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NANO TREE-AN EFFECTIVE ELECTRICAL ENERGY PRODUCTIION

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Abstract — *Nanotechnology is a fascinating science for many scientists as it offers them many challenges. One such challenge is Nano leaves and Nano trees, which once thought to be a fantasy has come into reality now. One of the emerging nanotechnologies related to renewable energy is Nano leaves and stems of artificially created trees or plants. They are an emerging form of renewable energy through collecting energy from the sun and wind and converting it to electrical energy. The leaves are distributed throughout artificial trees and plants, and when operating at optimum efficiency can supply a whole household with electricity. In the years ahead we will witness a world where there will be scarcity for energy resources, but mankind is blessed that we are provided with the solar power which will last for millions of years. And recently with the emerging nanotechnology, scientists are working on the new concept called the Nano leaves that will help producing electricity with the help of solar power which can serve the future demands. As the near future it is expected to face a huge energy crisis. The paper deals with the latest renewable energy resource of nano tree to generate electrical energy how it works, the process of generating electrical energy ,process of storing and process of utilizing.*

Keywords- *Nano Tree, Bio Mimicry, Nano Leaves, Spiraling Phyllataxy, Solar Tree*

I. INTRODUCTION

In industrialized countries the energy consumption has been increasing at a very fast rate. Because of increasing energy and growing population one option to fulfill the increasing demand of energy is renewable energy source. Keeping this option in mind we should also take care that energy should not cause pollution and other natural hazards. Therefore nonconventional energy sources such as ocean tides, geothermal, sun and wind are good option. With this alternative energy sources we can fulfill the energy demand in coming future. In all these alternatives solar energy has more advantages for them a kind i.e. Solar Energy is free, inexhaustible and nonpolluting. 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.

II. LITERATURE REVIEW

Ali Rachini et al monitored grid connected photovoltaic system to evaluate the performance and the efficiency of conversion of solar energy into electricity. The monitoring system detects abnormal operations and power fluctuation in the grid connected PV system. It gives the possibility to optimize control laws and to implement interconnection strategies. It is used to evaluate the cost effectiveness of solar energy. Boyo A O et al compared solar radiation data measured with the satellite and the ground measurement radiation was analysed .The ground measurement radiation consists of data at the ground level and in the atmosphere.

The Kolmogorov-Smirnov test assesses statistical similarity between the two sets of data which was applied to global horizontal daily radiation data value from Gun-Bellani Pyranometer collected at Nigeria Meteorological Agency Oshodi, Lagos and Satellite data from National Aeronautics and Space Administration (NASA) The differences in data are because of the behavior of measured data at a particular station, such as recording errors and behavior of estimates made from satellite images . J C Mourmouris et al did a case study for the island of Samothrace, Greece and analyzed that Samothrace has a high potential for energy resource exploitation (mainly Wind and Solar), but has social acceptance problems because of its social, economic and environmental situations. Abhishek Agrawal et al studied the theoretical aspects of choosing a tilt angle for the solar flat-plate collectors used at different locations in India. Based upon the measured values of monthly mean daily global and diffuse solar radiation on a horizontal surface, the calculations are done. It is shown that if the angle of tilt is varied seasonally, four times a year then nearly optimal energy can be collected. Annual optimum tilt angle is found to be approximately equal to latitude of the location .

III. WHY IS IT NEEDED?

[1]. Due to less land requirement:

It is the best option of energy generation because it requires very less land as compare to the traditional PV system. Now a day's land becomes the costliest commodity for the human society because of high population growth. So we require such a plant which can generate maximum energy using minimum land.

[2]. Efficient energy generation:

It can generate energy very efficiently as compare to traditional system. Due to the technique called spiraling phyllataxy its efficiency further increase. Though it is somehow costly but as compare to all cost involve in traditional system it is more efficient.

[3]. It can collect energy from wind:

As the name suggest this is a device to generate energy from sun but it has some unique feature to generate energy from wind. The stem are flexible so that they can rotate in any direction and by shaking themselves they produce energy also from wind as in the case of a natural tree.

IV. BIO-MIMICRY

About Bio-Mimicry:

Our solution is primarily based on the principle of 'Distributed generation'. This solution is loosely based on the principle of Bio mimicry is an emerging discipline that studies nature's best ideas and then imitates these works of design and processes to solve human problems. It is the practice of developing renewable human technologies inspired by the nature.

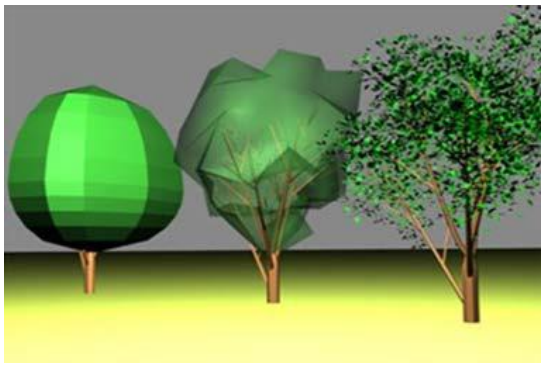

Fig1. Botanic Trees

We have abundant examples around us inspired by nature like Bionic Car: Daimler Chrysler has developed a new car concept from Mercedes-Benz based on the shape of an old tropical fish the Bionic Car. Using the shape of the tropical boxfish, designers introduced a modernised ideal that boasts 20% less fuel consumption and as much as an 80% of nitrogen oxide emissions are reduced. The diesel-powered compact will get about 70 miles per gallon, and can run just fine on biodiesel fuel.

Solar Botanic Trees:

Solar Botanic will introduce substitute trees that will use renewable energy from the sun and wind , they are an efficient clear and environmental sound mean of collecting solar radiation and wind energy. This plan will collectively bring 3 different energy generations together. They are

- Photovoltaic are series of cells containing a material that converts sun radiation into direct current electricity. Materials presently used for photovoltaic are amorphic silicon, polycrystalline silicon, microcrystalline silicon, cadmium telluride etc.
- Thermoelectricity refers to a group of phenomena in which a difference in temperature creates an electric potential or a electric potential creates a difference in temperature.
- Piezoelectricity is the ability of some materials to produce an electric field or electric potential in response to applied mechanical stress.
- Traps the power of the sun, conjoin all aspects of a tree such as leaf, branch and twigs and convert sun energy to electricity to power cities, auto and highways. In this bio mimicry conceptual view our trees are fitted with Nano leaves, a combination of Nano-photovoltaic, Nano-thermo and Nano-piezo generators converting light, and heat into green electricity Energy-generation technologies are mentioned below:

1. Photovoltaic (PVs) are arrays of cells containing a material that converts solar radiation into direct current electricity.
2. Electric potential created by temperature difference referred by Thermoelectricity.
3. Electric potential generated in response to applied mechanical stress is the ability of Piezoelectricity.
4. The power of the sun, integrate from all aspects of a tree from leaf, branch and twigs and convert solar energy to electricity.
5. Nano-photovoltaic, Nano-thermo voltaic and Nano piezo generator converting light, heat and wind energy into green electricity.

V. NANO LEAF

The fundamental element in this technology is Solar Botanic's artificial leaf called the 'Nano leaf'.

- Nano leaf consists of a very thin photovoltaic film on one side, which converts the light from the sun into energy.
- The other side of the nano leaf contains thin thermo voltaic film that converts the heat from the solar energy into electricity.
- In addition to solar power, as whispering wind or falling rain disturbs the false leaves, Nano generators in their petioles. The stalks connecting them to a branch should generate small amounts of piezoelectric power.

A Nano leaf is slinky like a feature weight like a natural leaf, when external forces, like the wind force, forcing the Nano leaf to move back and forth, then the mechanical stresses will appear in the petiole, twig and branches. When thousands of Nano leaves overlaps back and forth due to wind force, millions and millions of Pico watts of energy will be generated, if the wind force is high then the more energy is generated. Our Nano leaves only reflect a small part of the sunlight that strikes them, commonly the green light, and the rest of the spectrum is effectively converted into electricity.

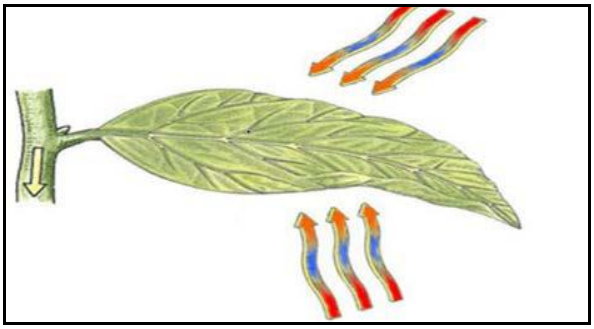

Fig2. Photo Voltaic Energy Conversion in Nano Leaves

Types Of Nano leaf's

1. Broad Leaf trees- These trees can provide between 3500 kWh and 7000 kWh per year. These species provide shade, cooling the air, green ambiance.
2. Ever green trees- They can provide between 2500 kWh and 7000 kWh per year. They can be used as single trees to fence gardens.
3. Shrubs, Plants, Roof, Wall and Fencing- Nano leaf roof Carpets can be installed easily on any roof design. Wall carpets can be applied as fencing

Fig3. Nano leaves create electricity

VI. CONSTRUCTION AND WORKING OF NANO TREE

Construction:

The main part of the Solar botanic tree is Nano leaf and in order to construct the nano leaves we need solar panel, thermo voltaic cell, piezo voltaic cell and photo voltaic cell. The construction of nano leaves is very easy. It consists of two transparent conducting layers of silica which will act as the outer body of the leaf. And one solar cell is placed in between these two layers which is used to convert the solar energy into electrical energy then the piezo voltaic cell, thermo voltaic cell and photo voltaic cell are used. All these cells are interconnected to the highly conducted metal film to complete the circuit for the flow of electrons and protons.

The piezoelectric generator is placed on the bottom of the leaf which is used to convert the stress due to rain and wind into the electrical energy. Now these leaves are connected to the twigs of the artificial tree. And these small twigs are connected to the stem of the tree with the means of the piezoelectric crystal to covert the stress of the twig also into electrical energy. The electrical energy from all the leaves and twigs is stored at the bottom of the tree by using the storing device. And the solar botanic tree is about 20 feet height

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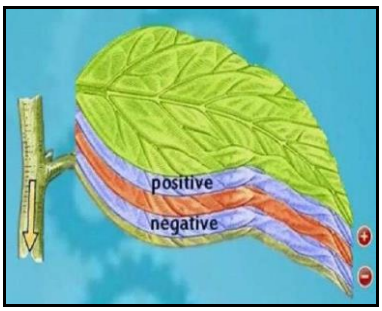

Fig4. Construction Of Nano Leaf

Working:

It works based on the principle of Photo synthesis in which, typical plants absorb the light emitted by the sun and CO2 in the atmosphere. Similarly an artificial tree utilizes light energy from the sun to generate the electricity. Electrical energy from the Solar Botanic Nano leaves can be generated by using Thermo voltaic cells, Photovoltaic cells and Piezoelectric cells which are integrated in the tree.

When Sun light falls on the nano-leaf, the photons are absorbed into the nano-leaf, their energy causes the electrons to become free. The electron moves towards the bottom of the nano-leaf and exit through the connecting nano wires working as trunk. This flow of electrons causes generation of electricity.

Fig5. Working Of Nano Leaf

VII. COMPARISON WITH OTHER SOURCES

Solar botanic tree utilizes renewable sources for the generation of electricity which is abundantly available. This tree is cost effective in comparison to other sources as well as efficient.

S No.	Source	Generation	Cost	Avability
1	Wind	0.3%	$35000/house	Unlimited
2	Solar	0.5%	$25000/house	Unlimited
3	Hydro power	4%	$47000/20 houses	Unlimited
4	Bio fuel	37%	$2000/house	Limited
5	Solar botanic tree	Nil til now	$5000/house	Unlimited

Table1. Comparison Of Nano Tree With Other Sources

VIII. FUNCTIONAL UNITS

The working components that formed the basis of our model are listed under this section. A general description of each component or unit is followed by the specification of the same used in our device.

A. Photovoltaic Modules:

Photovoltaic (PV) modules collect energy from sun and convert it directly into electricity. a photovoltaic cell is silicon, which absorbs sunlight. This energy directly gets converted into electrical energy, which is why they are efficient and convenient to use. Most PV modules contain a top protective layer, two specially treated layers of silicon and a polymer backing layer .In our model, we used six solar modules each made of polycrystalline cells.

B. Light Dependent Resistor:

Light Dependent Resistor (LDR) is a component that is sensitive to light. An LDR or photo resistor is made up of semiconductor with high resistance. Cadmium Sulfide is popularly used. In our model, we used single 5mm size ceramic LDR.

C. Light Emitting Diode:

It is a two lead semiconductor light source. It is a p-n junction diode which emits light when it gets activated. With high power LED lights, it is possible to save a high percentage of energy. They have low maintenance costs. We used three strips of LED lights in our model.

D. Electrodes:

Electrolysis of water is decomposition of water into oxygen and hydrogen gas due to an electric current being passed through water. This technique was used to obtain hydrogen fuel and breathable oxygen. We used a jar container with two graphite (carbon)electrodes for our model.

E. Battery:

Battery is a device consisting of two or more electrochemical cells that convert chemical energy into electrical energy. We used two rechargeable lead acid batteries with nominal voltage of 6V each and charge capacity of 4Ampere-hours each.

IX. FUTURE USE OF NANO ENERGY TECHNOLOGY

Novel lighting materials (OLED: organic light-emitting diodes) with Nano scale layers of plastic and organic pigments are being developed; their conversion rate from energy to light can apparently reach 50 % (compared with traditional light bulbs = 5%).

Nano porous insulating materials in the construction business can help reduce the energy needed to heat and cool building's. Nano material's could improve energy generation and energy efficiencies.

the electrical energy produced by these Nano trees can be used to:

1. Drive the cars.
2. To enlighten the home
3. For business purpose
4. It can be used as the balancing factor between power prediction and environment
5. the main advantage is that it is used in efficient and green energy production which can restrict global warming

X. ADVANTAGES

1. Low Cost:

Running and maintenance costs of this device are very low.

2. Eco-friendly:

The device is eco-friendly as it uses solar energy as basic source of energy.

3. Easy Installation:

The lack of wiring minimizes disruption caused to roads or nearby locations during installation. Solar street models can be erected at almost all locations.

4. Self-Sufficient:

Power outages have no impact on street lighting.

XI. DISADVANTAGES

Instead of having many advantages of Nano Tree, we can also have disadvantages as well.

1. Cost of solar panel is very high.
2. It may cause hazards to birds.
3. People eyes will get affected by the solar reflectors.
4. Very difficult to interface the inverter to the tree trunk.
5. It is very difficult to interface the nanocells into the tree leaves.

XII. APPLICATIONS

1. Desert: The power supplied by these trees ―planted in the desert can be used to power desalination plants to produce fresh water from seawater and brackish water aquifers and the electricity produced is used to power down- whole pumps, enabling water to be piped to other locations.

2. Parks, Recreation Grounds, and Golf Course: The electricity produced can be used to charge electrically powered ground maintenance vehicles such as grass cutters as well as electrically powered hand tools like grass trimmers and pruning shears.

3. Office Car Parks and Industrial Units: Trees planted in these locations will not only supply electrical power for the office and industrial units, but add aesthetic qualities to an otherwise drab area, whilst providing shade from the wind and sun.

4. Charging Purpose: Solar powered tree to charge mobile devices and it can also be used for charging laptops. Solar powered tree can be used during night time to lights up the street lights.

5. Electric vehicle: The depletion of petrol and diesel resources results in emergence of electric vehicles. These solar and wind powered trees can provide plug-in for electric vehicles and hybrids of the near and distant future. It can also be used in Airports, Coast lines, Highways, Solar Botanic flowering plants to harvest colorful your electric power etc.

XIII. CONCLUSION

These super eco-friendly synthetic trees will make use of renewable energy from the sun along with wind power, which is an effective clean and environmentally sound medium of gathering solar radiation and wind energy. Solar Nano technology has wide ranging potential. Using such technology, power producing solar products could be applied to just about any surface downtown or anywhere. These artificial trees not only will make the world stable in the field of energy but also will reduce the use of fossil fuel which is the main cause for the world's largest problem global warming. And by this Nano leaves we definitely try solve our future upcoming problems due to the scarcity of the electrical energy, and also we product our environment without any pollutions.

We intend to light on how exactly the Nano leaves can be achieved. Energy Harvesting Tree has many scopes, such as the electrical energy produced by these Nano trees can be used to drive the cars, to enlighten the home, for business purposes and it can be used as the balancing factor between power prediction and environment. The main advantage is that it is used in efficient and green energy production which can restrict global warming.

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