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# Study of MPPT Controller with Leakage Current utilization By Using PID and PLL

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**ABSTRACT:**

The latest expansion in the demand of PV systems is because of the point that they produce electric power short of hindering the environments by directly changing the solar radiation into electric power. The proposed circuit planned which provides constant and stepped up dc voltage to the load. Theproposed research planned the open loop characteristics of the PV array with difference in temperature andirradiation levels. In such a technique coupled the PV array with the boost converter that with variant inload, the changing input current and voltage to the converter follows the open circuit characteristic of the PVarray closely. At several isolation levels, the load is different and the equivalent variant in the input voltageand current to the boost converter is well-known. It is well-known that the fluctuating input voltage andcurrent monitors the open circuit characteristics of the PV array closely.

**Keywords:** PV system, Boost converter, Open loop characteristics, Solar cell.

## INTRODUCTION:

There is a quick decline in the sources of energies which are conventional. Since, the expenses related to energy is increasing hence, a better alternative solution can be the use of photovoltaic systems. These sources are available in huge amount, can be recycled and are pollution free elements which are all over the earth. The problematic area is only the cost of their installation and lower efficiency in working. Hence the main motive of the work is to improve the output of

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the power and the efficiency of the whole system. It is also checked that there is constant supply of voltage to the load source independent from the difference in the irradiance and temperature of solar. The system of PV array consists of arrangement of PV cells in series and parallel configurations which are utilized in generating electricity which are dependent on the conditions of environment. Hence it becomes essential to connect the array of PV with the boost convertor. In addition with, the system is created in a manner that by the differences in the load, there is a variation in the input voltage and the power which is feeded in the convertor tracks the features of open circuit in the array. The system may provide consistent step up voltage to the loads DC in nature.[1]

**SOLAR ENERGY:**

A non-conventional type of energy source is solar energy. Since past ages the solar form of energies are utilized by the human beings respective of using several technologies. The radiations from solar, in addition with sources which are secondary and solar-powered such as wind and wave energy, biomass energy, hydro energy, etc., are proved to be the best non-conventional form of energies on earth. Just a small portion of solar radiations are utilized. [2]

The generations of electricity from the solar sources are dependent on the photovoltaic system used alongwith heat engines. The exploitation of solar energy is only done by the creativity of the humans. In order toutilize the solar radiation; the most suitable method is to utilize the panels of photovoltaic cells whichperceives the energy in form of photons from the rays of the sun and further convert it in to electricity. Thetechnologies used in solar field is categorized mainly as form of active solar energy or passive solar energywhich is dependent on the process in which they receive, convert and distribute the energy from the sun.In the case of active solar technique, utilization of PV is included with solar type thermal collector panelsto obtain the energy. In case

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of passive solar technique, the position of the infrastructure with respect to sunis included, material selection which has better thermal mass or dispersion properties of light in additionwith model of spaces which circulate the air naturally. [3-4]. The application of solar energy are diverse insectors such as distribution of generated electricity, in water heating, power light in any building, drying ofcrops etc.

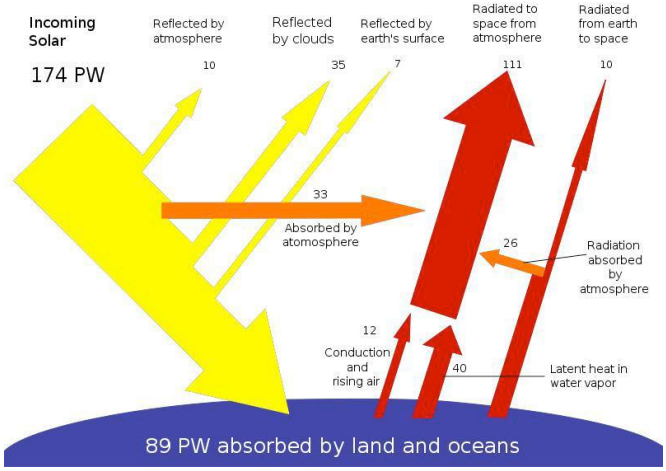


**Figure 1 Solar radiation distributions**

**PROPOSED METHODOLOGY:**

**Mppt Technique:**

Following the maximum power point (MPP) of a photovoltaic cluster is a basic phase of a PV framework [7][8]. In that capacity, numerous MPPT techniques have been presented and various variations of everystrategy have been proposed to beat particular detriments. The huge number of strategies proposed can makeit hard to decide the best strategy to embrace while executing a PV framework. The strategies all change inunpredictability, number of sensors required, computerized or simple usage, convergence speed, trackingcapacity, and cost adequacy. Besides,

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the kind of use can significantly affect the choice of MPPTcalculation. Consequently, this paper outlines the most prominent MPPT procedures being used today. Twopromising strategies are then featured for thought while actualizing a framework which needs to adapt wellover an extensive variety of irradiance conditions.The most extreme power is registered web based utilizing an adjusted perturb and observe calculation. Theregistered most extreme power is contrasted and momentary real PV power, the mistake between reference(greatest) power and genuine power enacts ON/OFF controller with a hysteresis band to drive the buckchopper. In this manner, the quick power removed from the PV is kept up between the tolerance bands.

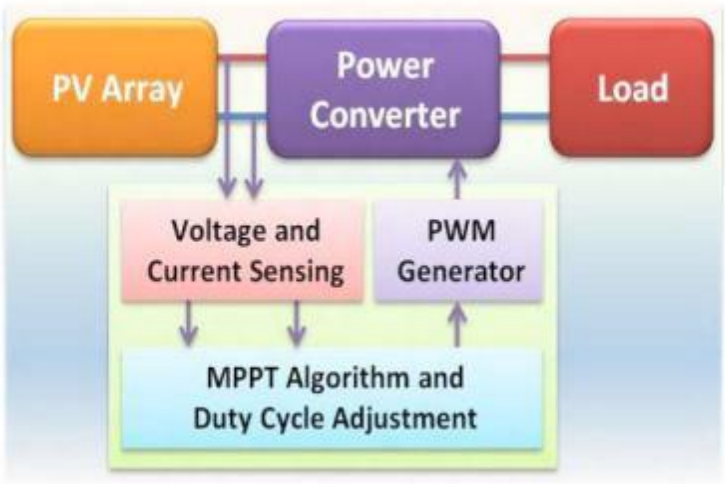


**Figure 2 Systems of MPPT**

**Perturbation And Observation (P & O) Method:**

The algorithm of P and O [5] [6], as depicted below in, operates by expanding or diminishing theclusterterminal voltage, or current, at ordinary interims and after that comparing the PV output power with that ofthe previous sample point. In the event that the PV exhibit operating

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voltage changes and power builds(dP/dV PV > 0), the control framework alters the PV cluster operating point in that direction; otherwise theoperating point is moved in the opposite direction [9]. At every perturbation point, the algorithm continuesto operate in a similar way [10] [11]. The fundamental favorable position of this approach is the simplicityof the strategy. Furthermore, previous knowledge of the PV panel qualities isn't required. In its simplestform, this method by and large displays good performance provided the solar irradiation does not shift toorapidly.

**Proposed Mppt Method In Grid Connected Pv System:**

Attempts are made mostly for MPPT techniques to obtain (search) the maximum power point VMPPas aresult from PV voltage, in other case finding the PV current IMPP with respect to the maximum PowerPoint.However, it tracks directly the maximum possible power PMAX that can be extracted from the PV. Theflowchart of the proposed MPPT method.

Rise in the values calibrated for PMAX and controlling of the power obtained from the PV tothis value. Ifin case controlling of the power is done restricted within tolerance band of the controller in hysteresis type,the tracking which was done partially is obtained and PMAX might be raised to higher value. But, in casethere is a failure of controller power in tracking the PMAX, this means that the computed PMAX is greater thanthe maximum possible power of the PV. Therefore, a reduction (decreasing) in the computed PMAX mustbe done until the error between PMAX and PACT is limited between upper and lower limit. Actually, thealgorithm starts by setting the computed maximum power PMAX to an initial value (zero or any othervalue). Actual PV voltage and current are measured. Then, the instantaneous value of PV power PACT iscomputed.

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The error between PMAX and PACT is input to ON/OFF controller with hysteresis band. The output of thecontroller is used to drive the power transistor of the Buck Chopper such that the PACT tracks PMAX. Tillnow, the real maximum power is not tracked. To track the maximum power, the error between PMAX andPACT is checked. If the error is lower than a certain upper limit (0.5 Watt), this means that the Power drawnfrom the PV is within allowable value, so we can increment PMAX by a certain step size. This new value ofPMAX is stored and used to control the actual power of the PV to track this new value. Then the algorithmis repeated again. When the error between PMAX and PACT exceed the upper limit it means that the PV isno longer able to deliver this value of PMAX. Therefore, we have to decrement of PMAX by a certain stepsize (0.5 Watt).

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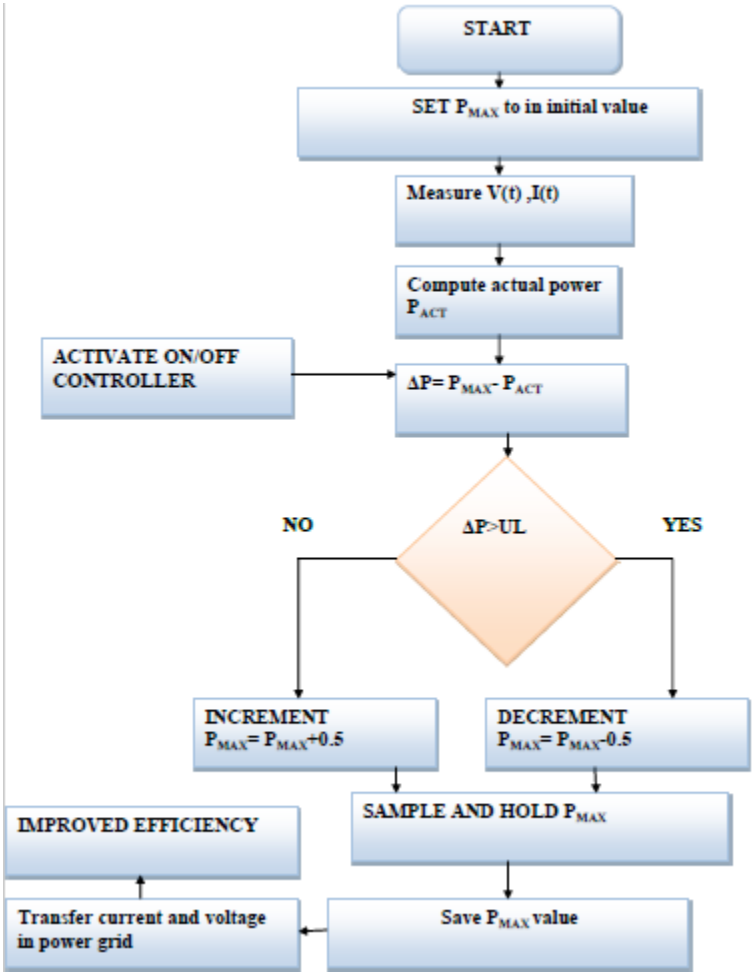


**Figure 3Flow Chart of proposed algorithms**

**RESULT AND SIMULATION:**

MATLAB/SIMULINK is used in order to create the required model of the photovoltaic system of theproposed method. A boost convertor is used in the array of PV for resistance load. The boost convertorinductance, the capacitor input and the output capacitance is used to carry out

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maximum MPP keeping trackof P&O in addition with IC algorithms which are recommended observance in notice the optimizationstrategy factors. The simulation of the tool defines the relative performance comprising the two parameterswith same conditions of working. In here the main motive is the performance dynamically in reference tospeed of convergence of the system on MPPT, in addition with the ripple effect in the power because ofoscillations at conditions of steady state.

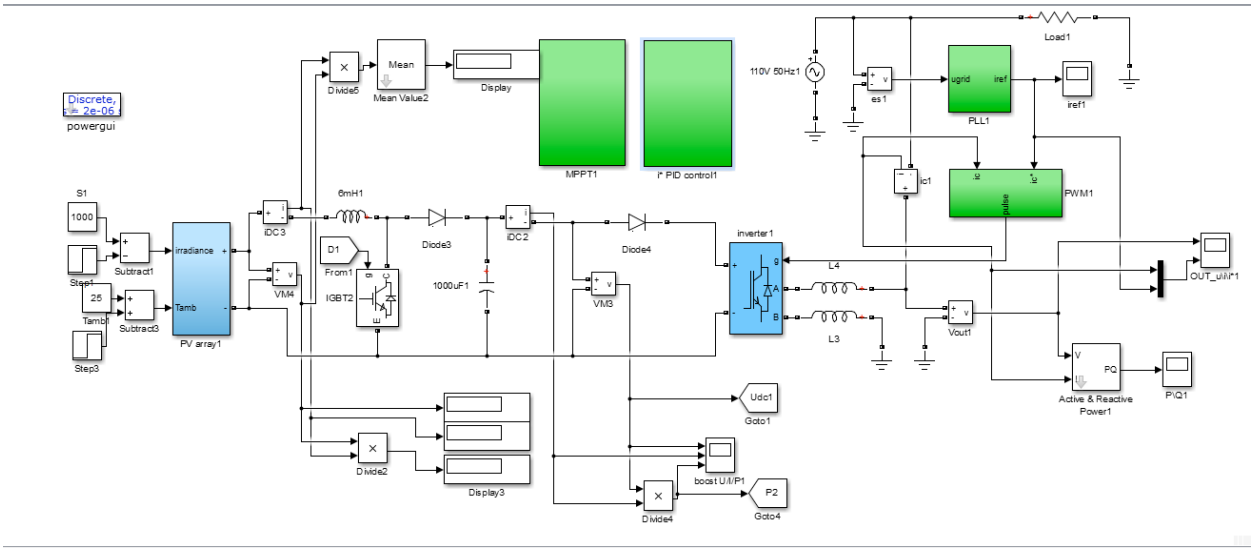


**Figure 4 MATLAB Simulink Model PID with MPPT.**

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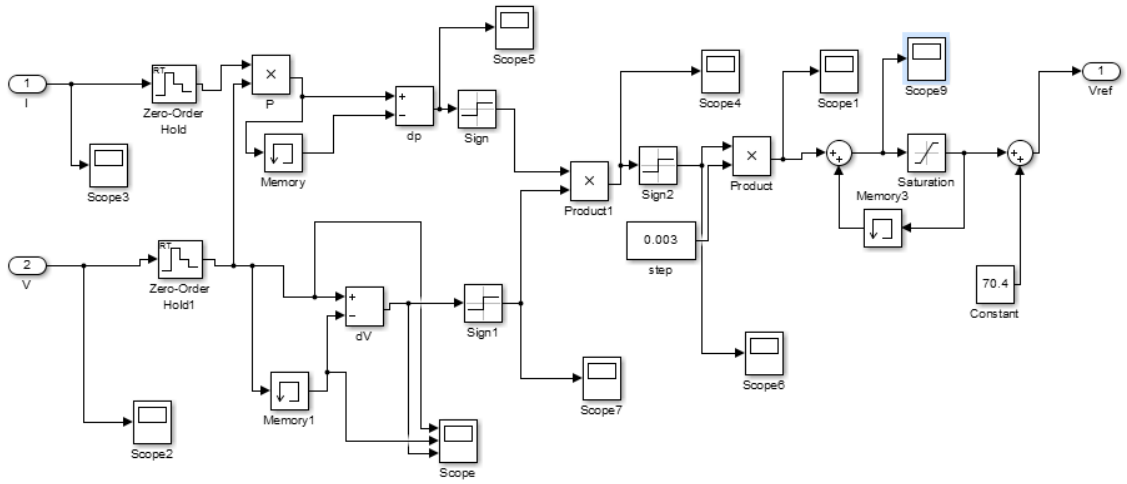


**Figure 5 MATLAB Simulink Model MPPT O&P.**

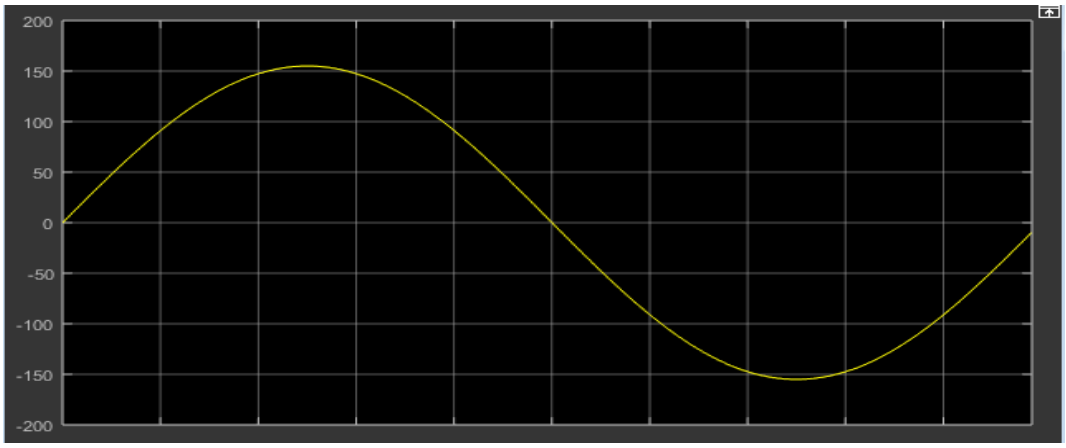


**Figure 6 Output of ALL modelling.**

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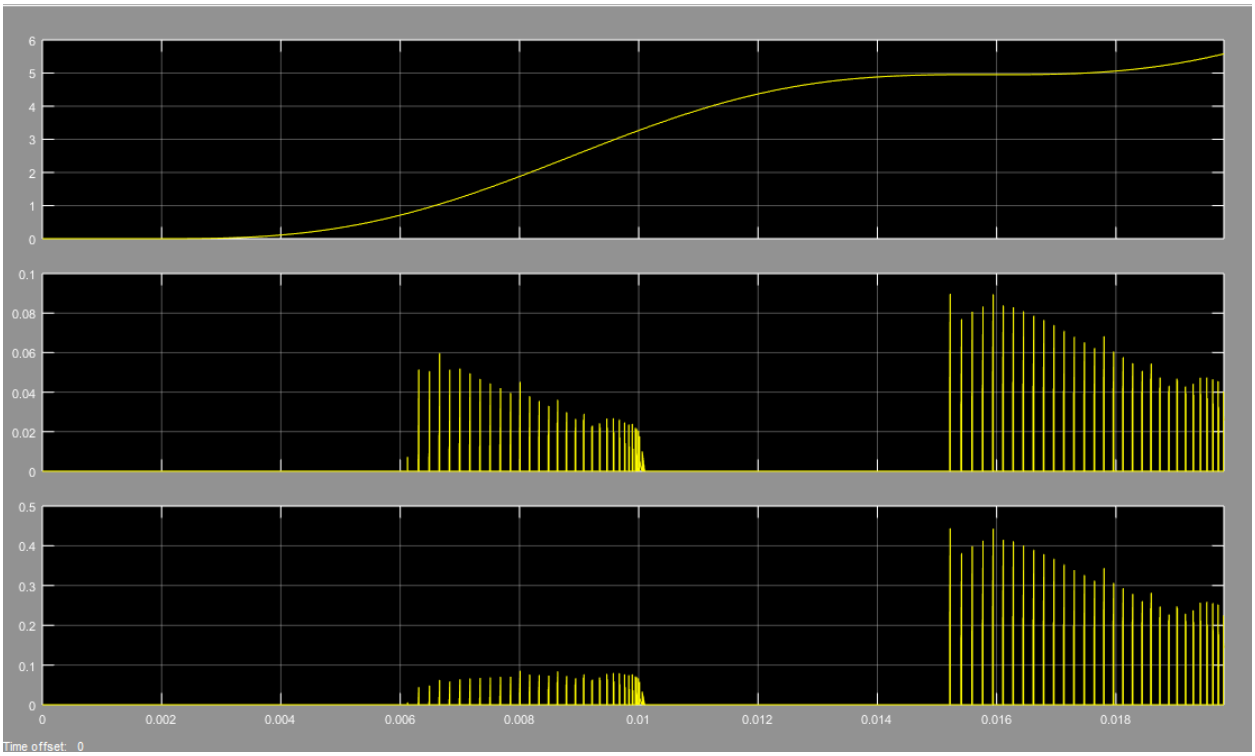


**Figure 7 Output of Boost converter modelling.**

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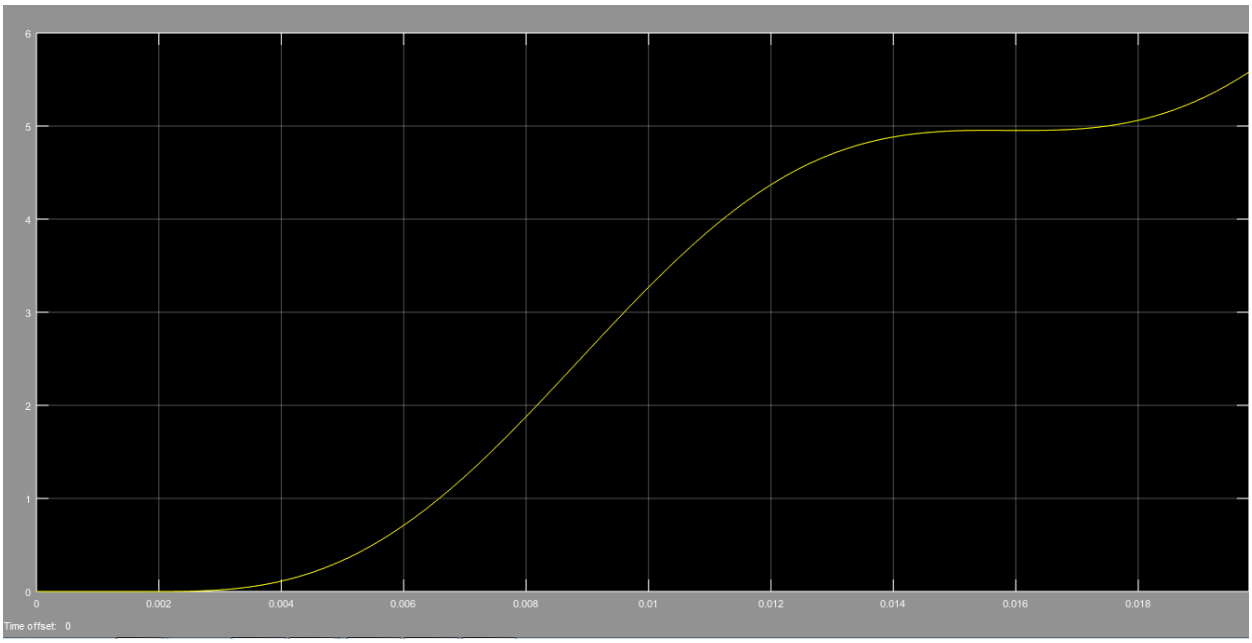


**Figure 8 Output of PID Damped**

## PARAMETERS TABLE IN OUT PROPOSED WORK

1. **without boost converter PV output:**

| | |
|---|---|
| **Irms** | **0.3456A** |
| **$V_{pv}$** | **0.4326V** |
| **$P_{pv}$** | **3.167Watt** |

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| | |
|---|---|
| **Temperature** | **$25^0$C** |
| **Irradiation** | **1000** |

**2. With Boost converter output:**

| | |
|---|---|
| **Irms** | **0.3456A** |
| **$V_{Total}$** | **150V( With Exponential Increase)** |
| **PQ** | **-2.61Watt,-1.183** |
| **Kp** | **0.00001** |
| **Ki** | **0.000015** |
| **Kd** | **0.000015** |

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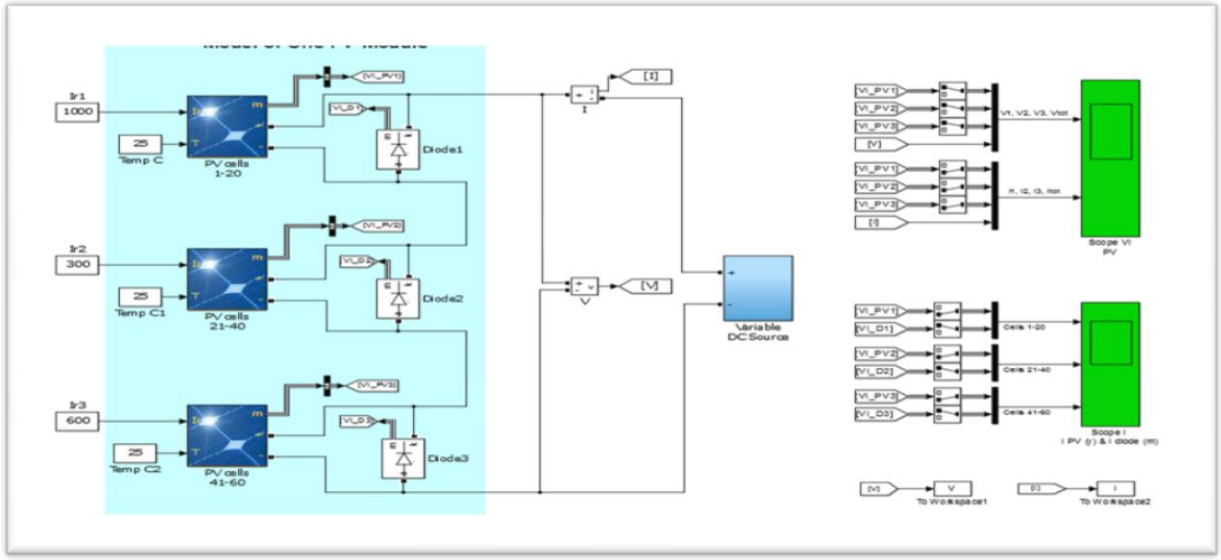


**Figure 9 PVs array with irradiation.**

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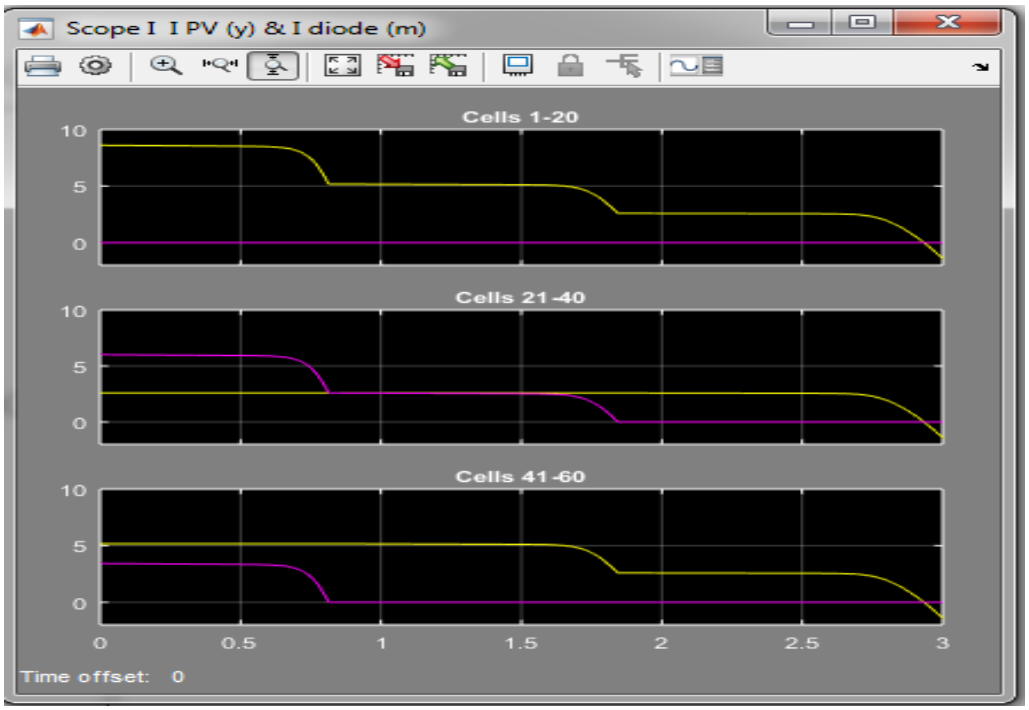


**Figure 10 Output current, voltage and power of boost converter without P&O algorithm**

**CONCULUSION:**

A summary of MPPT strategies, and considers their quality in systems that experience a large varies of in operation conditions. From this, it's clear that every MPPT technique has its own benefits and downsides and also the selection is extremely application-dependent. Once using solar panels in residential locations, the objective is to reduce the payback time. To do so, it's necessary to constantly and quickly track the maximum power point. Moreover, the MPPT ought to be capable of minimizing the ripple round the MPP. Therefore, the 2 techniques stages—incremental conductance (IC) and perturbation and observation (P & O) algorithms are

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appropriate. These 2 strategies are evaluated by simulating a standalone PV system, utilizing a DC-DC boost convertor to attach the PV panel to the load. Specially, the performance of every technique has been thought-about over a large vary of various irradiation conditions. Results show that the enhance of perturb and observe algorithmic rule exhibits faster dynamic performance and achieves steady state level better than the incremental conductance technique over a broad vary of irradiation settings and load profiles.In this proposed research, a general presentation of the photovoltaic systems and its components has been made. Models have been analyzed regarding the MPPT interaction. Different MPPT Methods have been defined and simulated. Some comparisons of MPPT's have been presented on: The requested sensors, which give an indication on the MPPT cost; the response time to a solar irradiance step; the performance of MPPT's for a 2 PV series structures; some drawbacks of each MPPT technique.

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