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Effectively predict the solar radiation transmittance of dusty photovoltaic panels through Lambert-Beer law

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1	Effectively predict the solar radiation transmittance of dusty photovoltaic
2	panels through Lambert-Beer law
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9 10	Abstract : Due to the instability and unsatisfactory prediction of the generating capacity
11	the photovoltaic power is hard to directly connect to the electric grid. Dust deposition is
12	one of the key impact facts for the photovoltaic power, but its effect cannot be predicted
13	through a reasonable physical model, and it became a hot research topic. This paper
14	proposed a comprehensive physical model to predict the impact of the deposition on the
15	light transmittance of solar panel. This model involves some physical parameters of the
16	deposition, which made it applicable widely. In addition, the results indicate the
1/ 18	influence of deposition prominently increased with the changes of particle diaphaneity
10	size of the particles, but decreased with the changes of particle diaphanenty.
20	Key words: dust deposition density, photovoltaic cell, light transmittance, physical
21	model, electromagnetic scattering
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24	1 Introduction
25	Energy is the material base for the survival of humanity, and an important resource
26	for the sustainable development of economy. Green power, not only can offer a clean,
27	very abundant energy for the continuously increasing energy demand, but also can make
28	significant contributions in solving some of the environmental and energy problems
29	faced by the world[1-3]. The most widely used green energy source is the photovoltaic
30	power[4]. However, because of its some disadvantages, photovoltaic power would not
31	be readily applied in the power grid, which lead to a serious abandoned phenomenon in
32	some areas[5]. The accuracy of forecasting the new energy power affects the capability
33	of the grid-connected electrical system and the grid-connected entrance system [6, 7].
34	In general, solar irradiation and air temperature have more significant impact on the
35	output power of solar cells[8]. The dust particles existing in the air can deposit on the
36	surface of a photovoltaic module, and create a dust layer on it, which lead to a negative
37	effect on the valid solar irradiation of solar cells[9, 10]. Therefore, some researchers

have carried out studies on the influence from dust, soiling, and so on [11-13]. For 38

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