

## **Photovoltaic plant Production and Maintenance Forecast**

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### **Abstract**

Due to the importance internationally accorded to the environmental issues, reflected by this treaties and agreements, the world renewable energy demand has considerably increased during the last few years. For the photovoltaics (PV) generated power, for instance, the market has recorded year growth rates over 30%. Despite its remarkable demand, the integration of the photovoltaics produced energy has been limited because of the production random fluctuations. Thus, the safety, the stability, and the economical performance of an electric power system integrating photovoltaics generated power may only be insured by robust and reliable power forecasting.

This present work aims to forecast photovoltaic plant production as well as its maintenance; two critical features for the energy management. For the first part, we will explore the correlation between the photovoltaic power production and the meteorological data such as temperature, humidity and irradiance. This will allow us to develop a machine learning algorithm that forecasts one day ahead PV production using the meteorological data as inputs.

In the second part, we will focus on the maintenance of the PV plant. We will study the reliability of its most important components. Then we will explore the influence of the environmental conditions in their most critical failures in order to integrate it to their reliability. Finally, we will propose a preventive maintenance plan for a finite horizon.

### **Keywords**

Photovoltaics, production, maintenance, reliability, forecasting.

### **Biographies**

**Hajej Zied** is an Associate professor at the University of Lorraine, Metz platform since September 2012. It operates research in the laboratory LGIPM Metz. After obtaining his doctorate at the University of Paul Verlaine - Metz in 2010, he was employed at the University of Metz as contract research engineer until August 2012. His main areas of research on the optimization of maintenance policies coupled to production and the development of methods and support the design and control tools in the production systems of goods and services. He is the author of numerous articles in international community of industrial engineering. Her teaching areas include modeling and organization of manufacturing and logistics systems, the practice of simulation, automation, and quality system production.

**Nidhal Rezg** is a professor at the University of Lorraine; he is a Doctor of Industrial Automatic from the National Institute of Applied Sciences (INSA) in Lyon in 1996. Accreditation to supervise research at the University of Metz in 2003. he was Professor at the Faculty of Engineering of the University of Moncton, New Brunswick Canada from 1997 to 1999 and Associate professor at the University of Metz until 2004, and currently holds the position of Professor of University. He is director of LGIPM laboratory since October 2006 and scientific responsible of the INRIA CusTom team from 2007 to 2011. His research interest is the optimization of maintenance policies coupled to production, the optimal control SED. He is the author of sixty papers in international journals, directors of 12 theses and 4 Accreditation to supervise research. Keywords researches are modeling, simulation and optimization of stochastic processes, reliability and maintenance and Petri nets.