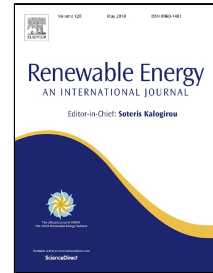


# Accepted Manuscript

Impact of tropical desert maritime climate on the performance of a PV grid-connected power plant

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PII: S0960-1481(18)30308-2  
DOI: 10.1016/j.renene.2018.03.013  
Reference: RENE 9882  
To appear in: *Renewable Energy*  
Received Date: 06 September 2017  
Revised Date: 05 March 2018  
Accepted Date: 06 March 2018

Please cite this article as: Daha Hassan Daher, Léon Gaillard, Mohamed Amara, Christophe Ménézo, Impact of tropical desert maritime climate on the performance of a PV grid-connected power plant, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.03.013

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.

1 **Impact of tropical desert maritime climate on the performance of a PV grid-connected**  
2 **power plant**

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12  
13 **ABSTRACT**

14 This paper provides experimental results on the performance of a grid-connected PV power  
15 plant operating under dusty, desert maritime climate conditions using data from the first  
16 installation of its kind in Djibouti. The first 4 years of operation were evaluated in terms of  
17 IEC 61724 measures, and the impact of climate factors was estimated using a novel  
18 combination of analysis techniques. The monthly average daily array yield and final yield  
19 were 5.1 kWh/kWp and 4.7 kWh/kWp, respectively. The average performance ratio for  
20 respective PV arrays and the global grid-connected system were 90% and 84%, corresponding  
21 to monthly average daily PV module and system efficiencies of 12.68% and 11.75%. The  
22 seasonal variation in PV module efficiency was found to follow a funnel-shape with a sharp  
23 minimum centred on July. The impact of ambient temperature and soiling-induced losses  
24 were evaluated, revealing a reduction in the performance ratio by 0.7% for each 1°C rise in  
25 daily ambient temperature. Losses due to soiling varied from 0.03% following rainfall events,  
26 to 14.23% during dry dusty periods. Finally, to maintain the modules performances losses less  
27 than 5%, a cleaning schedule is recommended every two weeks.

28 Keywords: grid-connected PV system, performance ratio, desert maritime climate, soiling  
29 loss.

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