Critical Simulation Solar Energy System

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Abstract— *A variable measurement system for systematic testing and measurement of the evolution of the I-V characteristic curves of photovoltaic panels or arrays is presented in this paper. The measurement system uses a circuit solution based on DC-DC converter. In addition, model is extended to grid connection of Isolated systems (i.e, Residential). An experimental test was conducted and the obtained results were presented.*

Key Words: Photovoltaic module, Comprehensive setup, Simulation.

I. INTRODUCTION

Solar energy is radiant light and heat from the sun solar heating , photovoltaics , solar thermal energy , solar architecture and artificial photosynthesis.

Solar power is the conversion of sunlight into electricity, either directly using photovoltaics (PV), or indirectly PV converts light into electric current using the photoelectric effect.

II. WAYS FOR CONVERTING SOLAR ENERGY INTO ELECTRICAL ENERGY

There are two ways by which we can convert solar energy into electrical energy. These are as shown in figure.

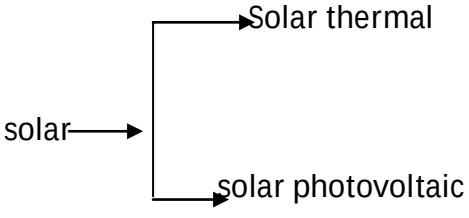


Figure: Ways of converting solar energy into electrical energy

Solar thermal:

uses lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. The heat is then used as a heat source for a conventional power plant. In all of these systems a working fluid is heated by the sunlight, and is then used for power generation or energy storage

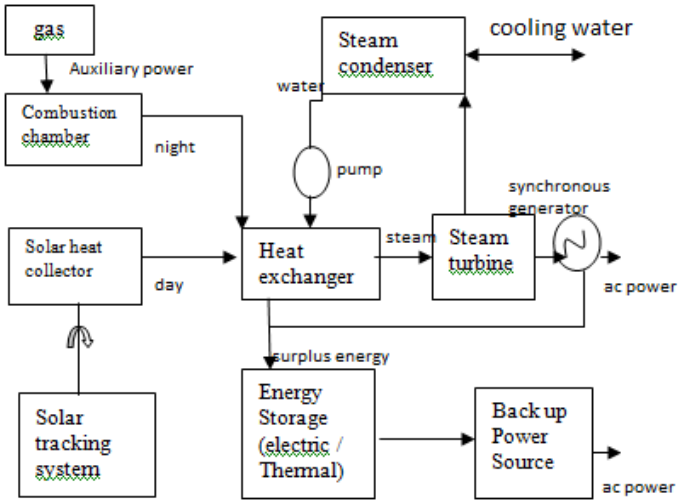


Figure: Large Scale electric power from solar thermal energy

Solar Photovoltaic: A silicon PV cell is a thin wafer consisting of an ultra-thin layer of phosphorus doped (N type) silicon on top of a thick layer of boron doped (P type) silicon. An electrical field is generated near the top surface of the cell where these two surfaces are in contact, forms P-N junction. When sunlight strikes the surface of a PV cell, this electrical field provides direction to light electrons, resulting in a flow of

current to an load.

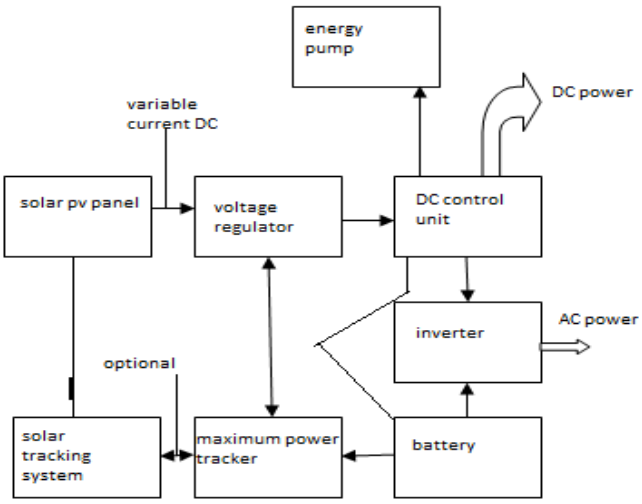


Figure: Photovoltaic Electric power Generation

III. WORKING OPERATION OF SOLAR CELL

- A solar power system typically has three main components.
  - A. The solar panel
  - B. The charge controller
  - C. The Battery
- The solar panel charges the battery and the charge controller manages the battery charging process.

A fourth optional part can also be used – an inverter. This would only be required in cases where you need to convert the DC power to AC.

IV. PROPOSED MODEL

- PV array_Grid : in this model of a 100-kW array connected to a load. DC-DC boost converter and a three-phase three-level inverter is used .Maximum Power Point Tracking (MPPT) is implemented in the boost converter and by using pulse width modulator technique pure sinusoidal ac generated. This power directly connected to isolated systems..
- In this model we use 96 parallel pv strings are used to generate 90 volts dc .
- Then , from avaliable 90v dc supply step up by using DC-DC boost converter , maximum power point tracing (MPPT) charge controller
- Then from avaliable dc by using three level bridge inverter DC is converted to AC of 150v

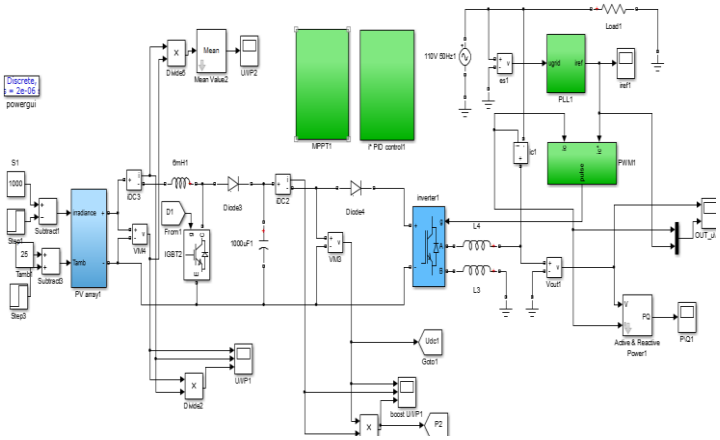


Figure : proposed model

PV ARRAY

In this model, our requirement is to generate 100kw power from solar .

For generation of 100kw , 120 solar panels required each panel rating is 120w.

These 120 panel are connected in series to generate 75 volts dc.

Now a days , households requirement is AC supply so DC supply is converted to AC by using three level bridge inverter.

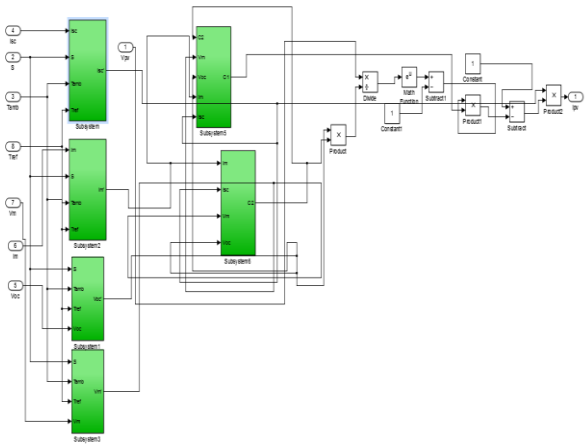
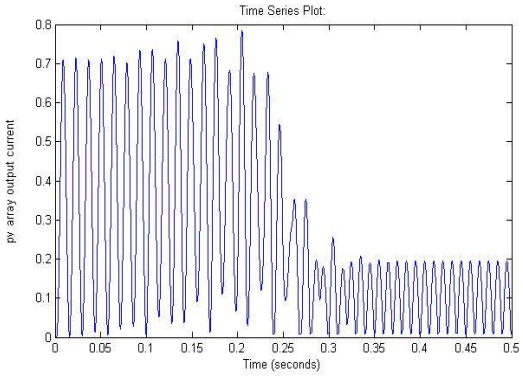


Figure: block diagram of pv array

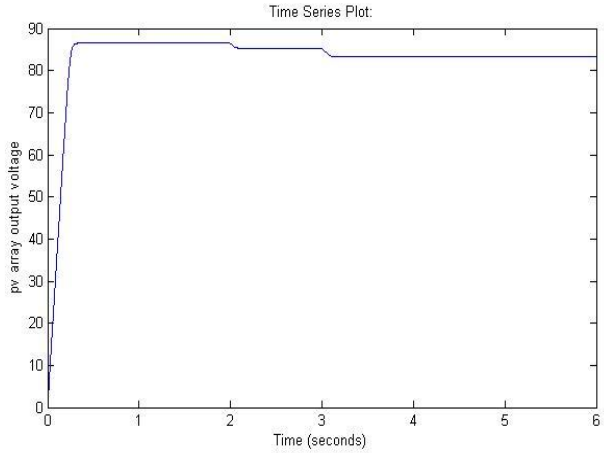
V. RESULTS

This section presents the characteristics of PV array obtained from the simulation

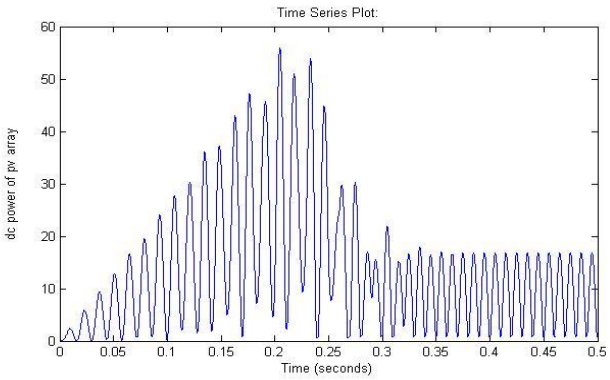
1. OUTPUT CURRENT OF PV ARRAY



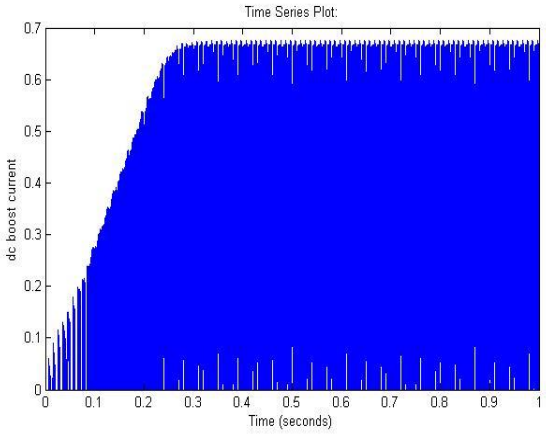
2. Output voltage of pv array



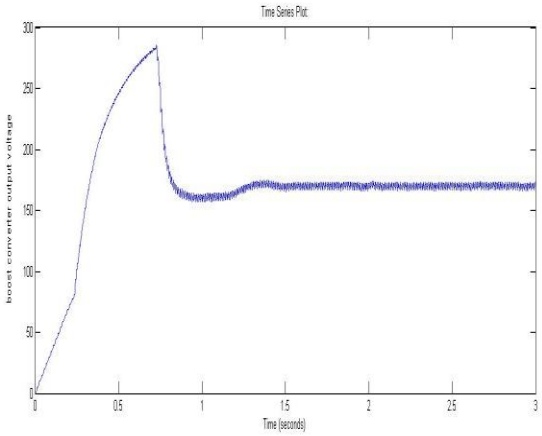
3. Output power of pv array



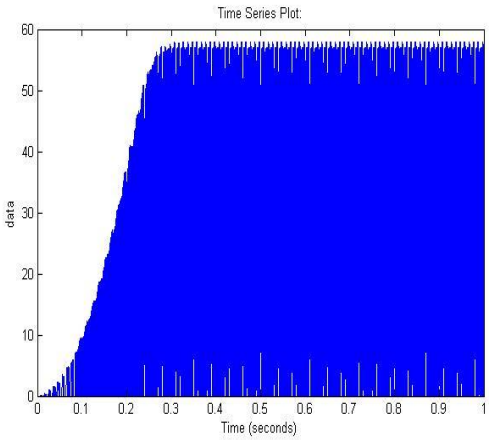
4. Boost converter output current



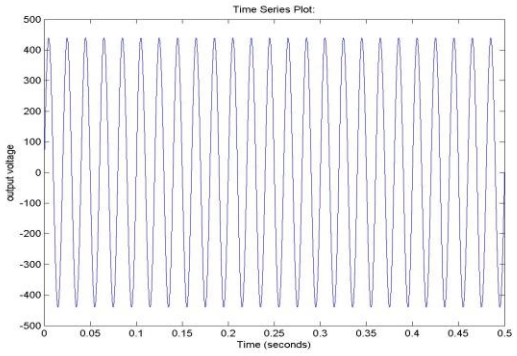
5. Boost converter output voltage



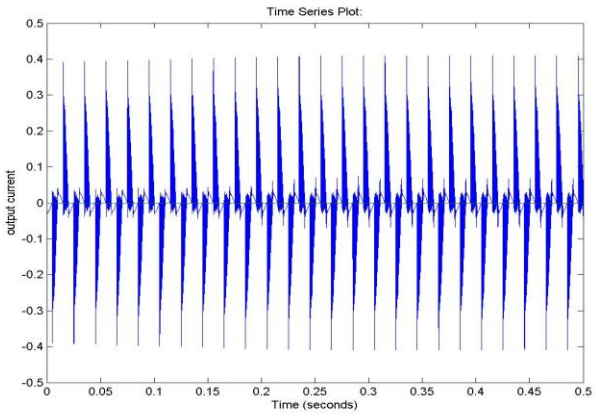
6. Boost converter output power



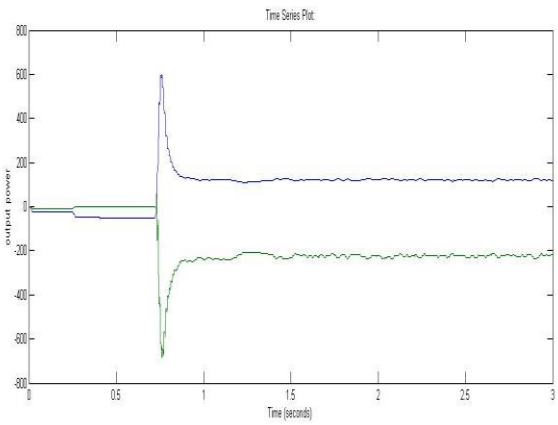
7. AC output voltage



AC output current



Output power



VI. CONCLUSIONS

The step by step procedure for modelling of PV araay is presented in this thesis using mathematical expressions. Of photovoltaic cell. In this thesis the total cost for generation of 1mw power plant is presented.

The simulation has been done on the following characteristics, are presented in this thesis:

I. I-V characteristics
II. P-V characteristics

And corresponding results are obtained in simulation are presented in this thesis

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