IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 8, Issue 5, May 2020

Sun Tracking Through Solar Tree: A Review

Kajal Saini[1], Kavita Sharma[2], Md. Asif Iqbal[3]

Student, Electrical Engineering, Poornima College of Engineering, Jaipur, India[1,2]

Assistant Professor, Electrical Engineering, Poornima College of Engineering, Jaipur, India[3]

Abstract: Demand of energy is expanding with each period, to satisfy the necessary interest we should need to focus on using renewable sources of energy. Energy obtained from the sun is the best choices among the sustainable power sources. It is free, limitless. Eco-friendly, non-Polluting and nonstop wellspring of energy. This paper described about Solar Power Tree that produce huge measure of energy by catching little land zone consistently.

Keywords: Solar Tree, Renewable Energy Sources and Photo Voltaic (PV) cells

I. INTRODUCTION

Directly with the making populace and expanding energy request we should take an elective choice of energy source and further more we should remember that energy ought not to cause defilement and various characteristics threats. As the time is taking off and the time furthest reaches of the characteristic sources is diminishing. At the present time all are examining about the sustainable power source and a standout among other sustainable power source is sunlight for example solar energy. Solar energy is accessible in wealth and considered as the most effortless and cleanest techniques for drawing from the inexhaustible power source. Direct change of solar radiation in sensible structure is basic and the courses are solar warm, solar photovoltaic and solar foundation. However, the primary issue related with tapping solar energy is the necessity to introduce huge solar authorities requires an exceptionally enormous space to keep away from this difficult we can introduce a solar tree regardless of various solar boards which require extremely little space.
India is fundamentally a populated nation, so we should try such an energy which requires an extraordinarily less space to make energy successfully. For this condition solar tree could be the best alternative for us. In this paper we are going to discuss solar trees which are advantageous than the straight forward solar boards. These solar trees can be utilized anyplace like enterprises, for domestic reason etc. These are especially advantageous where the population is high and the supply of common sources is less agreeing the population.

II. LITERATURE REVIEW

Monish Gupta (2015) described that Solar tree panels create 20% more Energy than any straight forward level solar board which is comprised of solar cells. As its territory is more and because of its tree like game plans of solar board it gathers sun raise 2.5 hours more than basic solar board game plan subsequently its solar radiations time diminishes and power age is increment up to half as it utilizes nano solar wires.
A P R Srinivas (2016) likewise inspected that a straight forward solar board mounted on a pole has a lower adequacy than number of solar boards presented on same post having a tree like structure. The housetop top solar systems can be displaced by solar tree and the housetop space can be utilized for amusement purposes. So this solar tree reduces the space need and makes more yield.
Dipak M. Patil (2016) saw that the day by day normal utilization of small Indian family is about 3.5 kW so it can be effectively so it very well may be effortlessly produced by power matrix arrangement of solar tree. The expense of solar tree and straight forward PV model is close about same. We can likewise diminish the expense of solar tree by making its plan basic and inventive. A similar plan can be moves to various areas for higher energy utilization.
The creator detailed about Solar Power Tree that produce colossal proportion of energy by getting uncommonly little land area reliably. Silicon-crystalline Photo-Voltaic (SPV) mounted on tall post which directs follower solar energy into electrical energy by techniques for the photo voltaic effect. Therefore, Solar Power Tree is amazingly capable to get colossal proportion of solar energy by utilizing a little surface domain of critical land.
Solar tree is an ornamental technique for creating solar energy and furthermore power. It uses diverse number of solar boards which outlines the condition of a tree. The boards are masterminded in a tree style in a tall tower/pole.
Meaning of TREE in Solar Tree is
T implies Tree creating
R implies Renewable
E implies Energy and
E implies Electricity

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 8, Issue 5, May 2020

Figure 1: Solar Tree

A solar tree is a structure consolidating solar energy innovation on a solitary column, similar to a tree trunk. It might be a solar work of art or useful power generator. A solar tree is having a post contained metal and solar sheets which are determined to different shafts having a strategy like pieces of a tree looks loves a fake tree like structure which makes power from using daylight by using PV cells. The measure of energy created by Solar tree is in excess of an array of solar cells. Solar Energy gathered by solar boards changed over into electrical energy and afterward put away into Batteries which can be additionally utilized according to the requirements. A Solar Tree is the best imaginative way, which requires less spot to convey energy profitably. We can execute in like manner the "SPIRALLING PHYLLATAXY" to improve the effectiveness of the plant. It is a strategy which used in organizing of solar tree. It gives a way to deal with assistance lower sheets from the shadow of the upper ones, with the objective that it can follow most outrageous power from sun. This technique is used to improve the proficiency of the plant.

III. INTRODUCING ABOUT SOLAR CELLS/PANELS

A solar or Photovoltaic (PV) cell is an electrical gadget that changes over energy of light straightforwardly into power by the photovoltaic impact, which is a physical and synthetic phenomenon. It's like a type of photoelectric cell, characterized as a gadget whose electrical qualities, for example, voltage, or opposition, shift when presented to light. Individual solar cell gadgets can be joined to frame modules, also called solar boards. The basic single intersection silicon solar cell can deliver a most extreme open-circuit voltage of roughly 0.5 to 0.6 volts.

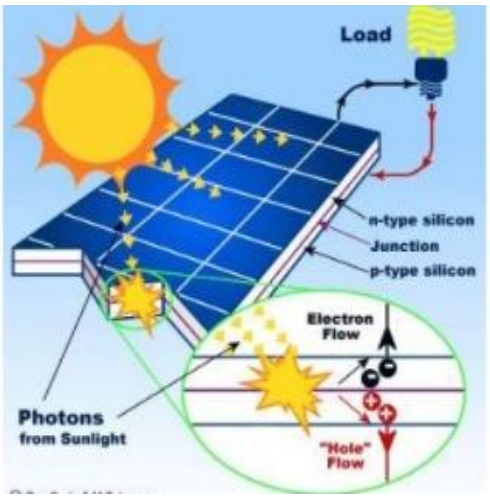

Figure 2: Working Solar Panel

Solar cells are depicted as being photovoltaic, regardless of whether the source is sunlight or a counterfeit light. Notwithstanding creating energy, hello can be utilized as a photo locator (for instance, infrared indicators), identifying light or other electromagnetic radiation close to the obvious range, or estimating light force.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 8, Issue 5, May 2020

The activity of a photovoltaic (PV) cell requires three essential qualities:-

- The assimilation of light, producing either electron-opening set.
- The division of charge transporters of inverse kinds.
- The separate extraction of those bearers to an outer circuit.

Interestingly, a solar warm collector supplies heat by engrossing sunlight, with the end goal of either direct warming or roundabout electrical power age from heat. A "photo electrolytic cell" (photo electrochemical), then again, refers either to a kind of photovoltaic cell (like that created by Edmond Becquerel and current color sharpened solar cells), or to a gadget that parts water straightforwardly into hydrogen and oxygen utilizing just solar light.

IV. DESIGN OF SOLAR TREE

Solar Tree is having a tree like structure made of metal bars and solar boards. Masterminded in such a manner, that shadow of any solar board is fall on other solar boards subsequently winding style plan of solar boards are generally utilized, as a result of such structures it requires less space and it might be presented close by the streets or in a nursery. The primary concern that must be caring about that shadow of anything not fall on the boards it may lessen the capability of solar Tree.

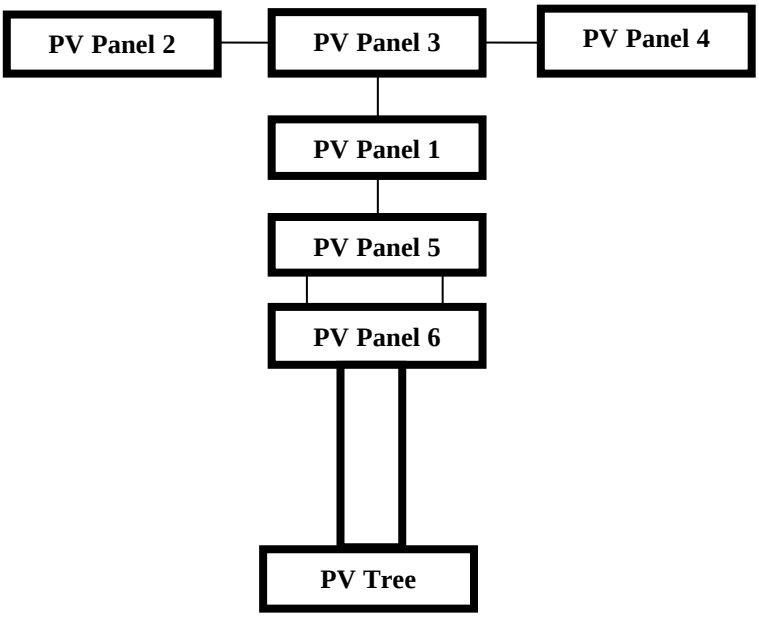

Figure 3: Design of Solar Tree

V. PRINCIPLE COMPONENETS USED IN THE SOLAR TREE

1. Numerous solar boards
2. Secure metal pole
3. Various lights
4. Battery units
5. Metallic trunk and branches for interfacing out numerous solar boards

There are numerous solar boards utilized in the solar tree for harnessing most extreme power yield from the solar energy. The solar boards are mounted in various ways to expand the surface region so as to catch more sunlight.
Secure Metal Pole: The secure metallic pole gives auxiliary honesty to the solar tree to fabricate, and consequently make the solar tree to withstand in any climatic condition.
Various lights: There are different LED's lights that are associated with the solar tree for using the electrical energy from the solar tree to change over it into light, as such shining each corner around the solar tree with light.
Battery Units: Battery units are utilized to store the produced electrical energy from the solar boards and afterward store it as chemical energy for additional utilization later on. The put away chemical energy is then changed over to electrical energy upon employments.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 8, Issue 5, May 2020

Metallic trunk and branches: The metallic trunk and branches are utilized for supporting the mounted solar boards, lights and battery packs. The metallic stem and branches gives various positions and points to the solar boards for catching solar energy.

VI. WORKING OF SOLAR TREE

Photovoltaic cell changes over sunlight into electrical energy and this impact is called as photovoltaic effect. Solar cells basically make power by changing over photons of light into electrons. The Solar Tree boards charge batteries during the day.

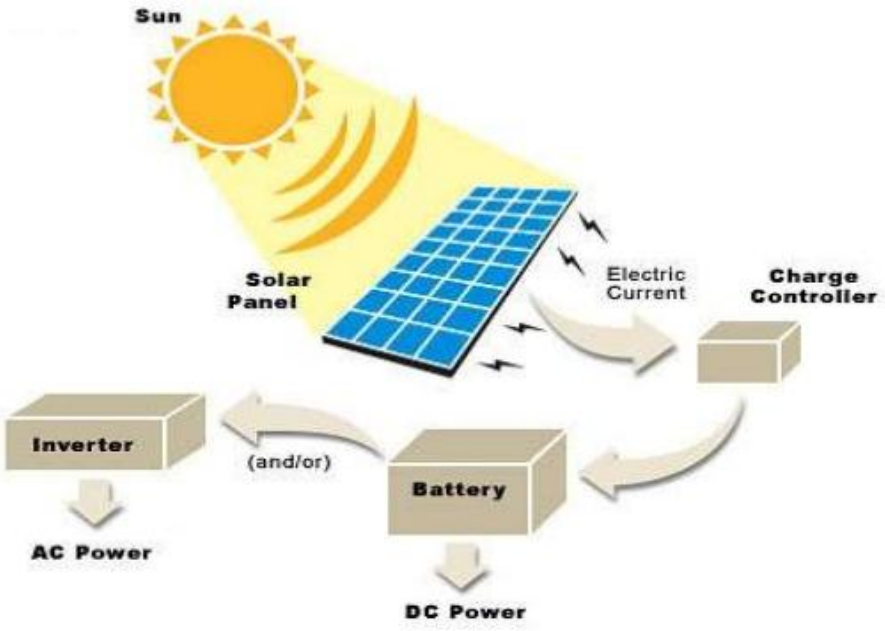

Figure 4: Working of Solar Tree

At sunset the Solar Tree consequently turns on its LEDs. The interior control can likewise manage the measure of light delivered relying upon how much charge is left in the batteries. Solar cell creating direct current (DC), this direct current is changed over to substituting current i.e. alternating current (AC) by utilizing inverter.

VII. ENERGY EQUATION FOR SOLAR TREE:-

$$E = A * r * H * PR$$

Where,
E is the Energy in (kWh),
A is the Total solar board zone in (m),
R is the solar board yield or productivity in (%),
H is the Annual normal solar radiation on title boards,
PR is the Performance proportion or coefficient for losses (the range is somewhere in the range of 0.5 and 0.9, default value=0.75)

Factors Affecting the Performance-There are following factors which are responsible for the performance of a solar PV system:-

1. Partial shading on PV condition
2. Dust collection on the panel
3. Temperature effect on panel

Shading on PV board might be because of shade of the long trees standing close by the framework, conceal from the other equal line of the board, the shade because of winged creatures sitting on the board.
Dust is likewise a significant factor that corrupts the board rating.
With the expansion in temperature, the solar PV framework will in general work with diminished effectiveness.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 8, Issue 5, May 2020

VIII. NEED OF SOLAR TREE

Small area/space requirement: It is the best option of energy creation since it requires very less land as diverge from the traditional PV structure. Directly a day's territory transforms into the costliest thing for the human culture because of high people improvement. Manual for produce 2 MW power from a PV module, we requires 10-12 segments of place that is known for land for housing of sheets specifically. Nevertheless, for a comparable proportion of energy we require simply 0.10-0.12 areas of place that is known for land in case of solar tree. So we require such a plant which can deliver most noteworthy energy using least land.
Productive energy production: It can create energy proficiently as contrast with the conventional framework. Because of the strategy called Spiralling Phyllataxy, it improves the efficiency of the plant. It tends to be applied in street lightening framework, modern power gracefully and so on. It is obviously superior to the customary solar PV framework in territory of view and furthermore progressively effective. Despite the fact that it is some way or another exorbitant yet as contrast with all expense include in customary framework it is increasingly effective.
Energy collection from wind: As the name suggest, this is a contraption to make energy from sun anyway it has some novel component to deliver energy from wind. The stem are versatile with the objective that they can move in the direction of any way and by shaking themselves they produce energy similarly from wind as by virtue of a trademark tree. The exceptional system is that versatile sheets related with the stem which can be turned as our longing. So the adaptability shirking of wind weight can be possible. Versatility offers manual turning so most outrageous power can be gotten.

Advantages of Solar Tree
Private home holders are finding the advantages to our natural and an approach to live joyfully off the lattice are thinking about introducing a matrix attached solar power framework to counterbalance their electric bill or because of a faith in diminishing their carbon outflows. These are extraordinary motivations to "go solar"___
Naturally Friendly: For evident reasons, the utilization of solar boards is eco-accommodating and considered one of the most "green" power resources. Since they work by communicating with a renewable energy source, sunlight, there is no dread of exhausting one more characteristic asset.
Reduced Electrical Bill: By changing to the solar energy, we can set aside cash our electrical bills in consistently. Regardless of whether power charges keep bringing up in the following barely any months you will have the true serenity realizing that your energy source depends on solar power.
Low Maintenance: Solar boards have no moveable parts and are extremely easy to utilize. In the wake of being set up appropriately, they don't should be tinkered with and will keep working for a long time. Truth be told, numerous makers have multi year guarantees on their boards.
Efficiency: Regardless of where you live, the odds are that you can effectively utilize solar boards for your electrical needs. They are tough and are truly versatile to atmosphere conditions and the most recent board models are effective enough to function admirably without confronting legitimately south and some will even create power under overcast spread.

Disadvantages of Solar Tree
- May cause risks to the feathered creatures and creepy crawlies.
- Hazards to visual perception from solar reflectors.
- Initial cost is so much high contrast with typical customary technique.

IX. FUTURE SCOPE

Agreeing every above actuality we can reason that the solar trees are need of things to come on the grounds that these are inexhaustible wellsprings of energy and in coming time these are turned out to be exceptionally famous on the grounds that the prerequisite of land is less and daylight accessible till what's to come. In India the researchers of Central Mechanical Engineering Institute of Research (CSIR-CMERI) made a solar tree which can edify five houses one after another by utilizing just 4square feet of the land. In India there is an excessive amount of populace and the land is less and the necessity of energy is high so the solar trees are as an elective arrangement of these issues. In future this can be utilized in house supplies, mechanical supplies and as a beautifying figure.

X. CONCLUSION

To fulfill the extending energy solicitation of the people and saving of land, this endeavor is amazingly productive one. This can give power with no force cut issue. The additional energy can be given to the network. The solar tree can trap the solar energy continually and the sheets can move similarly to sun improvement. Solar tree appears the perfect

solution for our future energy needs. Solar tree is a dynamic urban lighting thought. The tree design made half more prominent power and the collection time of daylight was up to half more. It helps nature, sets aside money, unobtrusive to use and you can have them on your homes. It is free, prop up for lifetime and condition neighborly.

REFERENCES

[1] Y. Zhao, L. Yang, and B. Lehman, "Decision Tree-Based Fault Detection and Classification in Solar Photovoltaic Arrays," pp. 93–99, 2012.
[2] S. Sawant, S. Bane, S. Bhokare, P. Bute, K. Gosavi, and A. Gawade, "Highly Efficient Constant Power Generation Using Solar Tree," *2018 2nd Int. Conf. Trends Electron. Informatics*, pp. 1–6.
[3] J. M. Esca, A. J. Gallego, and E. F. Camacho, "Fault Tolerant MPC of a solar trough field based on Classification and Regression trees," pp. 152–157, 2016.
[4] "Modelling and Simulation of Solar PV Array under Partial Shaded Conditions," pp. 7–11, 2008.
[5] A. K. Abdelsalam, "Hybrid Electro-Mechanical Photovoltaic Maximum Power Point Tracking Technique for Innovative Solar Trees," no. 3, pp. 406–414, 2017.
[6] Y. Jyoti, "A Review Paper on Solar Tree," vol. 5, no. 23, pp. 1–3, 2017.
[7] C. Republic, "Optimal Design of Neural Tree for Solar Power Prediction."
[8] J. Cai, F. Gao, X. Guan, K. Liu, N. Yao, and X. Cheng, "An Economic Dispatch Model Based on Scenario Tree in Industrial Micro-grid with Solar Power and Storage," pp. 1594–1599, 2016.
[9] D. K. Chaturvedi, "An Experimental Study and Verification of The Facts Related to Factors Affecting The Performance Of Solar Pv Systems," pp. 1185–1188, 2015, doi: 10.1109/CSNT.2015.186.
[10] A. P. R. Srinivas, "Design and Development of a SOLAR TREE," vol. 7, no. 10, pp. 1319–1327, 2016.
[11] M. Siegel, "Weather-Based Solar Energy Prediction," pp. 10–15, 2012.
[12] K. Gaikwad, "Novel Maximum Power Point Tracking (MPPT) Algorithm for Solar Tree Application," no. Icesa, pp. 189–193, 2015.
[13] F. Hyder, P. Baredar, and K. Sudhakar, "A novel Sun tracking technique through a Solar PV Tree and a smart controller," *2018 4th Int. Conf. Electr. Energy Syst.*, pp. 407–411, 2018.
[14] S. Torgal, "Concept of Solar Power Tree," vol. 3, no. 4, pp. 2393–2395, 2016, doi: 10.17148/IARJSET.2016.3440.
[15] S. S. Awaze, K. Bhamburkar, A. Babare, A. Asode, P. S. P. Bargat, and D. Rly, "Solar Tree : A Source of Energy- A Review," pp. 514–516, 2018.
[16] K. Kishore, B. Pesala, M. Santosh, S. C. Bose, and S. A. Akbar, "Highway Street Light with Ambient Monitoring Capability," *2019 10th Int. Conf. Comput. Commun. Netw. Technol.*, pp. 1–6, 2019.
[17] N. T. Khajavi, A. Kuh, and N. P. Santhanam, "Spatial Correlations for Solar PV Generation and its Tree Approximation Analysis."
[18] I. R. U. H. Ruhvw and Y. Mochizuki, "(IIHFWLYH 6HULHV 3DUDOOHO & HOO & RQILJXUDWLRQ LQ 6RODU," *2018 7th Int. Conf. Renew. Energy Res. Appl.*, vol. 5, pp. 294–300.
[19] Manish Dhone, Kishor Sonwane, Denis Farkase and Jayantsingh Baghel, "A REVIEW ON SOLAR TREE" *Vol- 4 ssue-2 2018 IJARIIE-ISSN (O) - 2395-4396*
[20] Sushma Gupta, Monish Gupta, "The Benefits And Applications Of Solar Tree With Natural Beauty OfTrees", SSRG International Journal of Electrical and Electronics Engineering, issue April 2015.
[21] "Development Of Solar Tree For Domestic Applications" International Journal Of Engineering Sciences &Research Technology issue August 2016, SSN: 2277-9655