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DESIGN AND IMPLEMENTATION OF 520W SOLAR TREE

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ABSTRACT:

This project is related to the solar energy power generation, more specifically the project revolves around the topic of solar tree. This project shows how efficient and important is the solar tree for this generation. This presents how solar trees converts the solar energy into electrical energy. Sunlight irradiates daily and blasts out an enormous amount of solar energy towards the earth, the total energy that is received from the sun is more than enough for humanity to run for many years, still the received solar energy is not harnessed properly and hence there is not sufficient energy production in the world. Since solar panels are the efficient method nowadays for generating electrical energy from the solar energy, but solar panels require lot of space to install. Hence this project solves this problem by using solar tree that is mounting of solar panels on artificial tree.

INTRODUCTION

It is a form of renewable energy resource that is competitive with fossil fuels in several ways. The force of energy of flowing water is known as hydropower. It generates almost all of the renewable energy in the United States. Hydroelectric power plants do not pollute the environment or use other energy to generate electricity. To avoid this problem, we can install a solar tree in spite of a no of solar panels which require a very small space.

The sun is a hydrodynamic spherical body of extremely hot ionized gases (plasma) that generates energy through the thermonuclear fusion process. The temperature of the sun's interior is estimated to be between 8106 k and 40106 k, where energy is released by the fusion of hydrogen and helium.

Solar energy is abundant and widely regarded as the simplest and cleanest method of harnessing renewable energy. The following routes are available for direct conversion of solar radiation into usable form: solar thermal, solar photovoltaic, and solar architecture. The main issue with harnessing solar energy is the need to install large solar collectors, which take up a lot of space. To avoid this situation, we can install a solar tree, despite the fact that solar panels require a very small amount of space.

BLOCK DIAGRAM:

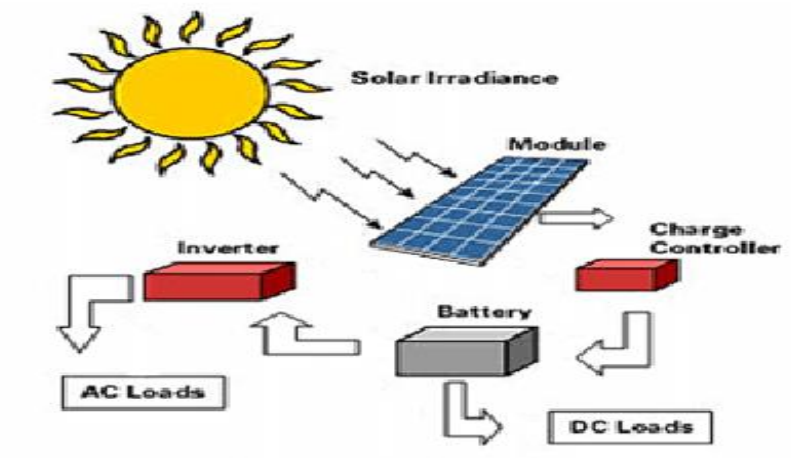

Figure 1: Structure of Solar System

Solar Energy:

Solar energy is radiant light and heat from the Sun that is harnessed using a range of technologies such as solar power to generate electricity, solar thermal energy including solar water heating, and solar architecture. It is an essential source of renewable energy, and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power, and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air. The large magnitude of solar energy available makes it a highly appealing source of electricity. Solar energy has been cheaper than fossil fuel.

Solar panel:

Solar energy begins with the sun. Solar panels (also known as "PV panels") are used to convert light from the sun, which is composed of particles of energy called "photons", into electricity that can be used to power electrical loads.

Solar panels can be used for a wide variety of applications including remote power systems for cabins, telecommunications equipment, remote sensing, and of course for the production of electricity by residential and commercial solar electric systems.

Charge controller:

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries to protect against electrical overload, overcharging, and may protect against overvoltage.

Battery:

A solar battery is a device that you can add to your solar power system to store the excess electricity generated by your solar panels. You can then use that stored energy to power your home at times when your solar panels don't generate enough electricity, including nights, cloudy days, and during power outages**.**

Inverter:

A solar inverter, is a type of electrical converter which converts the variable direct current (DC) output of a photovoltaic (PV) solar panel in to utility frequency alternating current (AC) that can be fed into a commercial electrical grid or used by a local, off-grid electrical network.

DC Loads:

The direct load can be directly powered up through solar power and a charge controller during the sunshine/day time and during the shading/night, the DC load can be powered up using the battery stored energy as backup power.

WORKING:

Photovoltaic cell converts sunlight in to electric energy and this effect is known as photovoltaic effect. Solar cells essentially create electricity by converting photons of light in to electrons. Solar cell producing direct current DC and the charge controller regulating the voltage and current flow from solar panels to battery and the battery stores the energy and this energy is given to the DC loads.

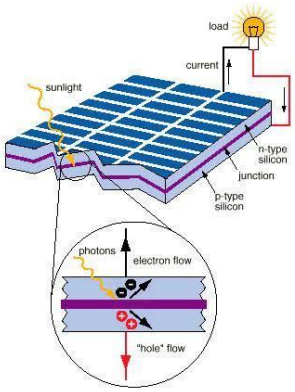

Figure 2: Structure of Solar Cell

A solar cell is a sandwich of n-type silicon (blue) and p-type silicon (red). It generates electricity by using sunlight to make electrons hop across the junction between the different flavors of silicon:

1. When sunlight shines on the cell, photons (light particles) bombard the upper surface.
2. The photons (yellow blobs) carry their energy down through the cell.
3. The photons give up their energy to electrons (green blobs) in the lower, p-type layer.
4. The electrons use this energy to jump across the barrier into the upper, n-type layer and escape out into the circuit.
5. Flowing around the circuit, the electrons make the lamp light up.

EXPERIMENTAL RESULTS:

Figure 3: Solar Tree

Figure 4: Solar Cell Application

The above figure shows the hardware prototype with components connected and results shown. This hardware helps us to give required amount DC power within the less space.

POWER GENERATION:

Total solar panels=13

One solar panel power rating= 40w

Total power generation= 520w

LOAD UTILIZATION:

S.NO	TYPE OF EQUIPMENT	QUANTITY	RATING	LOAD	WORKING HOURS	ENERGY
1.	Fans	4	80w	320w	4	1280wh
2.	Lights	4	40w	160w	4	640wh
3.	Laptop	1	40w	40w	1	40wh
Total				**520w**		**1960wh**

COST ESTIMATION:

S.NO	EQUIPMENT	QUANTITY	COST
1.	Solar panels	13	25000
2.	Designed tree	1	15000
3	Inverter(850VA)	1	5000
4.	Battery(150AH)	1	15000
Total			**60000**

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 cut off of electrical power by the solar tree. This is possible to generate enough electrical power on very less space of land to supply power to the whole world.

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