

Performance of a Bifacial Solar Module Under Different Backgrounds

Gloria Katunge, M^{a*}, Sebastian M. Waita ^a, Francis W. Nyongesa ^a, Bernard O. Aduda ^{a, b}

^a *Department of Physics, University of Nairobi, P.O Box, 30197, Nairobi, Kenya*

^b *Department of Physics, Egerton University, P.O Box 536-20115, Egerton, Kenya*

ABSTRACT

Bifacial Photovoltaic (BPV) is a rapidly growing technology that has the potential to increase electricity production while taking up less space compared to conventional modules and due to this, they have attracted significant attention in recent years. Apparently, little study has been conducted on these types of modules, notably on the use of reflecting surfaces to improve backside production, which in this case receives low irradiance. This paper reports on a section of my research conducted on the rooftop of the Department of Physics at the University of Nairobi's Chiromo Campus in Kenya. This study examines the influence of various backgrounds on the performance of a bifacial solar module. Two solar modules were mounted back-to-back to create a double-sided solar module (bifacial solar cell configuration), with one module facing the sky (front side) and the other facing the ground (back side). The module was kept at about 1.2 m and inclined at about 30⁰ to the horizontal facing north orientation. Beneath the module, various backgrounds were used in turns while parameters like solar irradiance, module temperature, current, and voltage values were recorded. Solar irradiance was measured using an HT304N reference cell fixed alongside the back module and connected to an irradiance meter. Current-Voltage values of the solar module were obtained using a current-voltage (I-V) solar analyzer. The effect of a reflective background on the module's performance was investigated using Metallized polyethylene terephthalate, (MPET), normal galvanized iron sheet, and mylar windshield sunshade as reflectors. Data collection was done daily between 12 pm and 1 pm East African Time, EAT at an interval of 2 minutes. Data analysis and visualization were done using Python and Origin software. The results confirmed that using reflective backgrounds greatly increases the power output of the bifacial solar module. Metalized polyethylene terephthalate, MPET reflectors produced the most irradiance of the tested three reflector samples, followed by the Mylar sunshade and finally iron sheet. MPET increased irradiance by 84.62%, Mylar by 77.21%, and iron sheets by 22.95%. Moreover, due to its high reflectivity, the MPET reflector was recommended for usage as a reflecting surface.

Keywords: Bifacial, solar module, background irradiance, performance

***corresponding author: Email address: gloriakatunge133@gmail.com**

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