Devise of Elevated Light Load Effective Power Conversion Scheme using Bidirectional Converter

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Abstract- This paper uses two power supplies for power conversion. Snubber capacitor is used to neutralize the mutual capacitance that is produced in the solar panel. Snubber capacitor voltage is used by the secondary voltage source i.e. the battery from which bidirectional buck converter provides power to the load even under a very light load condition. A buck converter is used between the bidirectional converter and the secondary voltage source to charge the secondary voltage source at a faster rate. The energy storage is of vital importance in applications such as hybrid electric vehicle, space vehicle, etc. A bidirectional converter is used between the source and the secondary voltage source i.e. the battery to match the voltage level. This project mainly deals with building the hardware for bidirectional power flow between source and load or battery and load. In this project, Bidirectional non-Isolated DC-DC converter is designed to operate with a battery.

Key words- *Radix-10 multiplier, redundant representation, sign-magnitude signed digits (SMSDs), VLSI design.*

I. INTRODUCTION

In this current scenario and environment promoting and using of energy saving, high efficiency instruments and devices are valued so that the power consumption is minimal. Especially under the light load condition since the power systems operate mostly under the light load condition. For example, the 80PLUS performance specification requires power supplies in computers and servers to be high efficient. The efficiency must be satisfied mostly to be greater than 90% at 10% load to achieve Titanium certification, as well as under a fullload condition. Furthermore, many manufacturers of computer, telecommunication, and network equipment require high light-load efficiency even below 5% load condition, which exceeds the latest Energy Star specifications. This means that very light-load efficiency will become more important in the future. In this project 'N' power supplies can be connected in parallel and provide the output power with an equally shared load current. It helps to increase overall efficiency and the power handling capability. In our prototype we are using two dc sources. Redundant power supplies are also being used in this structure. This helps in power to be continuously supplied even when the source is turned off due to some faults, which improves the reliability of the structure. Each power supply works on two power conversion stages. Each power supply has two power conversion stages. The first one is the input filter and the power-factor correction (PFC) circuit, which creates low EMI, surge protection, and a high power factor. The PFC circuit, which uses a boost converter , converts the AC voltage to DC link voltage Vs of about 400V. The second power conversion stage is the DC/DC power conversion circuits, which use an isolation transformer and regulate the output voltage at about 12V. A phase shift full-bridge (PSFB) converter is generally used to meet the high step-down voltage, low output voltage and high output current. In DC/DC conversion, many switches and magnetic components are used; therefore it is very difficult to improve the overall efficiency of the circuit, especially under a light-load condition due to switching and core-losses. Hot-swap circuits using a switch QHS and load-share control circuits are additionally required to connect and drive the paralleled power supplies.

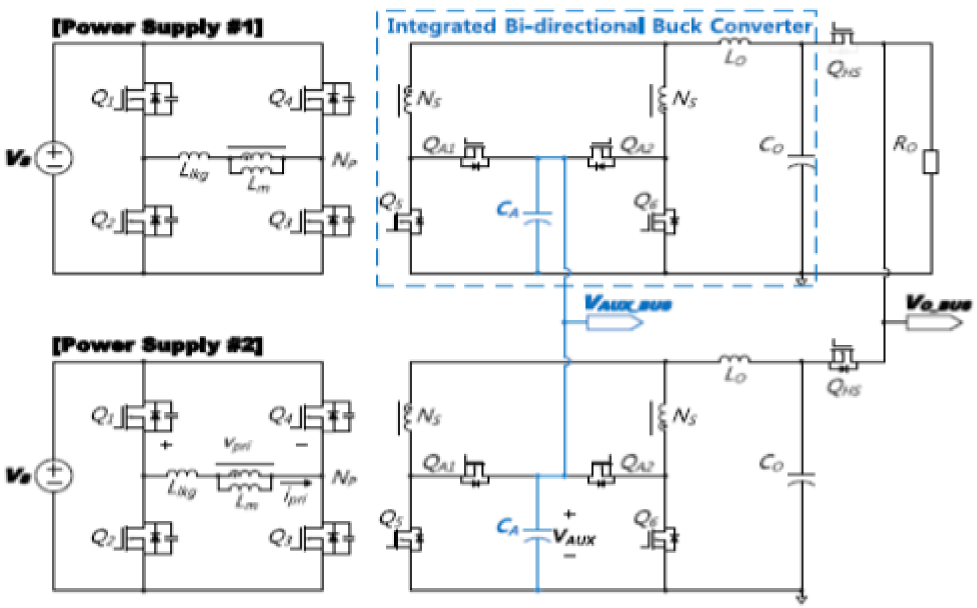


Fig.1: Block diagram.

II. LITERATURE SURVEY

The N power materials are linked in parallel as well as offer the outcome power with just as shared lots current. This raises the power taking care of ability as well as the total performance. In addition, repetitive power materials are typically embraced in this framework. These allow the power to be provided constantly also when an approximate power supply is switched off because of mistakes, which enhances general integrity. Each power supply has 2 power conversion phases. The very first one is the input filter as well as the power variable adjustment (PFC) circuit, which produces reduced EMI, rise security, and also a high power variable. The PFC circuit, typically making use of an increase converter, transforms the air conditioner voltage to dc web link voltage VS of regarding 400 V. The 2nd power conversion phase is the dc/dc power conversion circuits, which make use of a seclusion transformer as well as manage the result voltage at regarding 12 V. A phase-shift full-bridge (PSFB) converter is usually made use of to satisfy the high step-down voltage, reduced outcome voltage, and also high result current. In dc/dc power conversion, lots of parts, consisting of several buttons and also magnetic parts, are utilized, so it is extremely hard to boost the total effectiveness, specifically under a light-load problem, because of the changing and also core losses. At the same time, hot-swap circuits utilizing a button QHS and also load-share control circuits are in addition called for to link and also drive the paralleled power materials.

III. EXISTING SYSTEM

A three-level converter was examined. The buttons because converter need to carry out concerning two times the present as those in a two-level converter, yet it has reduced button voltage tension that is half the input voltage. Hence, a three-level converter has reduced changing loss which indicates greater light-load effectiveness, yet greater transmission loss which suggests reduced heavy-load effectiveness.

IV. PROPOSED SYSTEM

The proposed circuit employing the PSFB converter where RRCD in the RCD snubber is omitted to simplify the circuit diagram. First, the voltage source (VAUX) is implemented by the snubber capacitor (CA). Generally, multilayer ceramic capacitors are used for CA because low capacitance and high power density are required. However, in the proposed circuit, aluminum electrolytic capacitors are employed to provide the power for the load with sufficiently large capacitance and stored energy. Moreover, by connecting the snubber capacitor and adding another voltage bus (VAUX BUS), the energy of VAUX can be maximized in the paralleled modules. Therefore, VAUX can be used as a new voltage source under a very light-load condition. Second, the bidirectional converter is required to not only transfer power to the load but also charge VAUX effectively. Meanwhile, the bidirectional buck converter is widely used for nonisolation and bidirectional power flow due to its simple structure and high efficiency. Thus, the bidirectional buck converter is applied to the proposed circuit for transferring power from VAUX−BUS to the load and charging VAUX−BUS from the slave. Fortunately, with small changes, the bidirectional buck converter can be easily integrated into the secondary-side circuit of the PSFB converter. By using the switches (QA1 and QA2) instead of the diodes of the RCD snubber (DA1 and DA2), two bidirectional buck converters with one inductor LO are integrated. The output inductor current iLO is equally divided into two bidirectional buck converters with the help of the transformer secondary windings (NS) which are coupled to each other with same turns. Therefore, the proposed concept can be implemented very effectively in converters which have a center-tap rectifier with SRs and an output inductor.

V. SIMULATION RESULTS

Thus, the bidirectional buck converter is applied to the proposed circuit for transferring power from VAUX−BUS to the load and charging VAUX−BUS from the slave. Fortunately, with small changes, the bidirectional buck converter can be easily integrated into the secondary-side circuit of the PSFB converter. By using the switches (QA1 and QA2) instead of the diodes of the RCD snubber (DA1 andDA2), two bidirectional buck converters with one inductor LO are integrated. The output inductor current iLO is equally divided into two bidirectional buck converters with the help of the transformer secondary windings (NS) which are coupled to each other with same turns. Therefore, the proposed concept can be implemented very effectively in converters which have a center tap rectifier with SRs and an output inductor.

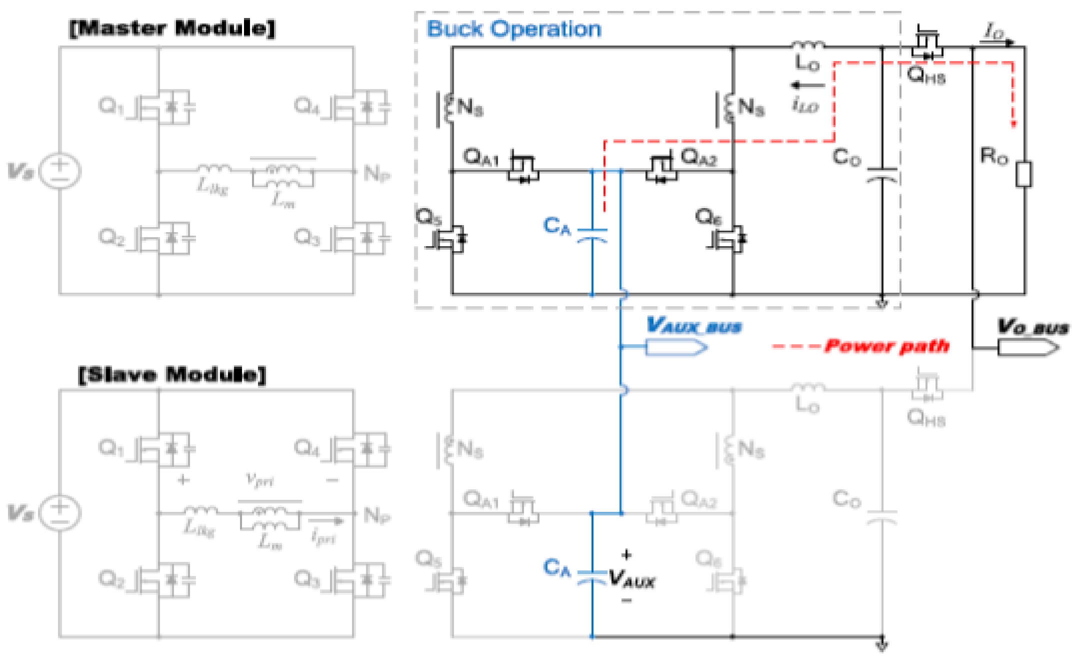


Fig.2: Power flow model.

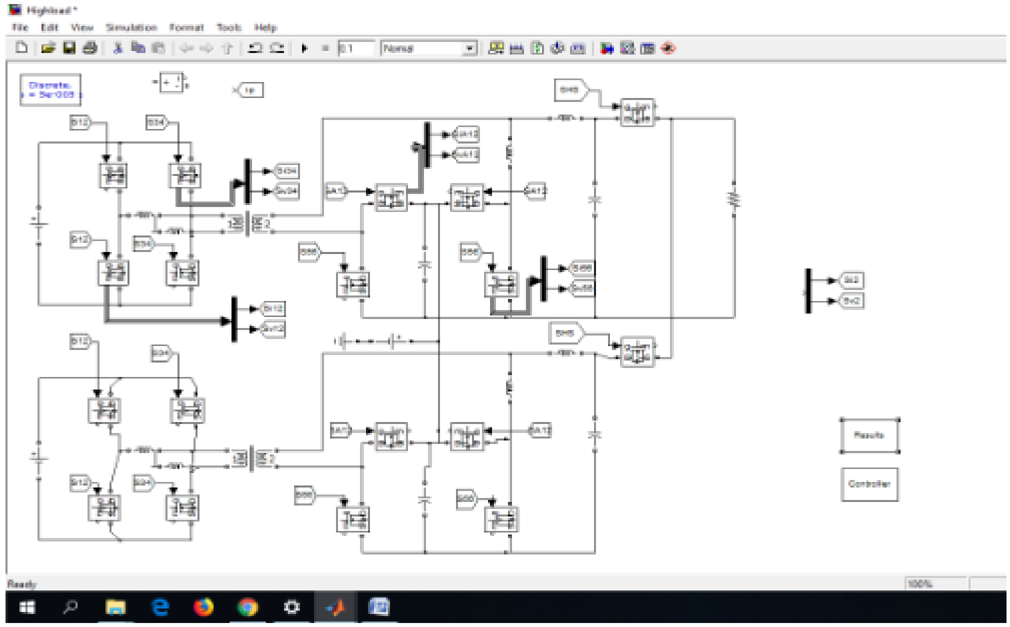
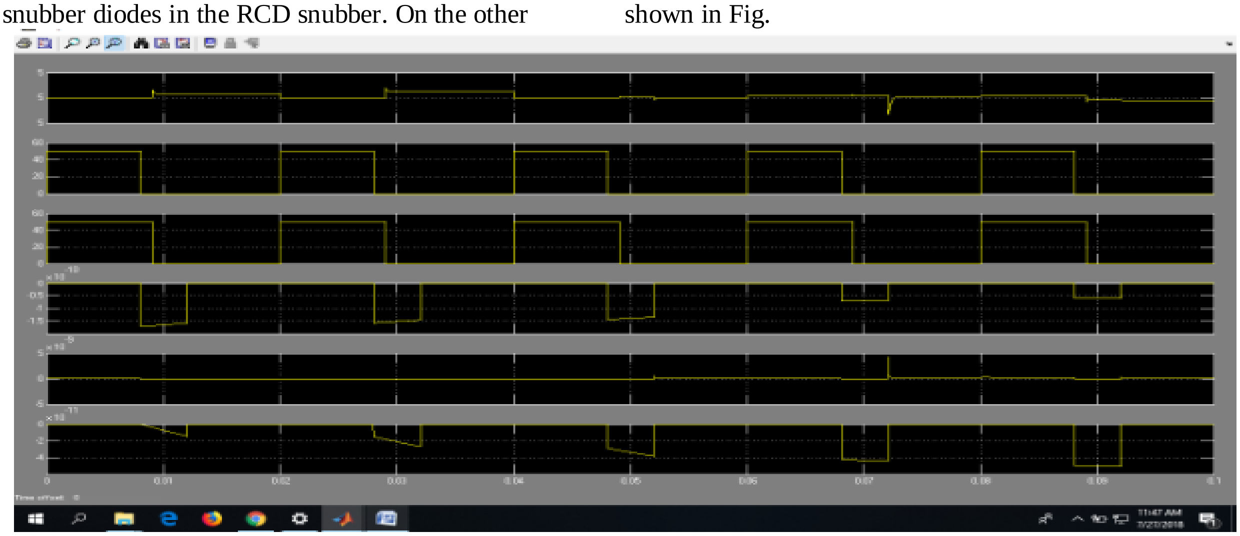


Fig.3: Simulation model in matlab.

In the charging mode, the primary side of the master is still turned off but the slave is turned on. Thus, the slave transfers power to the load and charges CA by using the bidirectional buck converter with the boost operation, as shown in Fig. First, since the PSFB converter in the slave operates normally, QA1 and QA2 in the slave are turned OFF and their body diodes act as snubber diodes in the RCD snubber. On the other hand, in the master, the secondary-side circuits operate like the boost converter to charge CA by using the energy stored in CO . Thus, in the master, when Q5 and Q6 are turned ON, iLO builds up with a slope of VO BUS/LO. After Q5 and Q6 are turned OFF and QA1 and QA2 is turned ON, iLO decreases to zero with a slope of (VO BUS − VAUX)/LO as shown in Fig.



VI. CONCLUSION

A new power conversion scheme was presented using paralleled modules. The proposed converter has high efficiency, especially under a very light-load condition, achieved by using an integrated bidirectional buck converter. The buck converter was integrated easily by using switches instead of snubber diodes. Also, by connecting the snubber voltage from each module and by using it as additional voltage bus, an auxiliary voltage source was effectively obtained for the buck converter. The circuit operation and design considerations were illustrated in this paper. The validity of the basic operational principles was confirmed by the experiment with two 12- V/750-W prototype modules. The experimental results demonstrate that the proposed converter has higher light-load efficiency than the conventional converter.

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