A Review Paper on MPPT Techniques and Photovoltaic Cell

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***Abstract* -The solar panel is becomes an emerging topic foe the renewable energy world. The effective utilization of the solar panel and the constant power for small technique to big energy system is required. This paper presents model of solar photovoltaic module based maximum power point tracking (MPPT) for boost converter in a standalone photovoltaic system under variable temperature and insolation in static and dynamic conditions. A circuit based simulation model for a PV cell for estimating the IV characteristic curves of photovoltaic cell panel with respect to changes on environmental parameters and cell parameters. Simulation and modeling of the solar panel is the initial point to enter in the research related to the solar energy scheme. The power output is highly depending on the environment condition and solar radiation.**

***IndexTerms*–Photovoltaic cell, MPPT, Buck Boost converter, etc.**

I. INTRODUCTION

In the power sector the demand of energy is not enough to fulfill the day to day requirement this need of energy give rise to use of conventional energy resource. Utilized laterally with conventional systems to meet the energy demand. Our aim is to increase the efficiency and power (energy) output of the system. Also required that constant voltage be supplied to load irrespective of the variation in solar irradiance and temperature. So it is necessary to couple the photovoltaic array with a buck boost converter. The output voltage magnitude of this converter either greater than or less than the magnitude. Our system can be used to supply constant stepped up/stepped down voltage to dc loads.

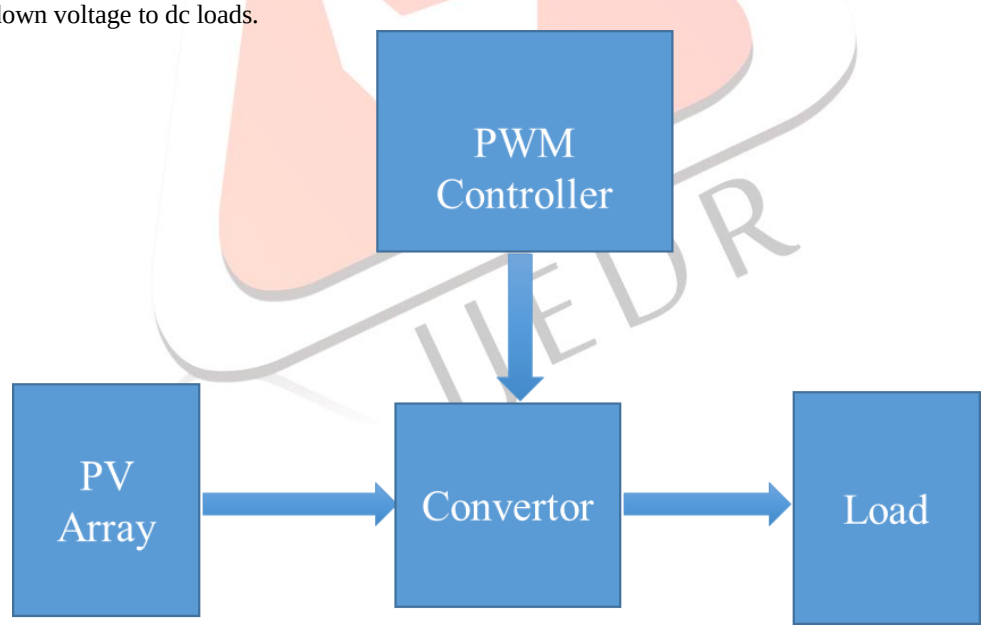

Fig. 1 General Block Diagram

PV is the field of technology related to the application of solar cells by converting sunlight directly into electricity. Due to the nonlinear relationship among the current and the voltage of the photovoltaic (PV) cell, it can be observed that there is a unique Maximum Power Point at a particular environment, and peak power point keeps changing with solar illumination and ambient temperature. In an important consideration in achieving high efficiency in PV power generation system is to match the photovoltaic (PV) source and load impedance properly for any weather conditions, therefore obtaining maximum power generation. Then, the system needs a Maximum power point tracking (MPPT) which sets the scheme working point to the optimum and increases the scheme's output power. The main aim of this work is to use the solar power with MPPT method. An attempt has been made to design solar panel with MPPT controller and DC - DC converter which switches in between buck converter and boost converter topology depending upon the input voltage and the switching signals from the Maximum power point tracking (MPPT) algorithm. It uses a multi objective control algorithm wherein, the system is classified into various states based on operating conditions of the

photovoltaic (PV) array and the load to generate the Pulse Width Modulation. By judging the state and setting the related control goal, the power will be balanced to satisfy the MPPT control system.

II. SOLAR CELL

A solar cell is an electrical device that converts the energy of light directly into electricity by the photovoltaic (PV) effect. It is a form of photoelectric cell (in that its electrical characteristic. current, voltage, or resistance vary when light is incident upon it) in which, when exposed to light, can generate and support an electric current without being attached to any external voltage, but do require an external load for power consumption. The operation of a photovoltaic cell requires 3 basic attributes:

1. The absorption of light, a generating either electron-hole.
2. The separation of charge carriers of opposite type.
3. The separate extraction of those carriers to an external circuit.

Fig. 2 solar cell

III. SOLAR ENERGY

Solar energy is a non-conventional type of energy. The solar energy has been harnessed by humans then ancient times using a variety of technologies. Solar radiation along with secondary solar energy powered resources such as wave power and wind power, hydroelectricity power and biomass power, etc., account aimed at most of the available non-conventional system type of energy on earth.

Solar powered electrical generation relies on photovoltaic scheme and heat engines. The solar energy uses are limited only by human creativity. The most common technique is to use photovoltaic (PV) panels which will receive photon energy from sun and convert to electrical energy. The solar technologies are broadly classified as both passive solar system and active solar system depending on the technique they detain convert and distribute solar energy process.

Active solar techniques include the using of Photovoltaic panels and solar thermal collectors to strap up the energy. In the passive solar methods include orienting a building to the Sun, choosing materials through favorable thermal mass energy or light dispersing properties, design spaces that naturally circulate air.

IV. MAXIMUM POWER POINT TRACKING

Maximum power point tracking is a technique that charge controllers use for wind turbines and photovoltaic solar systems to maximize power output. The PV solar systems exist in several different configurations. Most basic version sends power from collector panels directly to the DC-AC inverter, from there directly to the electrical grid. Second version, called a hybrid inverter, might split the power at the inverter, a percentage of the power goes to the grid and the remainder goes to a battery bank. In third version is not connected at all to the grid but employs a dedicated photovoltaic inverter that features the Maximum power point tracking. In this configuration, power flows directly to a battery bank. A variation on these configurations is that instead of only one single inverter technique, micro inverters are deployed, one for each photovoltaic panel. This allegedly increases photovoltaic solar efficiency by up to 20%. New Maximum power point tracking equipped specialty inverters now exist.

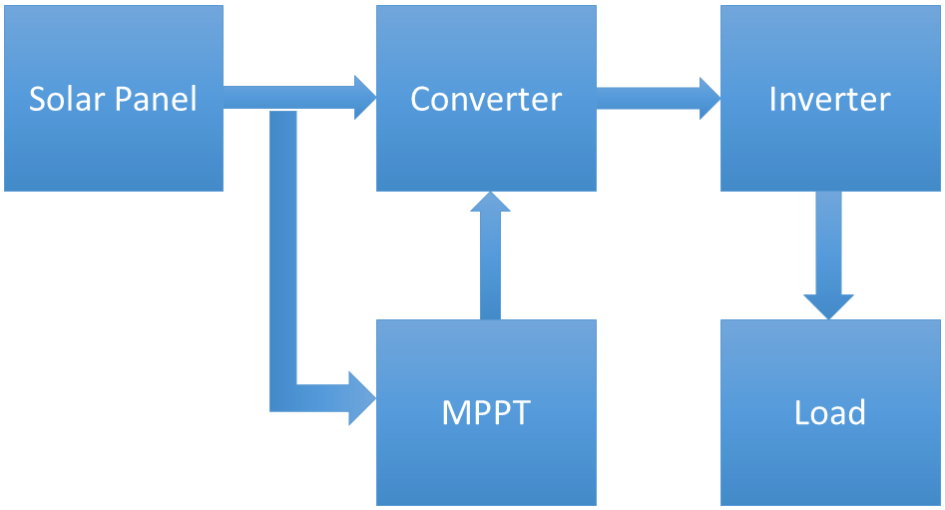

Fig. 3 Solar cell with MPPT technique

V. LITERATURE REVIEW

The many researchers have been done in field of economic dispatch problem some of the work is described in this paper.

N. Pandiarajan and RanganathMuthu [1], done study in their paper, presents a unique step-by-step process for the simulation of photovoltaic cell with MATLAB Simulink. In one-diode equal circuit is working in order to examine P-V characteristics, and I-V characteristics of a typical 36 Watts solar cell system. In the proposed model is designed with a user-friendly icons and a dialog box like MATLAB Simulink block libraries. The simulation of one-by-one procedure for modeling the photovoltaic cell module is presented. This mathematical of photovoltaic modeling in process serves as an aid to persuade more people into solar energy investigation and gain a closer understanding of P-V characteristics and I-V characteristics of photovoltaic (PV) modeling.

Aarti Gupta, PreetiGarg.[2], In any PV based scheme, the inverter is a critical constituent responsible for the control of electricity flow among the dc source and loads or grid. This paper presents a solar photovoltaic (PV) generation system integrated to the grid. The results of matlab modeling of the system detail the comparative operation of inverter topologies which are the conventional two level inverters and multilevel inverter topology to reduce total harmonic distortions in grid voltage and electromagnetic interference schemes. The proposed control scheme to mitigate the power quality issues for power quality improved in grid integrated simulated using MATLAB/ SIMULINK in power system block set.

G. Carannante [3], in this paper, photovoltaic (PV) power system performance depends on local irradiance conditions. The photovoltaic (PV) systems are sometimes subject to partial shading, which may produce a nonideal characteristic curve, presenting true and local power maxima in the PI curve. In traditional maximum power point tracking (MPPT) algorithms can converge to local maximum, which is not the true maximum power point. In order to solve the problem, this paper investigates the effects of non-uniform solar irradiance distribution on a photovoltaic source. An MPPT algorithm that is able to optimize the source instantaneous operating power under non-uniform irradiance is proposed. The ability of the algorithm and its increased performance by respect to traditional algorithms are evaluated through means of experimental tests performed on a real PV power system. This paper proposed an MPPT technique for a partially shaded PV source. The algorithm was tested on a real PV source of 4 kWp, operating under inhomogeneous irradiance. The results of the tests focused on the performance of the technique in individuating the instantaneous true MPP, also in the presence of local maxima. A comparison of the performances of the proposed and alternative MPPT algorithms evidences how accuracy and speed can significantly impact the energy produced by the PV source.

Ashish Pandey [4], study in this paper, the power available at the output of solar arrays keeps changing with solar insolation, ambient temperature. Expensive and inefficient, the solar arrays must be operated at maximum power point continuously for economic reasons. Of the numerous algorithms for this purpose, perturb and observe is a standard. A derivative of gradient ascent method used in the optimization theory, this algorithm introduces a tradeoff between tracking and dynamic performance. This algorithm also has a tendency to drift the system away from the maximum power point as atmospheric conditions change. With continually changing atmospheric conditions, these inadequacies lead to poor utilization of solar arrays. In this paper addresses both the issues. A variable-step-length algorithm is proposed to eliminate the tradeoff. In the drift is minimized by evaluating the entire trend in a power versus voltage curve. Analytical results, validated on a prototype system show excellent performance. Solar MPPTs cater to wide-ranging applications. For rooftop applications, FulCurvE, or hybrid algorithms can provide an excellent MPPT solution. Overall, the hybrid algorithm provides an excellent maximum power point tracking (MPPT) solution for all types of applications. Future work includes integrating the maximum power point tracking (MPPT) system with an inverter system creating opportunities to explore various software architectures to reliably schedule various time critical tasks.

VI. CONCLUSION

Today, PV technology is playing an important role as a clean and pollution- and maintenance-free electrical source. In this paper presented MPPT techniques for PV system with the different irradiation and temperature. Mathematical modeling procedure serves as an aid to induce more people into photovoltaic research and gain a closer understanding of I-V and P-V characteristics of PV module.

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