AN IMPROVED NON ISOLATED STEP UP CONVERTER WITH DC-DC CAPACITOR SWITCHED STORAGE CELL

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Abstract : This Paper Mainly deals with Photovoltaic (PV) or Fuel cells Connected to Grid connected system, a high step up converter is required to boost the low voltage of PV of fuel cell to a relatively high bus voltage for the downstream the advantage of the output voltage is converter can produce a high excellent efficient switch ,Basically when switch is ON, The Inductor is Charged and the capacitor is connected in series with load, When Switch is OFF the inductor releases to charge the multiple capacitors in parallel, voltages are controlled by PWM Technique, Voltage gain of DC-DC Converter can be obtained with good regulation, By this topology new proposed converters are analyzed. This Design can be simulated by MATLAB Simulation

Index Terms–High voltage gain, high efficiency, non- isolated, switched capacitor cell.

I. INTRODUCTION

The mass usage of traditional fossil energy with the effect of greenhouse environment pollution some new energy has been created to overcome the renewable energy resources such as solar energy wind energy and hydrogen energy with producing PV Cells and fuel cells power generation is the most utilization for the new energy system has been applied to large scale.

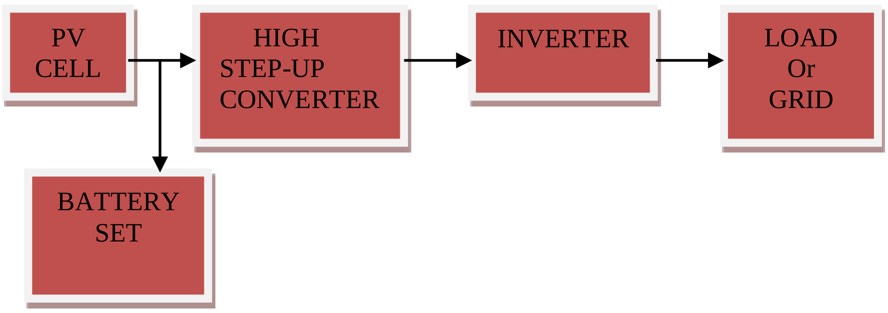


Fig.1. Block Diagram of Photovoltaic system.

Thefig 1 shows the Block diagram representation of photovoltaic system consists of PV Cell, High step up converter, inverter, load and Battery Set. The High step up converter performs importantly from the system requires a sufficiently high step up conversion ,Basically Conventional step up converter such as the Boost converter and fly back converter, cannot achieve a high step up conversion with high efficiency because of the resistances of elements or leakage inductance.

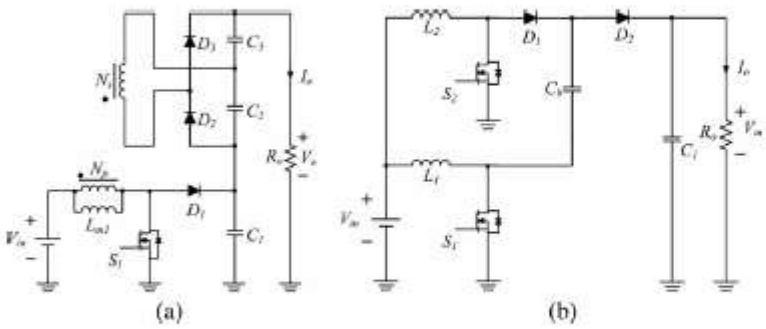


Fig.2. High Step-up Based Classical Boost Converter (a) Integrated fly buck-boost converter Structure (b) interleaved boost converter with voltage capacitor Structure.

2. BASIC SWITCHD CAPACITOR CONFIGURATIONS ADOPTING INDUCTOR ENERGY STORAGECELL

Fig. 2 Shows the topology of a Step up Based Classical Boost Converter With Diodes D1,D2,D3….Dn and the input voltage Source with charged Capacitors C1,C2,C3….Cn in Paralleland the voltage source charged the capacitors are connected in series of the supply voltage. Therefore the output voltage is (n+1).Vg where n is the number of the switched capacitors with Vg

The circuit shown in the above figure can boost converter,Here after the switched capacitor is called buck-boost capacitor when it is connected in parallel with the inductor. Diode D is used to prevent capacitor C from Being Short from fig 2(a) or being in parallel with the input voltage source fig. 2b When Switch is ON, Obviously, the positions of the diode and the Switched capacitor can be Exchanged Each Other.

At Steady Condition the Volt-Sec Relationship of the inductor is given as VgDyTa = Vcbb (1-Dy) Tg.

Obviously, the voltage of the boost capacitor is higher than that of the buck boost capacitor with same duty cycle, as shown in fig.2. Share the inductor energy storage cell and two position arrangements of the diodes and capacitor, SC structure, sharing the Storage Cell from fig.3.

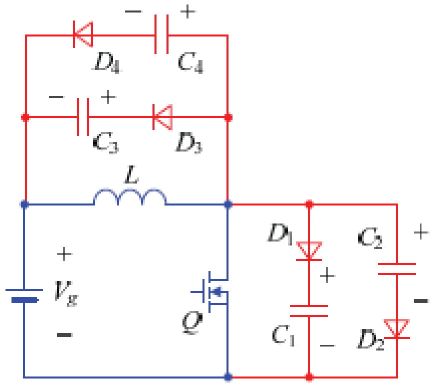


Fig.3. SC Structure Sharing an Inductor Energy Storage Cell.

When Q is On Inductor Charges C-Capacitor is Turn Off by the above fig C1, C2, C3, C4….Cn Charges respectively simultaneously by the inductor,

3. NON –ISOLATED HIGH STEP UP DC-DC CONVERTER WITH STORAGE CELL BASED SC'S

A. Derivation of High step up converter with single inductor Energy source cell Based SC

To obtain a high Voltage gain, the switched capacitor cell fig.3. Shows the connected in series as many possible when switch is ON *Q*, and the polarity of the capacitor is connected in series should be different of the connection point. Since the positive terminals of C2 and C4 Cannot be Connected in series .Likewise C1 and C3 also same because the possible connection methods of two capacitors can be Connected in Series because the negative terminals of the two capacitors are connected through a input terminal of voltage.

The Equivalent Circuit of the Proposed Circuit can be as shown in figure Modes of Operation can be stated as Follows.

Mode I [to,t1]: At t=to the power switches S1 & S2 are both are turned off and Diode are reverse biased Lm1 & Lm2 as Leakage inductors are charged by input voltage sources of Lk1&Lk2 Vin.

Mode II [t1,t2]: At t=t1 the switch S2 is switched OFF, there by turn ON diodes are Reverse Bias D2 and D4, The Energy Stored in the inductor is stored and transferred by secondary side of the output filter capacitor C3.The energy that magnetizing inductor Lm2 has stored and leakage current Lk2 and the voltage lift capacitor allows the capacitor to charged by C1.

Mode III [t2,t3]; At t=t2 diode D2 automatically Switches by Total Energy can be release a large amount of energy by leakage inductor Lk2 the output filter of capacitor can be transfer forms the secondary side of the Output Capacitance Co
By the diode of D4.

Mode IV [t3,t4]: At t=t3 the power switches ON by the Switched capacitor and the diodes are OFF, the operating stages re followed by I to IV.

Mode V [t4,t5]; At t=t4 the power switches S1 is switched OFF ,which turns ON Diodes D1&D3.The energy stored by magnetising inductor Lm1 is transferred to the secondary side charging the output filter capacitor C2 .The charging output of the capacitor filter voltage can be considered as Vcb,Vc1,Vc2 of infinitely large capacitance.

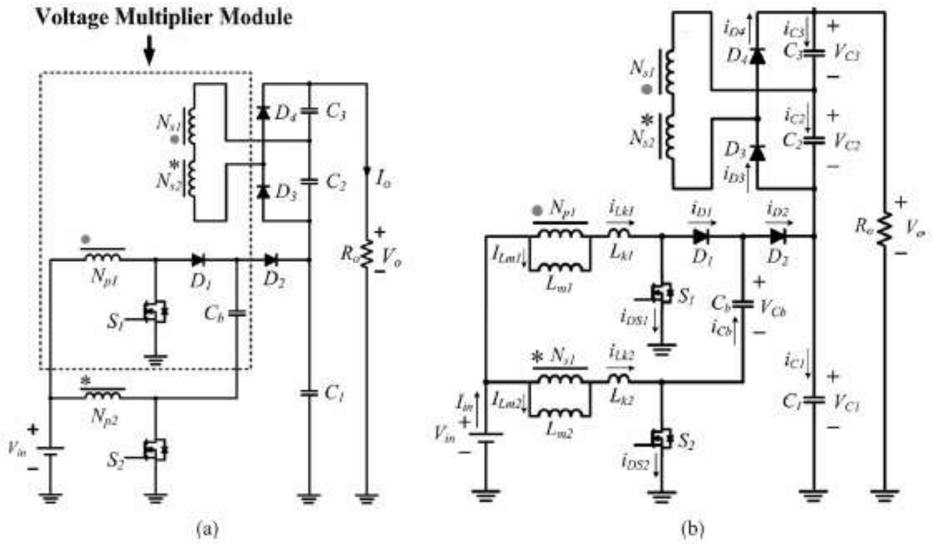
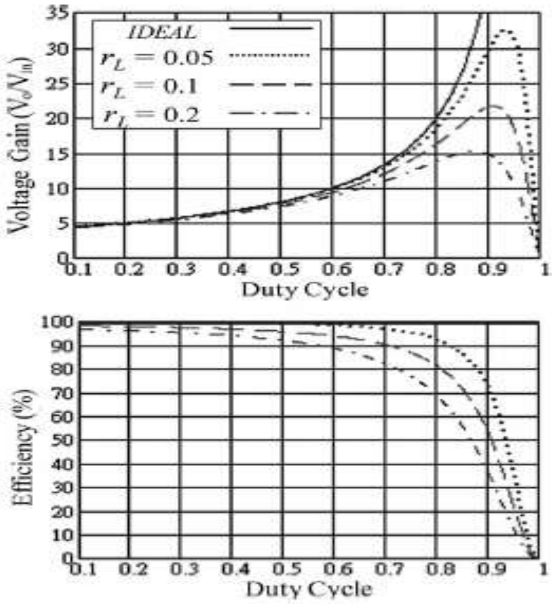


Fig: 4(a) Voltage Multiplier Module **4(b) Proposed Equivalent Circuit Converter**

4. PERFORMANCE COMPARISION



The Performance of the proposed converter is compared with the high step up interleaved converters are as shown in TABLE-I. The high step up, high power conversion of the PV System.

Fig 5. Calculated Voltage gain and efficiency with different copper Resistance.

TABLE-I

High step-up interleaved converter	Converter in [33]	Converter in [30]	Proposed Converter
Voltage gain	$\frac{2}{1-D}+nD$	$\frac{2(n+1)}{1-D}$	$\frac{2(n+1)}{1-D}$
Voltage stress on switch	$\frac{V_o}{2+nD(1-D)}$	$\frac{V_o}{2(n+1)}$	$\frac{V_o}{2(n+1)}$
The highest voltage stress on diodes	$\frac{2V_o}{2+nD(1-D)}$	$\frac{(n+0.5)V_o}{n+1}$	$\frac{nV_o}{n+1}$
Quantities of diodes	4	6	4
Quantities of cores	3	2	2
Quantities of secondary side windings	1	2	1

5. DESIGN AND EXPERIMENT OF PROPOSED CONVERTER

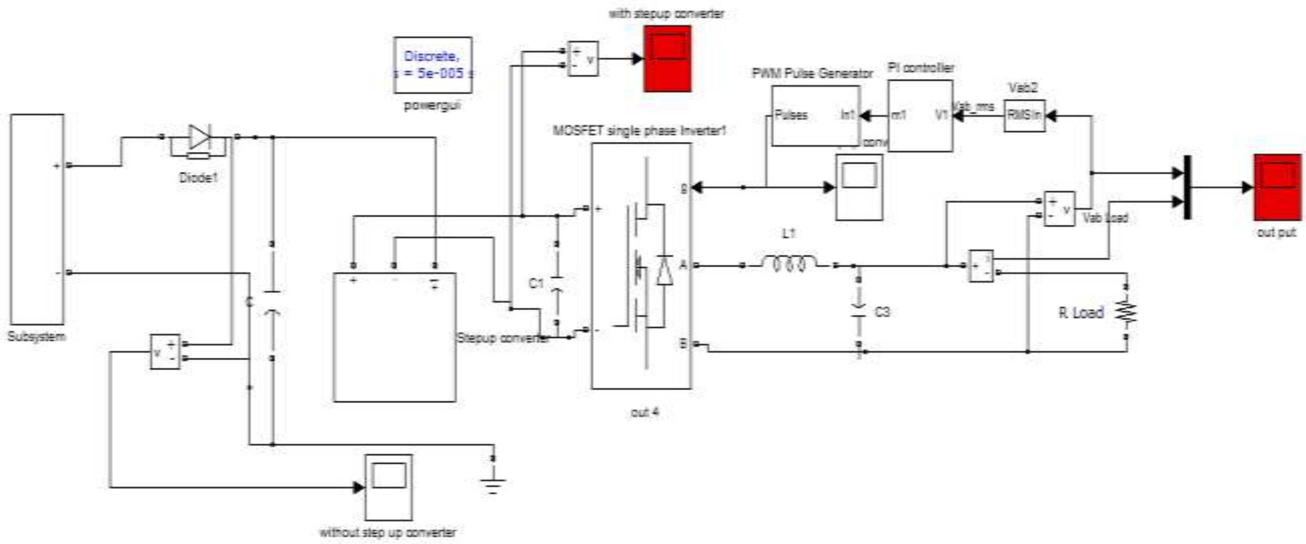


Fig 6. Simulation Design of Step up Converter

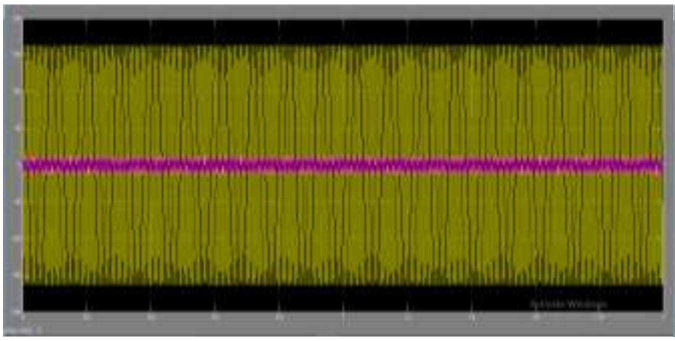


Fig 7. Output Voltage and Current

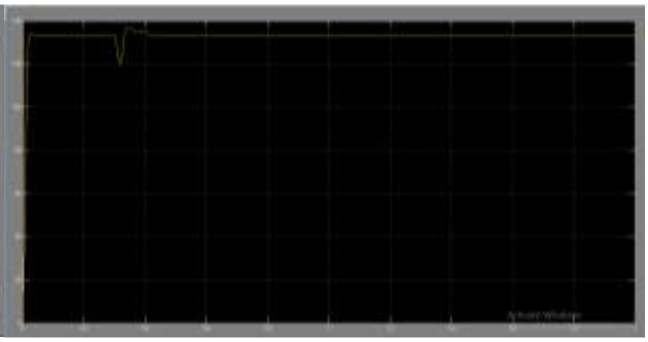


Fig 9. Without Step up Voltage

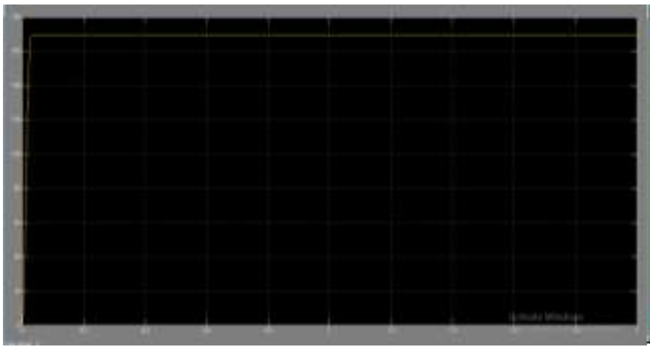


Fig 8. Step up Voltage

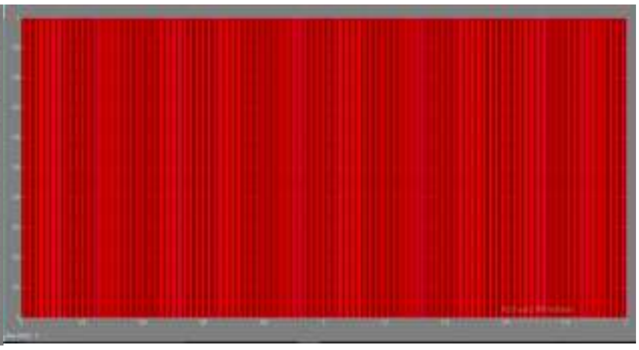


Fig 10. Output Current

CONCLUSION

This Project has the Presented the steady analysis of topological principles, steady state analysis, and experimental result has efficiently step up conversion .The interleaved PWM Scheme reduces the current ripples by approximately 6%.The Switches conducted to low voltage rated and low on state resistance MOSFET can be selected .Furthermore, the full-Load efficiencyFurthermore, the full-load efficiency is 96.1% at *Po* = 1000 W, and the highest efficiency is 96.8% at *Po* = 400 W. Thus, the proposed converter is suitable for PV systems or other renewable energy applications that need high step-up high-power energy conversion.

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