Grid Interconnection of High Step Up DC to AC Converter With Renewable Source Integration And Resonant Switch Capacitor

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***Abstract* — In this paper a new high step up DC to AC converter is introduced with controlled pulse width modulation technology. The power output of the 3 phase AC is connected to the grid using the LC filter. The converter is connected to a low-voltage -renewable power source such as PVA or battery. Low voltage increases in high voltage through the proposed converter with an inductor integrated with a resonant switched capacitor. Due to the synchronization of the Sync unit synchronous boost unit with multiple integrated inductor-SC units the structure can be easily expanded to gain ultrahigh voltage. Electronic power switch works with soft fluctuations with reduced voltage pressure which increases the reliability of the converter. MOSFET power switches are used to control the output voltage with a frequency switch frequency of 100 kHz. This high frequency switch reduces the DC power output bursting and reduces the harmonics on the AC power side. The converted AC power output is synchronized to the grid by the control loop control using an independent reference method. The complete model was developed in the MATLAB Simulink environment with discrete circuit analysis. Graphs are sorted by time and defined using the GUI environment**

Keywords—Pulse width modulation (PWM), Phase locked loop (PLL), Energy Efficiency etc.

I. INTRODUCTION

Low DC voltage sources and energy storage devices, such as photovoltaic (PV) cells, fuel cells, and super capacitor, often need to be upgraded to the highest voltage levels in industrial applications. One solution is to use in step-up multilevel inverter to convert it to high voltage AC directly. Another option is to hire high DC to DC converters to upgrade them to DC level and connect with a full bridge. With high-density DC to DC conversion, power-to-switch switched-mode switches (SMPS), such as Fly back and Forward converters, etc., are often used due to their simple structure. In recent years, most DC to DC converters have been developed using one of the following methods: switched-capacitor (SC), also known as voltage-frequency or pump, switch inductor, modified inductor, and coupled inductor .For instance, the top converters of zero-current measure embedded in the resonant SC process are presented in. The high-step converter and step-down version that includes buck / boost and SC techniques is introduced respectively.

II. METHODOLOGY

A. DC TO DC Boost Converter

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B. BOOST-UP VOLTAGE

When the resonant converter circuit operates in two modes in first mode MOSFET S1 ON and S2 OFF and second mode MOSFET S1 OFF and S2 ON.

Then in the first modes when S1 is ON and S2 is OFF in this case the two capacitor that are connected to near PVA .which is C1 and C2 like this C1 and C2 come in series thus the first capacitor may have voltage Vc1 and the second capacitor may have voltage Vc2.

Thus the total voltage.

$$V=Vc1+Vc2$$

Thus the resonant converter may get voltage boost .we can see the result of this in the scope of the circuit.

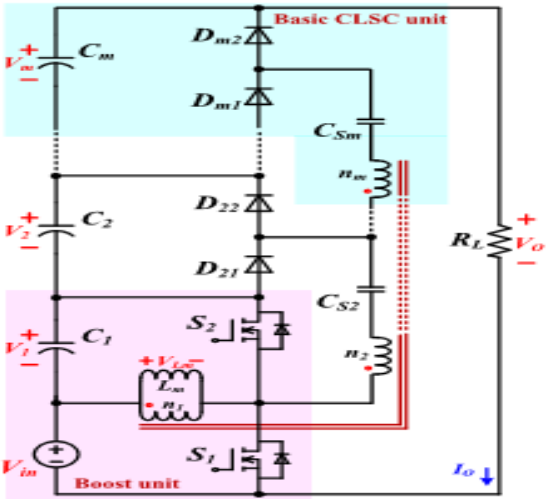

Fig. 1. Step up DC to AC converter

C. Design Of Photovoltaic Array

Solar Energy is a good solution for the release of solar energy .The solar radiation converted directly into electricity

through a solar photovoltaic module. The Solar Module contains a solar cell. A solar cell is basically a p-n compound built into a thin wafer or semiconductor layer. Photovoltaic modules are made of silicon cells. Silicon solar cells unit provide an output of about 120V under rotation conditions. When so many cells are connected in series we get a solar PV module. There are typically 36 cells in the module mode that show an open circuit volume of approx. 20V.

The current rating of the modules depends on the location of the individual cells. At the top of the cell surface, the maximum current output of the cell, to obtain high power, solar PV modules are connected to a series and a combination similar to building a solar PV installation. When exposed to sunlight, photons with higher-than-semiconductor band-gap capabilities are captured and create more electron-hole in line with the irradiation phenomenon.

With the influence of the internal electric fields of the p-n junction, these carriers are pulled apart and form a current image equal to the separation of the sun.

III. DEVELOPMENT OF GRID INTERCONNECTION

In this chapter we present a Modeling Simulation of grid that is compatible with the Photovoltaic Energy System and a murder lesson using MATLAB / Simulink. The Photovoltaic energy framework is considered in three basic components of the PV Model, Power Forming System and Grid interface. The Photovoltaic Model is in the middle of a grid connection using full electronic control gadgets. Recreation refers to the PV power framework at normal temperatures and solid loads using MATLAB.

The first goal of this phase is to develop new learning, illuminating Mat lab / Simulink identified by a framework that comprises dynamic energy management frameworks through Repetitive Power Reserves (Res), such as spotless and productive areas to collect first earth and special grid requirements associated with grid control. Therefore, it is important to commit to the development of specific functions that allow the installation of RES in a high-power power inverter and safety. By using these good frameworks, the client is not only a consumer, but moreover a power maker. This fact will have an immediate effect from special, financial and social perspectives, and will add to the increase in quality of life.

The average age-rounded units (DG), including continuous and non-renewable resources, on small grid-related networks and small power supplies (up to 1000 kW) associated with an improved operating system. There has been an increase in the number of standard DC sources, for example power devices and Photovoltaic clusters, or AC frequency intensity that is less concentrated or higher than grid density, for example, smaller amounts of electricity. These generators require a DC / AC converter connected to the grid. Although a few generators can be connected directly to the power grid, for example, power powered by no current manufacturers, there is a pattern to accept the installation of a used Hardware building that converts power from bat to DC and then uses an inverter to transfer power to the grid of 50Hz AC

IV. PHASE LOOKED LOOP

Closed loop loops (PLLs) are used in grid topologies connected to a synchronized grid voltage. PLLs are required to ensure the direct flow of power from the power source to the grid. PLLs are used in power conversion with renewable energy sources .PLLs can be used for control and monitoring purposes.

V. RESULT

Complete project-related design is done in Mat Lab and simulation using simulation. Power System Toolbox. This project is done in two phases in other word this designing conducted in two stages.

1. To high step up DC to DC voltage using resonant switching capacitor coupled inductor and soft switching.
2. To grid interconnection with high step-up DC to AC converter.

TABLE I. SYSTEM PARAMETERS

PARAMETERS	VALUES
Irradiation	**1000 W\m2**
Temperature constant	**35º**
Capacitance C1 And C2	**100µf and 180µf**
AC voltage source	**220V**
Frequency	**50Hz**

Here the proposed model of high-voltage DC to R converter is shown in figure. The combination of resonant switching capacitor and magnetic coupling inductor. Due to the flexible capacitor, it reduces the loss of operating efficiency in SC operation, increases the strength of the strength and provides a wider production range for higher performance. It is very clear from figure where 130 voltages are the switching engine of the circuit and power output is generated at 700 continuous voltages.

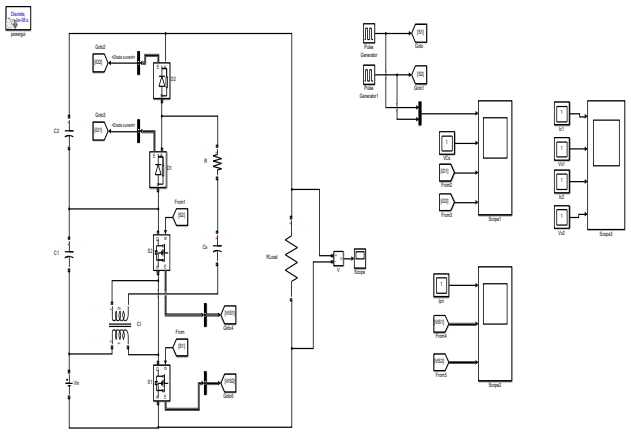

Fig. 2. Proposed model of high step up DC to AC converter with resistive load.

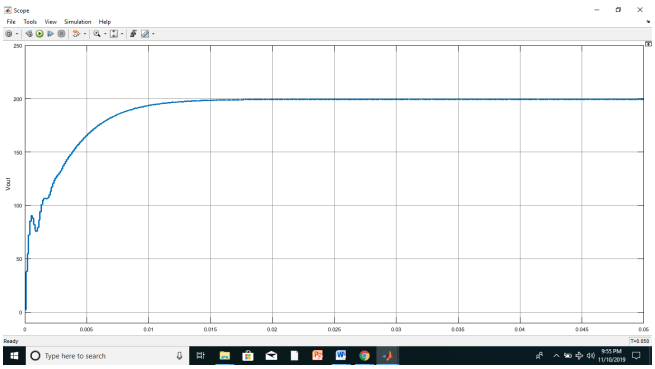

Fig. 3. output voltage for high step up converter with resistive load.

Recommended model of high-speed DC in ac converter with grid load is shown on figure number 2 and mixed capacitor switching capacitor and magnetic coupling inductor phase three bridge.

PWM generator SRF with PLL. It is very clear from fig no.5.4 where 130 voltages are injected in the resonant switching circuit then the output is 700 volts and again 700 voltages of DC are allowed to be converted from DC to AC. to three input levels and ultimately the power generated in the grid is approx.2200VA these active forces are shown in fig no.5.3shown the mat lab simulation model of high step up DC-AC converter.

According to this circuit then three phase supply is through a step up transformer of 100 KVA rating convert from 440V to 11KV then convert 11kv to 132kv through step up transformer to provide the grid and extra three phase connection in parallel for three phase supply or domestic purpose use.

VI. CONCUSION

The proposed converter can be extended for ultrahigh voltage gain.

The drop inductance of the coupled inductor is utilized to get soft switching of the diode employed in the proposed converter.

In this converter used low-voltage rated MOSFETs with small on-state resistance to this paper presents a no isolated high step up DC-AC power converter implemented by the combination of coupled-inductor and switch capacitor Technology for grid application.

Improve the efficiency.

Use MATLAB/SIMULINK R2016 software.

VII. FUTURE SCOPE

The proposed DC to AC converter is widely used in many applications mainly renewable energy based.

The converter is suitable for distribution generation systems.

It can be used high voltage gain for induction motor application.

It can be used industry power supply.

This is green energy.

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