



Integration of a Single phase Bidirectional Inverter with Two Buck/Boost MPPTs for Dc Distribution Applications

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ABSTRACT—This paper describes the operation of a bidirectional inverter with two buck/boost MPPTs. The MPPTs have to draw maximum power from solar PV panels and given to dc to dc converter for getting required range of voltages. This DC voltage will be converted into AC by using bidirectional inverter for supplying grid. Now a days these types of renewable sources are become more popular due to its advantages. By implementing these types of proposals we will get the required maximum power output without degrading natural resources. The installation cost, operating cost and maintenance cost is also low for solar energy. So, in future we will hope to generate maximum power from these renewable energy resources.

KEYWORDS- MPPTs, buck/boost converter, bidirectional inverter.

I INTRODUCTION

As the population is increasing day by day, the demand for electricity is increases. But the amount of conventional energy resources are decreasing, so in order to generate the required amount of power we have to concentrate on renewable energy resources like solar energy, tidal energy, wind energy etc., Among these solar energy plays an important role due to its advantages like no noise, abundant, conversion is easy, less maintenance, low capital cost.

In this paper, solar PV panels are used for generation of electricity. But the output of solar panels are low and nonlinear, in order to get maximum power we are implementing MPPT techniques for the panels. Though there are many MPPT techniques, P&O algorithm is more preferable in order to get high DC output, we are using buck and boost converters. The output of the MPPT technique is duty cycle which will be given as input to the converter, with that input value the converter will gives the required value of output. The DC output power is again given to bidirectional inverter and it converts given DC to AC output.

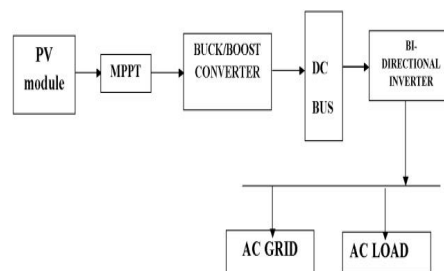


Fig.1. Block diagram

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The pattern of the power flow in the circuit is shown in fig.1. The conventional circuit in this paper have only the boost converter implementation, stepdown of voltages is not possible, due to this there are many disadvantages like stepdown of voltage is not possible, voltage stress on inverter and maximum power could not be tracked accurately.

In order to overcome these disadvantages of this conventional circuit, we are proposing two stage buck/boost converters along with the P&O MPPT algorithm is implemented.

In conventional circuit, there is two stage boost converters which are connected in parallel which only operates in boost mode,gives output to dc link.This output is given to bidirectional inverter for converting it into AC and this AC supply will given to AC grid.

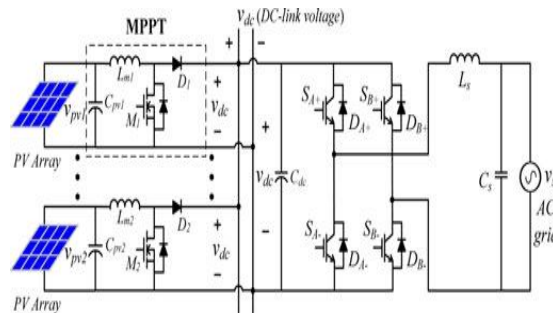


Fig.2. Conventional two stage PV system with boost type MPPTS

II.PROPOSED CIRCUIT

The proposed circuit is shown below,

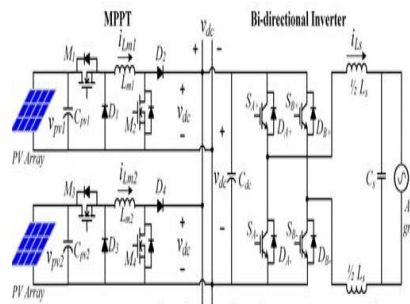


Fig.3.Proposed two stage buck/boost converter

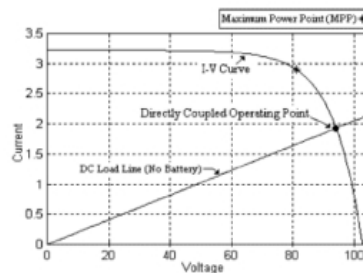


Fig.4.maximum power tracking using PO method

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In this circuit (Fig. 3), both buck and boost converters are used for getting the desired value of output. When PV voltage is greater than DC link voltage, buck converter is used. When PV voltage is less than DC link voltage, boost converter is used. Perturbation and observation algorithm is chosen over the other because of the following advantages like simplicity and ease of implementation.

III. OPERATION

The MPPT formed with both buck and boost converters will have the input voltage of 600V for each panel and the two panels are connected in parallel, the MPPT senses the PV voltage and current which will give duty cycle as output and this output is given as input to the converter.

The converter also inputs the gating signals which are produced from PWM techniques, The operation mode of converter will be based on input voltage. The proposed circuit will operate in two modes. They are:

- A. Buck mode
- B. Boost mode

A. BUCK MODE:

When PV voltage is greater than DC link voltage, then buck converter will be used to step down the voltage. During this mode switch M1 is turned on and inductor L_s will store current, and when switch M1 is turned off the stored energy in inductor will bypass through diodes D1 and D2.

B. BOOST MODE:

When PV voltage is less than the DC link voltage, then boost converter will be used to step up the voltage. During this mode, both switches M1 and M2 will be on to store the magnetising current in L_s . When M2 is turned OFF the magnetising current will discharge through D2.

IV. RESULTS

A. SIMULATION OF PROPOSED BUCK/BOOST CONVERTER IN BUCK MODE

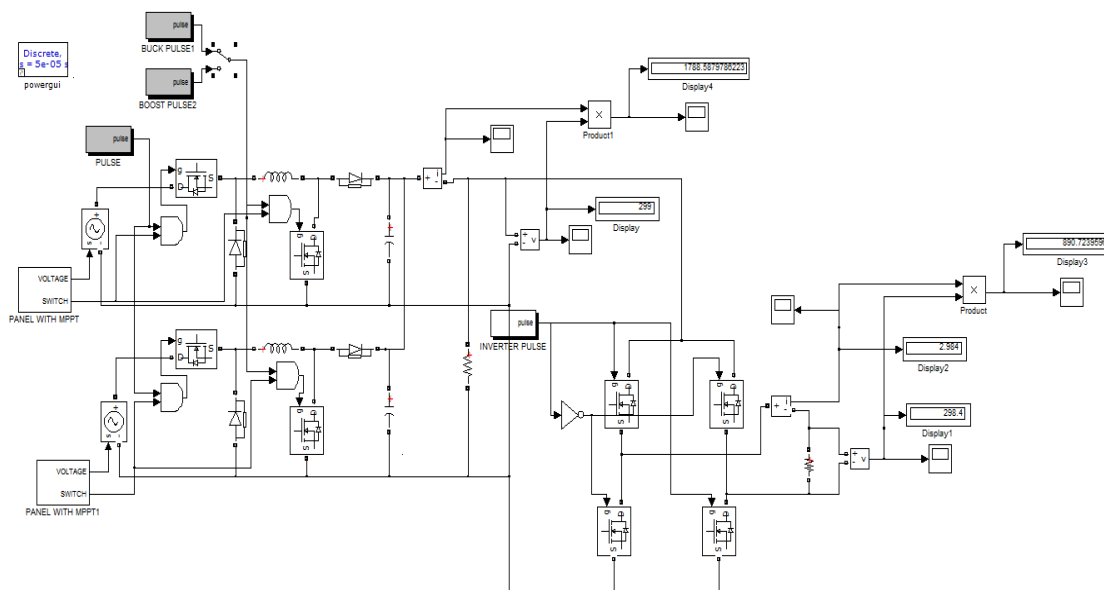


Fig.5.simulation diagram of a proposed buck MPPT



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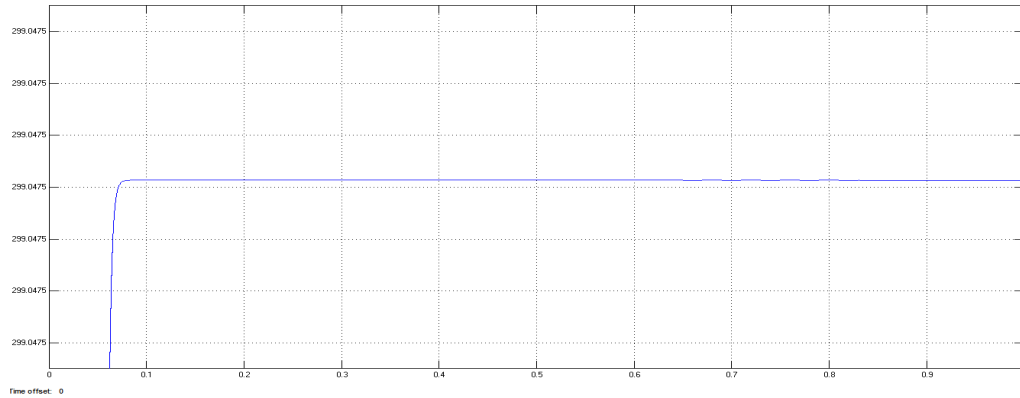


Fig.6. output DC voltage of a proposed buck MPPT

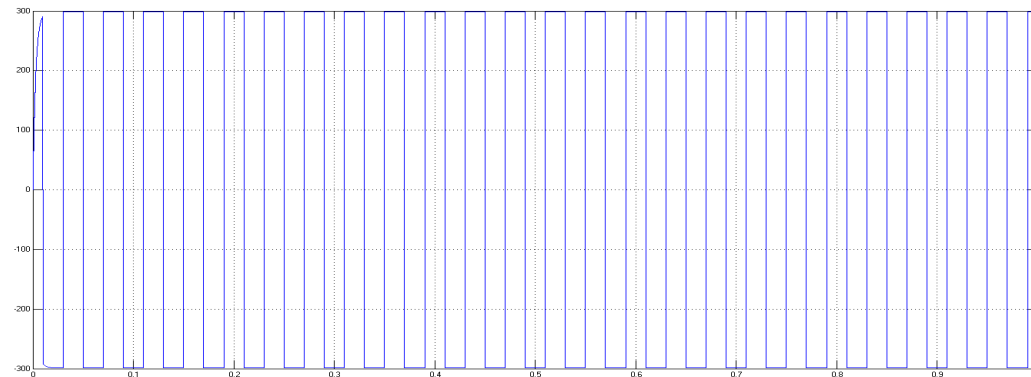


Fig.7. output AC voltage of a proposed buck MPPT

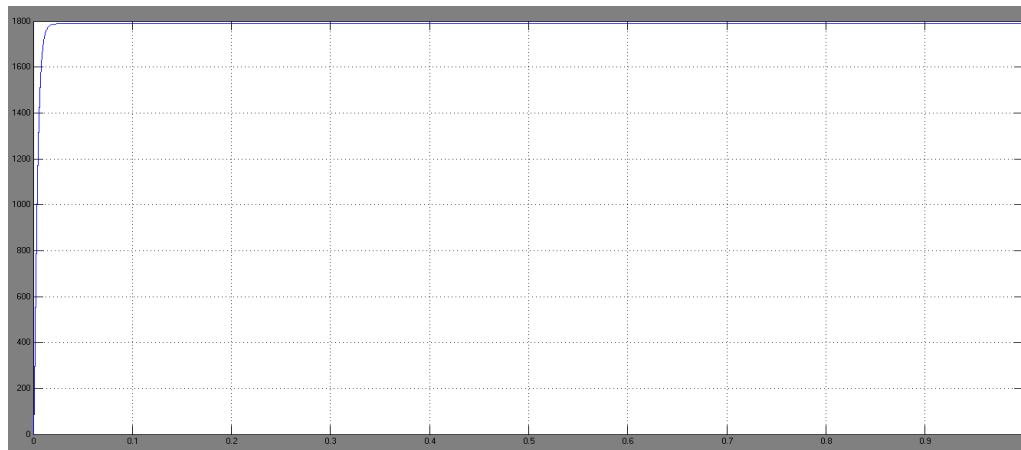


Fig.8. output AC power of proposed buck MPPT

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B. SIMULATION OF PROPOSED BUCK/BOOST MPPTS IN BOOST MODE

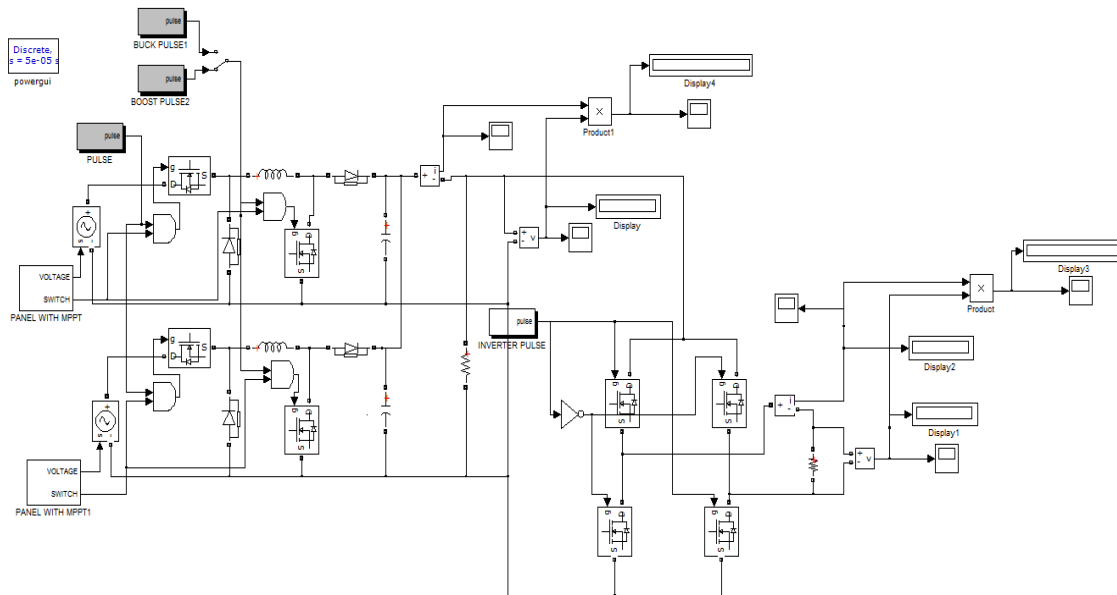


Fig.9.simulation of a proposed boost converter

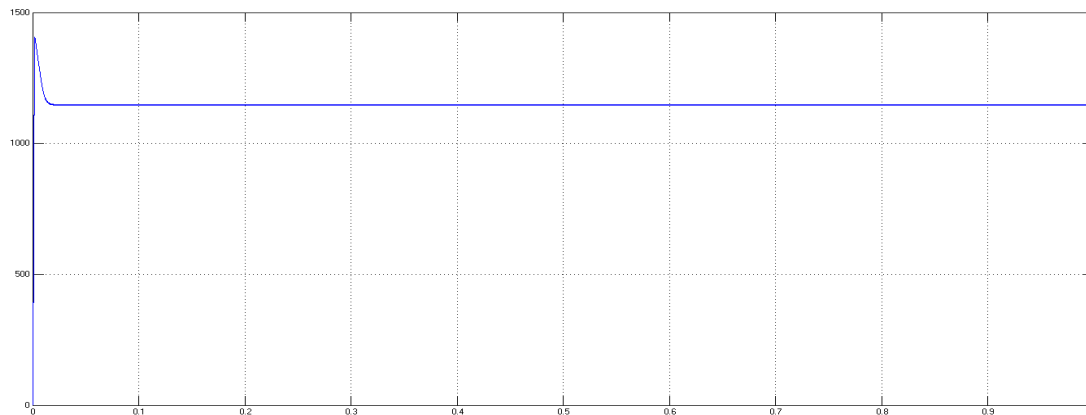


Fig.10.output DC voltage waveform of a proposed boost MPPT



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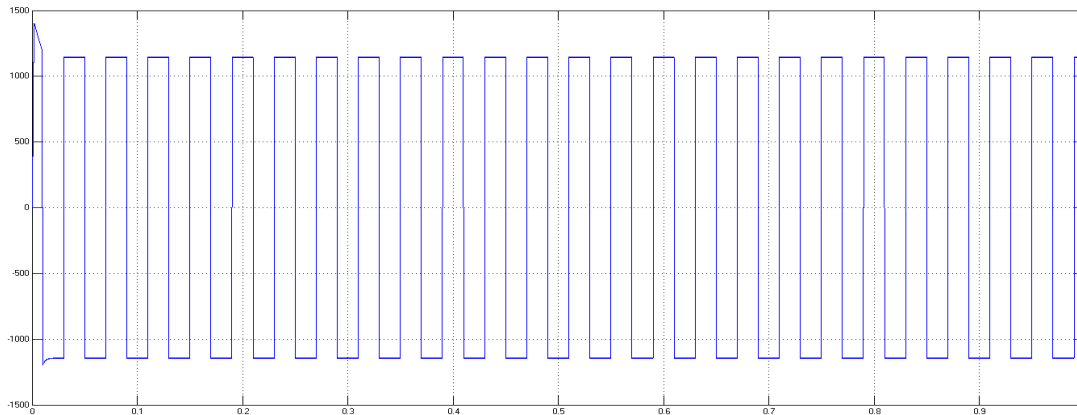


Fig.11.AC output voltage of proposed boost converter

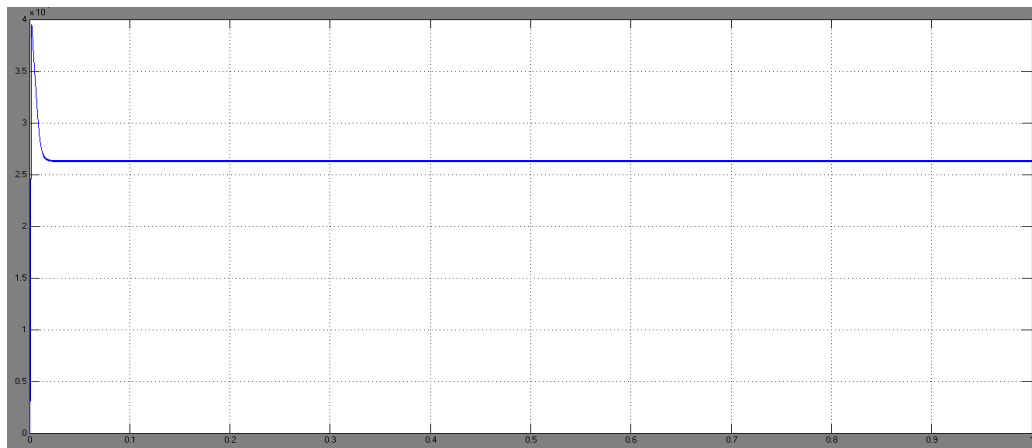


Fig.12. AC output power of proposed boost converter

V.CONCLUSION

A single phase bidirectional inverter with two buck/boost MPPTs is implemented. since the PV array voltage will vary from 0-600V, the MPPT formed with both buck and boost converter operates at the desired DC bus voltage reducing the voltage stress on the following inverter.

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