

# PROPOSE OF BIDIRECTIONAL DC TO DC CONVERTER BY USING SWITCHED CAPACITOR FOR HIGH VOLTAGE COMPETENCE IN EXTERNAL STORAGE IN RES

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**Abstract-**An interleaved switched-capacitor bidirectional DC-DC converter with a high step-up/step-down voltage gain is recommended. The interleaved framework is embraced in the low-voltage side of this converter to decrease the surge of the current with the low-voltage side, as well as the series-connected framework is embraced in the high-voltage side to attain the high step-up/step-down voltage gain. On top of that, the bidirectional concurrent correction procedures are performed without calling for any kind of added equipment, as well as the performance of the converter is enhanced. In addition, the operating concepts, voltage and also existing

anxieties, as well as existing surge qualities of the converter are evaluated. Ultimately, a 1kW model has actually been created which confirms a large voltage-gain variety of this converter in between the variable low-voltage side (50V-120V) as well as the consistent high-voltage side (400V). The optimum effectiveness of the converter is 95.21% in the step-up setting and also 95.30% in the step-down setting. The speculative outcomes likewise verify the usefulness as well as the efficiency of the recommended geography.

**Keywords-** DC to DC Converter; Switched capacitor; RES networks; PV systems; THD; Harmonics.

## I. INTRODUCTION

The high gain capability of SSI converter allows it to be connected directly to a medium voltage DC bus. This will facilitate direct connection of a large PV system to MV alternative current (AC) grid (i.e. 20 kV) only using a single transformation stage. In addition, the interleaved configuration increases the flexibility of the converter allowing for either higher voltage gain and/or current rating, thus increasing the power rating of the converter. The SSI converter can also be used by a stationary FC power conditioning system. The high gain characteristic is suitable to boost the low DC voltage of FC modules to the DC voltage level required by the inverter. Moreover, the converter is able to handle high FC current owing to its interleaved configuration besides reducing the FC current ripple and improving the performance and lifespan of FC module. The performance of two different energy systems based on SSI converter is validated using simulation models and experimental setups. The proposed PV system based on the SSI converter achieves satisfactory performance for boosting the PV array voltage. The stationary FC PCS utilizing SSI converter successfully increases the relatively low FC voltage to the required DC bus voltage with high efficiency and good overall performance. The sun is almost an inexhaustible energy source, and the PV cell is the technology

that directly converts sunlight into electricity. The term PV is originated from the process of converting light (photons) to electricity (voltage). The basic element of PV technology is the solar cell, which is the area of p-n junction diodes fabricated in a thin wafer of semiconductor layer. When the solar cell is illuminated, photons with energy greater than the band-gap energy of the semiconductor create an electron-hole pair. These carriers are swept apart under the influence of the internal electric field of the p-n junction and create a current proportional to the incident radiation. A typical solar cell generates 0.5 W at approximately 0.5 V. In order to achieve adequate power levels, cells are connected in series to form a PV module, and multiple modules are then connected in series or parallel to build a PV array. Figures show how PV cells are arranged into modules and how modules are connected into arrays.

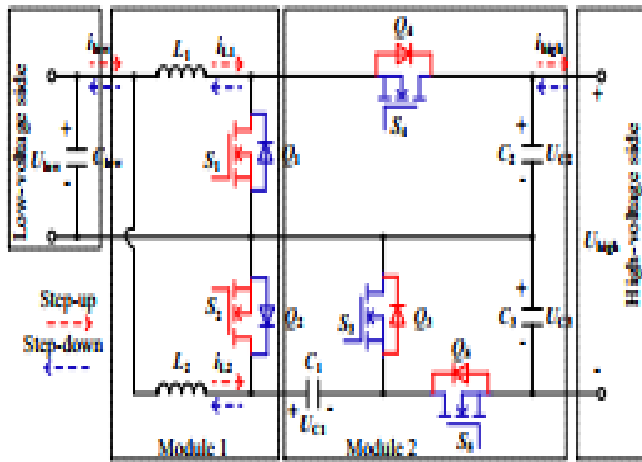


Fig.1.1: Block model diagram.

## II. PREVIOUS STUDY

This existing approach defines a worldwide power situation and also the damage of the atmosphere air pollution; the renewable resource systems come to be crucial worldwide. Nevertheless, the renewable resource systems, consisting of photo-voltaic systems as well as wind-power producing systems, could not give a secure power and also supply sufficient rapid power when the tons power instantly enhances. The standard two-phase interleaved bidirectional DC-DC Converter could decrease low-voltage side present surges, yet this converter still has downsides consisting of the slim voltage conversion variety as well as the high voltage stress and anxiety for power semiconductors. The voltage tension of power semiconductors of the bidirectional three-level DC-DC converters is half that of the traditional two-phase interleaved bidirectional DC-DC converter, yet its voltage-gain variety is still slim. The bidirectional converters as well as just need 3 semiconductors. Yet their voltage-gain varieties are still tiny. Furthermore, the low-voltage and also high-voltage side premises of this converter are linked by a power semiconductor or an inductor, which will certainly additionally create additional EMI issues. Ultimately, the high voltage-gain converter in requirements even more power elements as well as cannot attain bidirectional power circulations. On top of that, the well balanced inductor currents simply could be accomplished when the variety of the voltage multiplier phases is strange. The converter in struggles with the massive existing surge in the low-voltage side. The switched-capacitor converter frameworks as well as control methods are straightforward and also simple to broaden. Various billing and also releasing courses of the capacitors transfer power to either the low-voltage or the high-voltage side to attain a high voltage gain. Solitary capacitor

bidirectional switched-capacitor converters were recommended. However the converter performance is reduced. This paper stands for an interleaved switched-capacitor bidirectional DC-DC converter with a high step-up/step-down voltage gain is recommended. The interleaved framework is embraced in the low-voltage side of this converter to lower the surge of the current with the low-voltage side, as well as the series-connected framework is embraced in the high-voltage side to accomplish the high step-up/step-down voltage gain. Furthermore, the bidirectional simultaneous correction procedures are performed without needing any kind of added equipment, and also the effectiveness of the converter is boosted.

## III. PROPOSED SYSTEM

This suggested approach explains a two-phase interleaved bidirectional DC-DC converter as well as the bidirectional three-level DC-DC converter, the recommended converter has benefits consisting of reduced existing surge, reduced voltage-stress of power semiconductors and also vast voltage-gain variety. Additionally, the link in between the low-voltage and also the high-voltage side premises of the recommended converter is a capacitor as opposed to a power semiconductor. To attain a high action- up gain, the capacitors are butted in parallel as well as released in collection in the step-up setting. Reverse to the step-up setting, the high step-down proportion could likewise be acquired since 2 capacitors are butted in collection and also released in parallel. These non-detached bidirectional DC-DC converters suggested over cannot at the very same time complete the reduced existing swell, the reduced voltage concern of strength semiconductors and also the large voltage-gain run. With a certain objective to look after this concern, an interleaved traded capacitor bidirectional DC-DC converter is recommended in this paper. Contrasting and also the typical two-stage interleaved bidirectional DC-DC converter and also the bidirectional three-level DC-DC converter, the suggested converter has centerpieces consisting of reduced present swell, reduced voltage-worry of strength semiconductors as well as broad voltage-gain run. Also, the organization in between the low-voltage as well as the high-voltage side premises of the recommended converter is a capacitor instead of a power semiconductor. To complete a high development up gain, the capacitors are butted in parallel as well as launched in plan in the development up setting. Inverted to the development up setting, the high advancement down percentage could similarly be hopped on the premises that 2 capacitors are butted in setup and also launched in parallel. Besides, the capacitor voltage of the suggested converter is fifty percent of the high-voltage side voltage, as well as the effectiveness is boosted by concurrent modification task. This paper is made up as takes after.

#### IV. SIMULATION RESULTS

When the power streams from the low-voltage side to the high-voltage side, the result voltage  $U_{high}$  is tipped up from  $U_{low}$  by managing the power semiconductor of Q1, and also Q2, as well as the anti-parallel diodes of Q3, Q4 and also Q5. The partnership in between d1 as well as d2 could be created as  $d1=d2=d$  Boost, where d1 and also d2 are the task cycles of Q1 and also Q2 specifically. Fig. 2 reveals the regular waveforms in the step-up setting, and also Fig. 3 reveals the present circulation course of the recommended converter.

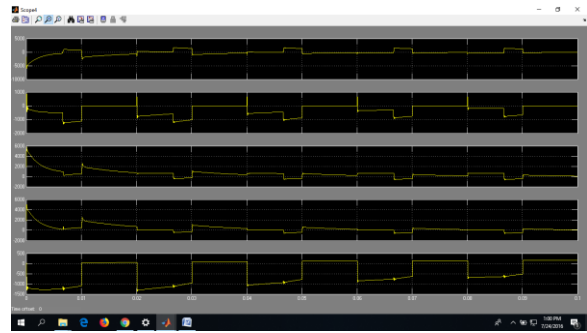


Fig.4.3: Output voltage across the source 2.

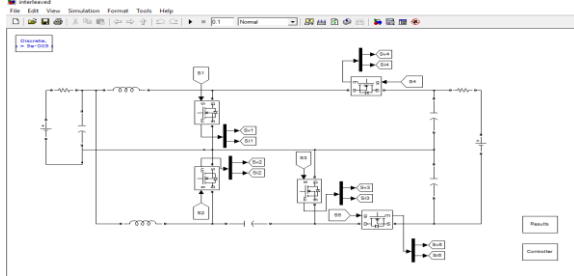


Fig.4.1: Simulation circuit.

The power semiconductor Q1 is switched on as well as Q2 is shut off. The anti-parallel diode of Q3 is switched on, while the anti-parallel diodes of Q4 as well as Q5 are switched off. The existing circulation course of the suggested converter is shown in Fig. 3(a). The power is moved from the DC resource  $U_{low}$  to the inductor L1. Meanwhile, C1 is being billed by inductor L2, while C2 and also C3 are releasing. C2 as well as C3 are linked in collection to offer power for the tons in the high voltage side.

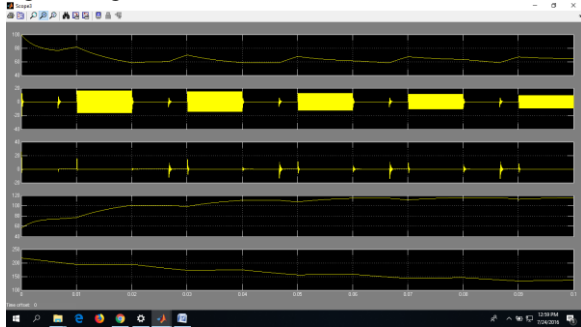


Fig.4.2: Output voltage across the source 1.

The power semiconductor Q1 as well as Q2 are switched off. The anti-parallel diodes of Q3 and also Q4 are activated, while the anti-parallel diode of Q5 is switched off. The present circulation course of the suggested converter is given up Fig. 3(b). Inductors L1 and also L2 are releasing. Meanwhile, C1 is billing from inductor L2, while C3 is releasing. The DC resource  $U_{low}$ , L1 and also C3 result power to the lots.

#### V. CONCLUSION

In this paper, an interleaved switched-capacitor bidirectional DC-DC converter has actually been presented. The recommended geography could take advantage of high step-up/step-down proportion, a large voltage-gain variety and also preventing of the severe responsibility cycles. Additionally, this converter has the benefits of the reduced voltage tension of power semiconductor as well as capacitors, as well as reduced existing surges in the low-voltage side. Besides, the servant energetic power semiconductor enable ZVS turn-on as well as turn-off, and also the effectiveness of the converter is boosted. The capacitor voltages and also the inductor currents could be quickly well balanced as a result of the self-balance feature.

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