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Solar Tree: A Source of Energy

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Abstract: Solar tree is a metal construction that resembles a actual tree. Solar panels are established on pinnacle of every branch. Generated power will be to be had to anybody and it'll be used for charging batteries of cellular phones and portable computers. This paper describes the vital steps required for a successful final touch of this project. Additionally, this paper discusses advantages of this project for the students and the community.

As a part of this paper describes an unique answer for the sun tree, alongside with important calculations, technical specifications, simple characteristics, working principle and three-D rendering of the chosen layout at its future location. The location around the solar tree would turn out to be an area in which college students and their buddies can gather to recharge their gadgets and, at the equal time, whilst they wait, exchange ideas, advices and their experiences with each other.

I. INTRODUCTION

Solar tree represents a metal construction that resembles a real tree. Solar panels are put on top of its "branches". Utilizing the sunlight energy, solar panels produce electric energy which is then used for charging batteries of mobile phones, tablets, laptops etc. and, additionally, as an element of street lighting.

Its attractive and modern design will complement the public areas of our campus and it'll be integrated completely into the architectural design, thus allowing all students and visitors on campus to freely use its resources.

Alongside the promotion of renewable sources of energy, Solar tree also promotes the use of energy efficient technologies, ie. LED street lighting.

II. RESEARCH METHODOLOGY

A solar tree is a decorative means of producing solar energy and also electricity. It uses multiple no of solar panels which forms the shape of a tree. The panels are arranged in a tree fashion in a tall tower/pole.

2.1 Working Method

- it's a known incontrovertible fact that everyone today can utilize solar power . Sunlight reaches Earth's surface no matter weather , but its intensity is reduced by passing through the clouds (we call it diffused light or indirect radiation).
- Direct radiation may be a lot stronger, as sunlight reaches Earth's surface without being blocked by the clouds. Enough sunlight reaches Earth's surface to be used for electric energy production even at locations with tons of foggy days One solar cell is compromised of two or more thin layers of semiconductor , usually made from silicon (Si). Under the silicon layer, there's a skinny conducting layer made from metal.
- When silicon is exposed to sunlight, electrons are knocked loose from their atoms, causing potential difference. As a result, DC (DC) starts to flow through the fabric so as to wipe out the electric potential (Figure 1).

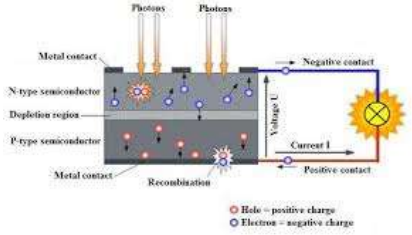


Fig. 1 Working method of a solar cell

2.2 Laboratory Test

- Standard Test Conditions (STC) test
- NOCT-Test
- Carbon Footprint Verification (CFV)

In these tests, the solar PV panels are subject to **various** loads, which are defined by the so-called **ICE standards**. The standards were established by the **International Electrotechnical Commission** (IEC) in Geneva.

2.3 Specification of equipment that will be used for the project

Panels: • 10 x 80 W = 800 W • Connection type: 2 panels from every branch in series, then all 5 branches in parallel to achieve a 24 V output • Output : 25 A, 24 V
Batteries: • 4 x 110 Ah (12V), high deep discharge • Connection type: 2 in series, then those groups of two in parallel • Output: 24 V, 220 Ah
Regulator: • PUBC 30 A with display
Inverter: • 24V/900W
Cabling: • Cable 2x4mm2, cca. 150 m • Safety fuse gPV 10A and breaker switch • Cable 1x16 mm2 • Load switch 32A/500 VDC • Other small installation equipment (boxes, plugs etc.)
Control switchbox: • Monitoring of the generation and consumption on the basis of the ARDUINO platform • Display showing current readings • Remote control via GSM module
Other: • Installation of Wi-Fi hotspot • LED

2.4 Types of Solar Trees

- Original Solar Tree Artworks
- Ross Lovegrove's Solar Tree
- Spotlight Solar structures
- CSIR's Solar Power Tree
- Solar Power Tree Artifact
- Possibility Tree (Solar Tree)

III. RESULT

The first task of the experiment that we tested was determining the relationship between distance and voltage output. It is important to remember that as the distance between the light source and the solar panel increase, the light intensity decreases because the photons spread out more with greater distance. We tested this by using a flashlight (in my group we used a iPhone) to serve as our sunlight. We changed the distance between the light source and the solar panel during each trial. We did three trials, each having a distance of 1 cm, 5 cm, and 10 cm respectively. If you look at the graph below, you can conclude that the relationship between light intensity and voltage output is linear. Both variables are inversely proportional to each other. As the distance increases the voltage output will decrease. Our coefficient of determination was 0.9062 thus proving there is a obvious correlation between distance and voltage output.

Table No. 1 change of voltage with distance

1 cm (No Filter)	10 cm (No Filter)	5 cm (No Filter)
0.35738	0.10078	0.10078
0.2804	0.10078	0.10078
0.26757	0.12644	0.16493
0.29323	0.04946	0.1521
0.26757	0.12644	0.16493
0.2804	0.03663	0.08765
0.35738	0.10078	0.19059
0.26575	0.07512	0.08798
0.25474	0.04946	0.19059
0.34455	0.06229	0.19059
	Average	
0.297079	0.082818	0.143119

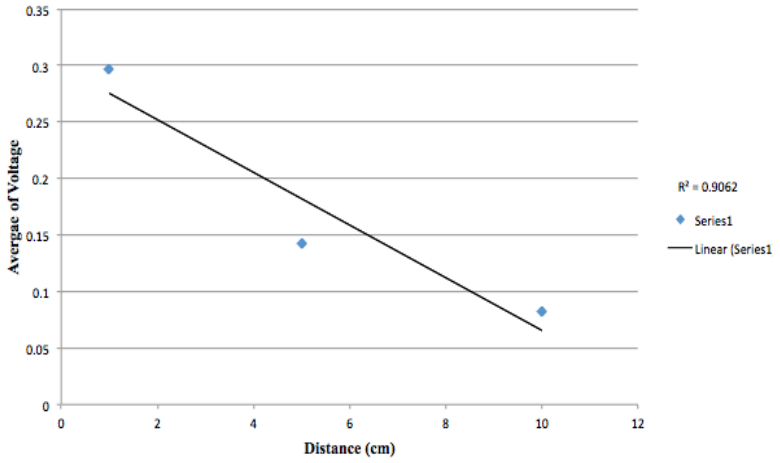


Fig. 2 Distance VS Average of Voltage

The second task of the experiment that we tested was discovering how a colored filter affects the voltage output, while keeping the distance constant. We used a green, red, and purple/blue clear transparent filters. We compared the voltage output of each filter to the

voltage output with no filter. As can be seen in the bar graph below, as the color depth got darker, the voltage output was getting lower. This is a result of the darker colors absorbing more light and allowing a smaller amount of light through it.

Table No .2 change in voltage with colour

1cm (Blue)	1cm(Red)	1cm(Green)
0.10078	0.1521	0.20342
0.10078	0.22908	0.19059
0.07512	0.24191	0.22908
0.10078	0.13927	0.22908
0.11361	0.13927	0.24191
0.12644	0.17776	0.21625
0.1521	0.24191	0.25474
0.07512	0.12644	0.17776
0.16493	0.16493	0.22908
0.08795	0.22908	0.19059
	Average	
0.109761	0.184175	0.21625

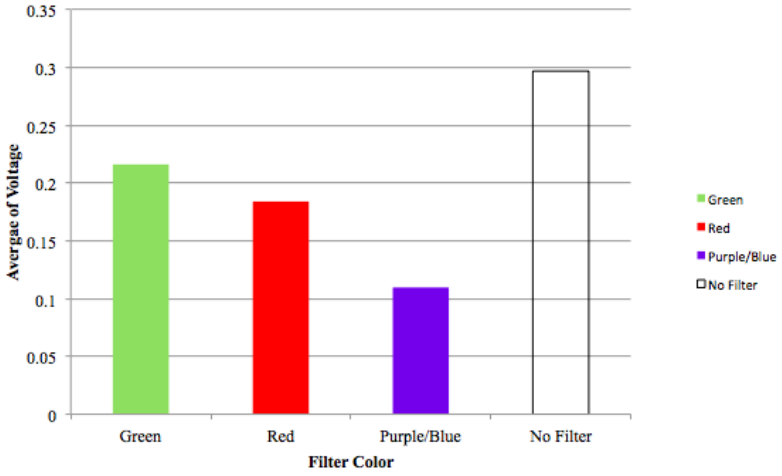
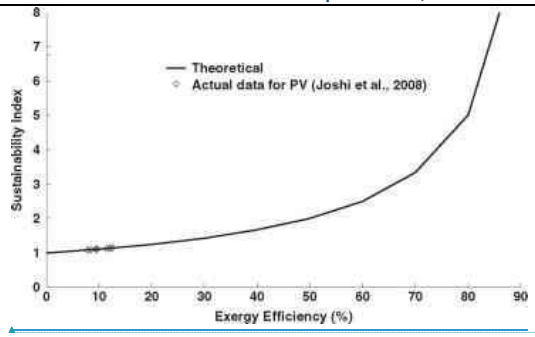


Fig. 3 Filtor Colour VS Average of Voltage

The panel showed no output power loss due to temperature. The ambient temperature for the day was not tracked or monitored.

This question is open for all to experiment with. I did not get the chance to see what would happen on a cloudy day. I do know it will not work if the wind blows it over. It may burn up the motors since the panel cannot move and hit the limit switches.



Variation of sustainability index (SI) with exergy efficiency

IV. CONCLUSION

Solar tree can completes the need of energy demand of people, saving the land and produce oxygen and hydrogen. So, that the implementation of solar tree in India is very successful without causing the problem of power cut and extra energy can be provided to the grid. India having 2nd largest population in the world can increasing the demand of energy and scarcity of land and try to find the way to fulfil all the demands of the country which is no polluted and efficient source of energy then we can say that solar tree is best option. It is therefore the responsibility of every young mind present in the earth to act seriously and take right decision. Solar tree sound like perfect solution for our future energy needs. Solar tree act as a revolutionary urban lightning concept. The design of solar tree can make 50% more electricity and collection of sunlight also increase upto50% more than usual plant. solar tree can save the money, long lasting, cheap to use. It is free and eco-friendly. Solar tree is better than traditional solar PV system because of area point of view and also more productive of energy. Solar botanic trees is a non conventional source of energy having good enough for generating electricity as compared to other sources.

The applications of solar tree are:-

1. Street light
2. Airports
3. Privates gardens
4. Highways
5. Mountains region
6. Recreational area
7. City parks

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