

# Portable Solar Tree

S.Abimanyu<sup>1</sup>, P.Jagadheeswaran<sup>2</sup>, S.Jaganath<sup>3</sup>, K.Sanjay<sup>4</sup>, R.Sivapranesh<sup>5</sup>, K.Velmurugan<sup>6</sup>,  
N.Mohananthini<sup>7</sup>, C.S.Satheesh<sup>8</sup>, S.Saravanan<sup>9</sup>

*UG Scholars<sup>1,2,3,4,5,6</sup>, Assistant Professor<sup>8</sup>, Associate Professor<sup>7</sup>, Professor<sup>9</sup>*

*Department of Electrical and Electronics Engineering Muthayammal Engineering College (Autonomous),  
Rasipuram, Tamilnadu India*

**Abstract** - The project work described the design and implementation of solar tree structure design with the rising population and less place to produce energy efficiently. Solar panel has been used increasingly in recent years to convert solar energy to electrical energy. The solar panel can be used either as a stand-alone system or as a large solar system that is connected to the electricity grids. The earth receives 84 Terawatts of power and our world of renewable energy source and that energy source should not cause pollution and other natural hazard consumes about 12 Terawatts of power per day. We are consuming more energy from the sun using solar panel. In order to maximize the conversion from solar to electrical energy, the solar panels have to be positioned perpendicular to the sun. Thus, the tracking of the sun location and positioning of the solar panel are important. Photo resistors will be used as sensors in this system. The system consists of light sensing system, microcontroller, gear motor system, and a solar panel. Our proposed system got the output up to 40% more energy than solar panels without tracking system.

**KEYWORDS:** Solar panel, Battery, Solar inverter, Solar Tree

## I. INTRODUCTION

In recent year, the utilization of renewable energy has become an attractive cause of the improvements in semiconductor technology. Since PV systems are relatively expensive, researchers in the field of PV are concentrating more on improving the conversion efficiency of solar energy. There are various factors that contribute to the reduction of output power from PV arrays. One of the major factors is partial shading. Partial shading is caused by the passage of clouds, buildings, towers, and trees. The losses caused by alternative to fossil fuels because of the growing concern on the environmental issues. PV is emerging as a promising solution because partial shading are mainly due to the electrical configuration of the modules in the array because a shaded module in series with other unshaded modules limits the string current thereby reducing the maximum power generated by the array.

## II. PROPOSED SYSTEM

### *Solar Tree Solar panels*

A solar panel is a series interconnected silicon cells joined together to form a circuit. In greater numbers the amount of power produced by these interconnected cells can be increased and used as an electricity production system. To make solar cells, the raw material silicon dioxide of either quartzite gravel or crushed quartz is first placed into an electric arc furnace, where a carbon is applied to release the oxygen. The product escapes carbon dioxide and molten silicon. When light energy strikes the solar cell, electrons are knocked loose from the atoms in the semiconductor material. If electrical conductors are attached to the positive and negative sides, forming an electrical circuit, the electrons can be captured in the form of an electric current that is electricity.

### *Pipes*

Solar PV modules are mounted on a single tall pole and the branches are connected to it. The branches of the solar tree are tilted at an angle 40-45 for acquiring more amount of sun rays. To get the required power for the small household purpose total of six branches are being installed containing solar panel at the tip and the top of the pole consists of one solar panel having tilting mechanism to tilt the topmost solar panel at different angles through the day.

### *Battery*

Battery is used to store the power which is generated by the solar power tree. The Separator and plates absorbed the dilutesulfuric acid electrolyte and immobilized. When the battery accidentally overcharged then it produce hydrogen and oxygen, special one-way valves allow the gases to escape thus avoiding excessive pressure build up otherwise, the battery is completely sealed and is, therefore, maintenance free, leak proof and usable in any position.

*Solar Charge controller*

A charge controller limits the rate at which electric current is added too drawn from electrical batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, it may also prevent completely draining a battery or perform controlled discharges, depending on the battery technology to protect battery life.

*Inverter*

An inverter is one of the most important pieces of equipment in a solar energy system. It is a device that converts direct current (DC) which a solar panel generates, to alternating current (AC) which the electrical grid uses.

*Solar Panel*

Solar panel is made up of small solar cells. When sunlight falls into the solar cells, they convert light energy into current or electricity. Solar tree generates energy during day time and in night LED's of solar tree are automatically on and get off in the morning. This automated process is done by the sensors which are used in solar tree. Here we are using total seven solar panels. Out of them six panels are fixed at top of the branch and the other one is rotating according to the position of sun. The rotation of solar panel is done by using DC motor. Out of the seven panels three panels are connected in parallel and the other three panels are also connected in parallel. Then remaining one panel and both the parallel connections are connected in series. These panels connections are given to the charge controller.

*Block Diagram*

Fig shows the block diagram for solar tree. The charge controller is connected to the battery. The battery is used for storage. When sunlight falls on the solar panels generation of electricity takes place. Firstly, there are three panels which are connected in parallel and next three panels are also connected in parallel and the output of solar tree is connected to charge controller which displays voltage and it prevents overcharging and may protect against over voltage.

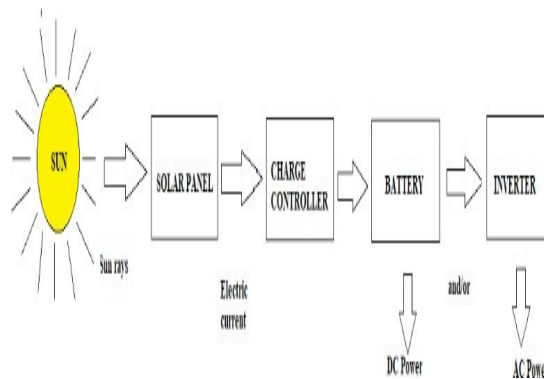


Fig.1 Block Diagram for Solar Tree  
 III. RESULTS AND DISCUSSION

*Simulation Result*

Three panels are parallel connection and two panels are series connected Characteristic of Voltage and current characteristics of solar module. MATLAB simulation result as shown in Figure.

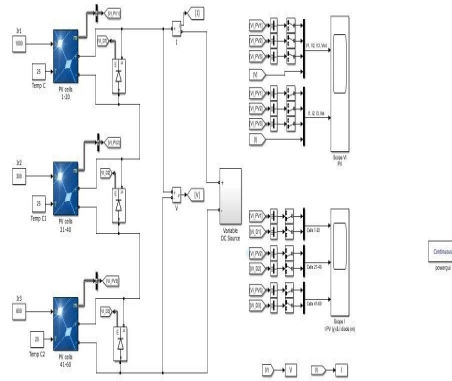


Fig.2 Matlab Simulation

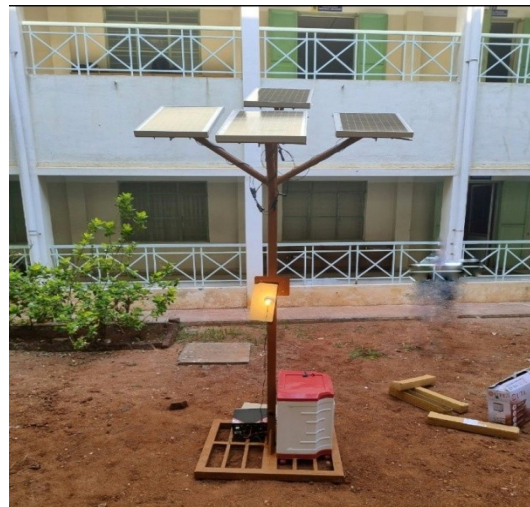


Fig.3.Hardware Result

Figure shows the hardware implementation for solar tree. The solar tree is latest initiative towards the renewable energy. By occupying less space, We are producing much amount of electricity. Our solar system uses latest technology panels called as monocrystalline panels which is more efficient than others. Design of the solar tree is made in such manner that it grabs more sunlight to produce the electricity. We are using seven panels out of them first four are connecting in series and remaining three are connected in series these series connected panels are connected in parallel. These connections are producing amount of power which is easily fulfilling the Basic demand. Here we designed solar based MPPT algorithm for tracking of maximum power of System, we connected Three panels are parallel connection and two panels are series connected characteristic of Voltage and current characteristics of solar module.

#### IV. CONCLUSION

Solar trees are the solution to the scarcity of the land, the solar tree can be built in any place and can be installed in any place in all over the world, since sun light is reachable to almost every corner of the earth, there is no place in which the solar tree cannot generate electrical power. And the most important aspect of the solar tree is

that it requires very less space to install, there is no need for vast land to install the solar panels that generates same amount of electrical power. The solar tree only takes 1% of the total land that is required by the conventional methods. There is no cutoff of electrical power by the solar tree. This is possible to generate enough electrical power on very less pace of land to supply power to the whole world. A fixed interconnection scheme for large PV arrays, which enhances the PV power under different shading conditions, is proposed in this paper.

The proposed structure facilitates distribution of the effect of partial shading over the entire array without physical movement of the panels there by reducing the mismatch losses because of partial shading. The performance of the system is investigated for different shading conditions and both simulation and experimental results show that the power extracted under partial is greater with the proposed configuration compared with other configurations. It is also found that the EAR scheme and the proposed scheme yield the same power under different shading patterns. However, implementation of the proposed scheme is significantly simpler and cheaper compared with the EAR scheme since it is one time renumbering.

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