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ENHANCEMENT OF PV CELL BOOST CONVERTER EFFICIENCY WITH THE HELP OF MPPT TECHNIQUE

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Abstract
The recent upsurge in the demand of PV systems is due to the fact that they produce electric power without hampering the environment by directly converting the solar radiation into electric power. However the solar radiation never remains constant. It keeps on varying throughout the day. The need of the hour is to deliver a constant voltage to the grid irrespective of the variation in temperatures and solar isolation. We have designed a circuit such that it delivers constant and stepped up dc voltage to the load. We have studied the open loop characteristics of the PV array with variation in temperature and irradiation levels. Then we coupled the PV array with the boost converter in such a way that with variation in load, the varying input current and voltage to the converter follows the open circuit characteristic of the PV array closely. At various isolation levels, the load is varied and the corresponding variation in the input voltage and current to the boost converter is noted. It is noted that the changing input voltage and current follows the open circuit characteristics of the PV array closely.
Keywords: PV system, Boost converter, Open loop characteristics, Solar cell.

Introduction
The Conventional sources of energy are rapidly depleting. Moreover the cost of energy is rising and therefore photovoltaic system is a promising alternative. They are abundant, pollution free, distributed throughout the earth and recyclable. The hindrance factor is it's high installation cost and low conversion efficiency. Therefore our aim is to increase the efficiency and power output of the system. It is also required that constant voltage be supplied to the load irrespective of the variation in solar irradiance and temperature. PV arrays consist of parallel and series combination of PV cells that are used to generate electrical power depending upon the atmospheric conditions (e.g solar irradiation and temperature). So it is necessary to couple the PV array with a boost converter. Moreover our system is designed in such a way that with variation in load, the change in input voltage and power fed into the converter follows the open circuit characteristics of the PV array. Our system can be used to supply constant stepped up voltage to dc loads.

Work Summary
We have discussed about the renewable energy, solar energy, distribution of solar radiation reaching the earth's surface. The details regarding the PV cell have been discussed in chapter 3. The PV array has been designed in MATLAB environment. The open-circuit characteristic of the PV cell has been studied in depth. The boost converter design, the coupling of the PV array with the converter has been described. The deals with the simulation results and discussions part. The P-V, I-V, P-I curves have been obtained at varying irradiation levels and temperatures. The generation of the PWM signal has been shown. We get constant voltage across the load resistance of the boost converter. Output load of the boost converter is varied and the variation in the input voltage and current fed into the boost converter is noted. The various values of the voltage and current have been plotted in the open loop curves of the PV array. The voltage and current values lie on the curves and thereby prove that our coupling of the boost converter with the PV array is proper.

Proposed Algorithm Smart MPPT System
Tracking the maximum power point (MPP) of a photovoltaic array is an essential stage of a PV system [7] [8]. As such, many MPPT methods have been introduced and numerous variants of each method have been proposed to overcome specific disadvantages. The large number of methods proposed can make it difficult to determine

the best technique to adopt when implementing a PV system. The methods all vary in complexity, number of sensors required, digital or analogue implementation, convergence speed, tracking ability, and cost effectiveness. Furthermore, the type of application can have a significant impact on the selection of MPPT algorithm. For this reason, this paper summarizes the most popular MPPT techniques in use today. Two promising methods are then highlighted for consideration when implementing a system which needs to cope well over a wide range of irradiance conditions.

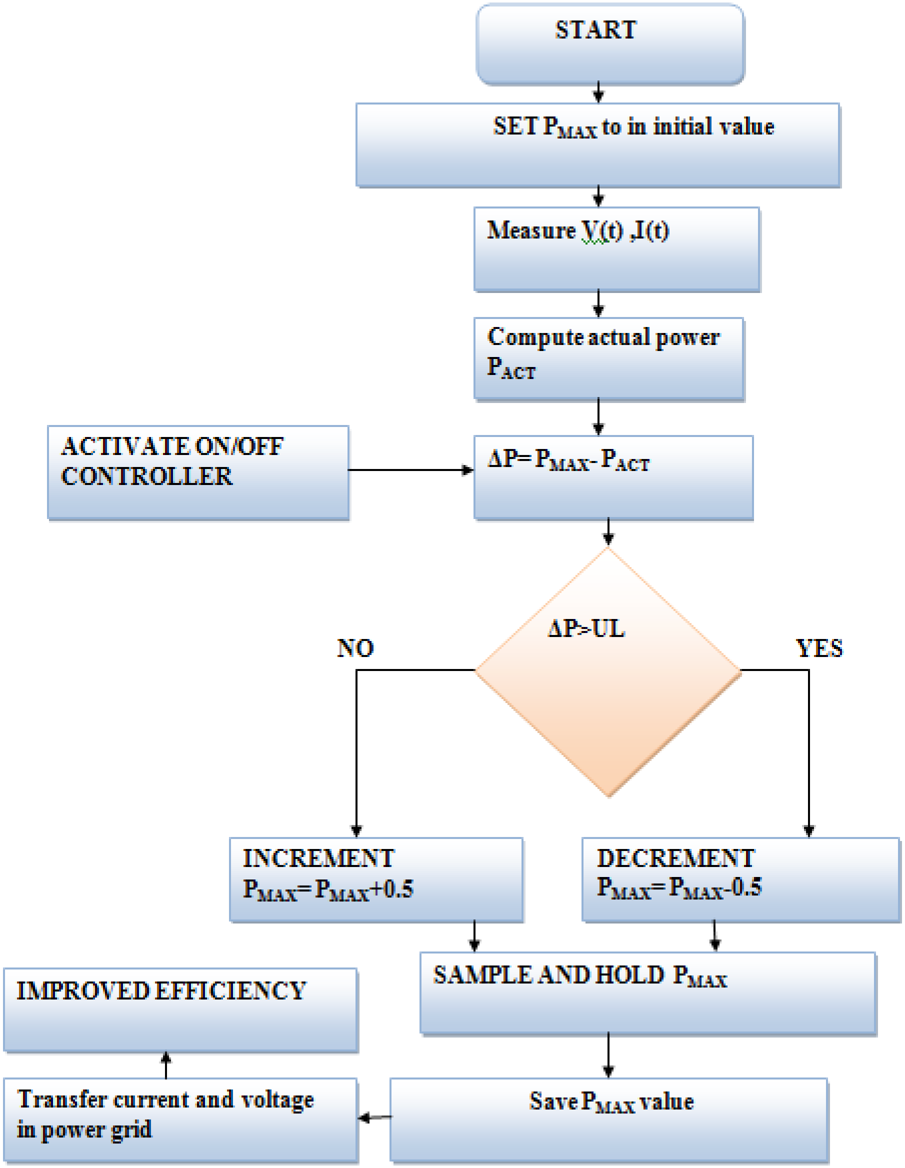

Figure 3. Flow Chart of proposed algorithms

Result And Simulation Model

A diagram of a proposed standalone photovoltaic system is illustrated in The system is modelled in MATLAB/Simulink. A boost converter is used to interface a PV array to a resistive load. The inductance of the boost converter is, input capacitance is, and output capacitor is To perform the maximum power point tracking, both P & O and IC algorithms have been implemented with all consideration of the optimization techniques. The simulation allows verification of the feasibility and relative performance of both algorithms under correctly the same conditions. Here, the main aspect to consider is the dynamic performance in terms of the speed at

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which the system converges on maximum power point, and the ripple in the power due to oscillations around the maximum power point at steady state conditions.

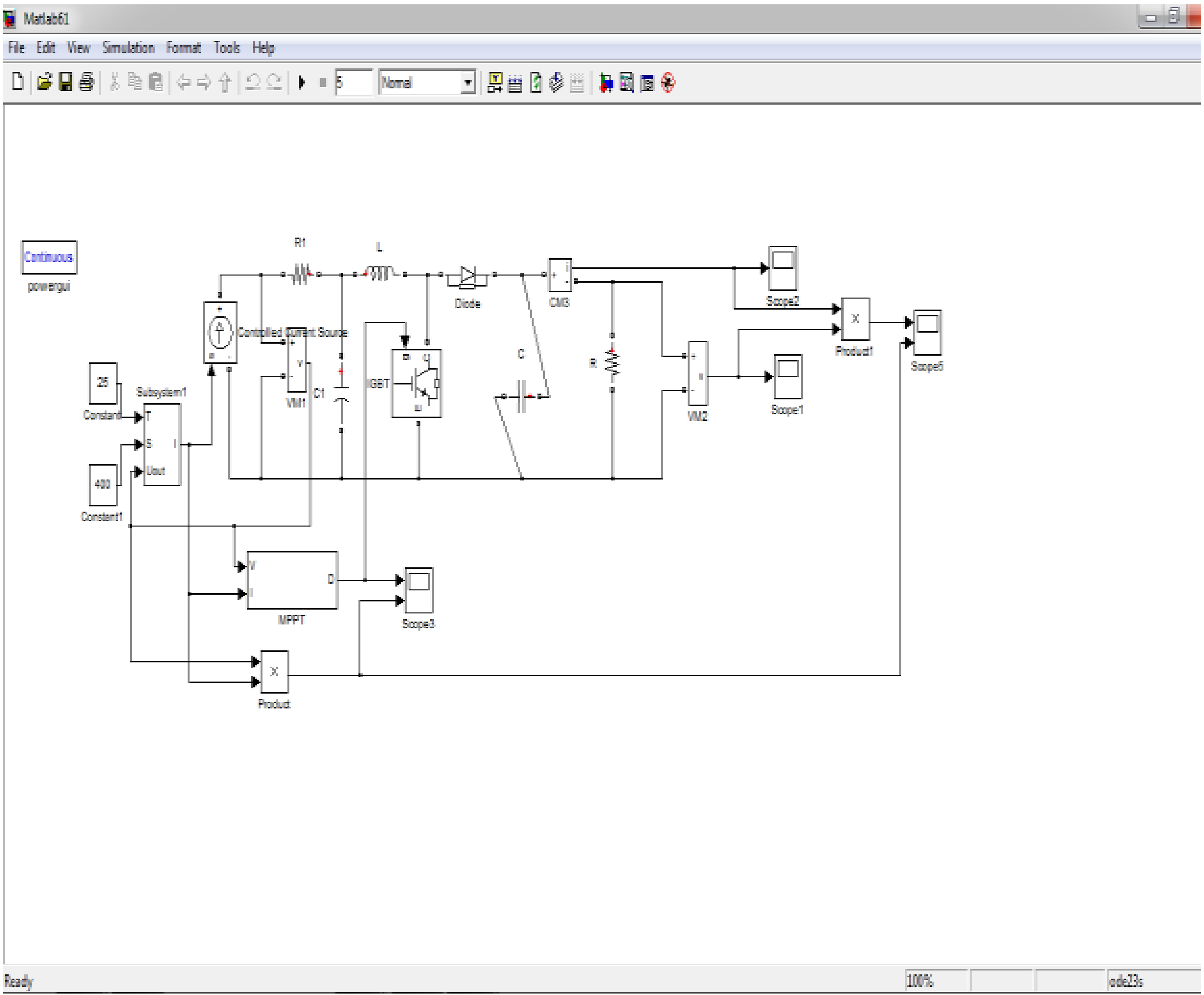

Figure 4.1 Simulink Modeling

The following different type of solar insulation are used to test the MPPT techniques at different operating conditions: step inputs (Fig.7.5), ramp inputs (Fig.7.4), rectangular impulse inputs (Fig.7.5), triangular impulse input (Fig. 15 m), and two-step input (Fig.7.5). The inputs in Fig. 15 simulate the time variation of irradiance on a PV array, for example, on a train roof during its run or on a house roof on a cloudy day, and so on.

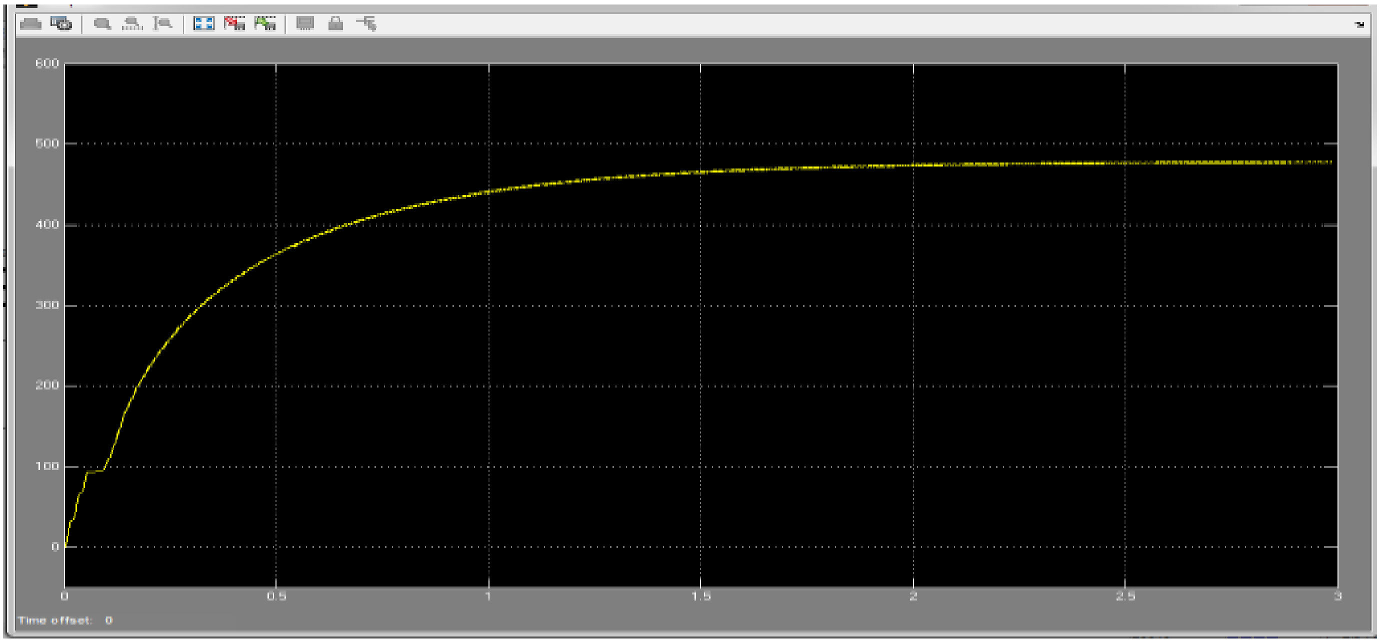

Figure 4.2 Grid Output voltage waveform.

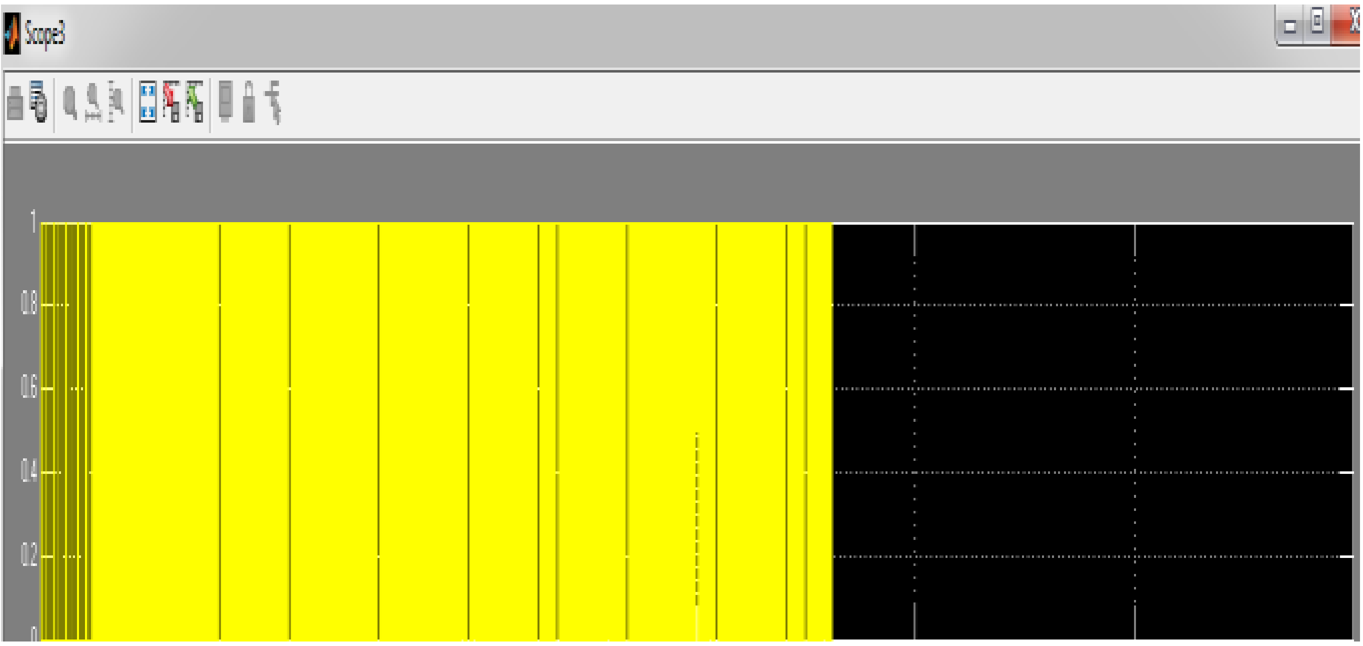

Figure 4.3 PWM Output Grid Output

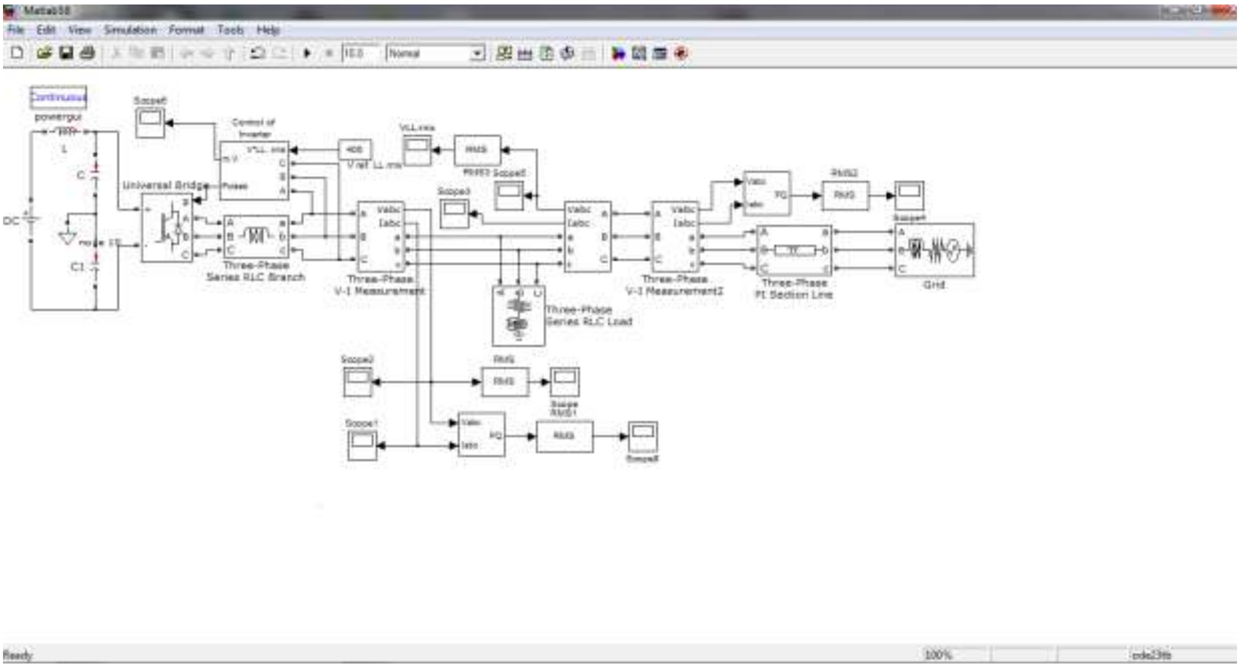

Figure 4.4 All over power of Grid.

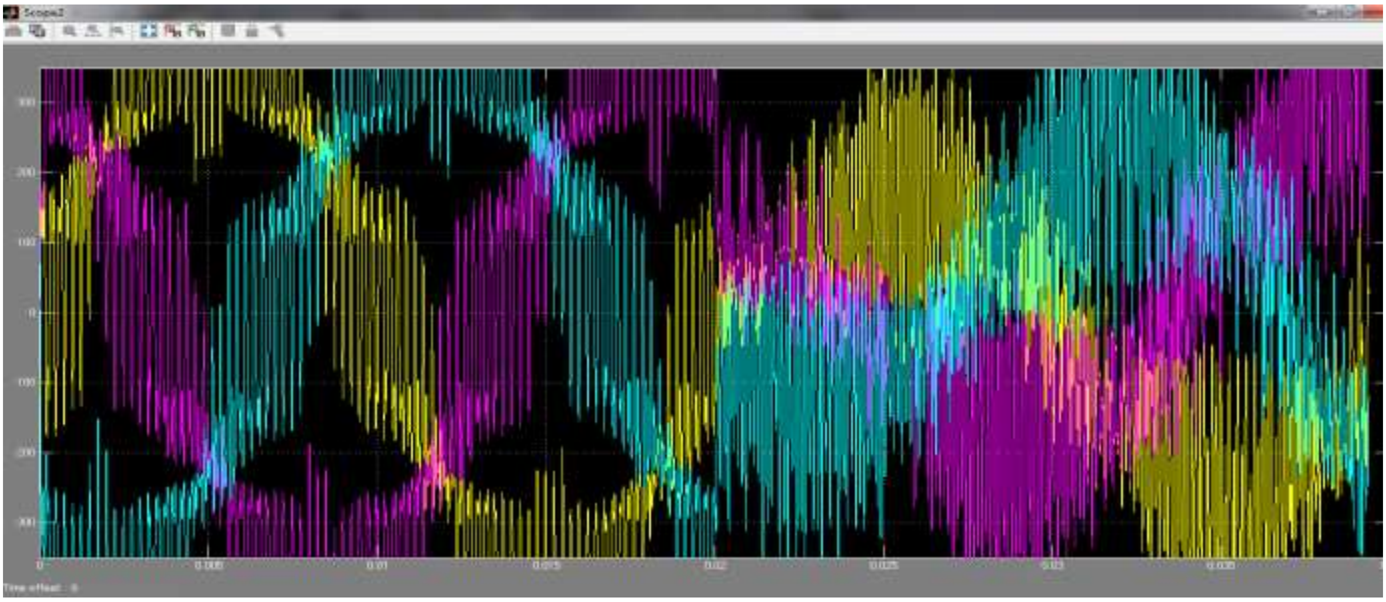

Figure 4.5 All over power of Grid Output

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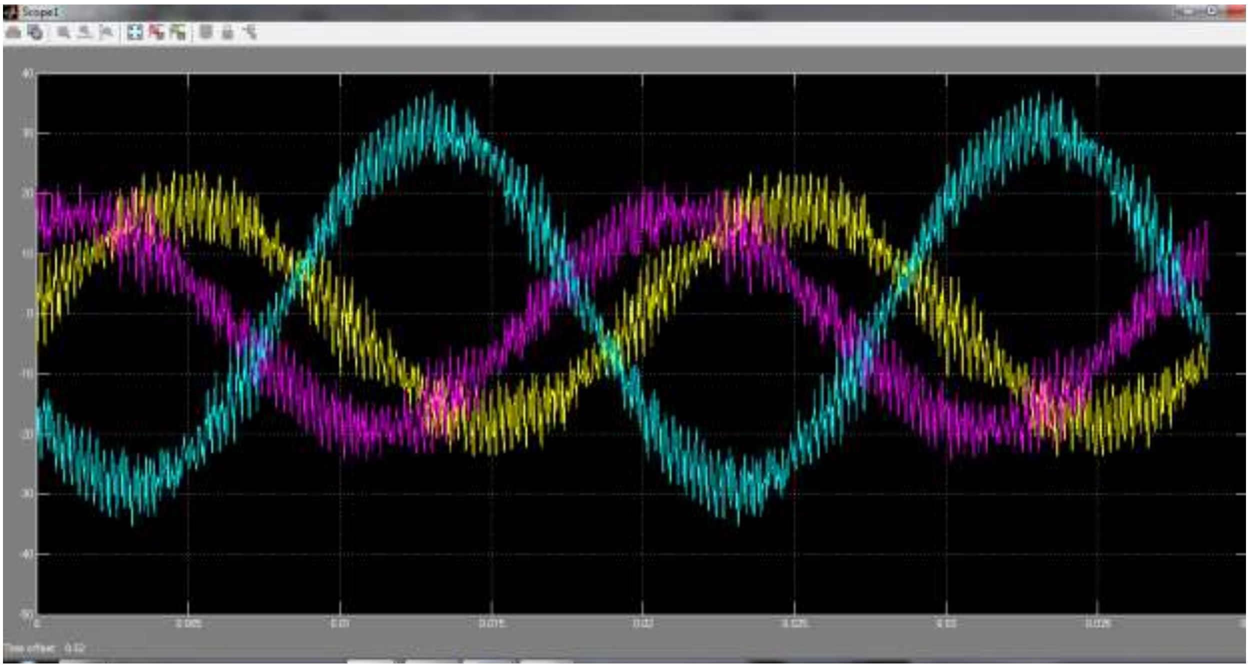

Figure 4.5 Power, Voltage, Duty cycle, Irritation curve.

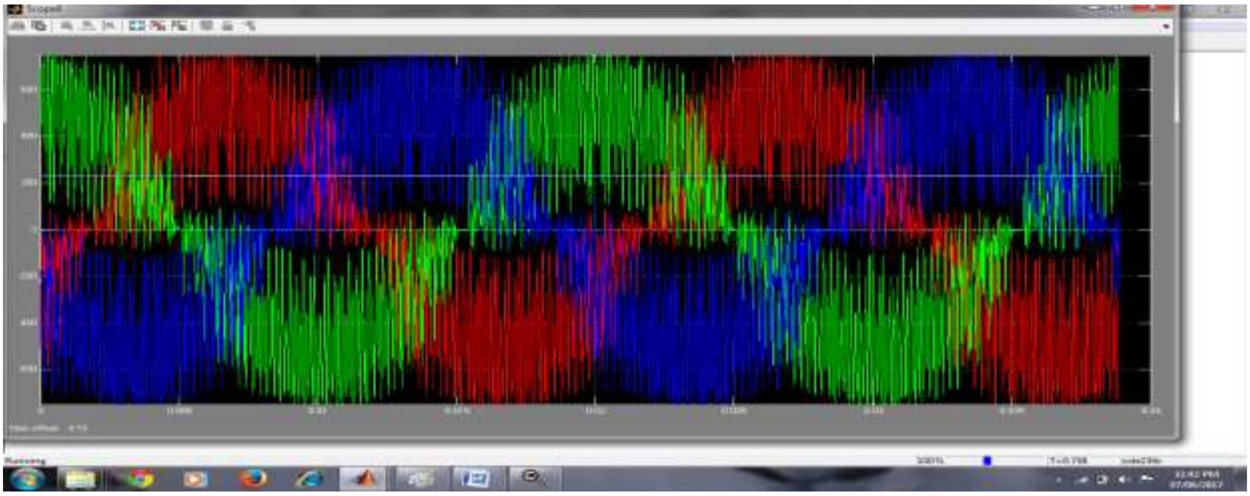

Figure 4.6 Power grid inverter output.

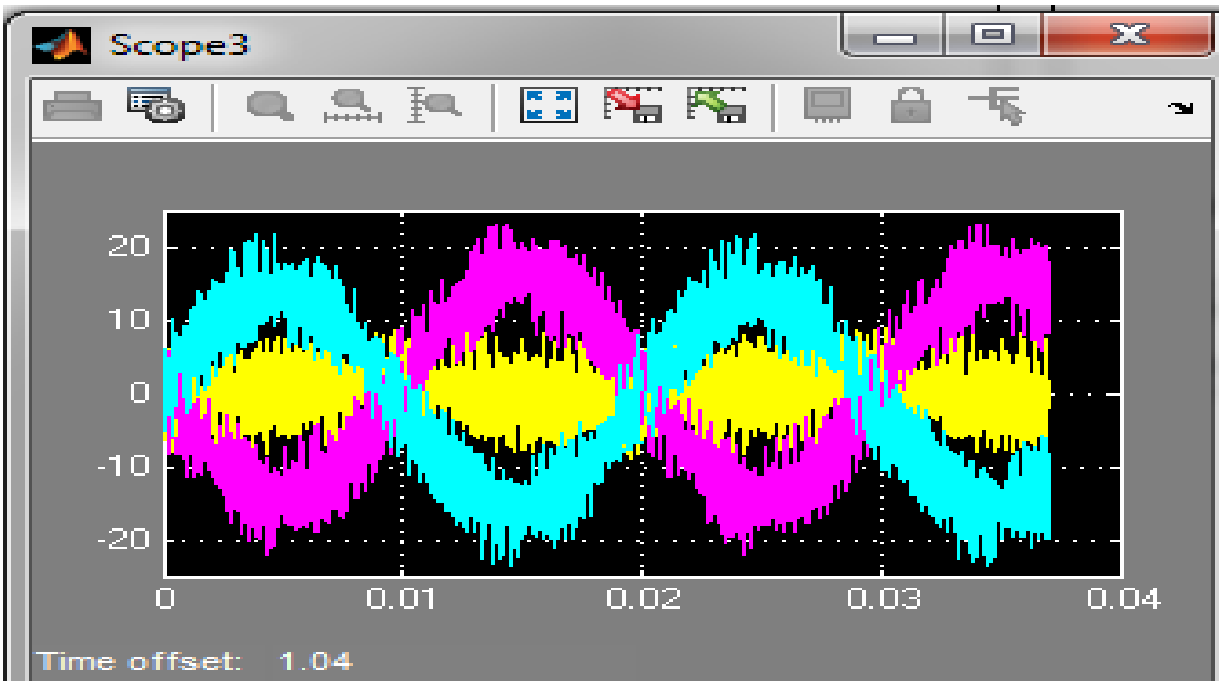

Figure 4.7 Power grid RMS current.

Table 2 Comparitvely Analysis Of Irradiace Variation With Power Grid Output

IRRADIACE W/M^2	Vdc BOOST	P(KW) BOOST	Vdc	Pgrid
250	257.93	22.56	499.36	22.20
500	264.54	46.54	500.94	45.39
800	271.50	78.26	500.99	76.26
1000	274.74	100.71	499.97	99.04

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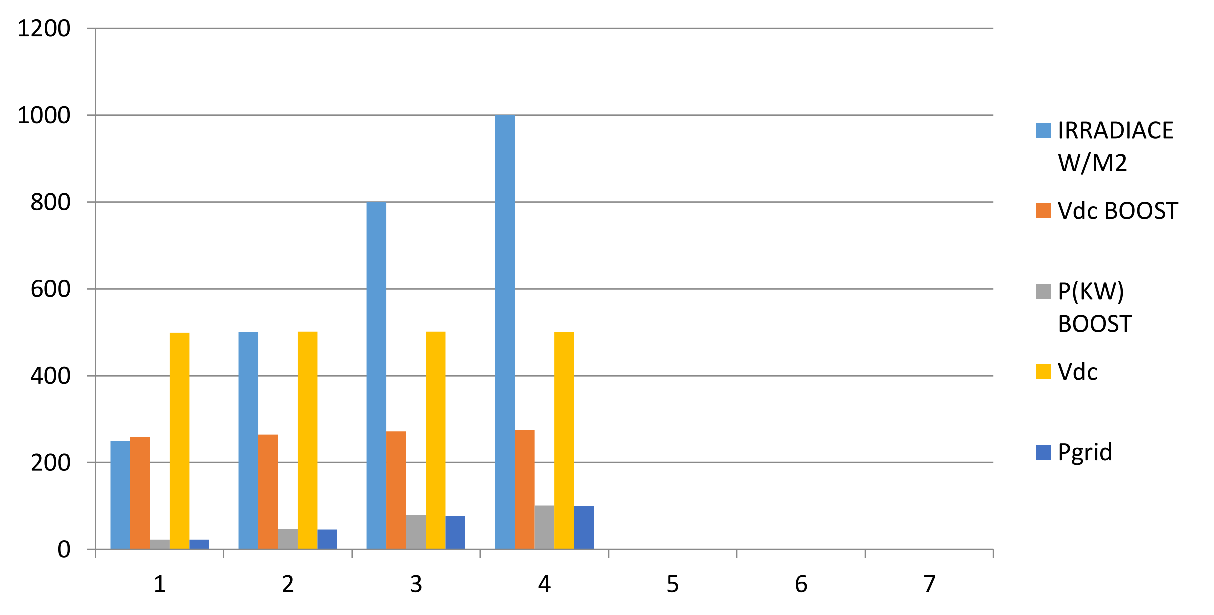

Figure 4.8 Higher efficiency above of 99.00%.

Conclusion And Future Scope

This Thesis presents an overview of MPPT methods, and considers their suitability in systems which experience a wide range of operating conditions. From this, it is clear that each MPPT method has its own advantages and disadvantages and the choice is highly application-dependent. When using solar panels in residential locations, the objective is to reduce the payback time. To do so, it is necessary to constantly and quickly track the maximum power point. Furthermore, the MPPT should be capable of minimizing the ripple around the MPP. Therefore, the two techniques stages—incremental conductance (IC) and perturbation and observation (P & O) algorithms are suitable. These two methods have been evaluated by simulating a standalone PV system, utilizing a DC-DC boost converter to connect the PV panel to the load. In particular, the performance of each method has been considered over a wide range of different irradiation conditions. Results show that the enhance of perturb and observe algorithm exhibits faster dynamic performance and achieves steady state level better than the incremental conductance method over a broad range of irradiation settings and load profiles.

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