NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 4, ISSUE 6, June -2018

AN OVERVIEW OF SINGLE SWITCH DC/DC CONVERTER TOPOLOGY FOR SOLAR PHOTO-VOLTAIC APPLICATIONS

SAURABH V. KHANDIZOD
Department of Electrical Engineering, Dr. B.A.T.U. Lonere, Raigad,M.S.- 402103

DR. P.K.KATTI
Department of Electrical Engineering, Dr. B.A.T.U. Lonere, Raigad,M.S.- 402103.

ABSTRACT:

The solar photo-voltaic applications are increasing rapidly now a days. For the developing countries like India, solar system is growing vastly. It is the green generation system for electricity and doesn't have any replacements in coming future. Authors have proposed the overview of the single switch DC/DC converter for photo-voltaic applications. This will help in improving the performance of the existing system. The problems faced with the solar system is its reliability and efficiency. We are trying to improve the system performance with the proposed converter topology. Achieving the high voltage gain is the main objective of the study carried out.

KEYWORDS: Solar photo-voltaic, DC/DC converters, High voltage gain,Buck-boost-flyback integrated converter (BBFIC), etc.

INTRODUCTION:

The grid connected PV systems are growing rapidly in India. The per MW installation cost is also decreasing with the efforts taken by the researchers. Many residential buildings are coming up with the PV system installation. Indian government is also supporting the solar PV generation of electricity. Being a green source of the electricity it has wide market and very popularly growing industry.

The step up process of the terminal voltage needs high voltage gain. This is the basic requirement for the success of the grid-connected PV systems. Practically, it has observed that the efficiency of the normal DC/DC converters gets reduced. It has several reasons, and hence normal converters can not be used for solar photo-voltaic applications.

This is very severe condition and the researchers have to address it anyhow. Being the concern to address the problem authors have decided to address this situation. Authors have proposed the unique DC/DC converter with high voltage gain. The high output voltage can be achieved with the help of the capacitors or inductors.

The inductors used to achieve this task may flyback and hence another circuit is required to utilize the energy stored in the inductor i.e. freewheeling. The extra circuit means extra cost and energy consumption.

On the other hand, we need to improve the efficiency of the converter also. The solution to this problem is using cascading power stage. It gives high voltage gain. The analysis and improvements in the proposed system are the future scope of the work. But the system seems to be addressing the stated problem.

The randomness of the solar generation pattern is the factor affecting its wide use in last decade. Cluster of research has been carried out to improve the performance of the system. Researchers have worked on versatile issues of the solar PV system and now it is easily adoptable system in India. The Indian electricity demand is huge and it is increasing continuously. The source like solar can be the only solution to fulfill the energy demand. Initial cost of the systems were high earlier but with the variety of the providers now it has came down little bit.

The location, environmental conditions and the time duration are the main factors to affect the electricity generation by the solar system. It require to have the efficient converters to connect the PV to grid. The proposed solution will be helpful to address this problem.

The figure below shows the proposed BBFIC circuit.

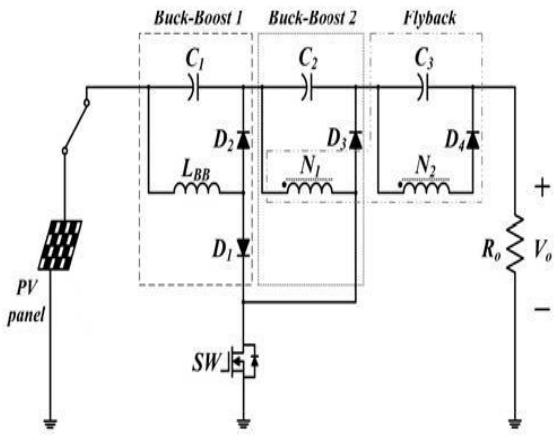

Fig. 1: Power stage of the proposed BBFIC

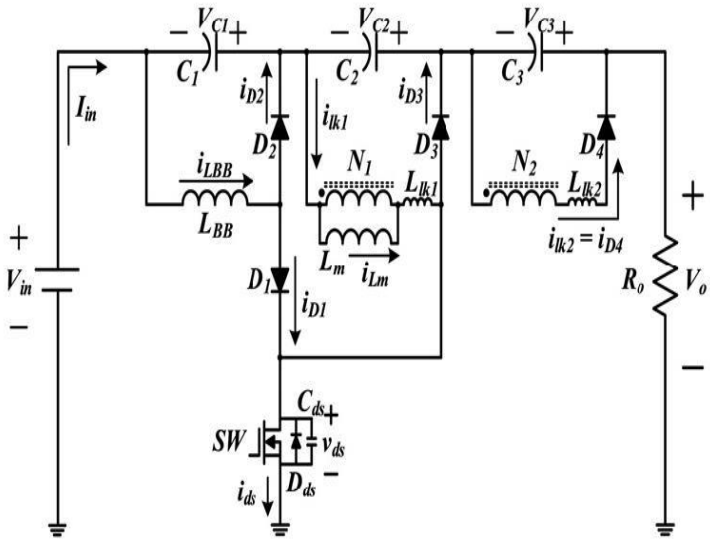

Fig.2: Equivalent circuit with the definitions of voltage polarity and current direction

OBJECTIVES OF THE STUDY:

- To develop a basic model of PV panel having precise outputs.
- To design a circuit and develop a mathematical modeling for the circuit based on the PV outputs.
- To develop a Buck-Boost flyback Integrated Converter such that achieve high voltage gain for PV applications, and compare with the other high voltage gain techniques.
- To simulate the proposed technique in MATLAB/SIMULINK software.

PROPOSED METHODOLOGY:

To achieve the high voltage gain there are plenty of techniques available in PV systems. There are various techniques are available for achieve high voltage gain for PV applications, below mention the propose technique and also more other techniques for the compare with the proposed technique.

- Buck-boost-flyback integrated converter with single switch to achieve high voltage gain for PV applications.
- A safety enhanced, high step-up DC–DC converter for AC photovoltaic module application.
- Novel high step-up DC–DC converter for fuel cell energy conversion system.
- High step-up boost converter integrated with a transformer-assisted auxiliary circuit employing quasi-resonant operation.
- Novel high step-up DC–DC converter for distributed generation system.

CONCLUSION:

This paper deals with the single switch DC/DC converter. The main aim of the system is to achieve high voltage gain. The step up converter proposed is found suitable for the grid connection of the PV system. The problems of the stored energy utilization of the normal converters are addressed here. This system is well suited for the present PV systems in India. Authors are working on the detailed analysis and the study of the proposed system. This technology will be bring revolution in the grid tied PV systems.

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