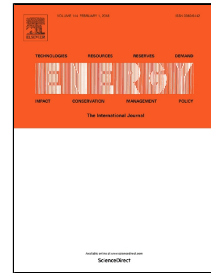


Accepted Manuscript

Performance analysis of Solar powered airport based on energy and exergy analysis

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PII: S0360-5442(18)30323-2
DOI: 10.1016/j.energy.2018.02.095
Reference: EGY 12395
To appear in: *Energy*
Received Date: 18 September 2017
Revised Date: 19 December 2017
Accepted Date: 19 February 2018

Please cite this article as: Sreenath Sukumaran, K. Sudhakar, Performance analysis of Solar powered airport based on energy and exergy analysis, *Energy* (2018), doi: 10.1016/j.energy.2018.02.095

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1 Performance analysis of Solar powered airport based on energy and exergy analysis

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6 Abstract:

7 In this paper, performance analysis of 12MWp grid interactive solar photovoltaic power
8 plant, located at Cochin International Airport, India is carried out using energy and exergy
9 analysis. The thermal performance of the PV plant installed within the airport premises has
10 been investigated based on actual weather data and monitored values of the plant. In order to
11 evaluate the exergy and energy performance of the PV plant, a parametric approach with
12 destruction is applied. The energy efficiency of the plant varied between 16.4% and 13.33%
13 and its value depends on the electrical energy output and insolation only. The annual average
14 exergy efficiency is found to be 9.77%. Theoretically, cost of exergy destruction in terms of
15 unit electricity cost is estimated. The thermal destruction is huge in an MW scale solar PV
16 plant. A considerable amount of thermal losses (4.44MW) can be avoided by integrating
17 cooling technique to the SPV system. Thus the thermodynamic analysis of PV system
18 provides more clarity about system performance and serves as a useful reference for future
19 PV power plants in an airport environment.

20 **Keywords:** utility scale PV, exergy efficiency, energy efficiency, thermal destruction,
21 sustainable

22 1. Introduction

23 The use of conventional energy sources is increasing the concentration of green house gases
24 in the atmosphere (Shukla et al., 2017). In this aspect, renewable sources of energy are
25 gaining much importance all over the world. Theoretically, 1% of sun's energy is enough to
26 satisfy the energy requirement of the whole world. Solar energy is infinite and available
27 worldwide (Sukumaran and Sudhakar 2017a). So the future prospect of solar energy is huge
28 and significant. Proper and effective tapping of solar energy can even replace the use of
29 fossil fuel. The quantity and quality of sunlight depending on the location, altitude,
30 atmospheric conditions and the solar path (Sukumaran and Sudhakar 2017b).
31 The performance of grid connected PV system is normally estimated by calculating its energy
32 yield (daily, monthly and yearly), capacity utilization factor and performance ratio (Sharma
33 and Chandel, 2013). All these parameters depend on the electrical energy output and none of

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