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新能源与分布式发电

光照强度快速变化时光伏系统稳定性分析

廖志帆，祁新梅，郑寿森，王飞

中山大学 理工学院，广东省 广州市 510275

摘要：

由于太阳能电池输出功率受光照条件影响，在多云和刮风等使光照强度瞬时有较大变化的天气环境下，光伏阵列的最大功率点会相应移动，常规最大功率跟踪算法不能分辨光伏阵列输出功率的变化是来自自身扰动还是外界光强变化的影响，因此普通最大功率跟踪算法会暂时失效。研究了快速光照强度变化时光伏阵列特性数学模型及常规最大功率跟踪方法失稳的原因，研究了在2个采样点插入1次测量来抑制光强变化对光伏系统影响的最大功率跟踪方法。理论分析及仿真结果表明，采用抑制光强影响的最大功率跟踪方法可以有效避免控制器误判，准确分辨光伏阵列由最大功率跟踪扰动产生的功率增量，从而避免光强变化时系统工作点偏离最大功率点，提高系统的稳定性和可靠性。

关键词： 光强变化　光伏阵列　最大功率跟踪　稳定性

Stability Analysis of Photovoltaic Generation System Under Rapid Change of Light Intensity

LIAO Zhifan, QI Xinmei, ZHENG Shousen, WANG Fei

School of Physics and Engineering, Sun Yat-sen University, Guangzhou 510275, Guangdong Province, China

Abstract:

Since the output power of photovoltaic (PV) cell depends on light intensity, under the weather conditions, such as cloudy weather and windy weather, that make temporary obvious change of light intensity the maximum power point (MPP) of PV array will temporarily move correspondingly, so common maximum power point tracking (MPPT) algorithm will temporarily lose efficacy because conventional MPPT algorithm cannot distinguish that the change of PV array's power output is caused by its own disturbance or by the change of external light intensity. The reasons causing the instability of both mathematical model of PV array characteristics and conventional maximum power tracking method under rapid change of light intensity are analyzed, then an MPPT method, in which an extra measurement is inserted between two adjacent samplings, is proposed to eliminate the influence of rapid change of light intensity on PV generation system. Results of theoretical anlaysis and simulation show that utilizing the proposed MPPT method that can eliminate the influence of light intensity change can effectively avoid the misjudgement of controller and accurately the power increment of PV array caused by disturbance of MTTP, thus the moving away of operation point of PV array from MPP can be avoided and the stability and reliability of PV generation system can be improved.

Keywords: change of light intensity　PV array　maximum power point tracking (MPPT)　stability

通讯作者：廖志帆

作者简介：

作者Email: kinic@hotmail.com

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