# Performance Analysis of Positive Lift LUO Converter

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| Article History | Abstract |
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| **Article Submission** 18 October 2011 **Revised Submission** 22 January 2012 **Article Accepted** 2 February 2012 **Article Published** 31st March 2012 | *The quick depletion of remnant fuels, environmental pollution has become more solemn matter. Recently a good deal effort made to find renewable energies and solar energy is the ideal solution. In photovoltaic arrays, cells are arranged in series to obtain the required voltage. The output characteristic feature of photovoltaic array show a discrepancy radically by way of solar irradiation, temperature and presents MPP under various atmospheric nominal conditions. Based on Perturbation and Observation method, MPP is tracked for PV. The DC-DC converter is used to improve the output voltage and are widely used in solar energy conversion systems.. Here ultra-lift LUO converters are normally used to convert low input voltage in to high output voltage (same principle of Boost converter). But these converters are not stable in voltage lift and less reliability. By using Voltage lift method, voltage transfer gain higher than other classical converters is obtained.* **Keywords**: LUO Converter, MPP, Renewable Energy |

## I. Introduction

Energy crisis pertaining in the world lead us for search of alternative energy. The solar energy find greater importance as it is profuse, free & inexpensive, pollution less and widely distributed all over the world. The demand for solar energy is growing because of reduced price, improvement in efficiency of the solar cells and its manufacturing process. The operating condition of photovoltaic cells are greatly influenced by solar radiation, temperature of the solar cell and load cell values. The novelty of the PV cell is that it has a unique point at which it gives out maximum power output. There is a great necessity to develop a simulation model for photovoltaic cells to understand the efficiency of the converters and PV arrays. This proposed paper analyses the principle behavior of Photovoltaic cell power and presents a mathematical model. All the simulations are performed using MATLAB environment.

Current equation for PV panel is given

$$I = I_{PV,cell} - I_{o,cell}(e^{\frac{qv}{akt}} - 1) \tag{1}$$

$I_{PV}$, cell is the Current generated by the solar light,

q represents charge of the electron,

k -Boltzmann constant,

t -the existing temperature,

a -diode constant.

Equation to calculate PV current

$$I_{p} = (I_{pvn} + K_1 \Delta T) \frac{G}{G_n}$$
(2)

n is the number of solar cells arranged in series
ΔT is change in temperature
G is irradiance
Gn is nominal irradiance

Thermal voltage equation for the solar panel is given below

$$V_r = \frac{N_s kT}{q}$$
(3)

Equation for change in temperature is given below

$$\Delta_T = T - T_n$$
(4)

## II.    Simulation model of PV Array

First the photovoltaic cells are connected series to make it in an array fashion, the array is represented in mathematical form as a single cell through multipliers integrated for that reason. Hence, the experimental model of the PV array is dependent on the amount of series/parallel manacles in array. The simulation models of photovoltaic array depending upon single and double index model are recognized respectively. Single and double index model linked together to form function module in MATLAB simulation environment.
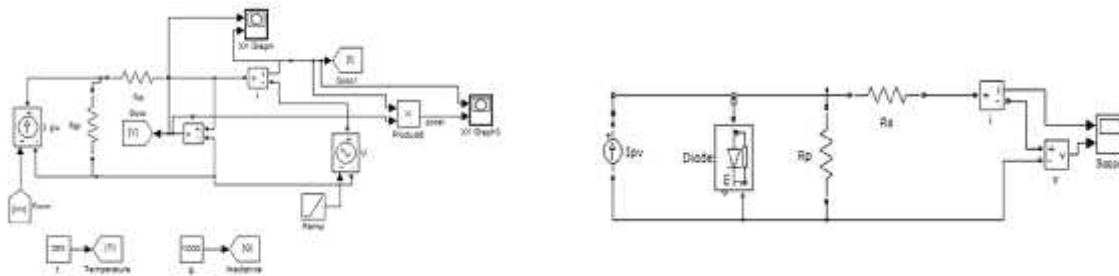


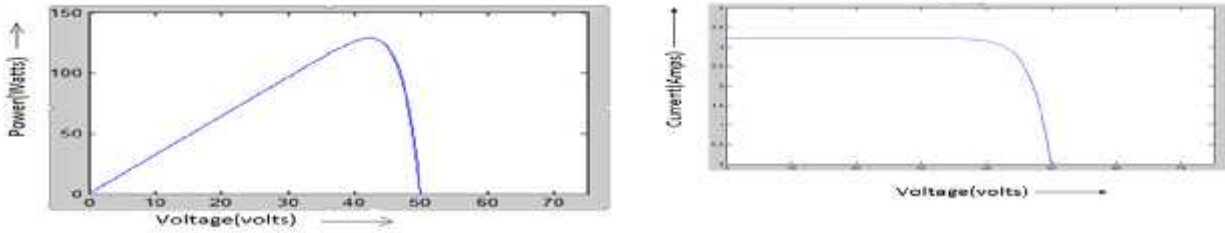*Fig.1: Simulink model of photovoltaic panel*

*Fig.2: The power Vs. Voltage graph for photovoltaic panel*

## III. DC-DC conversion

In this part DC-DC conversion is did by the LUO converter. This LUO converter has positive lift LUO converter and negative lift LUO converter this works on voltage lift technique. Voltage lift technique is generally applied in industrial application. In this it works same as like the boost converter where the output voltage increases triple time of the input voltage. The circuit representation for LUO converter is given in MATLAB simulation as shown in figure 3.
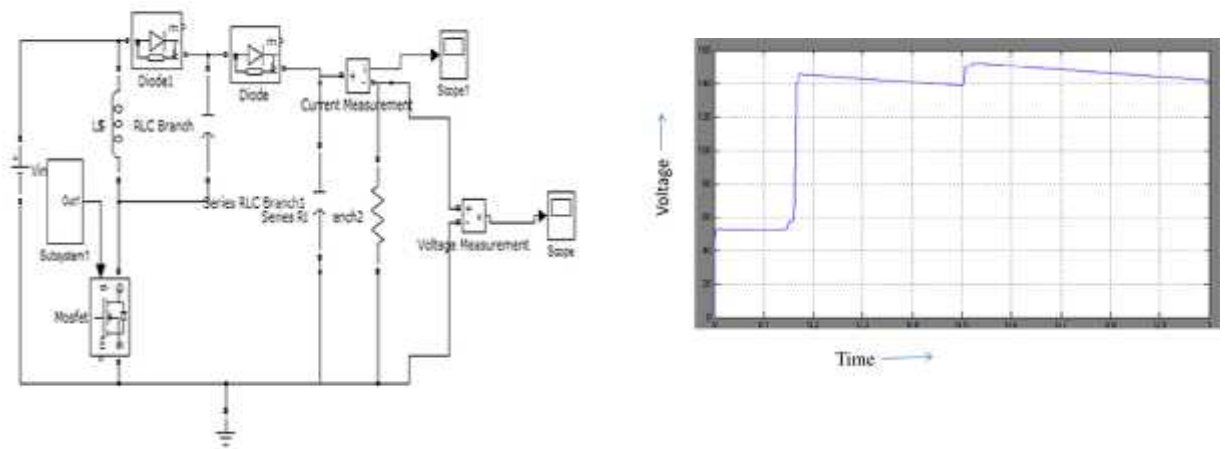


*Fig.3: Simulink model and graph of DC-DC conversion*

For this converter the calculated value is given in the table below

*Table 1: Parameters and Values*

| Parameters name | Value |
|---|---|
| Input voltage | 50 V |
| Output voltage | 150 V |
| L1 | 1μH |
| C1,C2 | 50mF |
| R | 50Ω |

In this graph shown in fig 3, the shoot over period respectively from140V-152V respectively. Here it is absorbed that the obtained output from the PV panel is not a regulated DC voltage there by combining it with the converter it is possible to regulate and boost the output voltage obtained. The output obtained from this circuit is fed as the gate pulse to the converter circuit. Pulse input given to the converter is given below
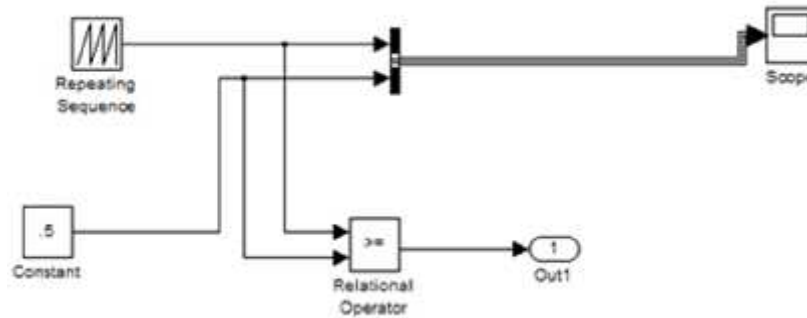


*Fig.4: Pulse input to DC-DC converter*

## IV. Inverter circuit to convert DC-AC

After this process this circuit is combined with the inverter to convert the obtained DC voltage to the AC voltage respectively in order to convert H-Bridge inverter is used. With this the individual circuit analysis is completed. In the next set after combining converter and inverter the output is obtained in such a manner.
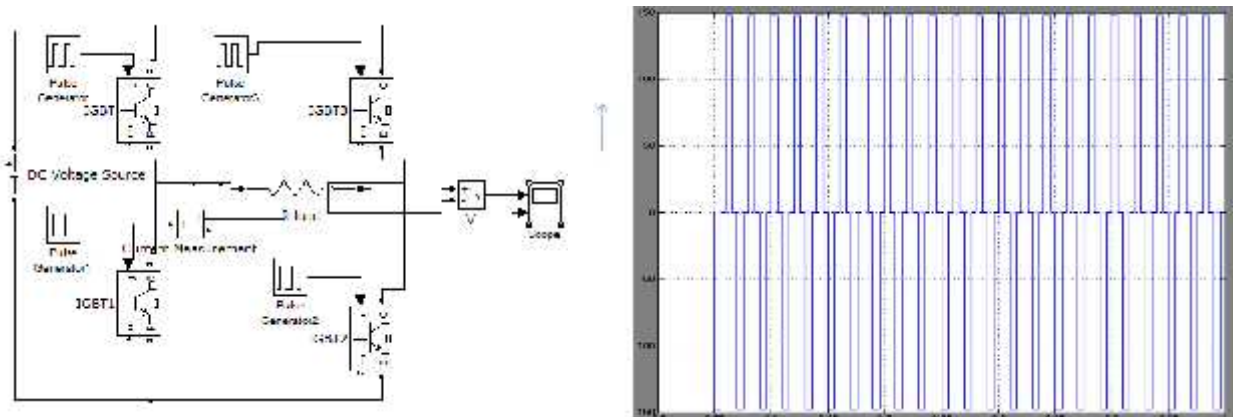


*Fig.5: Simulink model and graph of DC-AC conversion*

After combining the converter and inverter obtained result is given below there it will have losses in the circuit losses ranges from (30-40) volts respectively.
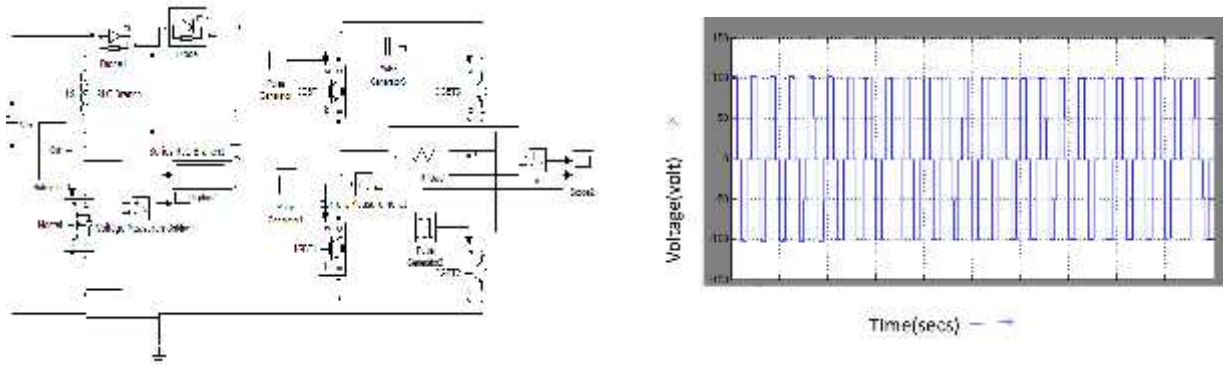
*Fig.5: Simulink model and graph of DC-AC conversion*

## V. MPPT (Maximum power point tracking)

MPPT utilizes a well-established control circuit to look for maximum power point and enhancing the converter to extract highest maximum power from the photovoltaic panel. This tracking leads to the increase or decrease in power in the either direction. Hence, the peak power tracker endlessly seek the peak power condition.
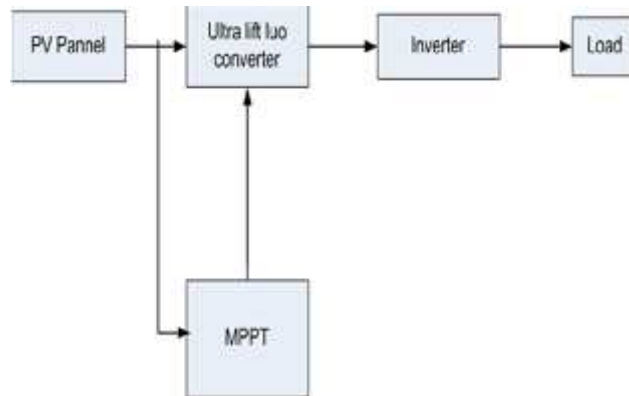


*Fig.6: Block of MPPT implementation*

The simulated diagram of the P&O method is given below in the figure 7. After combining all these the expected result for this circuit is to improve the output voltage for 100V.
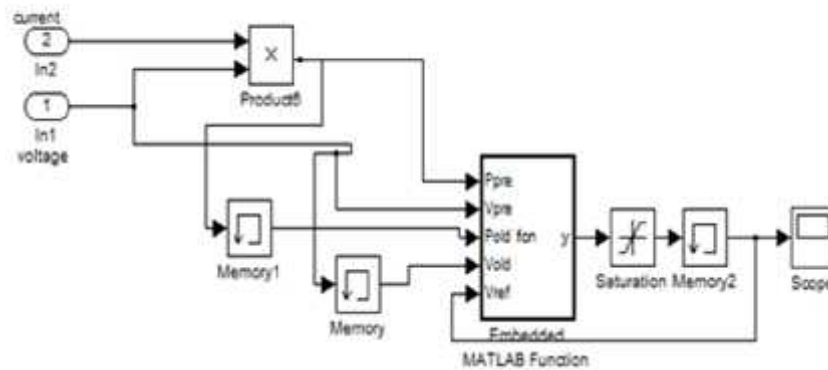
*Fig.7: Simulink model of P&O Method*

## VI.  Conclusion

There are various controlling algorithm which are used for tracking MPP here P&O technique is implemented. P&O is abbreviated as Perturbation and observation. The proposed method has a simple feedback construction and a few essential parameters. The operation periodically increases or decreases the arrays terminal voltage. A comparison is made between the Photovoltaic output powers with that of the prior obtained value power value. The main advantage with this method is its simplicity and its easy implementation.

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