International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017),e-ISSN:2455-2585
International Conference on
Recent Explorations in Science, Engineering And Technology (ICRESET'19)
Volume-5, Special Issue-March, 2019.

LUO CONVERTER BASED SOLAR PV SYSTEM

Mrs.C.Maheswari, Dr.S.Rajeswari

Assistant Professor, Professor
Electrical and Electronics Engineering, Dr. N.G.P. Institute of Technology,
Electronics and Communication Engineering , KGiSL Institute of Technology Coimbatore, India

Abstract: ***To meet the increase in power demands and to reduce the global warming, the cheap and obtainable renewable energy sources like wind, solar, hydro and tidal energy based system is used. Out of the various renewable energy sources, solar energy is the best alternative for fossil fuel because of its nonpolluting, reliable and clean in nature. But the solar system converts only 30 to 40% of solar irradiation into electrical energy when compared to other renewable energy sources. To get maximum output from a PV panel system, an extensive research has been carried out for long time to access the performance of PV system and to analyze the different concerns related to the use of solar PV system efficiently. This paper presents a method of gaining high output voltage using LUO converter which is a high DC-DC converter. This method uses a combination of inductor, and a capacitor to lift the input voltage to a higher value of output voltage. The voltage gain of the converter in a re-lift configuration is two times of that provided by a boost converter while using a single switch. The system is simulated using MATLAB and the results are presented and compared with the hardware model results to support the theoretical analysis.***

I. INTRODUCTION

Conversion technique is one of the major research areas in the field of power electronics. The equipment's used for conversion technique are found to have applications in industry, research and development, various organizations and in daily life. All the existing DC/DC converters are designed to meet the requirements of certain applications only. The conventional types of DC/DC converters include Buck converter, Boost converter, Buck-Boost converter, Cuk converter etc. Among these, boost converter is found to be applicable in large number of applications like, Hybrid Electric Vehicles (HEV), lighting systems, tramways, railway electrification. The DC/DC conversion technique was established in 1920s.The simplest form of conversion was using voltage divider.

II. STAND ALONE SOLAR PV SYSTEMS WITH DC-DC POWER STAGE

In the use of nonconventional energy Sources, photovoltaic (PV) installations are being increasingly employed in several applications, such as distributed Power generation and stand-alone systems. However, a major Challenge in using a PV source is to tackle its nonlinear output Characteristics, which vary with temperature and solar Insolation.

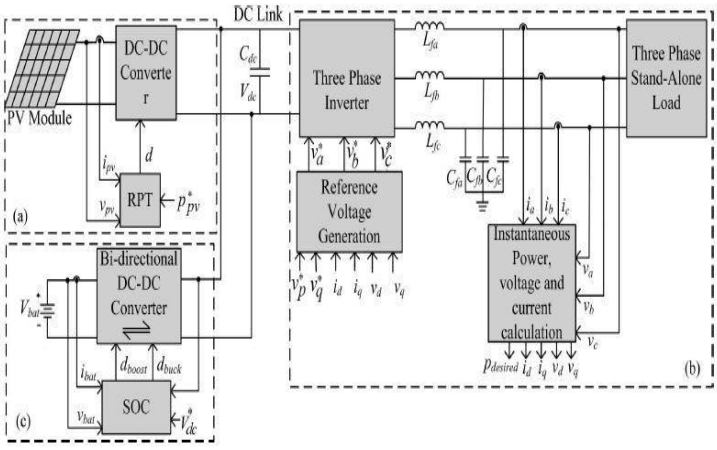

Figure: 1 Block Diagram of Standalone PV Systems

II. OPERATION OF LUO CONVERTERS

LUO converters are one of the simplest form of DC/DC converters which operates on voltage lift technique. Many series of LUO converters are available now, ranging from elementary 2 lift to 192 lift LUO converters.

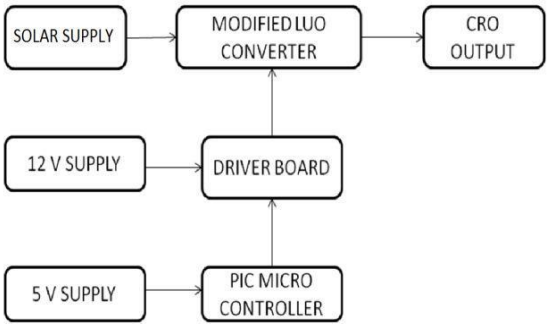

Figure 2. Block Diagram of LUO Based Solar PV Systems

A LUO converter mainly consists of two series, main series and additional series. The main series consist of 2 lift, 4 lift, 8 lift LUO converter etc., and additional series includes 3lift, 6 lift, 12 lift etc. The following is the circuit diagram of the conventional LUO converter and its operation during switch on and off operation. This configuration is the basic switched capacitor LUO converter.

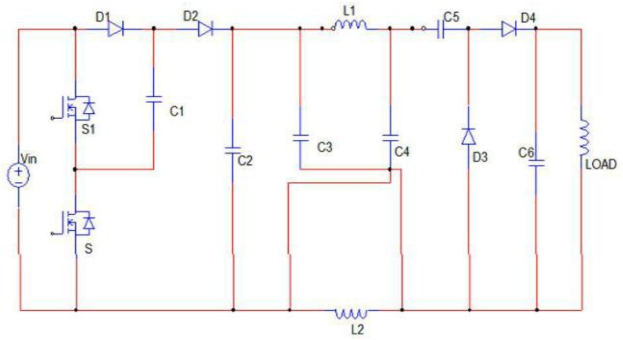

Figure 3.Circuit Diagram of proposed LUO Converter

III HARDWARE IMPLEMENTATION

The hardware consists of driver circuit, PIC controller, LUO converter and the impedance network.

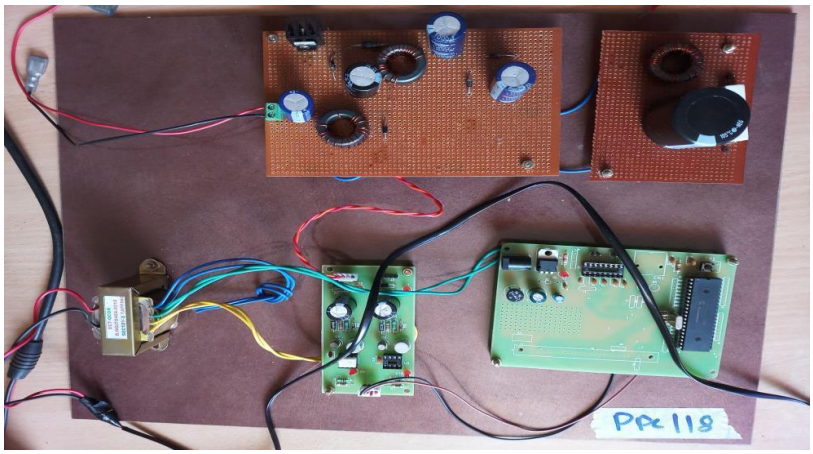

Figure 4 Hardware Snapshot of LUO Based Solar PV Systems

IV HARDWARE REALIZATION

The following figures 9 & 10 shows that the input and output measured from multimeter.

Figure 5. Input Voltage Measured from the module

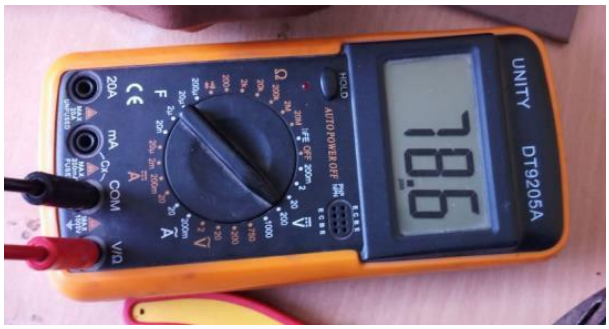

Figure 6. Output Voltage Measured from the Module

Table 1: Comparison of LUO converter with conventional converter

Input Voltage	Expected Output Voltage	Conventional System	Proposed LUO System
10V	20V	18.33 V	20.2V
50V	100V	98.05V	113.7V
100V	200V	197.7V	230.5V
400V	800V	795.5V	931.5V
600V	1200V	1194V	1399V
V_0	$V_0=2V_{in}$	$V_o<2V_{in}$	$V_0>2V_{in}$

V. CONCLUSION

The simulation based on maximum power output (LUO converter) was successfully simulated and tested with a prototype part by part. The implementation and practical testing was done in the workbench effectively. The current power scenario of the country urges us to develop a novel system like these to electrify and digitize the rural community. Additionally this proposal can be a backup for the existing systems.

The use of solar energy is essential for providing solutions to the environmental problems and also energy demand. The vast development to improve the efficiency by the MPPT algorithms encouraged the domestic generation of power using solar panels. The available MPPT techniques based on the number of control variables involved, types of control strategies, circuitry, and applications are possibly useful for selecting an MPPT technique for a particular application for grid tied or standalone mode of operations. This review has included many recent hybrid MPPT techniques along with their benefits for mismatched conditions such as partial shading, non-uniformity of PV panel temperatures, and dust effects.

REFERENCES

[1] F.L. LUO & Hye, **"**Ultra-lift LUO-converter**'** IEEE, Proceedings-Electric Power Applications, 2005.

[2] Y Jiao, F.L. LUO, M Zhu, **"**Voltage-lift-type switched-inductor cells for enhancing DC–DC boost ability: principles and integrations in LUO converter**"**, IET Power Electronics, 2011.

[3] A Kavitha & G Uma, **"**Experimental Verification of Hopf Bifurcation in DC-DC LUO Converter**"**, IEEE Transactions on Power Electronics, 2008.

[4] Chilambarasan Madhavan, Sujatha and Muthu Ramesh Babu, **"**Design and Simulation of LUO Converter Topologies for Photovoltaic Applications**"** International Journal of Applied Engineering Research, January 2014.

[5] Saradha Devi R, Mrudhulaa P. V, Priyadharshini K, Seyezhai R, Mrudula Vempati, **"**Development of Solar DC Home System using Modified LUO Converter**"** International Journal of Engineering and Advanced Technology (IJEAT) I, Volume-8 Issue-1, October 2018.

[6] Divya Navamani Jayachandran, Vijayakumar Krishnaswamy, Lavanya Anbazhagan and Karthikeyan Dhandapani, **"**Modelling and Analysis of Voltage Mode Controlled LUO Converter**"**, American Journal of Applied Science, 2015.

[7] Zhu, H; Zhang, D; Zhang, B; Zhou, Z. A Non-isolated Three-Port DC–DC Converter and Three-Domain Control Method for PV-Battery Power Systems. IEEE Transactions on Industrial Electronics, 2015; 62(8):4937-4947.

[8] Chien, L. J; Chen, C. C; Chen, J. F; Hsieh, Y. P. Novel three-port converter with high-voltage gain, IEEE Trans. Power Electron., 2014; 29(9):4693–4703 .

[9] Di Napoli, A, Crescimbini, F; Solero, L; Caricchi, F; Capponi, F. G. Multiple-input DC–DC power converter for power-flow management in hybrid vehicles, in Conf. Rec. IEEE IAS Annu. Meeting, 2002; 1578– 1585.

[10] Wang, Z; Li, H. An integrated three-port bidirectional DC–DC Converter for PV application on a DC distribution system, IEEE Trans. Power Electron, 2013; 28: 4612–4624.