ABSTRACT.

Silicon solar cells are known to convert solar energy in form of light photons into electric signal. This is achieved at the pn-junction where a depletion layer is created to allow the flow of electrons. The current solar cells being used for energy conversion face current loses through cell resistance in metal contacts and the influence of environmental temperatures. This results to low efficiency of the solar cells. Solar cell modelling is an essential task in improving the efficiency of the solar modules by maximizing the available solar potential of a place through analysis of solar cell internal parameters and environmental factor influencing solar power extraction. To achieve this model, MATLAB/Simulink block diagram was used to analyze cell parameter behavior and effects of temperature. Simulink library was most useful in realization of the block diagram. Solar radiation data and environmental temperature of Olderkesi region in Narok county obtained from meta data website was used in the model. The analysis involved simulation of IV and PV characteristics of the solar cell under different shunt and series resistance as required. Temperature dependence on cell output power was also analyzed using the cell characteristics for different configurations. From the study, series resistance reduces the output power of a solar cell while the shunt resistance increases the output power. Increased temperature reduces the power output of a solar cell. This therefore gave the conclusion that to maintain high power at any weather conditions a minimum temperature of about 16^0C, series resistance of 0Ω, shunt resistance of above 500Ω should be maintained. Temperature of 16^0C can be realized using a material that allow visible light and reflects away or absorb high temperatures above 16^0C. Series resistance can be reduced to zero by using no-resistive metal contacts in cell. Shunt resistance can therefore be improved by using high resistive materials at the edges of the cell to eliminate alternative current paths.