A Review of Experimental Study of Photovoltaic Energy Storages System with Maximum Power Point Tracking

Gausiya Sadaf Mansoori[1] Prof. Amir Ansari[2]
[1]M.Tech Student [2]Assistant Professor
[1,2]Department of Electrical Engineering
[1,2]Takshshila Institute of Engineering and Technology, Jabalpur (M.P.)

Abstract— *Maximum Power Point Tracking (MPPT) is used to optimize photovoltaic cells power. Maximum power is tracked with the help of maximum power point tracking algorithms. Calculation of duty cycle is depending on photovoltaic cells output voltage and current. Output power of DC-DC converter is measured in order to verify the algorithm in different irradiation levels in photovoltaic cells.*

Keywords— Experimental Process, Photovoltaic Cells, Energy Storage System

I. INTRODUCTION

The quantity of the energy from the sun, that arrives on the earth surface in a day. Through the photovoltaic effect the energy contained in the sunlight can be converted directly into electrical energy. This method of energy conversion presents some advantages, such as: Its modular characteristic offers large flexibility in the design and application of this kind of energy generator. Short time of installation and operation. High reliability, and low maintenance.

II. PHOTOVOLTAICS (SOLAR CELLS)

The photovoltaic cell converts the light energy into electrical energy depending on the irradiation of the sun and temperature in the atmosphere. Basically PVC is a PN junction diode. But in PN junction diode DCI AC source is needed to work, but here light energy is used as a source to produce DC output. PVC is a current control source not a voltage control source.

Each individual solar cell is constructed by layering different component materials together. Individually, these components cannot generate electricity. However, when combined in a specific configuration, they generate and conduct electricity from sunlight. Imagine a solar cell as a framed picture. Enclosed in a metal frame and sandwiched in between the clear, protective cover glass and a sturdy backing material would be the picture. Solar cell construction is similar. The difference would be to substitute our picture with the electrical current generating properties of the solar cell core.

It isn't economical to use this individually designed cell configuration in an active solar power application. In reality, a number of these individual solar cell cores are connected in series to form a solar panel. The panel, containing multiple solar cell cores would be framed in metal and covered with clear glass and a backing support material. Let's dissect the actual components used in a photovoltaic solar cell from top to bottom.

Antireflective Coatings are used to help avoid the incoming sunlight from being reflected back off the solar cell. Only by capturing and absorbing as much of the incoming sunlight as possible can a solar cell maximize its electricity generating capacity. Since only spectral solar light is processed during the photovoltaic effect, the antireflective coating helps increase absorption over the entire solar spectrum and aides in the absorption of sunlight when the cells aren't oriented to optimum sun angles.

There are two common techniques for applying antireflective coatings to solar cells. One is to cover them with a thin film of silicon monoxide. Another process is to texture or "rough up" the surface of the cell by chemically etching it and forming tiny scratches that resemble cones and pyramids. The cones and pyramids redirect the sunlight down into the cell core instead of allowing it to reflect back off the panel.

The N-Type Semiconductor Silicon layer produces the negatively charged electrons needed to conduct an electrical current. The conduction is made possible through a process called doping. An N-type silicon semiconductor is doped when the impurities of phosphorus atoms are added. This creates extra negatively charged electrons. These extra negative electrons combine with holes created in the doped P-type semiconductor's positive electrons creating an electrical current which flows through to the contact grid.

The N-P Junction lies in between the top N-type semiconductor and the bottom P-type semiconductor. It is the absorber layer or the core of the semiconductor layers. The junction is created at the point where the doped N-type semiconductor negative electrons and the doped P-type semiconductor positive electrons meet and the transfer of electricity takes place through the photovoltaic effect.

III. EXPERIMENTAL PROCESS

Fig. 1: photovoltaic cells with LED

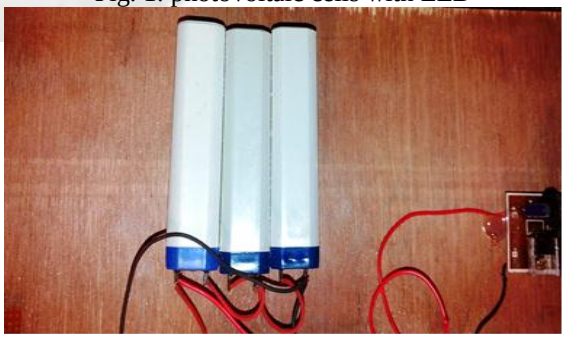

Fig. 2: Battery with circuit

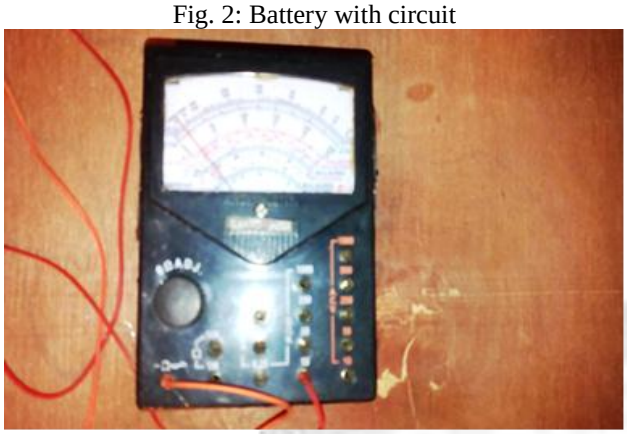

Fig. 3: Display

IV. CONCLUSION

Experimental approach of a static conversion system of the solar energy from photovoltaic cells. This system is connected with the mains power supply, contributing to the generation of the commercial electrical energy. According to the results obtained we have a direct conversion system with the following features:

1) Many systems can be associated in parallel.
2) Simple installation.
3) Lower harmonic distortion of current.

This system can be applied in residential or commercial buildings, for low or high power. Therefore, this type of system are very useful for some residential and/ industrial applications.

REFERENCE

[1] G.Yoo, and J. Song, "A bifunctional utility connected photovoltaic system with power factor correction and U.P.S. facility," in Proc. 25th Photovolt. Spec. Conf., 1996, pp. 1363–1368.

[2] C. Nayar, and L. Borle, "A combined voltage controlled and current controlled "Dual Converter" for a weak grid connected photovoltaic system with battery energy storage," in Proc. 33rd IEEE Power Electron. Spec. Conf., 2002, pp. 1495–1500.

[3] H. Serban, "A control strategy for a distributed power generation microgrid application with voltage and current-controlled source converter," IEEE Trans. Power Electron., vol. 25, no. 12, pp. 2981–2992, Dec. 2010.

[4] N. Soltau, S. Thomas, and R. W. D. Doncker, "The balance of renewable sources and user demands in grids: Power electronics for modular battery energy storage systems," IEEE Trans. Power Electron., vol. 25, no. 12, pp. 3049–3056, Dec. 2010.

[5] Y. Miura, and T. Ise, "Low-voltage bipolar-type DC microgrid for super high quality distribution," IEEE Trans. Power Electron., vol. 25, no. 12, pp. 3066–3075, Dec. 2010.

[6] T. Bhattacharya,D. Tran, T. S. T. Siew, and A. M. Khambadkone, "Composite energy storage system involving battery and ultracapacitor with dynamic energymanagement inmicrogrid application," IEEE Trans. Power Electron., vol. 26, no. 3, pp. 923–930, Mar. 2011.

[7] J. V. Paatero and P. D. Lund, "Impacts of energy storage in distribution grids with high penetration of photovoltaic power," Int. J. Distributed Energy Resources, vol. 3, no. 1, pp. 31–45, 2007.

[8] Y. Ueda, K. Kurokawa, T. Itou, K. Kitamura, K. Akanuma, M. Yokota, H. Sugihara, and A. Morimoto, "Performance analyses of battery integrated grid-connected residential PV systems," in Proc. 21st Eur. Photovolt. Sol. Energy Conf., 2006, pp. 2580–2584.