JOURNAL OF ADVANCEMENT IN ENGINEERING AND TECHNOLOGY
Journal homepage: www.scienceq.org/JAET.php
ISSN: 2348-2931 V7I2.04
Research Article Open Access

Determining the output voltage of solar cell using mercury discharging lamp by changing vertical positions

Shewangzaw Hamelo*1, Getachew kuma*2
Department of physics, Wolaita sodo university, Ethiopia
*Corresponding author: Shewangzaw Hamelo, E-mail: Shewangzaw22@gmail.com
Received: January 02, 2019, Accepted: February 15, 2019, Published: February 15, 2019.

ABSTRACT
The output voltage for solar cell by using mercury discharging is studied with varying vertical position. The result indicates that mercury lamp height increase slowly the voltage output decreases and the output voltage goes to 0.1359v for the maximum height 11cm and the voltage difference has shown significantly at the above three voltages.
Keywords: *mercury discharging, solar cell, voltage Determining*

INTRODUCTION
The growing need for energy in the whole world has caused increasing global warming and air pollution dramatically in addition to the depletion of fossil fuels for power generation [1]. The clean solar energy use and available in most parts of the world considered the optimal solution to the problems caused by excessive burning of fossil fuels for power generation [2]. The conversion of solar energy into electricity has been a priority; this issue has become a matter of broad prospects in both space and terrestrial applications. Photovoltaic cells as solar energy applications are used to convert the solar energy directly into electricity by pairs of semiconductor interact with the effect of light. The photons which have a power greater or lower than the band gap generate heat that can be dissipated by the transmission loss. These heat generations called thermalization process where the photons are absorbed with less energy than the solar cells band gap energy. This thermalization process is the dominant loss that limits the conversion performance of solar cell [4].

1.1. Objective
The objective of this project is to study the relation of distance variation with the output of the PV cell voltage.

- To determine performance of mercury discharging lamp to the output voltage production on solar cell.
- To show the relation between distances variations of mercury discharging lamp with output voltage of the PV cell.

EXPERIMENT AND DISCUSSION
To determine the voltage output with vertical position change, the following materials were used

- Mercury discharging lamp
- Solar panel
- Cable wire
- Vertical stand with ruler
- Digital multi-meter

The vertical stand with mercury discharging lamp were set to the lower position which is zero centimeter and increased vertically with 0.5cm and five measures were taken using multi-meter for each respective positions. Finally the average output voltage versus vertical position were plotted using MATLAB.
To calculate the average output voltage for each position

$$V_{ave} = \frac{\sum_{i=1}^{5} v_i}{5} \quad \text{----------1}$$

Where

V_{ave} = Average output voltage

v_i = Respective output voltage measured in every position

The table bellow shows the data taken for every 0.5cm increments for different eleven positions of mercury discharging lamp from the solar cell

Table1: voltage of distance

	Distance	*Voltege1*	*Voltege2*	*Voltege3*	*Voltege4*	*Voltege5*	*Average voltage*
D1	*0cm*	*0.365v*	*0.356v*	*0.370v*	*0.372v*	*0.378v*	*0.3682v*
D2	*0.5cm*	*0.300v*	*0..271v*	*0.312v*	*0.333v*	*0.324v*	*0.2924v*
D3	*1cm*	*0.251v*	*0.245v*	*0.235v*	*0.236v*	*0.241v*	*0.2416v*
D4	*1.5cm*	*0.231v*	*0.234v*	*0.241v*	*0.245v*	*0.212v*	*0.2326v*
D5	*2cm*	*0.221v*	*0.219v*	*0.292v*	*0.216v*	*0.193v*	*0.2282v*

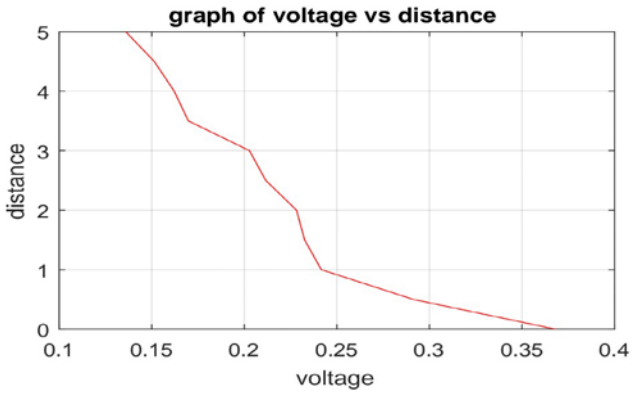
D6	*2.5cm*	*0.204v*	*0.211v*	*0..217v*	*0.211v*	*0.215v*	*0.2116v*
D7	*3cm*	*0.201v*	*0.202v*	*0.206v*	*0.205v*	*0.200v*	*0.2028v*
D8	*3.5cm*	*0.18001v*	*0.1732v*	*0.1705v*	*0.15301v*	*0.1722v*	*0.169784v*
D9	*4cm*	*0.1595v*	*0.1599v*	*0.1599v*	*0.1592*	*0.1722*	*0.16214v*
D10	*4.5cm*	*0.16102v*	*0.1522v*	*0.13223v*	*0.1557v*	*0.1554v*	*0.151324v*
D11	*5cm*	*0.1435v*	*0.1198v*	*0.1302v*	*0.1467v*	*0.1393v*	*0.1359v*

To study the characteristics of the output voltage the difference between two consecutive average outputs were taken and shown bellow on table2

Table2: The difference between consecutive output voltage characters

V	**V*ave***	**Formula**	**Difference**
V1	*0.3682*	*V1-V2*	0.0758
V2	*0.2924*	*V2-V3*	0.0508
V3	*0.2416*	*V3-V4*	0.009
V4	*0.2326*	*V4-V5*	0.0044
V5	*0.2282*	*V5-V6*	0.0166
V6	*0.2116*	*V6-V7*	0.0088
V7	*0.2028*	*V7-V8*	0.033016
V8	*0.169784*	*V8-V9*	0.007644
V9	*0.16214*	*V9-V10*	0.010816
V10	*0.151324*	*V10-V11*	0.015424
V11	*0.1359*		0.1359

From the above table the average output voltage (voltage in V) versus the vertical position (height in cm) is plotted as follows



CONCLUSION

The general objective of this work is to explain and study the output voltage of solar cell using mercury discharging lamp with varying distance. From this we understood that mercury lamp height increase slowly the voltage output decreases and the output voltage goes to 0.1359v for the maximum height 11cm and the voltage difference has significant change between the first three vertical positions and does not show any significant voltage change for the last three consecutive voltages. Therefore, one can determine that after some vertical elevation change in position gives insignificant output voltage due to the intensity effect on solar cell.

REFERENCES

1. Chaichan M. T., Abaas K. I., & Al-Zubidi, D. S. M. . (2016). A study of a hybrid solar heat storage ,wall (Trombe wall) utilizing paraffin wax and water. Journal of Research in Mechanical Engineering. pp. 1-7.
2. Kazem H. A., Al-Badi H. A. S. ,Al Busaidi A. S., & Chaichan M. T. (2016). Optimumdesign and evaluation of hybrid solar/wind/diesel power system for Masirah Island, Environment, Development and Sustainability.
3. Kazem H. A., Al-Badi H. A. S. Al Busaidi A. S., & Chaichan M. T. (2016). Optimumdesign and evaluation of hybrid solar/wind/diesel power system for Masirah Island, Environment, Development and Sustainability.
4. Kraemer D., Hu, L. Muto A., Chen X., Chen G., & Chiesa, M. (2008). Photovoltaic-thermoelectric hybrid systems: a general optimization methodology. Appl Phys Lett. pp. 2435-2443.
5. http://solarbotics.net/starting/2000202_solar_cell_2000202_solar cell_use.html
6. En.wikipedia.org/wiki/a/solar cell # pratical materials

7. photovoltaic cell conversion efficiency basic .u.s.department of energy . (retrieved 6 sep2014.).
8. De Vos,& H.pauwels . (1981). on the thermodynamic limit of photovoltaic energy conversion . pp. appl.phys.25: 119-125 ,.
9. www.rwireless_word.com Green match >log>2015>06>advanta

Citation: Shewangzaw Hamelo *et al* (2019). Determining the output voltage of solar cell using mercury discharging lamp by changing vertical positions, J. of Advancement in Engineering and Technology, V7I2.04. DOI: 10.5281/zenodo.2577146.

Copyright: © 2019: Shewangzaw Hamelo. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.