www.ijiarec.com

ISSN:2348-2079

Volume-7 Issue-1

International Journal of Intellectual Advancements and Research in Engineering Computations

Scaled micro grid implemented in the micro grid

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ABSTRACT

This paper presents the application of a hierarchical control scheme for islanded AC microgrids with a primary droop control and a centralized extended optimal power flow control. The centralized control is responsible for computing and sending, in an online manner, the control references to the primary controls in order to achieve three operational goals, i.e., improvement of the global efficiency, voltage regulation through reactive power management and compliance of the restrictions regarding the generation units capacities. Two case studies are defined and online tested in a laboratory-scaled microgrid implemented in the Microgrid Laboratory at Aalborg University. The primary controllers are included in a real-time simulation platform (dSPACE 1006), while the extended optimal power flow is conducted in a central controller by using a Smart Meter and LabVIEW for data acquisition and MATLAB for its implementation, taking into account load and capacity profiles. The obtained results show the reliability of the proposed scheme in a real system and its advantages over the conventional droop control.

Index Terms: Hierarchical Control, Droop Characteristics, Islanded, Microgrid, Optimization, Power Flow, Steady-State Solution.

INTRODUCTION

The improvement of renewable energy generation, grid connected inverters are being more and more broadly used. In order to achieve high efficiency of system use different types of inverter topologies. The transformer less grid connected inverter can support a wide variation in PV panel voltages. It is operates on buck–boost principle. It eliminates concerns pertaining to leakage current because of its neutral point clamped-based structure. It is free from shoot through fault and does not require any sensor for sensing the grid current. But drawback of this inverter additional dc-dc converter is need for conversion process. This will leads to high cost. It is not suitable for separate PV panel or single PV panel.The neutral point clamped based inverter is used to convert the solar energy into electrical energy. It is also minimize leakage current. The output of the PV panel voltage is varied due to the environmental conditions. This type cannot support large variation of PV panel voltage. In case of Z-source inverter is used for conversion process. It is operate step-up and step-down state. Conduction power loss is more due to presence of two additional inductors in the power loop. Hence increasing losses, efficiency become low

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BLOCK DIAGRAM

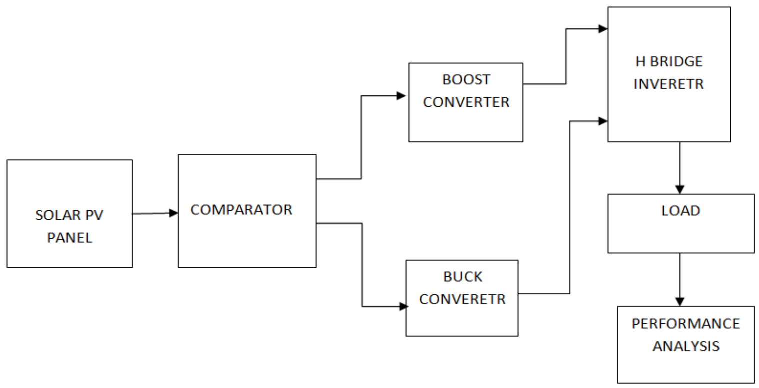


Fig1.Block diagram

DC/AC Buck-Boost converter is used for PV grid applications. DC/AC Buck-Boost converter operates both buck and boost mode with minimum number of switches. Hence power losses will be less than compared to previous method. Does not required any additional inductor and DC-DC converter so cost is lower than compare to Z-source inverter. If the output voltage of the PV panel greater than grid voltage buck operation will conduct else if boost operation will conduct. Hence the output of the DC/AC Buck-Boost converter is maintaining has no reverse recovery power losses. Using the merit of VSI and CSI and avoid the demerit of them, a high efficiency inverter was proposed .The improvement of renewable energy generation, grid connected inverters are being more and more broadly used. In order to achieve high efficiency of system use different types of inverter topologies [1].The transformer less grid connected inverter can support a wide variation in PV panel voltages

CIRCUIT DIAGRAM

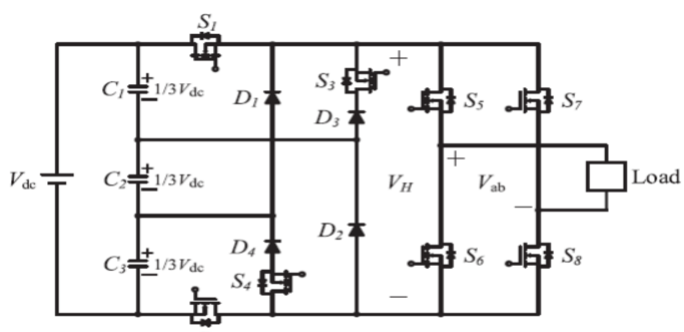


Fig 2.circuit diagram

The proposed system works only one power stage at high frequency and the output power stage works at the line frequency. Compared with the inverter in, the main difference is that the physical position of "Boost" stage and "Buck" stage has been exchanged and one inductor can be saved. So in theory, the related conduction power loss is also reduced and a higher efficiency can be achieved. The proposed system works only one power stage at high frequency and the output power stage works at the line frequency.

PHOTOVOLTAICS SYSTEMS

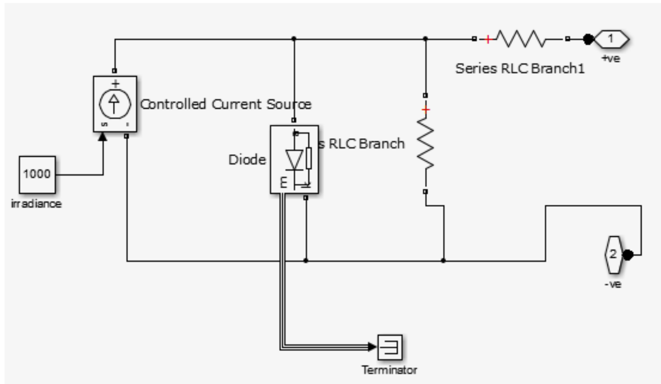


Fig 3.Equivalent circuit

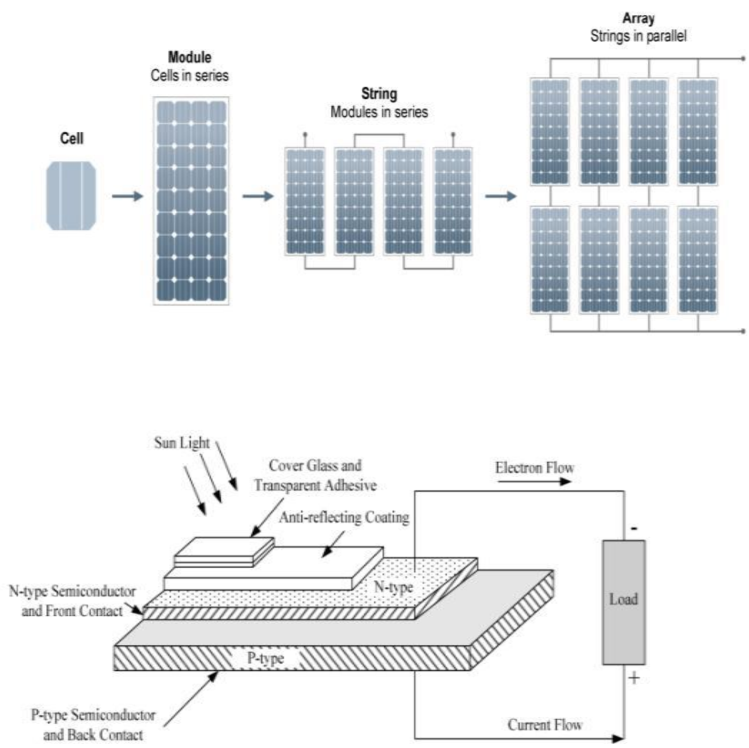


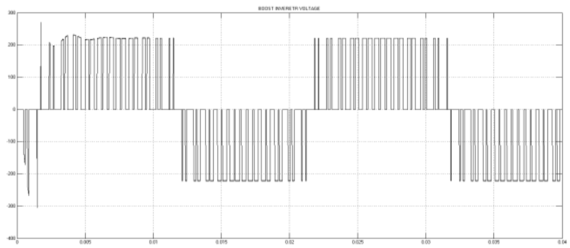
Fig4 .PV cell module& array

Photovoltaic systems are comprised of photovoltaic cells that convert solar radiation into electricity; the solar cell is made semiconductor material such as silicon. The PV cell usually produces less than 2 W at approximately 0.5 V DC, to get desired level of power and voltage raring it is necessary to connect PV cells in series-parallel configuration. The single PV cells are grouped to form modules and then modules are connected to build arrays.

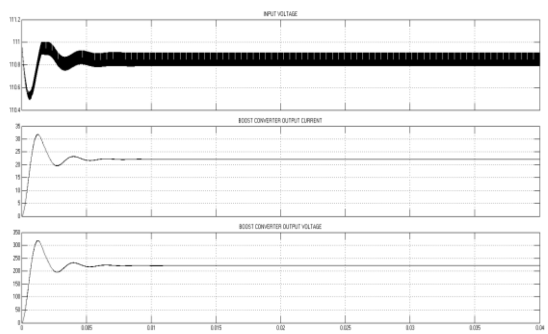
A photovoltaic system is made up of several photovoltaic solar cells. An individual small PV cell is capable of generating about 1 or 2 W of power approximately depends of the type of material used. For higher power output, PV cells can be connected together to form higher power modules. In the market the maximum power capacity of the module is 1 kW, even though higher capacity is possible to manufacture, it will become cumbersome to handle more than 1 kW module. Depending upon the power plant capacity or based on the power generation, group of modules can be connected together to form an array. Solar PV systems are usually consists of numerous solar arrays, although the modules are from the same manufactures or from the same materials, the module performance characteristics varies and on the whole the entire system performance is based on the efficiency or the performance of the individual components.

RESULTS AND DISCUSSIONS

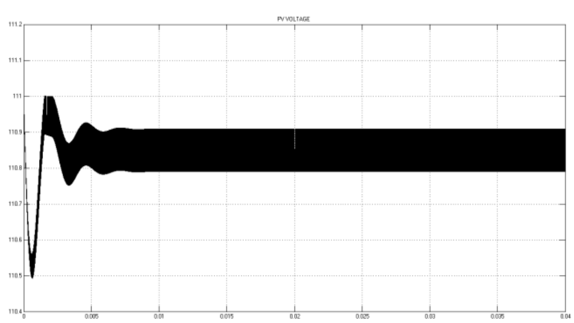
Boost converter output voltage, output current



Inverter output AC voltage



PV input voltage



CONCLUTION

In This paper improvement of renewable energy generation, grid connected inverters are being more and more broadly used. In order to achieve high efficiency of system use different types of inverter topologies. Proposed system DC/AC buck-boost converter achieve in high efficiency low power loss switching loss it will be reduced. The working modes of converter are introduced in detail through equivalent circuits. For this type of converter, when the output of the solar panel (DC) voltage is lower than the grid voltage it works at combination of VSI and CSI during the different working stages. If the output of the solar panel (DC) voltage is higher than the grid voltage, it work at pure VSI .This converter operates at only one power stage works in the high frequency stage at any time, which results in minimum switching losses .A 220 V/50 Hz/ 1000 W prototype have been finished. Simulations and experimental result shows that converter has good control performance.

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