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A New Model Design for RSC with Single Stage Power Conversion System

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ABSTRACT

This paper proposed a new converter is RSC (Reconfigurable Solar Converter) for PV (photovoltaic) applications, basically for PV-battery application. Objective of this new converter is to use a single stage three phase grid solar converter is to perform the dc to dc and dc to ac operations. The output of this converter is appealing for PV battery applications is to minimize the number of conversion phases to improve the efficiency, reducing weight, cost and volume. It is a combination of experimental tests and analysis of attractive performance of the proposed RSC.

Keywords: Solar Energy, PV Controller, RSC, Reactive power, MATLAB/SIMULINK.

I.INTRODUCTION

In India day to day Grid systems are very traditional technology. To grow technology for reliability and efficiency this grid systems are not supporting. The grid systems are using for generation, Transmission, and Distribution, because it is like a one way communication and also inter links one to one communication. It may use to lead the system when the interrupts/faults are occurs in any system. And the system have limited power transmission. Very poor communication between the power systems. Here there are no possibilities to create the flexible power system because cooperating resources and absences of intelligent. Because of this poor power system we will losses the more power. To tackle this problem we can't penetrate non-traditional power generation such as renewable energy systems into our power systems. To resolve this existing problem in this we are presented emerging trend of smart grids. It is nothing but a normal grid but here it is link grid with many micro grids are having two way communication. Basically this communication is possible by connecting more number of micro grids. So whenever we used micro grids it have more reliable control and communication is to improve the grid efficiency. But the existing traditional grid has low efficiency because it have only one way communication.

IJMTARC – VOLUME – V – ISSUE - 19 – SEPT 2017 ISSN: 2320-1363

There are various options for integration of energy storage is to be a utility scale solar PV system. The Energy storage can be integrated with either AC or DC side of the PV power conversion system with of Solar PV it may consist of various conversion stages. Like this way multiple integration solutions can be compared with multiple power stages, storage system flexibility, efficiency, and control complexity etc.

II.RELATED WORK

The device PV cell is used to convert solar energy into electrical energy. To generate electrical energy it should absorb the sunlight, those PV cells are made be semiconductor devices. When these PV cells are absorb photons are present in the sunlight to get free electrical energy charges are generated and also controlled the on surface existing semiconductors. So these photovoltaic are not like a heat engines for this not required high temperature, it operate with a normal room temperature is to adapted the weak energy of solar radiation.

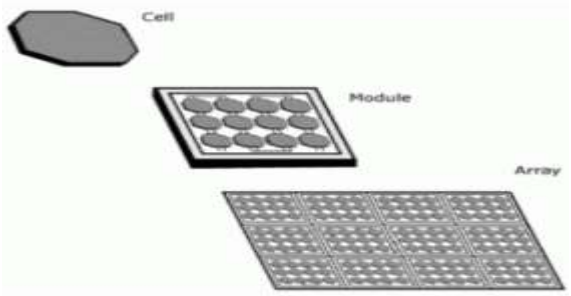


Fig.1. PV Model Array.

These PV cells are used for power generation in space craft of silicon solar cells is widely developed. These silicon cells has a crystal of silicon on which various doping materials is concentrated from a semiconductor. Photo cells are used to defined as a power developed for efficiency of the photo cell is dived array of solar cells.

III.METHODOLOGY OF RSC SYSTEM

The schematic of the proposed RSC circuit is shown in fig.2. The proposed RSC had few modifications are there for conventional three phase PV inverter system. With these modifications are allow the RSC to include the charging various function in the conventional three phase inverter PV system.

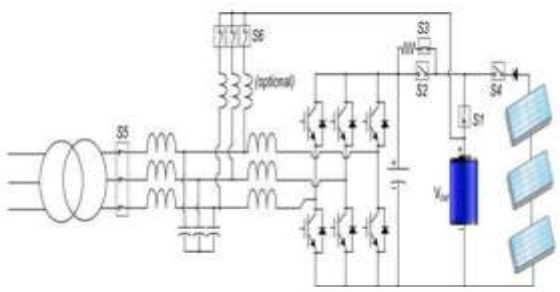


Fig.2. Schematic of the proposed RSC circuit.

Let us assume that the conventional utility of the PV system is consists of three phase voltage source converter with associated components for this RSC, and also requires few additional cables and mechanical switches are used in Fig.2.

IJMTARC – VOLUME – V – ISSUE - 19 – SEPT 2017 ISSN: 2320-1363

3.1 Modes of the RSC:

All possible operation modes for the RSC are presented in Fig. 3. In Mode 1, the PV is directly connected to the grid through a dc/ac operation of the converter with possibility of maximum power point tracking (MPPT) control and the *S*1 and *S*6 switches remain open.

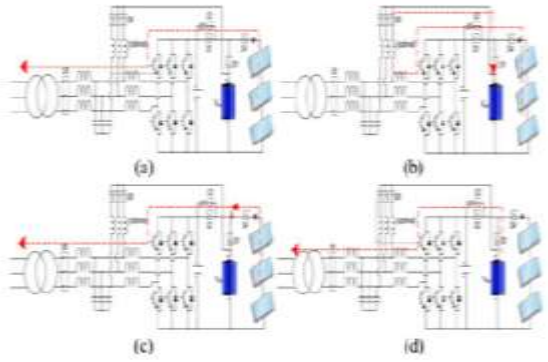


Fig. 3. All operation modes of the RSC. (a) Mode 1-PV to grid. (b) Mode2-PV to battery. (c)Mode 3-PV/battery to grid. (d)Mode 4-battery to grid.

In Mode 2, the battery is charged with the PV panels through the dc/dc operation of the converter by closing the *S*6 switch and opening the *S*5 switch. In this mode, the MPPT function is performed; therefore, maximum power is generated from PV. There is another mode that both the PV and battery provide the power to the grid by closing the *S*1 switch. This operation is shown as Mode 3. In this mode, the dc-link voltage that is the same as the PV voltage is enforced by the battery voltage; therefore, MPPT control is not possible. Mode 4 represents an operation mode that the energy stored in the battery is delivered to the grid. There is another mode, Mode 5 that the battery is charged from the grid. This mode is not shown in Fig. 3.

3.2 System Benefits of Solar PV Power Plant With the RSC Concept:

The RSC concept provides significant benefits to system planningof utility-scale solar PV power plants. The current state of-the-art technology is to integrate the energy storage into the ac side of the solar PV system. An example of commercial energy storage solutions is the ABB distributed energy storage (DES) solution that is a complete package up to 4MW, which is connected to the grids directly and, with its communication capabilities, can be utilized as a mean for peak shifting in solar PV power plants. The RSC concept allows not only the system owners to possess an expandable asset that helps them to plan and operate the power plant accordingly but also manufacturers to offer a cost-competitive decentralized PV energy storage solution with the RSC. Fig. 4 shows examples of the PV energy storage solutions with the RSC and the current state-of-the-art technology.

IJMTARC – VOLUME – V – ISSUE - 19 – SEPT 2017 ISSN: 2320-1363

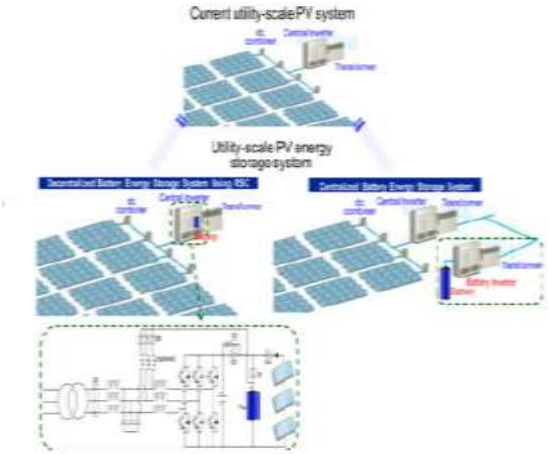


Fig. 4. Utility-scale PV-energy storage systems with the RSC and the currentstate-of-the-art solution.

The technical and financial benefits that the RSC solutionis able to provide are more apparent in larger solar PV power plants. Specifically, a large solar PV power plant using the RSCs can be controlled more effectively and its power can be dispatched more economically because of the flexibility of operation. Developing a detailed operation characteristic of a solar PV power plant with the RSC is beyond the scope of this paper. However, different system controls as shown in Fig. 5 can be proposed based on the requested power from the grid operator P_{req} and available generated power form the plant P_{gen}.

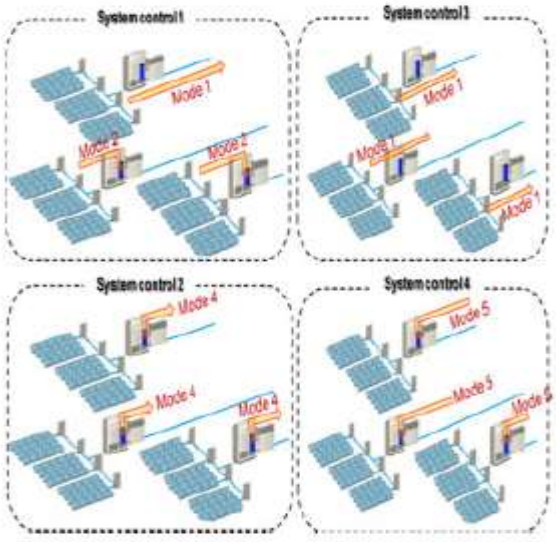


Fig. 5. Example of different system operation modes of a RSC-based solarPV power plant.

These two values being results of an optimization problem (such as unit commitment methods) serve as variables to control the solar PV power plant accordingly. In other words, in response to the request of the grid operator, different system control schemes can be realized with the RSC-based solar PV power plant as follows:

1) System control 1 for $P_{gen} > P_{req}$;

2) System control 2 for $P_{gen} < P_{req}$;

3) System control 3 for $P_{gen} = P_{req}$;

IJMTARC – VOLUME – V – ISSUE - 19 – SEPT 2017 ISSN: 2320-1363

IV.SIMULATION DESIGN

A model design technique as shown in Fig.5. is implemented in MATLAB/SIMULINK with the help of PWM for pulse generator sinusoidal is generated. The model design circuit is closed switch boost inverter is also designed.

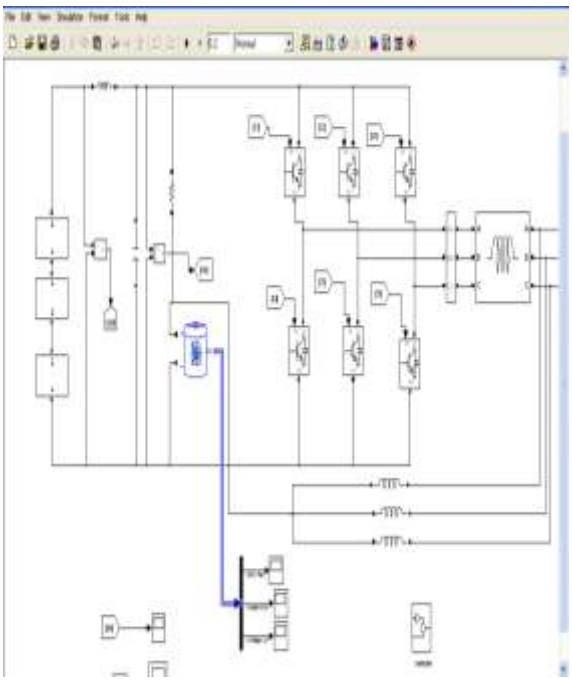


Fig.6. Model of Reconfigurable Solar Converter System.

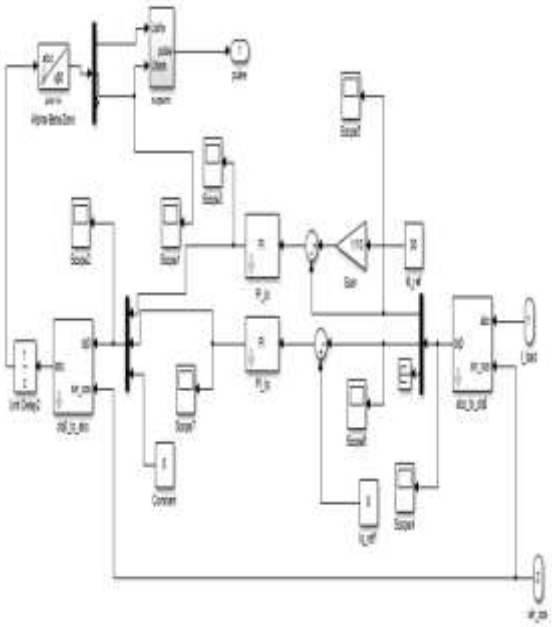
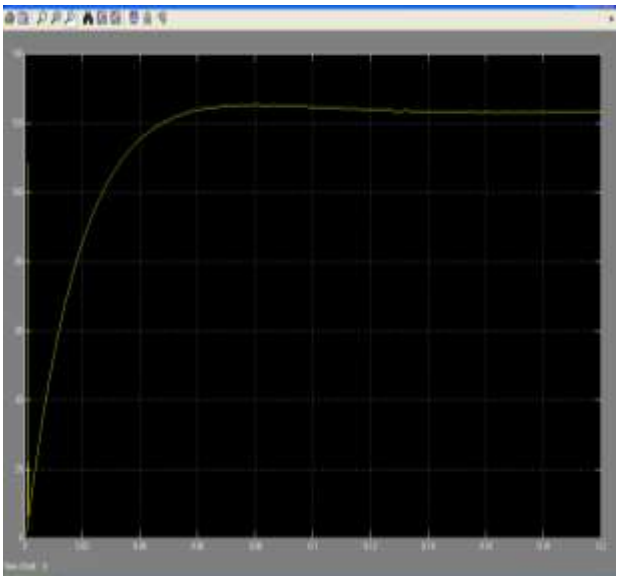


Fig.7. Model of inverter controlling system.

V.SIMULATION RESULTS



IJMTARC – VOLUME – V – ISSUE - 19 – SEPT 2017 ISSN: 2320-1363

Fig.8. PV voltage(DC-AC)

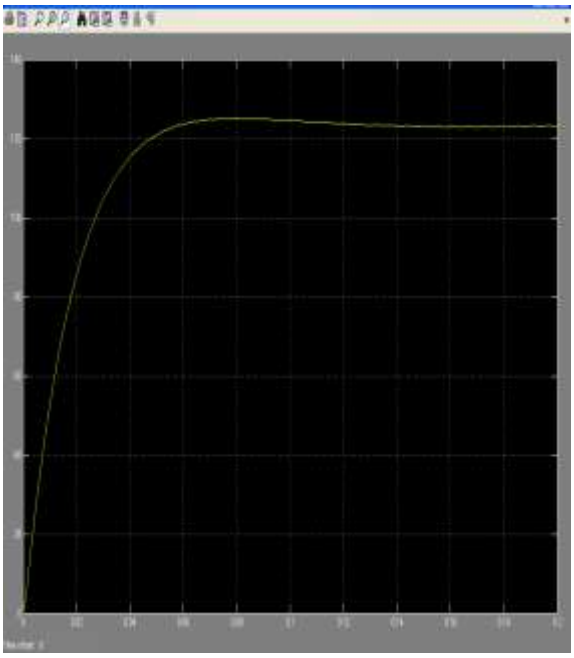


Fig.9. DC voltage(DC-AC)

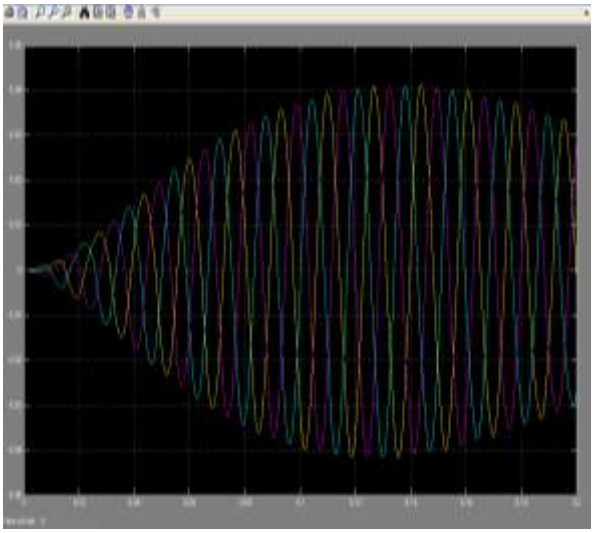


Fig.10. Grid voltage (DC-AC)

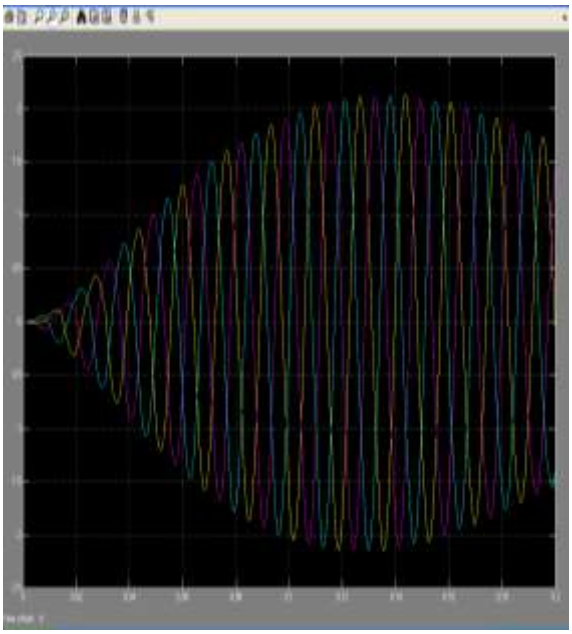


Fig.11. Grid current (DC-AC)

VI.CONCLUSION & FUTURE SCOPE

In India electricity is a really big issue in various areas. This issue can be resolved by using this proposed model. This system will be helpful in various regions where grid supply is not continuous. To provide continuous supply to region either by using battery, grid, or directly from solar plan without having any kind of discontinuity. The proposed system can be operate more than one load because of two different outputs is getting. Here the DC output can be inverted and fed into AC load. In this paper we discussed micro and smart grids to resolve the existing problems. And also improve the high voltage DC transmission and high frequency AC transmission. Here we also introduced resonant concept to

reduce the switching losses. In future it may reduce the distortions and also improve the system efficiency.

VII.REFERENCES

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