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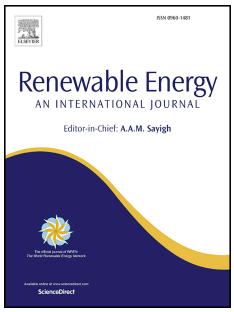

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Experimental Analysis and Dynamic Modeling of a Photovoltaic Module with Porous Fins

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Abstract

In this study, experimental analysis and performance predictions of solar photovoltaic (PV) module equipped with porous fins were performed. The experimental setup was tested in Technology Faculty of Firat University, Elazig of Turkey which is located at 36^o and 42^o North latitudes. The PV module was oriented facing south and tilted to an angle of 36^o with respect to the horizontal in order to maximize the solar radiation incident on the glass cover. Experimental analysis was conducted for configurations where PV module is equipped with porous metal foams. A multi-input multi-output dynamic system based on artificial neural networks was obtained for the PV configuration with and without fin by using the measured data (ambient temperature, PV panels back surface temperatures, current, voltage, radiation and wind velocity) from the experimental test rig. It was observed that adding porous fins to the PV module results in performance enhancements. The developed mathematical model based on dynamic neural networks can be used for further development and performance predictions of these systems.

Keywords: PV module, performance predictions, solar, artificial neural networks

Nomenclature

b	neural network bias term
f	sigmoid function
F	nonlinear map from input to output
I	current (A)
n_u	delays in the inputs
n_y	delays in the outputs
P	power (W)
PV	photovoltaic
q	radiation (W/m^2)
T	temperature (K)
t	time (sec)
V	voltage (V)
W	neural network weights
x	inputs
y	outputs
Subscripts	
a	ambient