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Review IJICEGT

Solar Tree: A Modern Approach in Renewable Energy

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Abstract

The Solar Tree is a revolutionary concept in the field of renewable energy that combines the benefits of solar energy with the aesthetics of urban landscapes. This sustainable solution is designed to provide clean and green energy to urban areas, while also enhancing the visual appeal of public spaces. The Solar Tree is a modern approach to renewable energy that utilizes solar panels arranged in a tree-like structure to capture and store solar energy. Trees can be installed in various urban settings, including parks, plazas, and public spaces. This abstract explores the potential of the Solar Tree as a sustainable solution for urban landscapes and highlights its benefits in promoting clean energy, reducing carbon footprint, and improving the overall quality of life in cities.

Keywords: Solar energy, renewable energy, carbon footprint, clean energy, clean energy

INTRODUCTION

Solar Tree, a modern renewable energy technique, aims to provide an environmentally friendly approach to generate electricity. The building, which resembles a tree, has solar panels atop it that convert sunlight into electrical energy. In addition to providing a renewable energy source, its innovative design raises the aesthetic value of the surroundings. The Solar Tree was first proposed by the French company. Since then, many companies and academic institutions have been working to advance this technology. The Solar Tree has become more well-known in recent years as people's awareness of the need for renewable energy sources has increased. In conclusion, Solar Trees offer a viable way to satisfy the rising need for renewable energy. They can completely alter how we produce electricity by providing a clean, beautiful alternative to conventional energy sources. One of the most plentiful and pure sources of renewable energy that can be used to fulfil our increasing energy needs is solar energy. Finding creative, cost-effective, and efficient ways to harness solar energy, however, is a challenge. Here is where the idea of a Solar Tree is useful. A Solar Tree is a cutting-edge method of generating renewable energy that resembles the form and framework of a tree. Utilising photovoltaic (PV) panels organised in a tree-like framework is a creative technique to capture solar energy. The panels are more effective than conventional solar panels because they are made to gather sunlight from all angles. Solar trees come in a variety of sizes and styles, ranging from small, portable solar trees to enormous arrays that can power entire buildings. They are ideal for crowded metropolitan areas where traditional solar panels might not be feasible due to a lack of space. Public amenities like charging stations, lamps, and other lighting can also be powered by solar trees. Finally, Solar Trees provide a practical solution to meet the growing need for renewable energy. They offer a beautiful, clean alternative to traditional energy sources, which has the potential to dramatically revolutionise how we generate electricity. Solar

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energy is one of the most abundant and clean forms of renewable energy that can be used to meet our growing energy needs.

THE CONCEPT OF SOLAR TREE

Solar energy is a clean and sustainable energy source, according to recent research. It has enormous potential to satisfy all our energy needs, including those for agriculture. Photosynthesis and the production of solar energy depend on solar energy [4,5,7]. Due to land constraints, this study investigates how solar energy might be used to meet agri-energy needs. To achieve these objectives, this study made use of the solar tree idea. Following that, it also goes through the fundamental design for optimal effectiveness. Additionally, it opens new possibilities and adjusts help close the current, sizable agri-energy divide. The energy that is provided to the farmers from the grid raises certain questions and worries. High energy costs and cuts caused by heavy industries are problems.

Small portable solar trees to massive arrays that can power entire buildings are all available as different sizes and types of solar trees. They are perfect for urban settings where there is a lack of space and conventional solar panels might not be practical. Solar trees can also be used to power public amenities like charging stations, lamps, and other lighting. In conclusion, Solar Trees offer a viable way to satisfy the rising need for renewable energy. They could completely alter how we produce electricity by providing a clean, beautiful alternative to conventional energy sources. One of the most plentiful and pure sources of renewable energy that can be used to fulfil our increasing energy needs is solar energy. Finding creative, cost-effective, and efficient ways to harness solar energy, however, is a challenge. Here is where the idea of a Solar Tree is useful. A Solar Tree is a cutting-edge method of generating renewable energy that resembles the form and framework of a tree. Utilising photovoltaic (PV) panels organised in a tree-like framework is a creative technique to capture solar energy. The panels are more effective than conventional solar panels because they are made to gather sunlight from all angles. The idea of a Solar Tree is based on biomimicry, which is the imitation of nature's design principles to address problems in society. The Solar Tree uses its branches and leaves to collect solar energy, mimicking the shape and function of a tree. PV panels that are attached to a central trunk, which serves as a power source, make up the tree's branches.

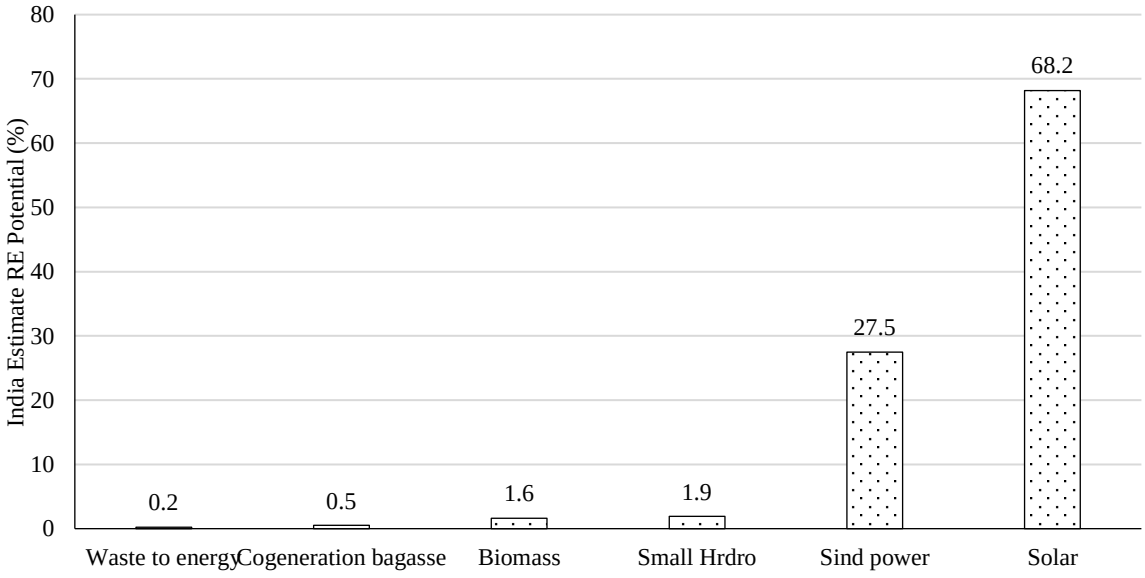

Figure 1. Potential Energy sources of India.

To provide optimal exposure to sunshine throughout the day, the leaves of the Solar Tree are engineered to move with the position of the sun. Energy storage systems can be added to the Solar Tree, enabling it to store extra energy produced during the day for use at night or in overcast conditions. The

sun tree is a cutting-edge renewable energy idea that produces electricity using solar panels. With branches that support the solar panels and a trunk that holds the wiring and electrical components, it is meant to resemble the shape and structure of a tree. To maximise their exposure to sunshine throughout the day, the solar panels are positioned at varying angles.

In urban places with limited space, solar trees are an inventive and sustainable approach to produce clean energy. They can be erected in public areas like parks, parking lots, and sidewalks to generate electricity while also offering shade. Streetlights, electric vehicle charging stations, and other public facilities can all be run by them. As more individuals become conscious of the need to decrease their carbon footprint and convert to renewable energy sources, the idea of solar trees is becoming more and more common. An outstanding illustration of how technology can be applied to provide sustainable solutions that are good for both people and the environment are solar trees (Figure 1). They enhance urban surroundings with a touch of beauty and greenery while also serving a practical purpose.

TYPES OF SOLAR TREE

There are various varieties of solar trees, each with a special structure and purpose. Some of the most typical varieties are listed below:

1. ***Standard Solar Tree:*** This form of solar tree has branches that support the solar panels and a trunk that holds the wiring and electrical parts. It is made to resemble a real tree.
2. ***Modular Solar Tree:*** This variety of solar tree is made up of numerous modules that may be set up in various ways to match the available area. Each module comes with a set of solar panels and electrical parts, making installation and maintenance simple.
3. ***Transportable Solar Tree:*** This variety of solar tree is made to be quickly and readily erected in various areas. It typically has wheels or a light frame, making it simple to move.
4. ***Hybrid Solar Tree:*** This variety of solar trees combines solar panels with additional sustainable energy sources, such wind or hydro power. It is more dependable than traditional solar trees since it can produce power even when there is no sunlight.
5. ***Artistic Solar Tree:*** This kind of solar tree is intended to be both a functioning energy source and a work of art. It can be found in a variety of sizes and shapes, giving public areas a special touch.

Related Studies

The photoelectric effect and photosynthesis are comparable in that both produce energy, which increases their significance for humans and their potential to have a significant environmental impact. Since sunlight is present in both, their usefulness as a tool for finding solutions to a variety of human problems is increased. One of the most significant is the requirement for energy. Numerous studies on the conversion of solar energy use photovoltaic (PV), solar thermal (ST), and solar photovoltaic-thermal (PV/T) conversion techniques, among others. Additionally, because of optical loss, thermal loss recombination, spectrum losses, and impedance matching, researchers are unable to reach 100% accuracy. Despite all of these, it is discovered that solar energy is the most expensive form of sustainable energy, but it has a long lifespan and requires little upkeep and operation. The concept of the solar flexible trees enables farmers to both meet their energy needs and become energy producers. This helps with farming as well as giving them a new source of revenue. In addition to making suggestions, this paper also discusses the challenges that this design paradigm presents and suggests potential areas for future research. We are guaranteed a farmer's sustainable energy solution thanks to the closer linkage of land usage and management and energy generation [1].

Significance in various domain & Future scope

Solar Trees can be used for a variety of things, such as:

Public areas: To give both clean energy and shade, Solar Trees can be put in parks, plazas, and other public areas.

Urban areas: Solar Trees can be put there to supply renewable energy and lessen the impact of the urban heat island.

Highways: To provide lighting and save energy use, solar trees can be put alongside highways.

Remote locations: Solar Trees can be utilised to provide clean energy there where there are no conventional power sources.

Commercial Buildings: To meet the energy requirements of a building, solar trees can be planted on the rooftops or in parking lots of commercial structures. Solar trees can be put in residential areas to supply households with renewable energy and lessen their reliance on conventional energy sources.

Educational establishments: Solar trees can be utilised as a teaching tool to teach pupils about sustainability and renewable energy. Outdoor events like concerts, festivals, and fairs can employ portable solar trees as a sustainable energy source for lighting and other equipment.

As improvements in solar panel efficiency and battery storage continue, the future of solar tree technology is bright. Here are some future advancements that might occur:

1. *Integration with Smart networks:* To enable more effective energy distribution and storage, solar trees could be combined with smart networks.
2. *Enhanced Efficiency:* Solar trees may produce electricity even more effectively as solar panel technology advances.
3. *Greater Versatility:* Solar trees might become more adaptable, enabling customization of the layout and positioning to suit particular requirements and situations.
4. *Integration with Electric Vehicles:* Solar trees could serve as electric vehicle charging stations, furthering the cause of environmentally friendly transportation.
5. *Improved Aesthetics:* As solar trees proliferate; designers may pay special attention to enhancing their aesthetic appeal to make them more pleasant to the eye in public areas.

CONCLUSION

The concept of solar trees is gaining popularity as a sustainable solution for clean energy generation. Solar trees are aesthetically pleasing and can be installed in urban areas, making them a viable option for renewable energy in cities. As more research and development is done, solar trees may become a more common sight in our communities, providing clean energy and reducing our reliance on fossil fuels. The future of renewable energy looks bright with innovative solutions like solar trees leading the way.

The Solar Tree Is a modern and innovative way to harness renewable energy from the sun. It combines solar panels and energy storage to provide clean and sustainable energy for urban areas. This technology is a step towards creating smart cities that prioritize energy efficiency and reducing carbon footprints. The Solar Tree is an example of eco-friendly architecture and urban design, which can help combat climate change and promote environmentally friendly living. With the increasing demand for alternative energy sources, the Solar Tree offers a promising solution for net-zero energy and off-grid living.

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REFERENCES

1. Mukesh Kumar, Lokesh Rana, Amruta Pattnaik. Solar Tree – A Sustainable Energy Approach for Farmers. Journal of University of Shanghai for Science and Technology. July 2021; Volume 23, Issue 7. 410-419.
2. Duflou JR, Peeters JR, Altamirano D et al. Demanufacturing photovoltaic panels: comparison of end-of-life treatment strategies for improved resource recovery. CIRP Ann 2018;67:29–32.
3. Kumar V, Mansoori MA. Solar botanic tree to harnessing the power of the sun and wind. IJCSNT 2017;6;87–90.
4. Cuce E. Toward multi-functional PV glazing technologies in low/zerocarbon buildings: heat insulation solar glass - latest developments and future prospects. Renew Sustain Energy Rev 2016;60:1286–301.
5. Cuce E, Cuce PM, Young CH. Energy saving potential of heat insulation solar glass: key results from laboratory and in-situ testing. Energy 2016; 97:369–80
6. Berny S et al. Solar trees: first large-scale demons tration of fully solution coated, semitransparent, flexible organic photovoltaic modules. Adv Sci 2015;3:1–7
7. M Kumar, JP Kesari, L Rana, Flexible Solar Power Tree-A Concept, Journal of Engineering Technology and Applied Sciences (2020), Vol 5(2): pp -217-221
8. Rajiv Singh, Neelam Rawat and Dr. Ratnesh Srivastava, Performance Evaluation of a Solar Tree Design and a Fixed Solar Panel for Effective Solar Power Harnessing, International Journal of Applied Engineering Research ISSN 0973-4562 Volume 14, Number 11 (2019) pp. 2616-2621
9. Nonhebel S., 2005, “Renewable Energy and Food Supply: Will There Be Enough Land?,” Renewable Sustainable Energy Rev. , 9 (2), pp. 191– 201
10. J Balaji, PN Rao SS Rao, Solar Tree with Different Installation Positions of Photovoltaic Module-Part, Journal of Green Engineering, 2020, Volume-10, Issue-9, September 2020

