

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 5, May 2018

## Dual Input DC-DC Converter for Photo Voltaic Applications

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**ABSTRACT:** This paper presents a new technology in incorporating the renewable source and grid for supplying power to the villages. This paper also explains the importance of renewable energy sources and the power electronic converters in efficiently converting multi-input dc-dc/ac power. In this paper, the first stage is to regulate the multiple input dc voltage from the renewable energy source. This includes boost converter for efficiently boosting the voltage. The second stage is to design the inverter, converting the boosted dc voltage to ac power. The third stage is to merge the different ac voltages from inverters and converting it into single output. The output is connected to the grid which supplies power to villages. Operation of dc-dc/ac converter is explained and simulated results are shown using PSIM.

**KEYWORDS:** Text detection, Inpainting, Morphological operations, Connected component labelling.

### I. INTRODUCTION

In the recent trends it is well known that power electronics is based on high efficiency and fast-switching silicon power semiconductor switches, such as diode, thyristor, triac, gate turn-off thyristor (GTO), power MOSFET, insulated gate bipolar transistor (IGBT) and their applications include dc and ac bi-directional converters etc. The ever increasing demand for energy resulted in a wide usage of renewable energy sources in India and worldwide.

Recently, renewable energy sources such as PV arrays, wind generators and fuel cells are gaining attentions due to the advantages like being abundant in nature and causing zero-emissions. Since these renewable sources are intermittent, using more than one renewable source can increase the certainty of continuous load supplying compared with either individual source because of their complementary feature. [1] In this topology, a hybrid wind/PV system for supplying an isolated small community with electrical energy is digitally simulated.[2] Most coastal areas are experiencing relatively large quantum of solar and wind energy. If the wind is heavy it might produce larger sea waves of high energy contents. The electricity needs of a township or a village situated in a coastal area can be partially fulfilled by installing modular mini electricity generating unit and an intensified solar heat extractor in buildings. [3] An application of grid-connected inverter interfacing with renewable energy resources for electrical power generation such as photovoltaic, fuel cell, and micro turbine has a higher attraction. [4]

In [5], a two-input buck converter is presented that is proposed as an efficient solution to a dc-dc converter. The author in this paper explains the concept of ordinary buck converter but with a battery placed in series with the diode. While this does not scale to more inputs, it is effective for the proposed application. In this paper, another two-input buck converter is proposed. [6] This topology scales to more inputs as needed, but of course is only capable of buck operations, which may be all that is needed in some applications.

The use of a multiple-input buck-boost converter for budgeting power between different energy sources is discussed. It is shown mathematically that the idealized converter can accommodate arbitrary power commands for each input source while maintaining a prescribed output voltage.

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In this paper, the configuration of a high-performance standalone PV generation system is depicted in Fig. 1. The system is mainly composed of a PV module, a two-input dc-dc converter, a three phase half-bridge inverter, a sinusoidal pulse width modulation and the output is connected to the grid. The identified problem in transferring power to the villages through the transmission line and solution is expressed in detail as follows. Due to the PV effect, the voltage of a PV plate is not very high. However, the PV array with a higher output voltage is difficult to fabricate and it may fail when any single PV plate is inactive. Besides, the corresponding output voltage ( $V_{pv}$ ) is varied easily with respect to the variation of loads. Also to satisfy the requirement of high voltage demand to the villages, a high-efficiency dc-dc converter with high voltage gain is needed as one of the essential mechanisms in the high-performance stand-alone PV generation system. A high step-up buck-boost converter is implemented to reduce the series-connected numbers of PV plates, to maintain a constant dc voltage ( $V_d$ ) for the inverter utilization, and to decouple and simplify the control design of a dc-ac inverter.

A sinusoidal pulse width modulation three phase inverter circuit to meet the requirement of an ac power source. Since the PWM inverter dominates the performance in converting the dc voltage source to an ac voltage source, the quality of the ac output waveform of the PV generation system is highly dependent on the performance of the PWM inverter.

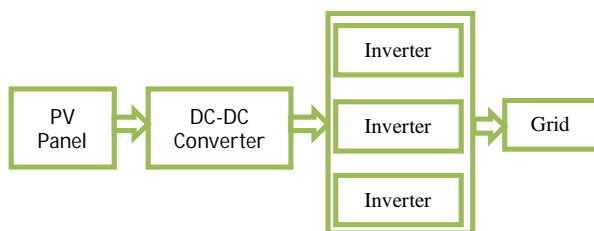


Fig. 1 Proposed design integrated with grid

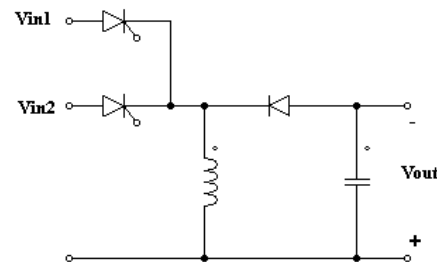


Fig. 2 Two input buck-boost converter

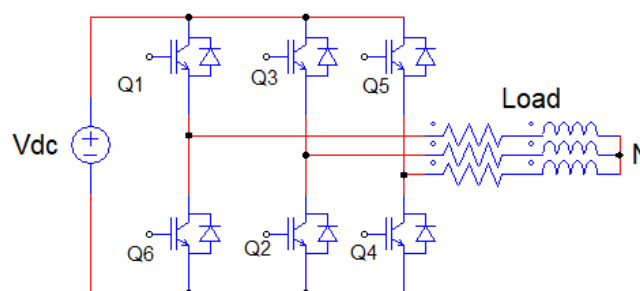


Fig. 3 Three-phase Full –Bridge Inverter

## II. DC-DC CONVERTER

The proposed buck-boost circuit topology is shown in Fig. 2. As shown, it is a two input buck-boost converter. It is fed from renewable energy source, dc source from the PV panel. The output supplies the boost output of 215. The passive components are inductor and capacitor. On the output side, a diode is used. On the input side, a forward-conducting, bidirectional-blocking (FCBB) switch is required on each input. An FCBB switch can be a gate turn-off thyristor (GTO) or a transistor in series with a diode. Recently, some semiconductor manufacturers have offered reverse-blocking (RB) insulated-gate bipolar transistor (IGBTs) that can achieve the same on-state voltage typical of an ordinary IGBTs. If it is known that some input voltage is always higher than the others, then need only be a forward-conducting, forward-blocking (FCFB) switch, such as an IGBT.

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Assigning the switching signals with binary values and assuming ideal switches, the average output voltage is

$$V_{out} = \frac{\int_0^T \max(q_i V_i) dt}{\int_0^T \prod_i q_i dt} \dots \dots \dots (1)$$

Consider a duty cycle control scheme where each switch switches at the same frequency and the leading edge of each gate signal coincides. The trailing edges do not coincide, as each switch has a different duty cycle. Then equation (1) simplifies to

$$V_{out} = \frac{\sum D_{eff(j)} V_j}{1 - \sum D_{eff(j)}} \dots \dots \dots (2)$$

Where  $D_{eff(j)}$  is the effective duty cycle of each switch; that is, the portion of time the switch conducts nonzero current.

### III. DC TO AC CONVERTER

The dc to ac converters more commonly known as inverters, depending on the type of the supply source and the related topology of the power circuit, are classified as voltage source inverters (VSIs) and current source inverters (CSIs). The three-phase dc/ac voltage source inverters are extensively being used in motor drives, active filters and unified power flow controllers in power systems and uninterrupted power supplies to generate controllable frequency and ac voltage magnitudes using various pulse width modulation (PWM) strategies.

In this paper, the standard three-phase inverter is proposed which consisting of six switches (Fig. 3). The switching of which depends on the sinusoidal pulse width modulation scheme. The input dc is usually obtained from a single-phase. The single phase voltage source inverters PWM technique can be used in three-phase inverters, in which three sine waves phase shifted by  $120^\circ$  with the frequency of the desired output voltage is compared with a very high frequency carrier triangle, the two signals are mixed in a comparator whose output is high when the sine wave is greater than the triangle and the comparator output is low when the sine wave or typically called the modulation signal is smaller than the triangle. This phenomenon is shown in Figure 4. As is explained the output voltage from the inverter is not smooth but is a discrete waveform and so it is more likely than the output wave consists of harmonics, which are not usually desirable since they deteriorate the performance of the load, to which these voltages are applied.

### IV. EXPERIMENTAL RESULTS

The validity and reliability of the Buck-Boost converter and the SPWM inverter control are verified by the following experimental results. To verify the effectiveness of the high step-up converter, the input side consists of five 10 W PV modules connected in series with a power source. Two 50V dc sources are given as the input to the boost converters as shown in figure (4a). The output of the boost converter is 215V as shown in the simulation results (4b).

The circuit components of the PWM scheme are as shown in figure (4c). The switching frequency is 30 kHz; the output of the inverter is 415V as shown in the simulation results (4d).

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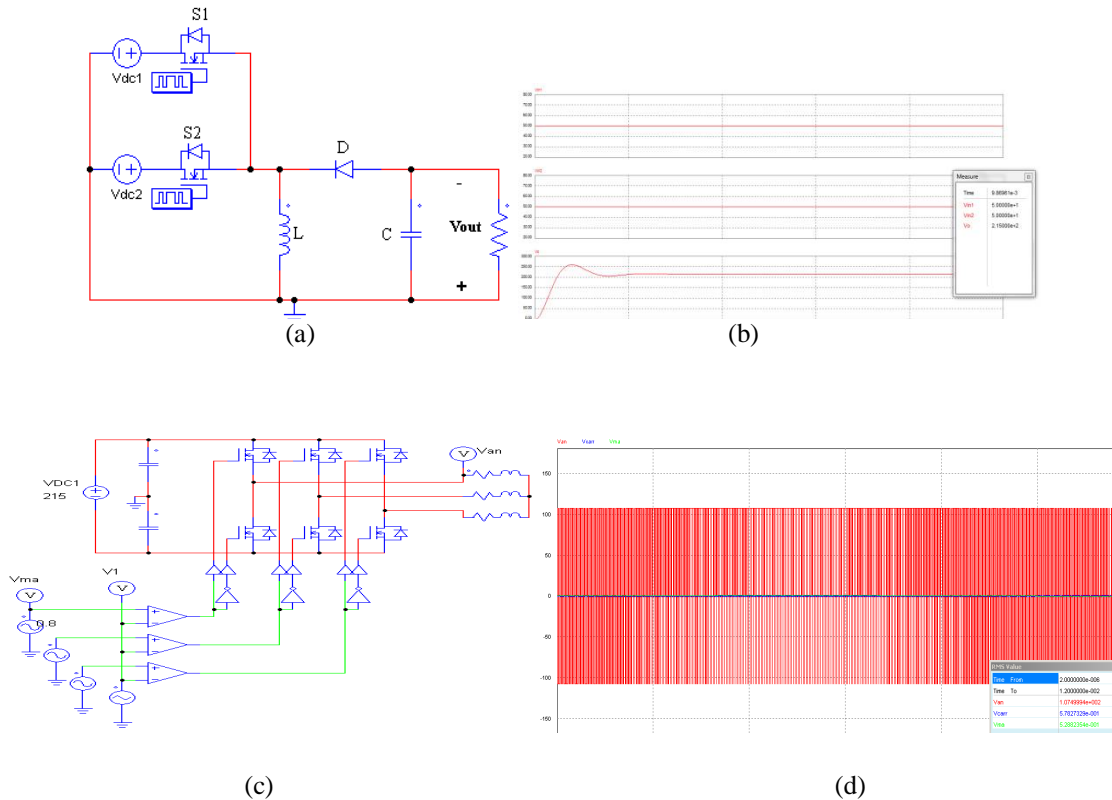


Fig. 4. Experimental results (a) Original image (b) Image after applying first set of criteria (c) Image after applying second set of criteria (d) Image mask (e) Inpainted image using patch size 4 x 4 and search window size 81 x 81.

## V. ACKNOWLEDGEMENT

I would like to thank the team members from Dept. of Electrical & Electronics Engineering, HKBK college of Engineering for their invaluable experience and expertise in this area helped to make this work possible.

## VI. CONCLUSION

This paper has successfully developed a high-performance Stand-alone PV system integrated with grid for village electricity generation. According to the results, the dc-dc converter is efficiently boosting the dc voltage to 215 V, and the SPWM inverter output is 415V as shown the simulation. The combined inverter outputs are connected to the grid. This approach leads self-sufficiency in electricity and provides pollution free electrical energy to the surrounding villagers.

## REFERENCES

- [1] Ubaidulla, Satish Kumar J., Malashree G. "Study and Analysis of DC – DC Step down Converter" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 6 June 2017, pp 11609-11614, ISSN : 2319-8753.
- [2] Nicholas D. Benavides "Power Budgeting of a Multiple-Input Buck-Boost Converter" IEEE TRANSACTIONS ON POWER ELECTRONICS, VOL. 20, NO. 6, NOVEMBER 2005.
- [3] Ketali B. Patil, Vishal A. Mahale, Rajan P. Sonawane, Yogesh P. Deore, Lokesh K. Patil, Rajendra V. Patil, A Review of Inverter Design for PV System, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 5, May 2017.



ISSN(Online): 2319-8753  
ISSN (Print): 2347-6710

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**Vol. 7, Issue 5, May 2018**

- [4] Bharathkumar M., Dr. H V Byregowda., Performance Evaluation of 5MW Grid Connected Solar Photovoltaic Power Plant Established in Karnataka, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 6 June 2014.
- [5] Priya V.N., Reena R. Rajan, High Gain DC-DC Converter for Photovoltaic Systems, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 7 July 2016.
- [6] Malashree. G, Gnaneshwari. V, Vinay Shreyas K. V, Ubaidulla, Satish Kumar J, Renewable Based Smart Home Control using Modern Technology, International Journal of Research and Scientific Innovation (IJRSI) | Volume IV, Issue VIS, June 2017