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A Review Paper On Three Phase Grid Interconnection Of BUCK BOOST Multi Photovoltaic Array Under Different Solar Irradiation

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ABSTRACT

This paper suggests using a hybrid converter to move power from the solar power source to the load. Due to its dependence on solar power intensity, solar power generation does not maintain a constant power level. As a consequence of this, the proposed system necessitates the use of a battery in order to achieve a power balance between solar power and load. When the proposed circuit uses the battery to balance power, it needs a charger and a discharger. The proposed converter can be made simpler by combining the functions of charging and discharging the battery with those of a buck-boost converter and a flyback converter. Zero-voltage switching (ZVS) can be used to reduce the switch's switching loss when the proposed converter is in the discharging mode at the turn-on transition. Additionally, the hybrid converter that is currently under consideration has a number of advantages, some of which include a lower component count, a lighter weight, a smaller size, a higher conversion efficiency, and so on. The proposed model can achieve an efficiency of 85% under full load conditions and outperforms its hard-switching counterparts in terms of conversion efficiency when used in the discharging mode by 4%. Experiments have been conducted on a prototype with a maximum output power of 20 W and an output voltage of 10 V to determine its viability. It is suitable for a nighttime electronic sign with a 200 W or less LED [1].

KEYWORDS *Photovoltaic, Maximum power point Traking , Array , BUCK and BOOST Converter*

INTRODUCTION

The technology of power electronics focuses on the effective control, conversion, and conditioning of electrical power through static devices. It efficiently converts electrical energy from its input form into the desired output form. The primary goal of power electronics is to control the flow of energy from a source to a load while maintaining high competence, dependability, and availability in a smaller, lighter, and less expensive package. 2]

PHOTOVOLTAIC ARRAY

The sun's energy is harnessed by a Photovoltaic Array (PVA) for efficient and long-lasting power generation. Power generation must also rise in tandem with rising energy demand. However, conventional power generation practices contribute to environmental issues such as climate change. Therefore, it is essential to enhance PVA efficiency. Maximum Power Point Tracking (MPPT) techniques can be used to optimize the silicon surface and ensure maximum energy extraction under varying light and temperature conditions. The PVA's design and simulation are carried out using MATLAB and Simulink. The PVA's output voltage is directly affected by the ambient temperature (Tx) and solar irradiance (Sx). A Photovoltaic Array (PVA) is made up of multiple solar cells connected in series and parallel to generate the required voltage and current. The voltage output is increased by connecting cells in series. Current capacity is enhanced by cells connected in parallel. 2]

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A Photovoltaic Array (PVA) is made up of multiple solar cells connected in series and parallel to generate the required voltage and current. The voltage output is increased by connecting cells in series. [3] Current capacity is increased by connecting cells in parallel. It has many advantages due to the most recent advancements in light emitting diode (LED) technology, including smaller size, longer lifespan, lower costs for maintenance, and increased strength against breakage [3–6]. As a result, LEDs are prevalent in our day-to-day lives. They are suitable for energy-saving lighting applications both indoors and outdoors, such as automotive taillights, TFT-LCD backlights, traffic signals, streetlights, and electronic signs [7–10]. Particularly at night, the electronic sign or streetlight is utilized. When solar power sources are used in the electronic sign or streetlight system, it is suitable for them to supply power. That is, during the day, the power system uses a charger to store energy from solar power sources to the battery, while at night, it uses a discharger to send energy from the battery to LEDs. As can be seen in Figure, the proposed power system requires both a

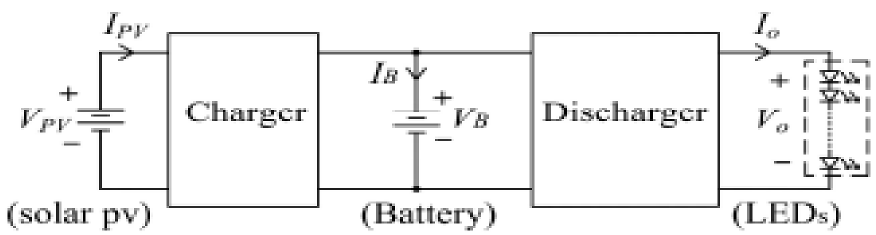

Fig.1: Block diagram of solar power system for electronic signor street-lighting application

For electronic signs and streetlights, the proposed power system requires a charger and discharger because it uses PV sources as its input source. The battery's output voltage is either lower or higher than that of the solar power source (8 V to 12 V). Therefore, it simultaneously needs a step-up and step-down converter, such as buck-boost, 'cuk, zeta and sepic converter [11–13]. The buck-boost converter has a simpler circuit topology than the 'cuk, zeta, and sepic converters. As depicted in Figure 2, it is selected as the battery system's charger. The fly back converter can be used in a solar power system or a battery system because it has many advantages, including a simpler circuit topology, wider voltage ratio ranges between input voltage and output voltage, and lower cost. As a result, the proposed power system can simultaneously use buck-boost converter and fly back converter to charge and discharge batteries [4], as shown in Figure 3.

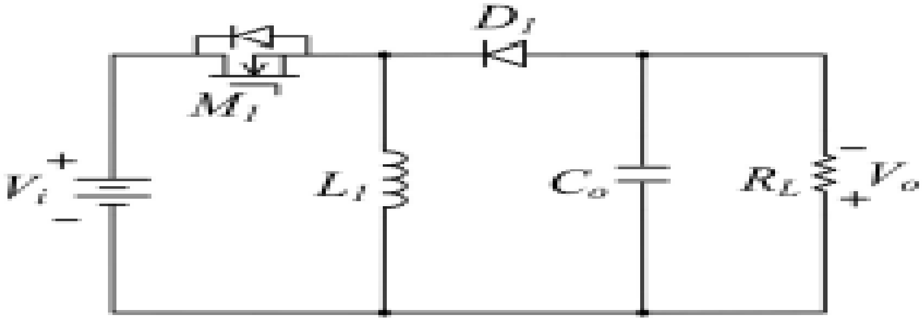

Fig.2: Schematic diagram of buck-boost converter for battery charging applications

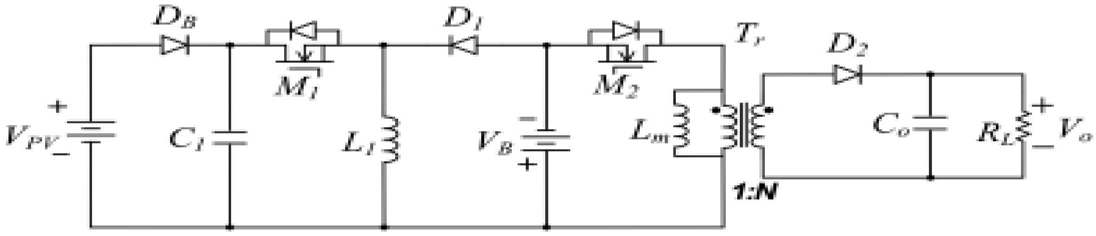

Fig.3: Schematic diagram of buck-boost/flyback hybrid converter for battery charging and discharging applications

DUAL BUCK-BOOST INVERTER AND ITS OPERATION

A dc to dc converter stage is followed by an inverting stage in the proposed Dual Buck & Boost based Inverter (DBBI) shown schematically in Fig. 1 V. In order to serve the two subar rays of the solar PV array, PV1 and PV2, the dc to dc converter stage has two dc to dc converter segments called CONV1 and CONV2. These lf-commutated switches—S1 with its anti-parallel body diode, D1, S3 with its anti-parallel body diode, D3, freewheeling diodes—Df1, Df3, and filter inductors and capacitors—L1, Cf1, and Co1—make up the segment known as CONV1. Similarly, the segment CONV2 includes the self-commutated switches S2 and its anti-parallel body diode, D2, and the freewheeling diodes Df2, Df4, as well as the filter inductors and capacitors L2, Cf2, and Co2. The self-commutated switches S5, S6, S7, and S8 and the body diodes D5, D6, and D8 that correspond to them make up the inverting stage. The Lg filter inductor serves as the interface between the inverter stage and the grid. The two capacitors Cpv1 and Cpv2 serve as models for the parasitic capacitance from the PV array to the ground [3].

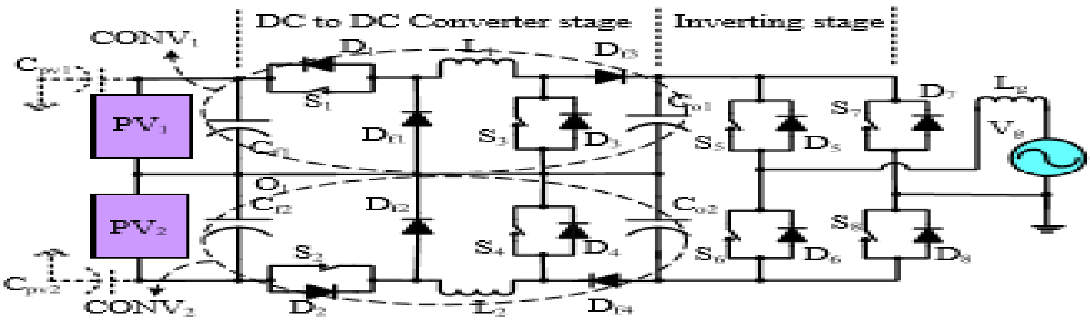

Fig.4: Dual Buck & Boost based Inverter (DBBI)

PROPORTIONAL-INTEGRAL CONTROL SYSTEM

Because there are fewer parameters to tune, proportional-integral-derivative controllers are widely used in industrial control systems. Additionally, they provide control signals that are proportional to the error between the reference signal and the actual output, or proportional action; integral, derivative, and integral actions, respectively [13]. The equation that results is as:

$$u(t) = K_p e(t) + K_i \int_0^t e(t)dt + K_d \frac{d}{dt} e(t)$$

FUZZY LOGIC CONTROLLER

The rule-base, which stores the knowledge in the form of a set of rules describing the best way to control a system, is one of the four main components of the fuzzy controller. Knowledge can be quantified using the membership functions. After determining which control rules are relevant right now, the inference mechanism decides which plant input should be enabled. The inputs are altered by the fuzzification interface so that they can be interpreted and contrasted with the rules in the rule-base. The inference mechanism's conclusions become the plant's inputs through the defuzzification interface

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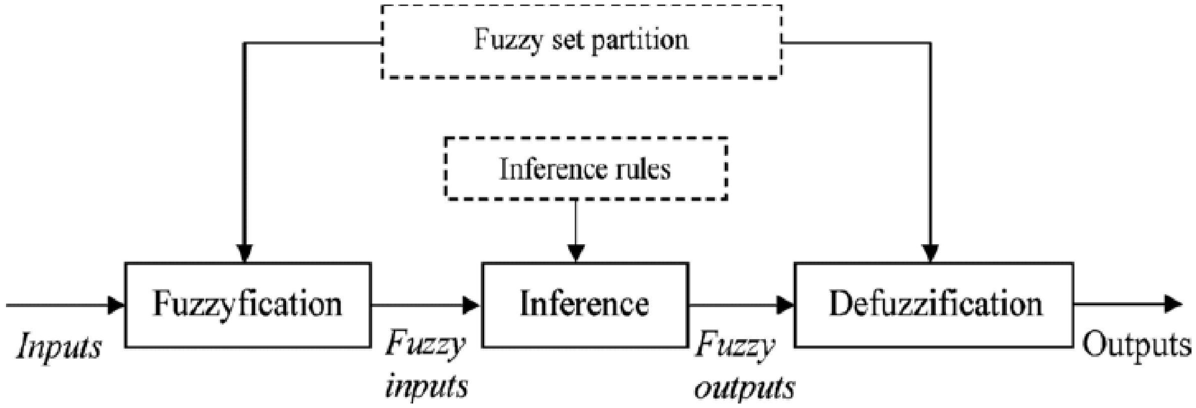

Fig.5: Control structure of Fuzzy Logic controller

Advantage of Fuzzy Logic Controller

- Fuzzy logic is cheaper than developing the model-based PI controller in terms of performance.
- Fuzzy logic is more robust than PI controller.
- Fuzzy logic are most customizable
- Emulate human deductive thinking.
- FLC is more reliable than PI controller.

 Fuzzy logic is provides more efficiency when applied in control system

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