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# A Dynamic Model of High Gain DC-DC Converter with Multiphase-Switched-Capacitor for Photo Voltaic Systems

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***Abstract:*** **Renewable energy plays a most pre dominant role in the economic growth of the country. The world has moved towards renewable energy since it is eco-friendly. Nowadays, solar technologies and photovoltaics are gaining a maximum share in the market which eventually leads to the development of the country. Substantially DC-DC converters are most prefered in renewable energy as they are capable of obtaining maximum energy hence they are also called as "power optimizers". The foremost inovation in DC-DC converters is the synchronous rectification process which in due course leads to reduction of switching loses. In this paper multiphase resonant switched capacitor converter (MRSC) is being analized using MATLAB simulation where the high level output voltage and maximum efficiency is obtained and hardware prototype is implemented.**

***Keywords:*** **Converter with Multiphase-Switched, Voltaic Systems, technologies and photovoltaics.**

## 1. INTRODUCTION

Renewable electricity useful resource is one of the power systems, which replenishes itself in a regular human lifestyles span. there are many one-of-a-kind forms of renewable power resources are used in real time, the promising of that is sun power. solar power technology structures are utilized in distribution power structures to alleviate the trouble of greenhouse emissions international. The reduced price of sun mobile arrays will accelerate the boom of sun power generation structures. The output of a sun cell array is an intermittent DC strength; the power conversion interface performs an vital role in a grid-connected sun energy era gadget. A single-level power conversion interface is suitable to huge-capacity solar power generation systems. an extra DC–DC strength converter is inserted among the sun cell array and the DC–AC. The existing resonant switched capacitor (RSC) converter contains various configurations like series modular configuration and cascade configuration .series modular configuration which contains two modular cells designed in manner to obtain equal voltage gains. Cascade configuration contains seven stages to obtain the voltage gain of 15. In the existing system by making use of both configurations the system efficiency is well improved to 95% provided with high step –up gain ,but there are various drawbacks like circuit complexity, losses ,poor regulation property, high device count .

**Proposed MRSC System:**

To provide an answer for the issues indexed above, this task proposes an optimized multiphase resonant switched dc/dc converter for photo voltaic programs. This device reduces the above noted negative aspects with the aid of considering the RSC converter containing two components namely the power component and the control element. Pulse generator and Pulse Width Modulation based totally gain reimbursement method are employed here for acquiring the maximum step up benefit and stepped forward law The proposed system is the implementation of Multi Phase Resonant Switched Capacitor MRSC converter whose block diagram is given below

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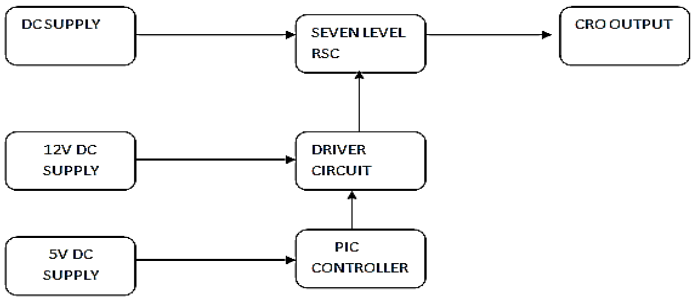


**Figure.1: Block Diagram of proposed system**

The 12v DC supply is provided as an input to the driver circuit . To driver circuit below 5V pulses are given. Role of the driver circuit is Amplification and isolation. It can be used to amplify the 5V pulses to 12V for using transistor technology and provided isolations for using opto coupler. It has two functions like isolation and amplification, Transistors are used to amplify the pulses and optocoupler IC is used to provide the isolation between main circuit and controller circuit. 12V supply is individually used to operate the transistors and optocoupler. The rectifier is used to convert AC voltage into DC voltage. A PIC microcontroller (PIC 16F877A) is used to make a switching signal for controlling the inverter.The circuit diagram for the proposed system is given below

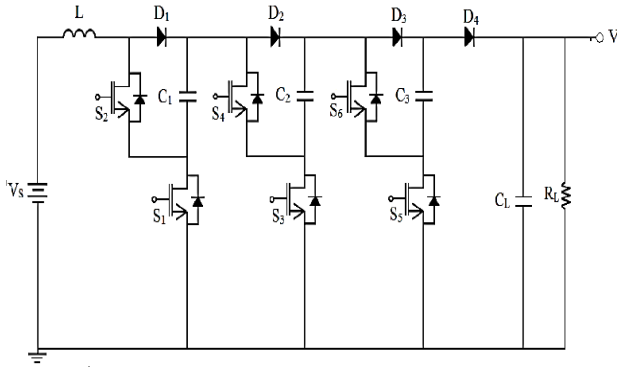


**Figure.2: Multiphase RSC circuit diagram**

The MRSC converter includes inductor, pumping capacitors output capacitor ad diodes.There are eight modes of operation ,where each mode has two phases. In those few modes are identical (ie) the phase 1 belonging to mode 1is similar to phase 1 of mode 0.The mode 2 and mode 4and mode 6 are entirely identical to mode 0, whereas mode 5 is identical to mode 1 and phase 1 of mode 3 and mode 7 is similar to mode 0.thus most of the modes are similar to mode 0.

The current flowing path of each mode is given below.

**Mode 0-Phase 1:**

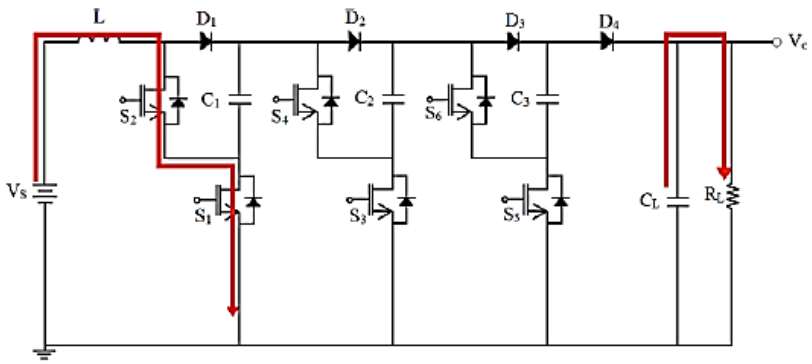


**Figure.3: Mode 0 – Phase I**

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**Mode 0-Phase 2:**

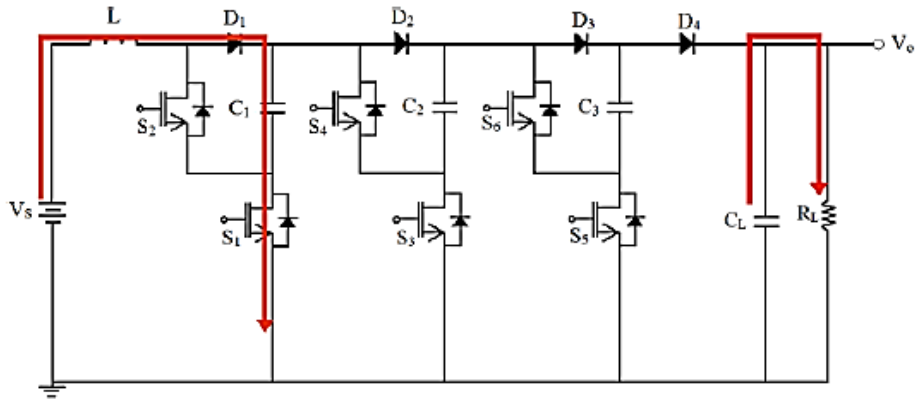


**Figure.4: Mode 0 – Phase II**

**MODE 1- Phase 2:**

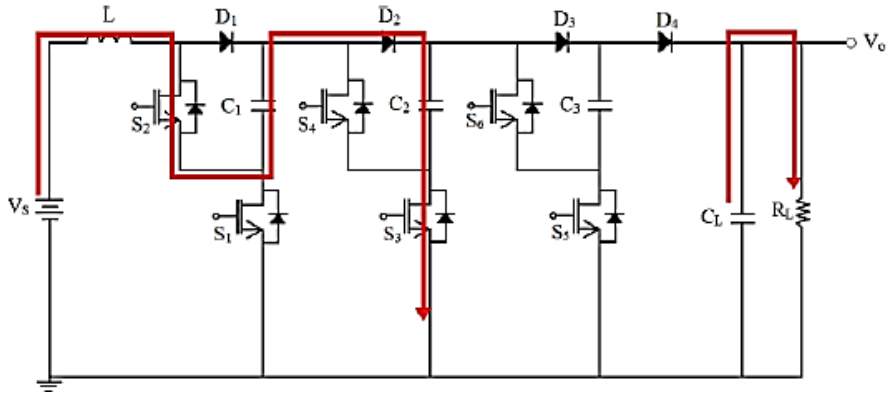


**Figure.5: Mode 1 – Phase II**

## 3. SIMULATION RESULTS

The Proposed MRSC converter is simulated with the aid of the use of Matlab. In this simulation as mentioned previous the 10V is given as an input and the duty cycle of 0.5 is applied and the 320V output is reached. The gain of the converter is 32.5. Output power divided by means of the input electricity offers the performance of the converter.the enter voltage Vin is 10V, the burden is a 750Ω natural resistor, the output voltage is 335V Finally, the proposed device simulation consequences are in comparison with the prevailing device simulation effects as shown in beneath Fig's. After the contrast, we tested the proposed gadget gives excessive benefit than the present gadget. The Voltage of the transfer throughout switch on state is 10V and during flip OFF state is 0V. Therefore the strain on voltage of the converter is introduced down finally switching losses also are decreased, because of this reduced stress at the voltage and switching losses the performance of the converter is extended to a better extent.

## 4. SIMULATION OF PROPOSED

The proposed multiphase resonant switched capacitor DC-DC converter accepts the 10kv as an input and it's miles boosted to 335kv for HVDC transmission. In renewable power structures the foremost issues are the renovation and exchange of parts which can be efficiently conquer by using series-modular strength conversion machine. (ie)each time there may be a failure in a single module, the feature of the converter will no longer be affected, it may nonetheless operate commonly at a reduced stage of electricity. In high voltage converters the semi-conductor device in collection converter which has a primary advantage of the entire voltage pressure is decreased to half of its price.There are three modular cells are designed to attain an equal voltage gains of 33.5.The passive thing losses and the switching losses.

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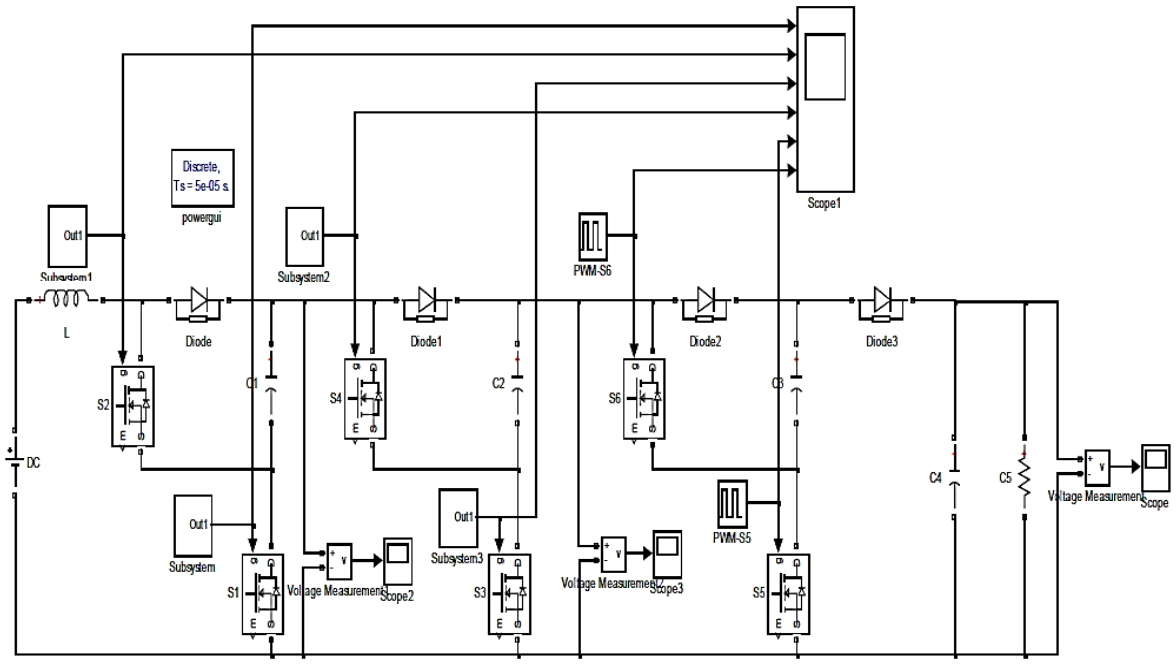


**Figure.6: Simulation Circuit of Three stage MRSC converter**

The three level multiphase switched capacitor and inductor converter output voltage is shown in beneath

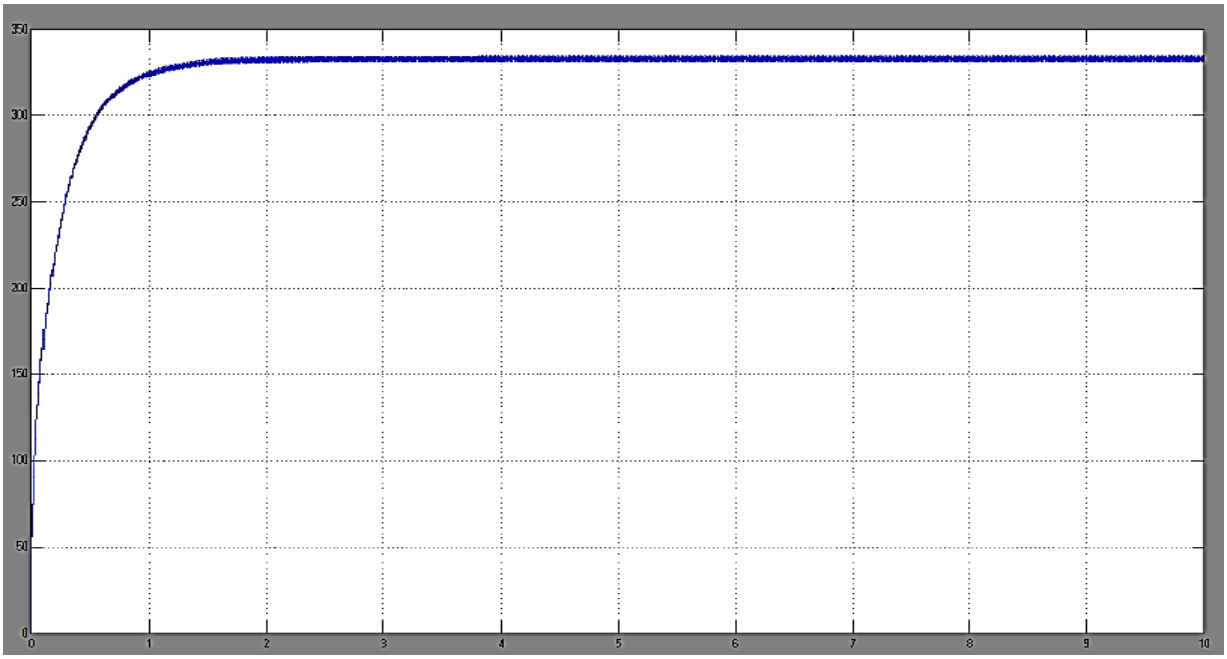


**Figure.7: Output Voltage**

## 5. HARDWARE PROTOTYPE

The driver is used to motive force circuit below 5V pulses. Position of the driver circuit is Amplification and isolation. Transistors are used to extend the pulses and optocoupler IC is used to offer the isolation between major circuit and controller circuit. 12V deliver is in my view used to function the transistors and optocoupler.

By using the usage of controller board PWM pulses are generated. percent controller is used to generate the pulses. 5V DC deliver is given to the percent controller board. Generated PWM could be under 5V. To function the MOSFET want to present 9-12V pulses. motive force circuit is used right here to boom the pulses amplitude.

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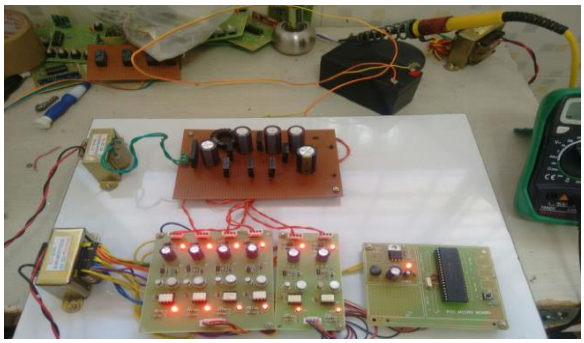

**Figure.8: Hardware Arrangement**

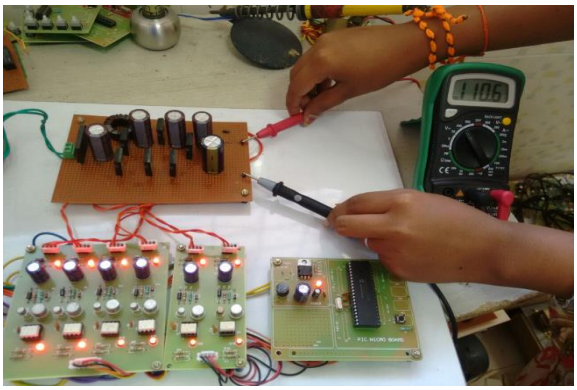

**Figure.9: Output Voltage Measured**

## 6. CONCLUSION

The multiphase resonant switched capacitor DC-DC converter consists of the energy component and the control part at the side of numerous passive components. MRSC converter whilst as compared to the MSCI converter the machine advantage is tremendously increased provided with a reduced tool depend hence in the end the complexity of the circuit is decreased. The PWM based totally benefit compensator and the pulse generator are used to beautify the regulation property of the converter.

The proposed converter provides a higher voltage gains and additionally a lower switching stresses while compared to the conventional switched mode converters. The important thing factors of this paper are DC-DC converters, HVDC transmission and renewable sources.

## REFERENCES

[1] Qun Zhao ; Bradley Dept. of Electr. Eng., Virginia Polytech. Inst. & State Univ., Blacksburg, VA, USA ; F. C. Lee High-efficiency, high step-up DC-DC converters Jan 2003

[2] WenzhouLu School of Electrical Engineering , Southeast University, Nanjing, China Keliang Zhou ; Danwei Wang ; Ming Cheng A General Parallel Structure Repetitive Control Scheme for Multiphase DC–AC PWM Converters21 November 2012

[3] K. Hatua, S. Dutta, A. Tripathi, S. Baek, G. Karimi, and S. Bhattacharya,"Transformer less intelligent power substation design with 15 kV SiCIGBT for grid interconnection," in *Proc. IEEE Energy Conversion Congr.Expo.*, 2011, pp. 4225–4232.

[4] I.Liard and D.D.C.Lu,High step up DC/DC topology and MPPT algorithm for use with a thermo electric generator,"*IEEEtrans,P*ower Electron.,vol.28,no,7,pp.3147-3157,july.2013

[5] Amir Prastar,Jul-Ki Seok" High gain resonant switched capacitor cell based dc-dc converter for offshore wind energy systems"February 2015