

## DESIGN OF MINI-SOLAR POWER PLANT

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### ABSTRACT

Increased demand for conventional energy like coal, natural gas, and oil, forcing researchers to develop renewable or non-conventional energy resources. Renewable energy sources such as fuel cells, wind and solar have received considerable attention because of the ever-increasing demand and electricity expectations. The most prominent and mature technology, among various renewable technologies, is the photovoltaic conversion from sunlight to electricity. This paper introduces a cost-effective and efficient way to generate solar energy in an urban environment, which is known to have a shortage of open well-lit areas. Thus, it provides an ideal solution to an increasingly industrialized world.

**Keywords:** Solar energy, renewable energy, cost-effective, efficient, electricity, photovoltaic

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### INTRODUCTION

A Mini-Solar Power Plant has been designed by taking inspiration from Solar Power Tree.

Solar Power Tree unlike a real tree is made up of metal and has solar panels on the top of it. One end of the main body (simple and hollow) is close to provide attachment to the upper, smaller rod which carries the solar panels. These panels are placed high above the other panels present at a vertical angle. Regardless of the sun trajectory during the day, this angle provides a constant area for sunlight.

Solar Power Tree has many stumbling blocks- high cost, more space requirement and can cause hazards to eyesight from solar reflectors. Mini-Solar Power Plant surpasses the Solar Power Tree in these aspects. It is not very expensive and area requirement is also less.

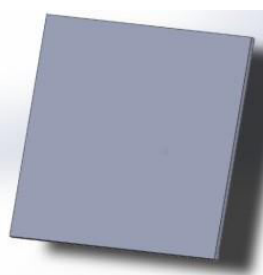
Due to the drastic environmental changes around the globe, this is a step which everyone can take to save electricity on an individual level unlike the solar power tree which can only be installed on an industrial level.

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### DESIGN AND WORKING OF MINI-SOLAR POWER PLANT

Several components are used in a mini- solar power plant. These are mentioned below:

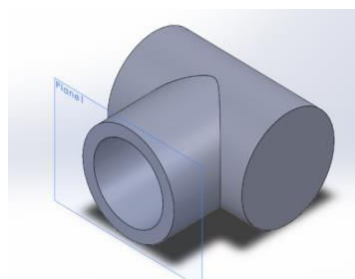
Solar Panel



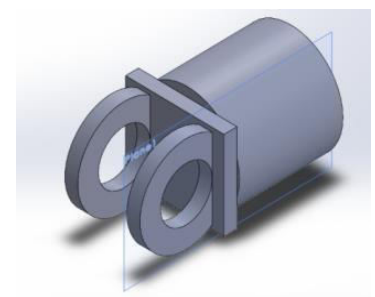
approximate weight-23grams

dimensions-13.72×12.19×0.76 cm

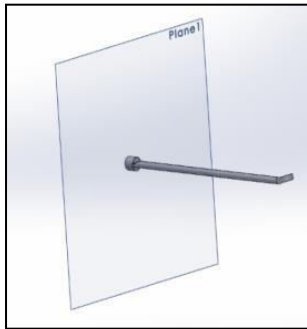
Connector 1 (T joint)



Connector 2 (Custom joint)



Branch



Rod



Length of Rod = 4 feet



Our 7 mini solar panel design

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### CALCULATIONS

Energy generated by mini solar panel per hour, 2W Total

$$\text{energy} = 7 \times 2 = 14\text{W of energy (Since, 7 panels)}$$

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### WORKING

Mini-Solar Power plant consists of several solar panels. Solar panel is made up of small solar cells. When sunlight falls over these solar cells, they convert light energy into current or electricity (photovoltaic conversion). Solar panel batteries are charged during the day. The batteries produce energy during the night. Charges left in the batteries determine the amount of light produced which is regulated by the internal control. The energy can be used in

the night time by utilizing the energy stored in the batteries. This is beneficial on the cloudy days that is when there is no sunlight the energy can be used which is stored in the batteries

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### DISCUSSION

Suppose a society has 20 buildings and each building has 4 floors. If this system is installed in every floor's balcony, then each building can generate 56W of energy and one society can generate 1120W of energy per hour alone. If there is 5 hours of sunlight available daily, that roughly translates to 2.044 MW.

Installing a mini-solar power plant is the need of the hour. As we know, by burning coal in a boiler produces steam, the steam thus flows into the turbine spins the generator to produce electricity. Burning of fossil fuels has a very negative impact on the environment. During combustion, coal emits harmful byproducts. These produce a lot of pollution and cause global warming, which leads to climate change. Besides the green-house gases, mercury, selenium, and arsenic are also released which causes acid rain. This causes lung diseases, asthma and many more problems in humans and it also absorbs important nutrients from the land which are necessary for the plants and trees thus causing deforestation.

In order to provide stability to the environment without relying on government and high authorities, we can install this mini solar power plant in our homes as it is cost effective and requires less space.

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### CHALLENGES FACED

- Weather dependent form of energy generation method
- Efficiency reduces significantly on rainy day

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### CONCLUSION

In this research paper, we designed a mini-solar power plant that can be easily installed in households as it requires a minimal space. The motto of this design is to generate electricity using a natural resource-sunlight. This is done to reduce our dependence on fossil fuels as they pollute the environment by emitting many harmful gases. Mini-solar power plant is an idea which can be implemented on a small scale. If each and every household makes use of this system, much electricity can be saved and bills will also be reduced. This system is eco-friendly and economically feasible.

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