ENERGY HARVESTING TREES

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Abstract- the energy harvesting trees are super eco-friendly synthetic trees will make use of renewable energy from the sun along with wind power, which are an effective clean and environmentally sound medium of gathering solar radiation and wind energy. The artificial trees are implanted with Nanoleaves, a composite of nano-photovoltaic nano-thermovoltaic and nano-piezo sources transforming light, heat and wind energy into eco-friendly electricity. The Nanoleaves transform the whole solar scale converting detectable light, infrared and Ultraviolet in a unification with piezo-electric generators that alter wind energy into electricity giving you efficient, cost efficient and attractive looking solutions, whilst providing the greatest electric power.

Keywords- Photovoltaic, thermovoltaic, piezoelectric, nanoleaf.

I. INTRODUCTION

In the years ahead we will witness a world where there will be scarcity for non-renewable energy sources, but mankind is blessed that we are provided with the solar power and wind power which will last for millions of years. By using this new technology, we can harvest the energy of the sun and wind by embodying substantiated science. Also existing source of renewable energy, solar panels, parabolic sun collectors, wind and tidal turbines are inefficient, expensive and environmentally insensitive.

One of the emerging nanotechnologies related to renewable energy is nanoleaves 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. They are intended to harness energy provided by the wind and sun, thereafter converting it into electrical energy.

There are mainly two important reasons for which we should go for energy harvesting trees. They are as follows:

- Firstly, this energy harvesting trees are eco-friendly and neat form of technology.
- Secondly, these solar trees could offer frequent plug- in stations for the electric vehicles and hybrids of the near and distant future.

II. OPERATION OF ENERGY HARVESTING TREES

Sun, wind, water, earth and life touch our living senses immediately always, everywhere and without any intervention of reason. They simply are there in their unmatched variety, moving us, our moods, memories, imaginations, intensions and plans.

To capitalize on the wealth of designs and processes found in nature, engineering and technology gave us the ingredients, creative thinking, and unique solutions made it possible to bring all this together into a natural looking tree - the Energy Harvesting Tree.

To complete the tree for multi energy exploitation, the petiole twigs and branches are incorporated with Nano piezo-electric elements. A Nanoleaf is thin like a natural leaf, when outside forces, like the wind pushes the Nanoleaf back and forth, mechanical stresses appear in the petiole, twig and branches. When thousands of Nanoleaves flap back and forth due to wind, millions and millions of Pico watts are generated, the stronger the wind, the more energy is generated. Our Nanoleaves only reflect a small part of the sunlight that strikes them, mostly the green light, and the rest of the spectrum is efficiently converted into electricity.

Besides converting the visible spectrum of light, our Nanoleaves also convert the invisible light, known as infrared light or radiation, we can't see it, but we can feel it - it's warm - that's why we call it radiation. Due to the unique combination of photovoltaic and thermovoltaic in our Nanoleaves it converts this thermal radiation into electricity, even hours after the sun has set.

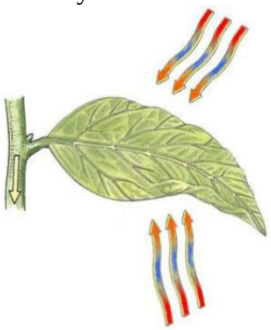
The more wind there is, the more Nanoleaves are moved. Wind that is moving thousands of Nanoleaves in a tree canopy are causing mechanical strain in the petiole, twigs and branches. Nano piezo-electric elements incorporated in the petiole twigs and branches are the tiny Nano piezo- electric elements that will generate millions and millions of Pico watts as these thousands of Nanoleaves flap back and forth due to wind. The stronger the wind, the higher the

"flap" frequency, and therefore the larger the watts generated in the petiole, twigs and branches. With the progress in nano technology, the photovoltaic, thermo voltaic and piezo electric materials are becoming more efficient and combined in one system it will give our products more efficiency and I believe that it will be more reliable/cheaper.

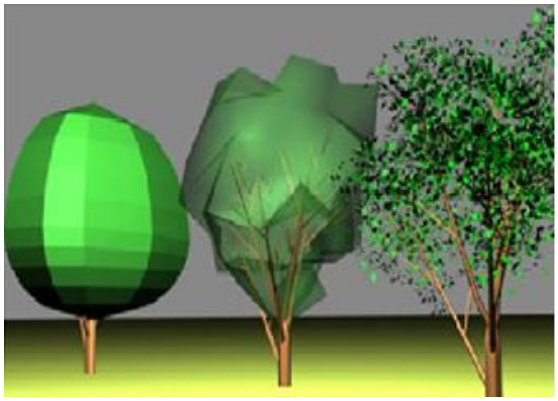
III.ELECTRICITY GENERATION USING ENERGY HARVESTING TREES

The Energy harvesting trees generate electricity in three ways:

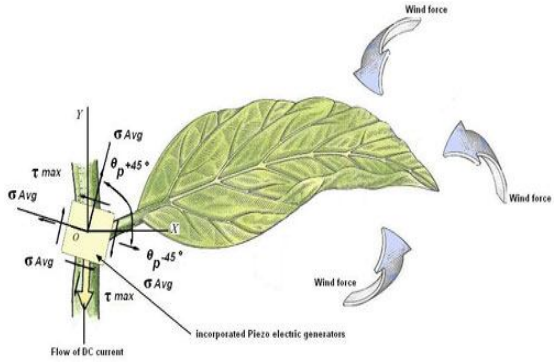
- Nano-photovoltaic generators in the leaf directly convert solar energy into electricity.



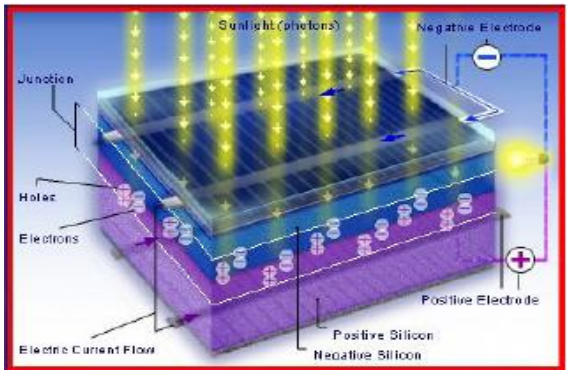
- Nano-thermoelectric cells convert solar heat to electricity.



- Nano-piezoelectric generators can also convert wind energy into electricity.



This technology is an inventive method of green energy collection, combining the conversion of light, heat and wind power. Integrated nano technologies enable the nanoleaves to convert solar radiation (light and heat) into electricity. Furthermore, the leaf petiole or the stem and twigs comprise nano-piezoelectric material- these tiny generators produce electricity from movement or kinetic energy caused by wind or falling raindrops. A Fundamental flaw in conventional solar cells is that electrons give too much energy by sunlight and lose that energy in heat form, as the electrons move thermally to the bottom of the conduction band. In this technology we are using quantum dots i.e. nano-particles to confine electrons long enough so that they could be extracted before their energy dissipates as heat.



With this process of combining the conversion of light, heat and wind, more energy is generated, as the cells in the tree can with the implementation of thermovoltaic cells. The design of nanoleaves is based on the principle of photosynthesis. a natural process where plants extract the light from solar energy, and along with carbon dioxide from the atmosphere , convert it to starches and oxygen, the oxygen being emitted to the atmosphere. However, nanoleaves is a step further in that they are capable of harvesting the thermal and light energy from the sun's energy and convert it to electricity. The stems of the nanoleaves are designed to collect kinetic energy from the wind, which they also convert to electrical energy.

IV. METHODOLOGIES

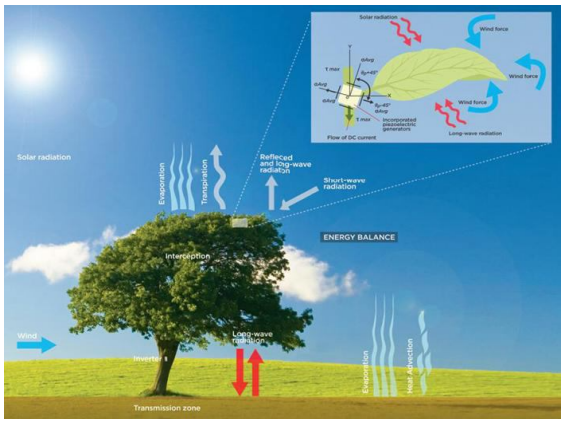
Instead of causing problems for the environment with the abundance of carbon footprint, we should come up with some practical solution to clean energy sources have become appealing. Solar power keeps the surrounding cleaner and healthier. Photovoltaic cells that harness the solar power is an attractive option for capturing light and generating power.

The nano-technology was initially developedto harness solely solar energy. However, nowadays it has widespread uses. It exploitsvarious alternative sources of energy likewind, solar and thermal energy.

Furthermore, these highly advanced artificial plants and/or trees use tiny cells to capture energy:

A. Thermal energy
This is captured through the use of thermo voltaic (TV) cells which convert thermal energy into electricity by using semiconducting materials (a material which is between a metal and an insulator; its conductivity increasing with temperature rise).

B. Light energy
There are also tiny photovoltaic cells (PV) incorporated in then anoleaves. These small PV cells capture the light rays emitted by the sun. The light is then converted into electricity.



C. Kinetic energy
Kinetic energy is harnessed through movement. The wind produces motion in stems and branches. This motion is collected viapiezovoltaic (PZ)cells. The PZ has semi-conducting devices incorporated into the artificial structure of trees and plants. The PZ and the semi conducting devices convert typical windenergy (kinetic energy) into electricity.

V. APPLICATION OF ELECTRICAL ENERGY FROM ENERGY HARVESTING TREES

The photovoltaic, piezovoltaic and thermo voltaic energy harvesters are linked to individual junction boxes, from where they are amalgamated and fed collectively into an inverter. This converts the electricity from Direct Current (DC) into Alternating Current (AC) the electrical power now being suitable for domestic or industrial use.

There are many places were the artificial trees and shrubs can be positioned as noted below:

A. Deserts
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. This water can then be used for drinking and land irrigation, without any environmental damage to the fragile desert environment.

Trees can be planted alongside oases and over fresh water aquifers, with the electricity produced used to power down-hole pumps, enabling water to be piped to other locations.

When planted along the desert roadways, trees will supply shade as well as protection from the sun, wind, and sandstorms.

B. Golf courses
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. When planted on golf courses the power produced can be used to charge golf buggies as well as electrically powered ground maintenance vehicles.

C. 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.

D. Charging Purposes
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.

E. Electric vehicles
The depletion of petrol and diesel resources results in emergence of electric vehicles. These solar and wind powered trees can provide plugins for electric vehicles and hybrids of the near and distant future.There are various other applications where we can utilise the electricity generated by Energy harvesting trees. This is a very novel method to generate electricity using renewable sources i.e. solar energy and wind energy.

CONCLUSION

The Energy Harvesting Trees are multifunctional, efficient, renewable energy system. These super eco-friendly synthetic trees will make use of renewable energy from the sun along with wind power, which are an effective clean and environmentally sound medium of gathering solar radiation and wind energy.Using such technology, power producing solar products could be applied to just about any surface downtown or anywhere. This is a new technology to harness the renewable energy. With the progress in nanotechnology, the photovoltaic, the rmovoltaic and piezoelectric materials are becoming more efficient and combined in one system which will lead to implementation of Energy Harvesting Trees sooner.

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