

The Design and Simulation of Solar Photovoltaics Cell For Maximum Power Output Using MATLAB/SIMULINK

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Abstract

Photovoltaic (pv) solar cells convert solar energy into electrical energy. The current solar cells suffer energy losses through cell resistance in metal contacts and undesirable environmental temperatures. This results in low efficiency of the solar cells. Solar pv cell efficiency can be improved by maximizing the available solar potential of a place through optimization of cell internal parameters based on environmental factors. Modelling solar pv cell in MATLAB and parameters analysis criterion was employed to predict a suitable solar cell for Narok region for maximum power output. Simulink library was useful in the realization of the block diagram. The data (irradiance and temperature) employed in the study was obtained from meta data website for Olderkesi region in Narok. Solar-pv cell IV and PV characteristics were simulated under different shunt and series resistance. The results showed that for maximum power output, minimum temperature of about 16°C, series resistance of 0Ω, shunt resistance of above 500Ω should be maintained. We suggest the surface of the pv cell to have a material that has selective absorption properties to realize the predicted temperature of 16°C which gave the maximum output power. This criterion is suitable for modelling pv cell for any region provided temperature and irradiance for that particular region are provided.

Keywords: solar cell, modelling, simulation, MATLAB/Simulink