

ANALYSIS OF BIDIRECTIONAL BUCK BOOST CONVERTER FOR UNINTERRUPTED POWER SUPPLY

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ABSTRACT

As we day by day activity continuously require the use of power, in the coming days, there would be no surprise if we will face a power shortage problem and on one day, it is surely going to happen. And the alternative sources of energy are Renewable Energy Resources among which the most used resource is solar energy, but the main problem with it that it does not supply energy at a constant rate as it is weather dependent, therefore we need some extra thing with it. By the use of a bidirectional buck boost converter with a battery we can overcome this problem. The project aims to analyse the bidirectional buck boost converter connected with a micro-grid and a battery for an uninterrupted power supply. This project is lighter and easier to implement as we can analyse it with the help of Matlab simulation.

Keywords: Power shortage, Renewable Energy Resources, bidirectional buck boost converter, analysis, Matlab Simulation.

I. INTRODUCTION

As our electricity generation system is centralized, so any issue in a generation and distribution part could affect the people of large area and therefore, a considerable amount of efforts in the last 5 to 6 years has been made in this field. Initially, a micro-grid was used for uninterrupted power supply, but the weather conditions in India keeps getting changed and therefore, it would not able to provide the same amount of energy over time and then the idea of storing surplus power generating during the peak generating time and then, utilised it when the load demand is higher than the supply. As a result of this, various new technologies were used but the problem of efficiency was still an issue to solve. Then, a bidirectional buck boost converter came in the light which could be used for residential purpose work by connecting with battery storage.

II. METHODOLOGY

In this paper, we have proposed and deployed a model which can provide a constant power supply irrespective of the weather condition by the use of a micro-grid connected to a bidirectional buck boost converter and battery storage. Whenever the grid generates more power than the load demands, the extra power would charge the battery and when the weather conditions are unsuitable for providing the required demand, then the stored energy in the battery would be utilised for fulfilling the demand and by doing so, there would be no energy wastage too. This model will work when the input voltage overlaps with the output voltage. We would get the required voltage whether it is greater or smaller than the input voltage using a bidirectional buck boost converter.

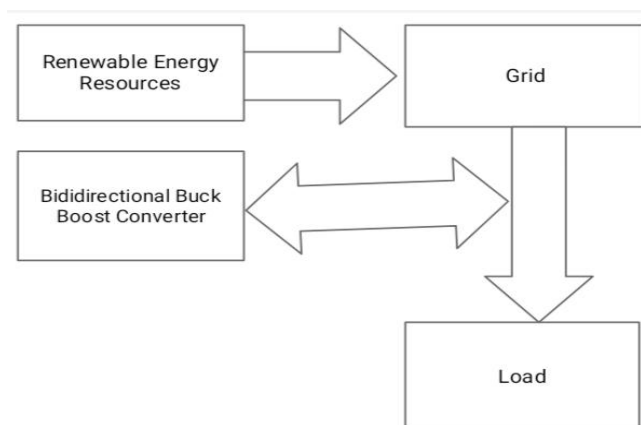


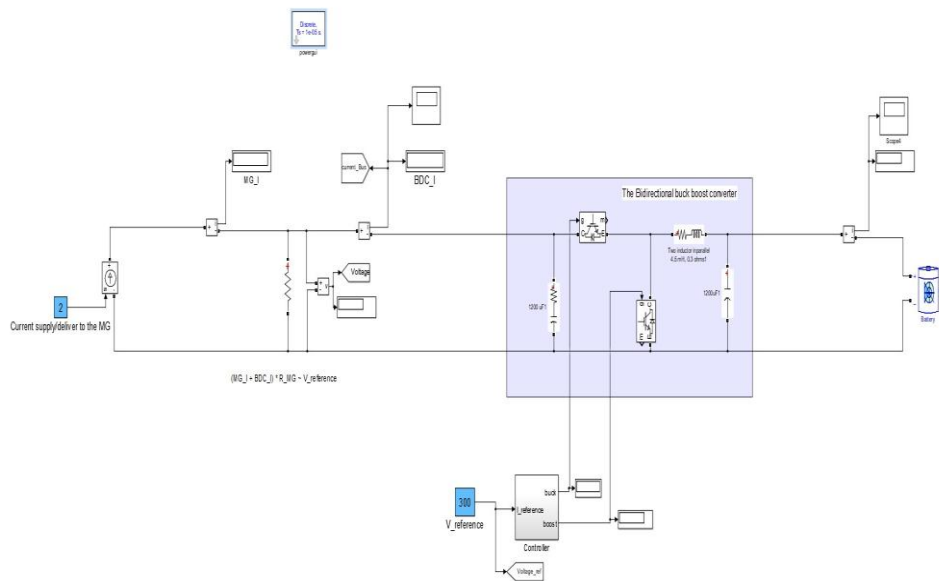
Figure 1: Energy flow from source to load

Bidirectional converter allows the flow of current and power in both directions with the help of connecting two diodes in anti-parallel along with MOSFET or IGBT, unlike conventional converter which can allow the flow of

current and power in only one direction along with this bidirectional converter can also step-up and step-down the voltage based on the requirements.

III. MODELLING AND ANALYSIS

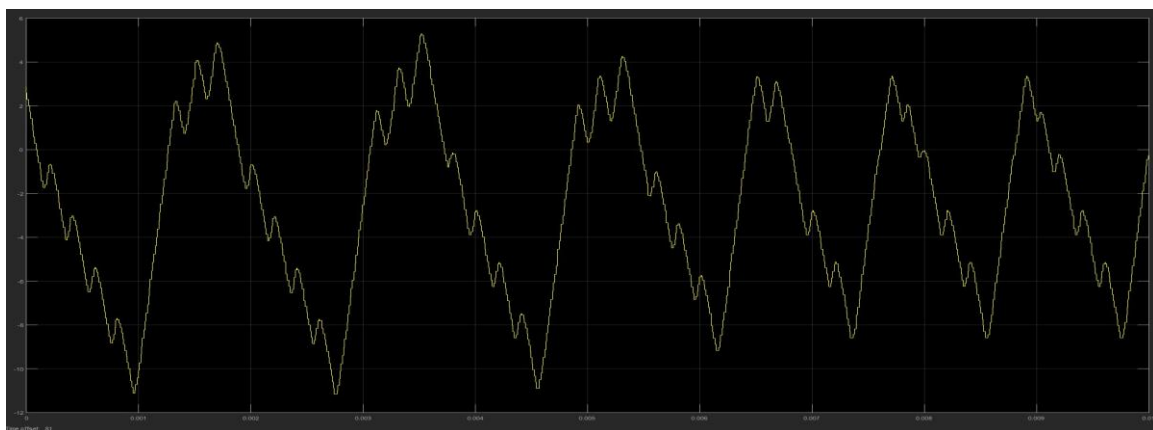
The bidirectional buck boost converter is used for charging and discharging the battery storage using a resonant inverter and snubber capacitors are used to reduce the turn off losses and the inductor keeps the operation



In continuous mode as it stores energy in it during the ON mode and then supplies the energy during the switch-off mode.

During buck mode of operation, converter steps down the input voltage and it is mainly used to charge the battery as it requires lower power and during boost mode of operation, output voltage gets stepped up and mainly used to match the load demand.

IV. RESULTS AND DISCUSSION



The output voltage of the bidirectional buck boost converter at time t has been shown in the above figure by performing simulation in Matlab which shows that the output voltage is continuous with changing amplitude which is controlled by a voltage controller which works on the logic of, if the voltage measured is higher than the reference voltage, then the bidirectional should send some current to the battery. This converter along with a micro-grid and battery can be used for small voltage range purpose with an uninterrupted power supply.

V. CONCLUSION

In this paper, I have shown a simulation model of a bidirectional buck boost converter with battery and micro-grid which can be used for uninterrupted power supply with high efficiency. I believe that this model will even

use for the medium and high voltage range purpose as we are using electronic devices which have higher efficiency, but lower operating voltage range, so by replacing suitable devices with transformers or other electrical apparatus we could use it at a larger scale as they have higher operating voltage values.

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