

电机电工

一种新型光伏并网逆变器控制策略

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摘要

分析了导抗变换器的特性,详细推导了整个系统各点电压、电流,提出一种新颖的三角波-三角波调制方法,该控制策略克服了采用传统正弦波-三角波调制方法带来的并网电流谐波含量高、功率因数低的弊端。将导抗变换器和光伏并网逆变系统有机结合在一起,利用导抗变换器的电压源-电流源变换特性,将光伏电池阵列的直流电压变换为正弦包络线的高频电流,经过高频变压器隔离和电流等级变换,得到的高频电流再经过高频整流桥及工频逆变器逆变后并入电网,实现了电流源并网。相对传统的电流源型并网发电系统,采用该方法不仅省去了串联电感,而且用高频变压器取代了工频变压器,有利于实现装置小型化和降低成本。另外,利用电网电压过零信号控制工频逆变器,保证了并网电流和电网电压同步,进一步提高系统功率因数,实现正弦电流并网。通过实验证明了该控制策略的可行性,该方法非常适合分散式家用光伏并网发电系统。

关键词 [电力工程](#) [光伏并网](#) [导抗变换器](#) [高频逆变器](#) [脉宽调制](#) [电流源型](#)

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A Novel Control Strategy for Photovoltaic Grid-connected Inverter

Abstract

A novel triangle-triangle modulation method is proposed based on immittance converter and PV grid-connected inverter system. The characteristics of immittance converter are analyzed in depth and formulas of waveforms in the whole system are derived in detail. The shortages such as high harmonic of grid current and low power factor which traditional sine-triangle modulation method has are avoided under the new control strategy. Immittance converter technology is applied in PV grid-connect inverter by utilizing characteristics of voltage source-current source conversion. Passing through immittance converter, high-frequency transformer, high-frequency converter and 50Hz inverter individually, DC output voltage from PV arrays is inverted into sine current which is put into grid. Therefore current source grid-connected technology is realized. Compared with conventional current source grid-connected PV system, the novel inverter has advantages of small volume and low cost due to delete input inductor and replace 50Hz transformer by high-frequency transformer. Furthermore, output current in phase with grid voltage is realized by using crossing-zero signal of grid voltage to control 50Hz inverter. At the same time, system power factor is improved. The feasibility of the PV grid-connected inverter is verified by experiment results. The novel system is especially suitable for household PV grid-connected system.

Key words [electric power engineering](#) [photovoltaic grid connected](#) [immittance converter](#) [high-frequency inverter](#) [pulse width modulation](#) [current source](#)

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