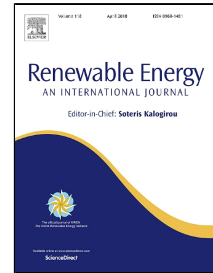


Accepted Manuscript

Energy and economic losses caused by dust on residential photovoltaic (PV) systems deployed in different climate areas

Julius Tanesab, David Parlevliet, Jonathan Whale, Tania Urmee



PII: S0960-1481(17)31280-6
DOI: 10.1016/j.renene.2017.12.076
Reference: RENE 9573
To appear in: *Renewable Energy*
Received Date: 05 September 2017
Revised Date: 14 December 2017
Accepted Date: 22 December 2017

Please cite this article as: Julius Tanesab, David Parlevliet, Jonathan Whale, Tania Urmee, Energy and economic losses caused by dust on residential photovoltaic (PV) systems deployed in different climate areas, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.12.076

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 Energy and economic losses caused by dust on residential photovoltaic (PV) systems 2 deployed in different climate areas

3
4 Julius Tanesab^{1,2}, David Parlevliet¹, Jonathan Whale¹, Tania Urmee¹

5 ¹*School of Engineering and Information Technology, Murdoch University, WA, Australia*

6 ²*Politeknik Negeri Kupang, Nusa Tenggara Timur, Indonesia*

8 Abstract

9
10 Results of the study revealed that when dust impinged on the surface of the PV modules,
11 monthly maximum power output of a 1.5 kWp system in Perth, Australia and a 50 Wp system in
12 Nusa Tenggara Timur (NTT), Indonesia decreased, on average, by about 4.5% and 8%,
13 respectively. Economic modelling showed that, the cost of production per kWh lost due to dust
14 exhibited by these systems were A\$ 0.26/kWh and A\$ 0.15/kWh, respectively. Comparison of
15 the cost of energy losses and maintenance revealed that, the Perth system would require manual
16 cleaning in October while the system in NTT would require cleaning in August and October.
17 Although the saving in production losses is not economically significant, this cleaning schedule
18 was recommended, particularly for small systems in NTT since the extra output can have a
19 significant effect on the quality of life in remote villages. The key finding was that higher dust
20 de-rating factors and more cleaning activity may be more appropriate for PV systems deployed
21 in tropical climate areas than that in temperate climate regions. It is recommended that PV
22 system Standards that use the 5% performance de-rating factor due to soiling are reviewed and
23 consideration given to climate-dependent de-rating factors.

24
25 **Keywords:** dust, PV performance, economic losses, maintenance cost, solar home systems

27 Nomenclature

29 A\$	Australian dollar
30 C_M	cost of materials applied for cleaning the PV system (A\$)
31 C_{MA}	maintenance cost activity (A\$)
32 C_O	cost of producing or buying electricity from other sources (A\$/Wh).
33 C_{PL}	cost of production losses (A\$)
34 C_{WF}	cost of workforce (A\$)
35 DCF	dust correction factor
36 E_L	energy losses caused by dust (Wh)
37 E_{PV}	daily energy produced by the PV system (Wh)
38 $E_{PV,c}$	energy produced by the PV system in clean condition (Wh)
39 $E_{PV,d}$	energy produced by the PV system in dusty condition (Wh)
40 f_{cable}	de-rating factor for DC cable (%)
41 f_{dirt}	de-rating factor for dirt/soiling (%)
42 f_{man}	de-rating factor for manufacturing tolerance (%)
43 f_{temp}	temperature de-rating factor (%)
44 H_{tilt}	daily solar irradiation on the tilted plane, (Wh/m ²)
45 L_T	load capacity over a period T e.g. monthly (Wh)
46 N	number of modules in the PV system
47 P_{max}	maximum output power of the PV module (W)

Download English Version:

<https://daneshyari.com/en/article/6764849>

Download Persian Version:

<https://daneshyari.com/article/6764849>

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