

Solar Tree Exploring New Form Factors of Organic Solar Cells, the Benefits and Applications of Solar Tree with Natural Beauty

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ABSTRACT: Now a days oil supply is decreasing therefore energy sources are becoming limited throughout the world. The technology of using Bio fuel is an alternate solution of energy sources, but if we think that all the world vehicles will be powered by bio fuels then the amount of land used for farming must be doubled. Abundant power is produced by Nuclear energy, but many fears from the emission of catastrophes from such sources. In all this Solar Tree proves to be most beneficial source of energy. This paper presents Solar Tree implementation as alternate source of energy in urban cities. Organic solar cells have great potential as a clean and renewable solar energy conversion system, due to their low cost materials, ease of production, and lack of harmful emissions. The rapid improvement in organic solar cell performance in recent years has triggered significant interests in developing organic solar cells for commercial applications. Harnessing the unique set of characteristics of organic solar cells, here we demonstrate a new form factor for organic solar cells, a "solar tree" or an electricity-generating artificial tree with organic solar cells as leaves. It was first fabricated polymer: fullerene based organic solar cells on flexible plastic substrates that show similar performance to devices on rigid glass substrates using the inverted device structure. Large-area flexible devices were fabricated and cut into palm leaf shapes with an active device area of 6.5 cm² using a steel rule die. 12 leaf-shaped organic solar cells were then assembled to form a prototype "solar palm tree". Two different wiring configurations among the devices provided different power delivery modes: a low-voltage, high-current "fan mode" and a high voltage, low-current "LED mode".

I. INTRODUCTION

The search for clean and renewable energy sources has become one of the greatest challenges for our society, due to the rapid depletion of fossil fuels and increasing demand on energy supply. One of the most promising alternative energy sources is solar energy, which is clean, renewable, safe and abundant. Using solar cells to directly convert sunlight to electricity is one of the major methods to utilize such an abundant energy source. Compared to inorganic semiconductors that are used in commercial solar modules, organic solar cells have several advantages such as the low material cost, easy tunability of material properties and compatibility with large-area and roll-to-roll manufacturing technologies.

Solar energy is most advantageous for countries having very less space to produce energy efficiently and having very large population like India. In all these solar tree could be the best option. The efficiency of the plant can be improved by using the technique known as "SPIRALLING PHYLLATAXY". This technique can also be used for system of street lighting, industrial power supply etc. In area point of view, solar tree is more efficient and much better than the traditional solar PV system. Therefore it should be implemented. Solar energy is available in very large amount and also easily available. The solar radiation can be directly converted into solar photovoltaic, solar thermal and solar architecture. The installation of large solar collectors requires a very big space which is the main problem associated with tapping solar energy. This problem can be avoided by installing a Solar Tree requiring less space instead of a no of solar panels. To satisfy pressing environmental and social demands for urban lighting solar tree opens new prospects.

Spiralling Phyllataxy :

It is a technique is used in designing of Solar Tree. For tracking maximum power from sun this Technique helps the lower panels from the shadow of upper ones. The efficiency of the plant can also be improved by this technology.

II. SOLUTION OF ENERGY PROBLEMS IN URBAN LOCATIONS

In urban location having large population, the problem of energy supply becomes even more difficult. Renewable energy source can solve such energy problems. Solar energy provides feasible design solutions for urban environment. The Solar Tree can be used for:

Uplifting the public opinion of citizens for renewable resources of energy.

At locations where free wireless internet is available it enables the people for free access of energy for charging their mobile and portable lap top devices.

Informations like important city locations, phone numbers, institutions and addresses which could be accessed by everyone can be provided by several interactive info panels.

III. CONCEPT OF SOLAR TREE

Photo-voltaic cells are arranged in Fibonacci series in place of leaves in solar tree which looks is an artificial tree. The amount of energy produced by solar tree is more than an array of solar cells. Solar Tree is made of metal structure and have solar panels at the top instead of branches of real tree. Solar energy is collected by Solar panel and converts it into electricity and uses it for batteries, charging of mobile phones, portable computers and tablets. The panels and lighting use this collected energy. No. of solar panels are used to give the shape of a tree and arranged in a tall tower/pole.

TREE Stands For:

T - Tree generating, R - Renewable, E - Energy and E - Electricity

Solar Trees are efficient for capturing energy from sunlight and wind for producing energy as plants in nature.

A. Components of Solar Tree

The solar tree have following parts:

- Solar panels
- Long tower
- LEDs
- Batteries
- Stems for connecting the panels

B. Why We Call It As Solar Tree

Trees produce their food by Photosynthesis. In photosynthesis Trees collects sun energy and the water from soil at the day time and prepare their food. In this way they are providing food to the human society indirectly as we depend on the green plants for our food. The working of solar tree can be understand by an example of a tree in which the solar panel acts like leaves and stems connected acts as the branches of the tree . Solar plates of solar tree are producing energy for the society like green leaves produces food for human beings. So it is called tree.



Fig.1. Natural Tree and Solar Tree

C. Need of Solar Tree

Less Land Requirement: In comparison traditional PV system, Solar Tree requires less land .Therefore a minimum land.

Efficient Energy Generation: Solar Tree can generate energy very efficiently.

Collection of Energy from Wind: Solar Tree with flexible stem rotating in any direction and by shaking themselves are able to produce energy also from wind like a natural tree.

D. Working Of Solar Tree

Major problems of Power system are the storage of Electric energy. Output fluctuations of solar cell are eliminated by the day and night cycle or weather shifts. Solar tree panels can charge batteries during the day time. Solar trees automatically switches on its LED. The internal control can also regulate the amount of light produced. A sensor is used to measure the amount of light in atmosphere and triggers the solar lamps to switch ON automatically at sunset and OFF at sunset.



Fig.2. Design Model of Solar Tree

E Scope of Solar Trees in India

India requires a power plant which generates maximum energy and uses minimum land as it is a developing and highly populated country. In India production of energy from sun by using solar tree must be increased to increase per capita land and fulfill the energy demand of increasing population.

F Future of Alternative Energy

Solar tree is the perfect solution for future energy need. Sun is sending energy constantly on the earth and our work is to collect sun energy to use. Sunlight cannot be available anytime but available everywhere besides this it wouldnot contribute to global warming.

IV. FIBANACCI SEQUENCE SOLAR TREE

The Fibonacci Sequence Solar Tree is one of advanced solar tress and shown in given fig 3.



Fig.3. Fibanacci Sequence

The plants follow a new growth pattern know as **Fibanacci Sequence**. This pattern shows that in sequence the previous numbers are added together to make the next number (1+1=2, 2+1=3, 3+2=5, 5+3=8 etc..) and in natural no. it corresponding golden ratio .Tree” uses the same sequence of leaves. In experiments it can be proved that amount of energy collected by the tree is more than that of normal flat-panel model, when photovoltaic cells are placed on an oak tree instead of leaves. The comparison of flat plate solar tree and Fibanacci solar tree is shown as below:

TABLE 1
COMPARISON CHART OF FLAT PLATE AND FIBANACCI SOLAR TREE

FLAT PANEL SOLAR TREE	FIBANACCI SOLAR TREE
1. In Flat panel model By arrangement Of solar cell, Electrical Energy produced Is 100%(say).	In Fibanacci series Manner Solar tree with cells arranged 20% more (i.e., nearly 120% more electrical energy.)
2..Sun light collected is less	Sun light collected is 2 ½ hours more .
3.Electrical energy produced Is less	50% more electrical energy is Produced
4. Collection time of sunlight is up to 50% longer.	Collection time of sunlight is Less
5.. In parallel-series circuit, the solar tree produces 2.31 watts	Fibanacci Solar tree produces 8.28 kilowatt
6. The solar tree system in a series circuit, produces 2.68 watts	Fibanacci Solar tree produces 9.648 kilowatt-hours.
7. In a series circuit Solar tree produces 268% more power than the single solar panel system	Fibanacci Solar tree produces 11% more power

V.APPLICATIONS OF SOLAR TREE

A. Solar Tree Product Applications

The Solar Tree is suitable for remote locations or where small foot print such as area lighting, car parks and street lighting are required. With a grid connection or battery store, the Solar Tree is the solution for energy requirements.

B. World's Best Looking Solar Gadget Charger



Fig.4. Solar Gadget Charger

The Concept of **Solar Tree is Photosynthesis** .To soak up juice from the sun, Bonsai tree uses 54 mini photovoltaic panels as leaves and able to charge the gadgets.

C. Making Light With Recycle Plastic Bottles



Fig.5. Light with Recycle Plastic Bottles

A normal PET-Bottle filled with water can be used as a light bulb to bring light into underprivileged house holds during the day.

D. Applications Of Solar Trees For Industrial Power Supply, House Supply, Street Light



Fig.6. Industrial power

House supply

Street Light

Different applications of solar tree used for industrial power supply, house supply and for street light supply is shown in fig. 6 .

VII. DIFFERENT ARTIFICIAL SOLAR TREE

The light of the sun is always available and it will never run out. There is a technique that converts sunlight into fuel. This technique is called the artificial solar tree. The artificial solar tree works like a real one. Just like the photosynthesis of a real tree, artificial one uses sunlight for the generation of energy. The aim is to store the energy is that it can be used wherever it is needed. This can be done by making a liquid fuel that can be transport and used as we need. These challenges in the design of Solar Tree are not only scientifically but costs, environmental are also considered.

A. Solar Botanic Trees

Artificial trees will be introduced by Solar Botanic which uses renewable energy from the sun and wind and provide clean and environmentally sound means of collecting solar radiation and wind energy [7].

Energy-generation technologies are mentioned below:

Photovoltaic (PVs) are arrays of cells containing a material that converts solar radiation into direct current electricity.

Electric potential created by temperature difference referred by Thermoelectricity.

Electric potential generated in response to applied mechanical stress is the ability of Piezoelectricity.

The power of the sun, integrate from all aspects of a tree from leaf, branch and twigs and convert solar energy to electricity.

Nano-photovoltaic, Nano-thermo voltaic and Nano-piezo generator converting light, heat and wind energy into green electricity.

B. Nano Leaf

Solar Botanic's artificial leaf called the „Nano leaf“ is the essential element in this technology. A very thin photovoltaic film on one side of „Nano leaf“ converts the light from the sun into energy.

On the other side of the Nano leaf thin thermo voltaic film converts the heat from the solar energy into electricity.

Small amounts of piezoelectric power are generated by stalks connecting to a branch.

Nano leaf is thin like a natural leaf and the wind outside forces pushes the Nano leaf back and forth, and in petiole, twig and branches mechanical stresses appears. When thousands of Nano leaves flap back and forth due to wind millions of Pico watts are generated. Stronger the wind and more energy is generated. A small part of the sunlight is reflected by Nano leaves that strikes them. Rest of the spectrum and the green light is efficiently converted into electricity. Nano leaves converts the visible light and invisible light, known as infrared light or radiation, which can feel only. In Nano leaves has unique combination of photovoltaic and thermo voltaic and converts thermal radiation into electricity.

VIII. ADVANTAGES AND DISADVANTAGES OF SOLAR TREE

The advantages of solar tree are :

Both the role of Paying homage to photosynthesis and the Photosynthesis tree are gracefully plays by Solar tree.

A positive environmental impact opposes to a negative one.

On street lighting in the area, Power outages have no impact . In all locations Solar street lights can be easily erected .

No air pollution energy sources.

In poor country people would access electricity. People can save money.

Land requirement is very less.

The disadvantages of solar tree are:

Cost is high.

It is dangerous to the birds and insects.

It is dangerous to eyesight from solar reflectors

IX. CONCLUSION

To fulfill the increasing energy demand of the people, saving of land, The solar tree concept is very successful one and should be implemented in India to provide electricity without the problem of power cut and the extra energy can be provided to the grid. India as the 2nd largest country of the world in the increasing demand of the energy and try to find a way from which efficient and abundant source of energy can be available. Also solar botanic trees is a non-conventional source having many advantages of producing electricity as compared to the other sources. It is therefore the responsibility on the shoulders of the youngsters of the earth to think smartly and take the right decision. Everyone should start as an individual to co-operate with the government to make life favorable for mankind.

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