

新能源与分布式发电

单相光伏并网系统共模电流分析

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摘要:

共模电流问题是光伏并网系统中的一个重要问题, 德国DIN VDE 0126—1—1对共模电流做出了相关规定。当共模电流超过规定值时, 系统必须在规定的时间内断开。考虑到共模电流在光伏并网系统中的重要性, 建立了共模模型。通过分析可知, 共模电流与调制技术和电感的安放位置相关。针对上述特点, 设计了能够抑制共模电流的新型单相光伏并网系统, 即带有交流旁路且电感对称分布在相线和中线上的全桥光伏并网系统。与传统的基于单极性调制技术和双极性调制技术的全桥逆变器系统相比, 此结构不但能消除系统产生的共模电流, 而且能提高系统效率和并网电流质量, 从而提高光伏并网系统的整体性能。理论分析和仿真结果验证了上述模型和系统的正确性和有效性。

关键词:

Analysis on Common Mode Current of Single-Phase Grid-Connected PV System

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Abstract:

Common mode current problem is very important to grid-connected photovoltaic (PV) system and in German standard DIN VDE 0126-1-1, the stipulations related to the common mode current are specified. When common mode current exceeds specified value, the connected PV generation system should be cut off within the stipulated time. Considering the importance of common mode current to the connection of photovoltaic generation to power grid, a common mode current is built. It is known through the analysis that common mode current is related to modulation technology and the position where the inductance locates. In allusion to above-mentioned features, a new single-phase grid-connected PV system that can suppress common mode current is designed. The designed system is a full-bridge single-phase grid-connected PV system with AC bypass circuit and in which inductances are symmetrically arranged at both phase line and neutral line. Comparing with traditional full-bridge inverter systems adopting unipolar or bi-polar modulation technology, the structure of the proposed single-phase grid-connected PV system not only can eliminate common mode current produced in the grid-connected PV system, but also improve system efficiency and quality of current sent into power grid, thus the overall performance of the grid-connected PV system is improved. Results from theoretical analysis and simulation show that the proposed model and system are correct and available.

Keywords:

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