

Accepted Manuscript

Reliable fault detection and diagnosis of photovoltaic systems based on statistical monitoring approaches

Fouzi Harrou, Ying Sun, Bilal Taghezouit, Ahmed Saidi, Mohamed-Elkarim Hamlati



PII: S0960-1481(17)30911-4

DOI: [10.1016/j.renene.2017.09.048](https://doi.org/10.1016/j.renene.2017.09.048)

Reference: RENE 9246

To appear in: *Renewable Energy*

Received Date: 21 March 2017

Revised Date: 29 August 2017

Accepted Date: 14 September 2017

Please cite this article as: Harrou F, Sun Y, Taghezouit B, Saidi A, Hamlati M-E, Reliable fault detection and diagnosis of photovoltaic systems based on statistical monitoring approaches, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.09.048.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Reliable fault detection and diagnosis of photovoltaic systems based on statistical monitoring approaches

Fouzi Harrou^a, Ying Sun^a, Bilal Taghezouit^b, Ahmed Saidi^c, Mohamed-Elkarim Hamlati^c

^aKing Abdullah University of Science and Technology (KAUST)

Computer, Electrical and Mathematical Sciences and Engineering (CEMSE) Division, Thuwal 23955-6900, Saudi Arabia

Tel: +966.12808.0602, Fax: +966.12802.1386, E-mail: fouzi.harrou@kaust.edu.sa

^bCentre de Développement des Energies Renouvelables, CDER, B.P. 62, Route de l'Observatoire, Bouzaréah, Algiers, 16340, Algeria, E-mail: b.taghezouit@gmail.com

^cSmart Grids and Renewable Energie (SGRE) Laboratory, Electrical Engineering Department, Tahri Mohammed University, BP 417 Route de Kenadsa, Béchar, Algeria

Abstract

This study reports the development of an innovative fault detection and diagnosis scheme to monitor the direct current (DC) side of photovoltaic (PV) systems. Towards this end, we propose a statistical approach that exploits the advantages of one-diode model and those of the univariate and multivariate exponentially weighted moving average (EWMA) charts to better detect faults. Specifically, we generate array's residuals of current, voltage and power using measured temperature and irradiance. These residuals capture the difference between the measurements and the predictions MPP for the current, voltage and power from the one-diode model, and use them as fault indicators. Then, we apply the multivariate EWMA (MEWMA) monitoring chart to the residuals to detect faults. However, a MEWMA scheme cannot identify the type of fault. Once a fault is detected in MEWMA chart, the univariate EWMA chart based on current and voltage indicators is used to identify the type of fault (e.g., short-circuit, open-circuit and shading faults). We applied this strategy to real data from the grid-connected PV system installed at the Renewable Energy Development Center, Algeria. Results show the capacity of the proposed strategy to monitor the DC side of PV systems and detect partial shading.

Keywords: Fault detection, Partial shading, Photovoltaic systems, One-diode model, statistical monitoring charts.

1. Introduction

Renewable energy is a key challenging problem increasingly gaining attention in worldwide. Renewable energy sources, such as solar and wind, are promising alternatives to conventional fossil fuels because they are clean, sustainable, safe, and environment-friendly with zero CO₂ emissions. For instance, [1] showed that 100 gigawatts of photovoltaic (PV)-generated power in Europe in 2012 kept more than 53 million tons

Download English Version:

<https://daneshyari.com/en/article/4925879>

Download Persian Version:

<https://daneshyari.com/article/4925879>

[Daneshyari.com](https://daneshyari.com)