

Simulation and Modelling of Solar Power Generator using Simulink, MATLAB

MODELLING AND SIMULATION OF SOLAR
POWER GENERATION FOR HOME

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INTRODUCTION

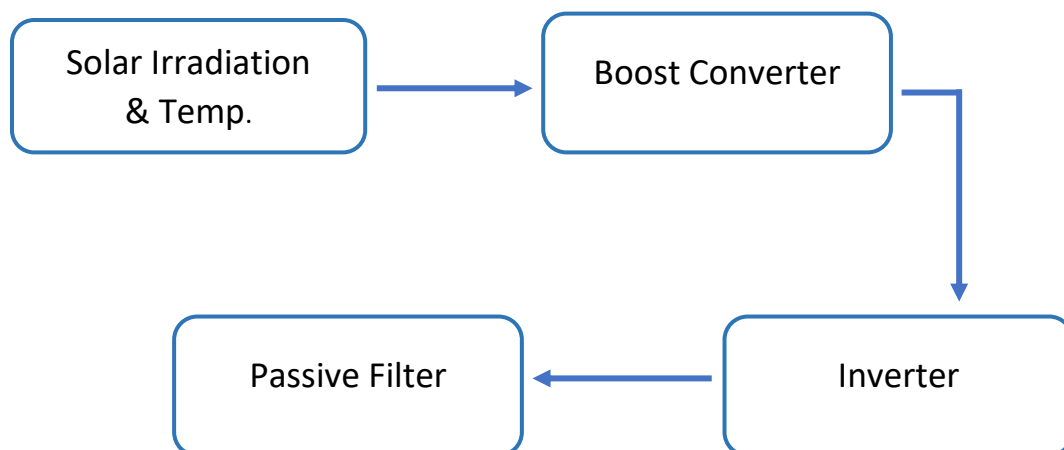
Sun is the primary source of energy, as earth receives 16×10^{18} units of energy from sun annually, which is 20,000 times the requirement of mankind. Harnessing Solar power has been the need of the times as solar power is completely clean and causes no harmful emissions.

A PV array used in the process which deliver the energy as DC output, that we can not use in our home directly so a inverter is required to convert that DC output into AC output.

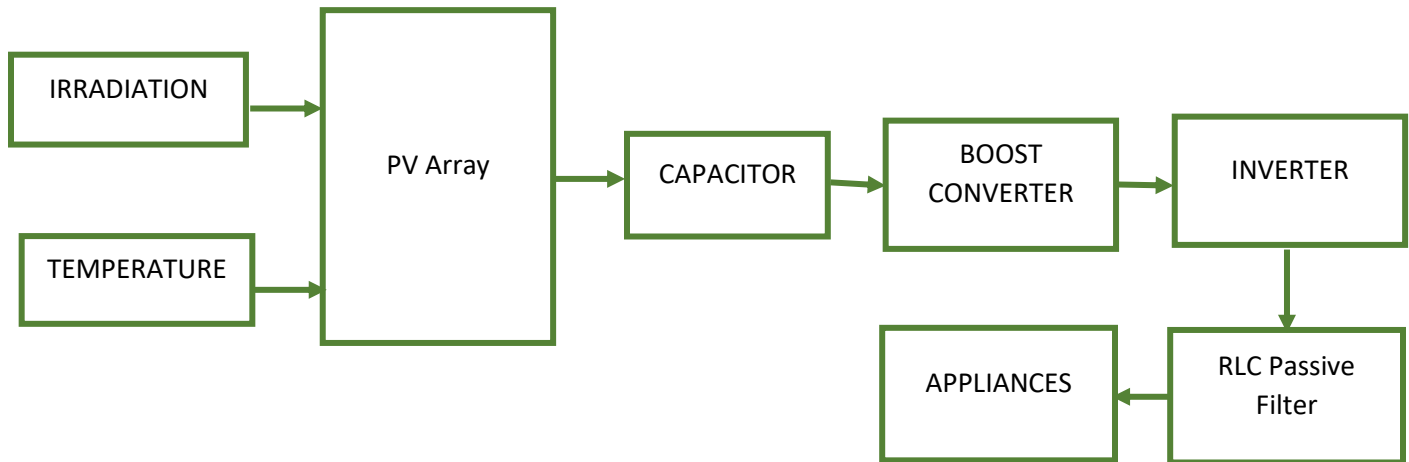
WHAT IS A SOLAR POWER GENERATOR

A solar generator works by collecting solar energy through solar panels and then storing that energy into its built-in solar battery.

An inverter connected to it, converts the collected energy (DC) into alternating current (AC) before used in home appliances.



BLOCK DIAGRAM



**Capacitor is used to reduce the ripple factor because the energy coming from sun is non-continuous.

** Inverter converts the DC into Pulsating AC. So, Passive Filter is used.

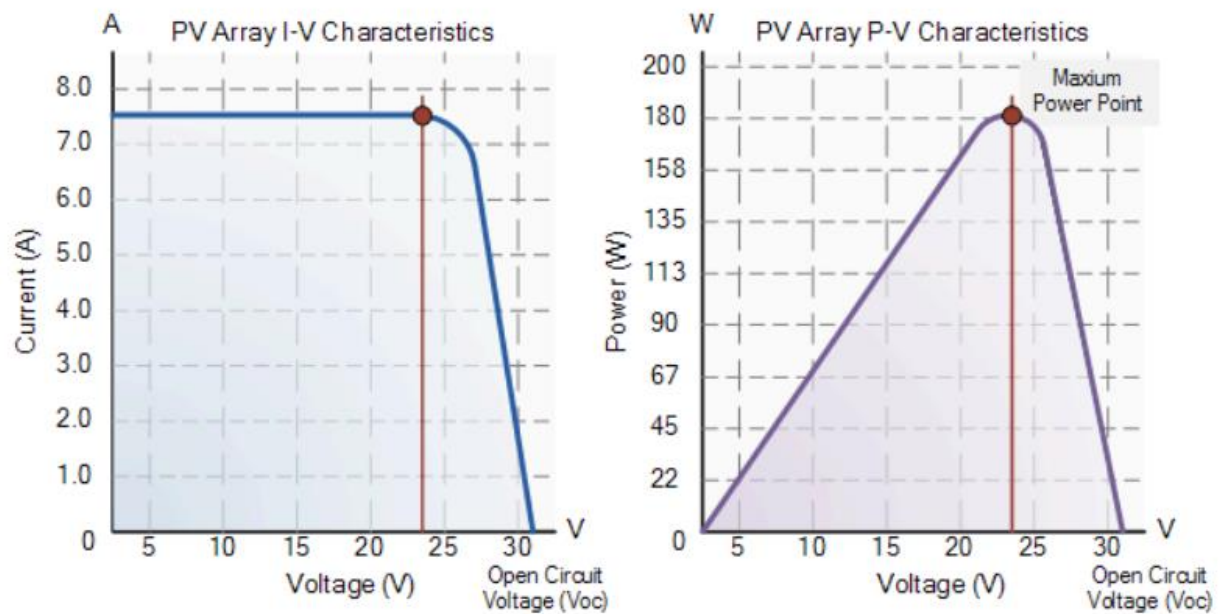
**We can use transformer instead of boost converter (but after inverter connection), but transformer is costly, so boost converter is more convenient.

PHOTOVOLTAIC ARRAY

A photovoltaic module is made up of multiple interconnected photovoltaic cell, and a combination of these photovoltaic modules is called a photovoltaic array. It is a complete power generating unit, consisting of any number of

PV modules. The electrical characteristics of a photovoltaic array are summarized in the relationship between the output current and voltage. The performance of PV modules is generally rated according to its maximum DC power output under Standard Test Conditions.

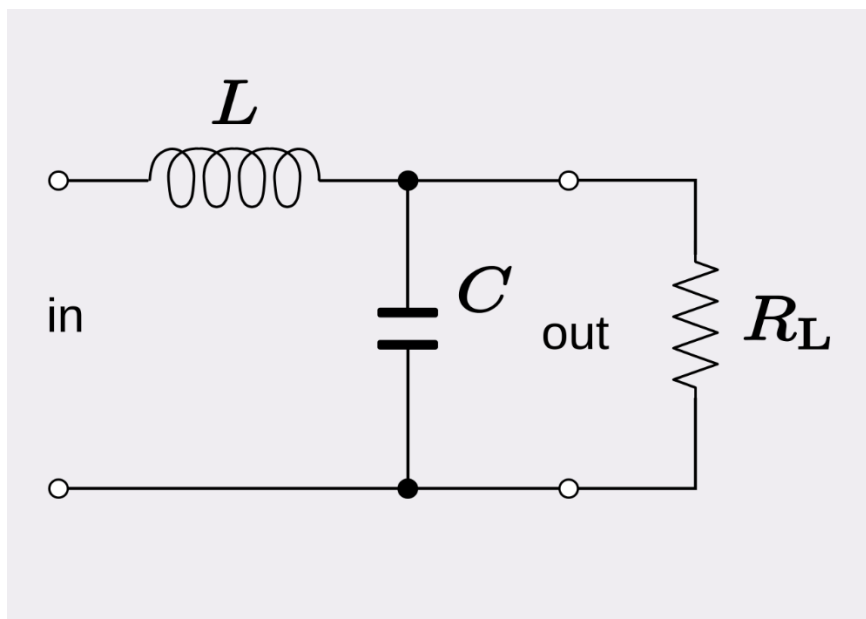
PV cells are made up of silicon or gallium arsenide, and convert incoming solar radiation to electrical energy in the form of variable DC signal.



RLC LOW PASS FILTER

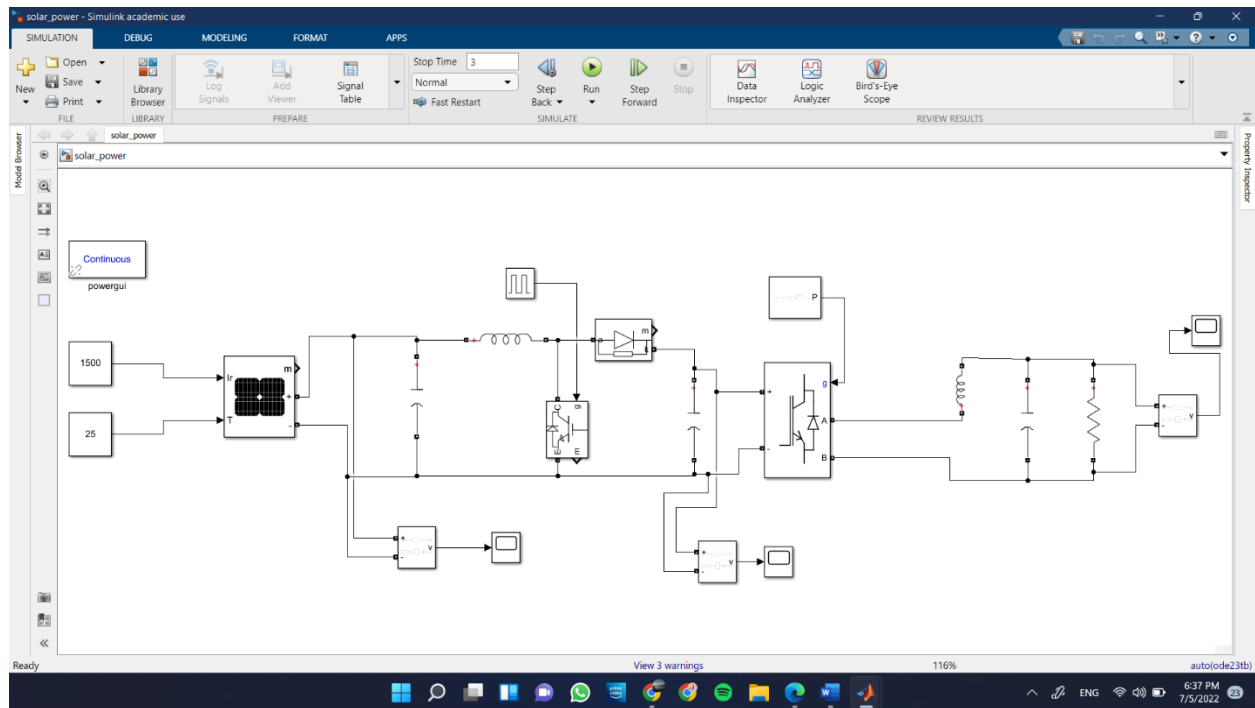
The low pass filter only allows low frequency signals from 0Hz to its cut-off frequency point to pass while blocking those any higher. The circuit forms a harmonic oscillator for current and will resonate in a similar way as an LC circuit will. The main difference that the presence of the resistor makes is that any oscillation induced in the circuit will die away over time if it is not kept going by a source. This effect of the resistor is called damping. The presence of the resistance also reduces the peak resonant frequency somewhat. Some resistance is unavoidable in real circuits, even if a resistor is not specifically included as a component.

In our simulation, RLC circuit used to convert the pulsating AC into AC.



IMPLEMENTATION

Simulink Model :



Specification of the system—

Open Circuit Voltage of the PV Array= 36.3V

Capacitance $C=0.006F$

Inductance $L=0.02H$

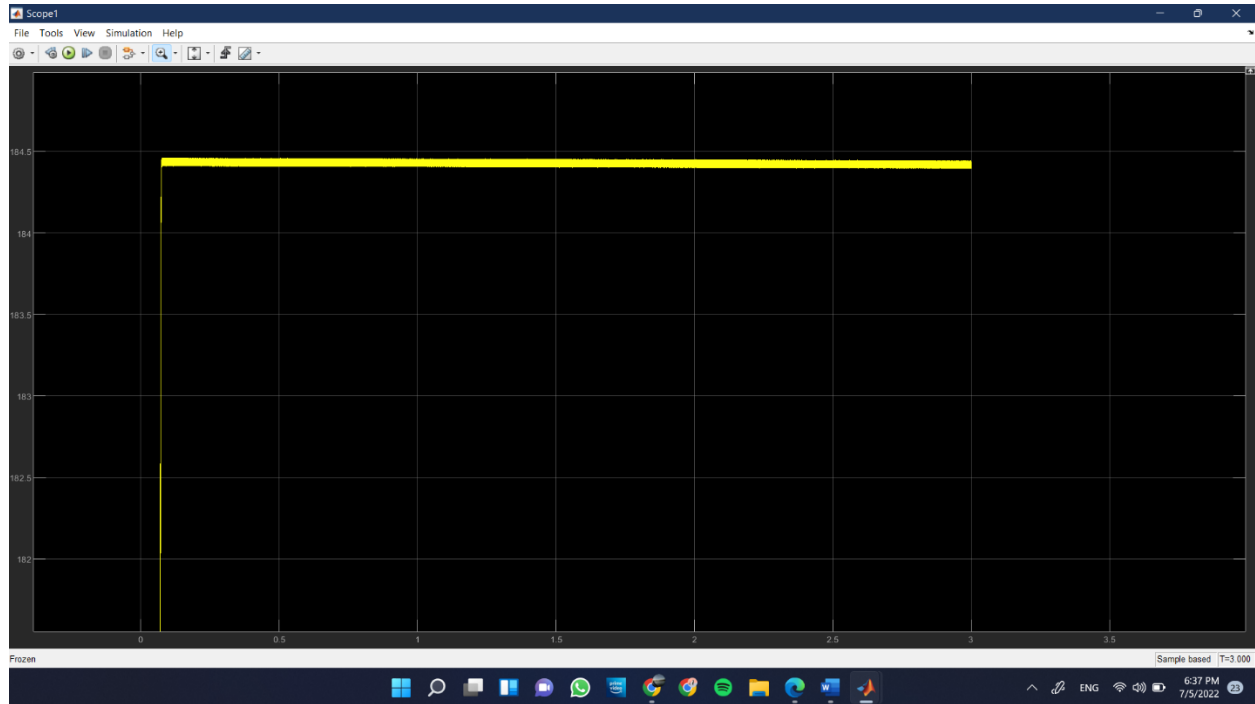
Resistance $R=1ohm$

Pulse Generator: Period(sec)= $1/1500$

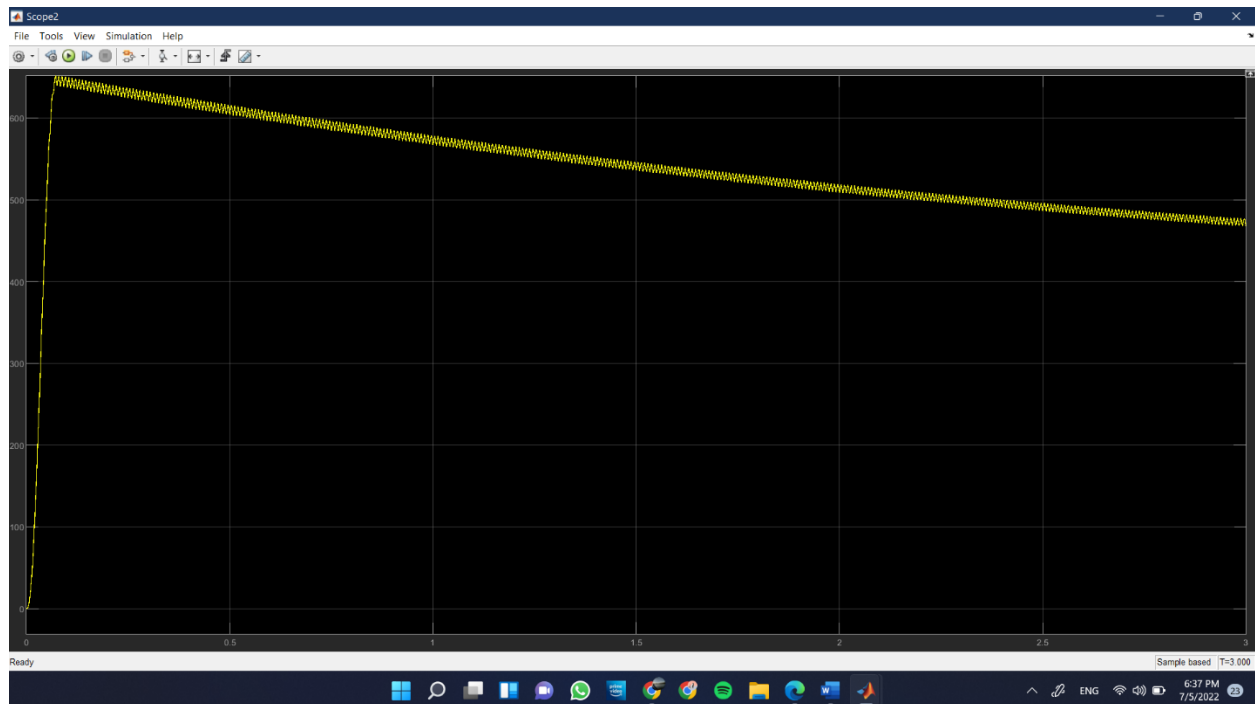
Pulse width= 50% of period

Output:

Scope 1-



Scope 2-



Scope 3-

