

DESIGN AND DEVELOPMENT OF OD SOLAR TREE SYSTEM

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Abstract

The work is related to the solar energy power generation, more specifically the paper revolves around the topic of solar tree. This paper shows how efficient and important is the solar tree for this generation. This presents how solar trees convert the solar energy into electrical energy. Sunlight irradiates daily and blasts out an enormous amount of solar energy towards the earth, the total energy that is received from the sun is more than enough for humanity to run for many years, still the received solar energy is not harnessed properly and hence there is not sufficient energy production in the world. Since solar panels are the efficient method nowadays for generating electrical energy from the solar energy, but solar panels require a lot of space to install. Hence this work solves this problem by using a solar tree that is mounting of solar panels on an artificial tree.

Keyword:- Solar,PV, Energy ,Electrical

1. Introduction

As conventional energy sources are exhausted rapidly everyone is looking towards non-conventional energy sources. But it is difficult to replace conventional energy sources with non-conventional energy sources. Because the energy consumption in today's world is in a large quantity which is quite difficult to obtain such an amount of energy from non-conventional energy sources. But, we can reach near to the quantity of required energy by increasing the efficiency of previously invented non-conventional energy equipments like solar panel, wind mills. And the other way is that, we can invent a new equipment which has a better efficiency with a better power generation rate.

Solar energy is the best option when we are looking for a non-conventional energy source. Because it is very easy to trap the solar radiations and convert it into electrical energy by using photovoltaic (PV) cells. Now, it is also necessary to think about the environment by reducing pollution. So solar energy is the best option when we consider all the above-mentioned parameters. The only problem occurs when we use solar energy is that a large space is required for an installation of big solar panels for higher outputs so it can be solved by this new product known as "Solar Tree"

The usable land that can be used as a cultivating field is going to be more costly than in the coming future. There are many ongoing projects that are undertaken by the government and are facing many issues regarding the acquisition of the land. Hence there is a need for a device or a method or a system for providing efficient and maximum power from a defined space of area, without utilizing much area generating economical revenue. A solar tree is a decorative way of producing solar energy. It uses a number of solar panels which form the shape of a tree. The panels are arranged in a tree fashion in a tall pole. The one way or method is harvesting solar irradiation by means of photovoltaic cells. In photovoltaic cells multiple semiconductors capture the solar irradiation that are called solar cells, and these solar cells then convert the solar irradiation into electrical energy. When the solar irradiation falls on the junction of the p and n type semiconductor, then the excited photons from the solar light jump out the electrons from their orbits and thus make them to move freely, thus producing a flow of electrons that in turn generates voltage across it and hence converts to electrical energy. The solar tree is the mixing of the present technology with the new design ideas, both of them are mixed together in an efficient way to build a high tech device with perfect design. The solar tree is used for using solar energy as a means for producing electrical energy. The solar tree uses multiple

solar panels attached to it in shape of actual tree. The panels are mounted in tall heighted tower shape.

2. Literature survey

Bhuvaneswari, R. Rajeswari: He was publish the paper that is Idea to Design a Solar Tree Using Nanowire Solar Cells in International Journal of Scientific and Research Publications, Volume 3, Issue 12, December 20131 ISSN 2250-3153, To introduces a new solar technology that emulates how trees convert sunlight into energy. Trees, shrubs and plants use an inherent structural design to expose their leaves, height dense to sunlight for photosynthesis. They do this determines their survival. Based on this we describe the coconut tree growing u to 30m(98 feet) tall, with pinnate leaves 4-6m(1320feet) long to design a solar tree. Pinnate refers to a leaf resembling like a feather having the leaflets on each side of a common axis. It can be either even or odd. By this structured pattern that leaves follow to arrange themselves on a tree. With this arrangement we introduce a new idea to design a solar tree using nanowire solar cell. Nanoparticles exhibit a number of special properties relative to bulk material. A single Nanowire concentrates the sunlight upto 15 times of the normal sunlight intensity. The solar new technology presented in this paper will provides nearly high efficiency. The number of papers and patents published in this area has grown up exponentially over the last 10 years. However at the present, research efforts have largely focused on solar trees. Nanowire can concentrate the sunlight up to 15 times of the normal sunlight intensity and hence the surprising results have the potential for developing a new kind of highly efficient solar cell. This can be used to give a higher concentration efficiency of the sun's energy[1].

Dr. Suwarna Torgal: She is publishing the paper that is Concept of Solar Power Tree in International Advanced Research Journal in Science, Engineering and Technology Vol. 3, Issue 4, April 2016. Demand for energy is increasing with each period, to fulfill the required demand we must have to concentrate on utilizing non-conventional sources of energy. Energy from the Sun is the best alternatives among the renewable energy sources. . It is free, inexhaustible, nonpolluting, eco-friendly and continuous source of energy. The paper detailed Solar Power Tree that generate large amount of energy by capturing very small land area throughout the year. Silicon-crystalline Photo-Voltaic (SPV) mounted on tall pole which direct convert solar energy in to electrical energy by means of the photo voltaic effect. In the world, oil is running out and it is estimated that 80% of the world's supply will be consumed in our lifetimes. Coal supplies appear to be very large but this stock is also stock out if rapidly uses. Nuclear power having a

dangerous aspect. Thus unconventional energy sources such as geothermal, ocean tides, wind and sun is best option to meet future energy requirements. Cultivable land is the greatest crisis of the earth rather it is already a burning crisis in major countries, the cultivable land is god of the farmers, if used for other than agriculture, it will be unpredictable loss to the society. Therefore Solar Power Tree is very efficient to capture large amount of solar energy by utilizing a very small surface area of valuable land [2].

Deepak M. Patil, Santosh R. Madiwal: He was publish the paper that is Design and Development of Solar Tree For Domestic Applications in International Journal of Engineering Sciences & Research Technology, August 2016 ISSN: 2277- 9655, he work Flat or roof top mountings of PV systems require large area or land. Scarcity of land is greatest problem in cities and even in villages in India. Solar Power Tree provides better alternative to flat mounting of PV systems. For domestic lighting and other applications use of Solar Tree is more relevant when PV system is to be used. In this article load or energy requirement of small house in India is estimated to 1.75kWhr/day. All the calculations are done considering solar radiation data at Kolhapur, Maharashtra (16.760). The solar tree concept is very successful to fulfill the increasing energy demand of the people, saving of land, and should be implemented in India to provide electricity without the problem of power cut-off and reduce the dependence on grid power. Daily average energy requirement of the small Indian family is calculated about 3.5kW. Such systems can be mounted on the terrace, in front of the house or near the wall avoiding shading areas. The initial investment cost of the solar tree is also equal to same capacity PV systems as other system components are similar [3].

Mr. A P R Srinivas: He was publishing paper that is Design and Development of a SOLAR TREE in International Journal of Scientific & Engineering Research, Volume 7, Issue 10, October-2016, 1319 ISSN 2229-5518. a new product called, 'solar tree' has been designed to increase the power output by many folds by consuming solar energy. It can be installed on the sides of heavy traffic roadways and on roof top buildings. The tree consists of numerous solar panels connected to one another in series and parallel connections. The solar tree consists of number of branches welded to a stem and each stem has a solar panel mounted on it. It adds up voltage in series and current in parallel connection. The paper calculates the sun earth angles at different times of the day and designs solar tree based on these sun earth angles. The panels are put on the structure in a spiral fashion. It proves to be a useful system to meet the energy demands of the world and to use a given space more efficiently. The present system of roof top solar systems can be

replaced by solar tree and the roof top space can be utilized for recreation purposes. The solar tree can be installed on ground also in addition to roof top spaces. So, this solar tree proves to be advantageous in saving space and increasing the power output by many folds. It saves a lot of energy over the years to come. The number of solar trees that could be installed in a given space depends on the wattage needed [4].

Sushma Gupta, Monish Gupta: She is publish the paper that is The Benefits and Applications of Solar Tree with Natural Beauty of Trees in SSRG International Journal of Electrical and Electronics Engineering (SSRG-IJEEE) – EFES April 2015, ISSN: 2348 – 8379. Now a days oil supply is decreasing therefore energy sources are becoming limited throughout the world. 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. A new idea of a solar tree design us in Nano wire solar cell is presented. Nano wires possess high physical light absorption properties which can be improved tremendously Hence we can say that it is a revolutionary urban lighting concept and these technologies lead to the development of high efficiency solar energy. Keywords -- Solar Tree, Renewable Energy, Nano-wire, solar cell, Solar Energy. 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 cab be available. Also a solar botanic tree is a nonconventional 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 starts as an individual to cooperate with the government to make life favorable for mankind [5].

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 [6].

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 [7].

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[8].

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 [9].

Immanuel Alphonse et al detailed the designing of a solar powered BLDC Motor Driven electric vehicle. Immanuel selected the appropriate components for the application and the various components for the same is subjected to various tests, cross checked with simulation results. The designing of the whole system depends on the application for which it shall be used, and accordingly the components are chosen. It was observed that according to the application, the motor was chosen first. From the rating of the motor, the battery which could satisfy its starting current and full load current was been selected, and then according to the rating of the battery, the solar charge controllers and the solar modules were selected. Finally the BLDC motor mounted upon the frame realized the prototype of the vehicle which was tested at different load condition [10].

Rustu Eke et al studied the operating parameters of KA58 amorphous silicon PV module and investigated the parameters as a function of solar irradiation and atmospheric conditions using current-voltage curves. This was done from April to May at Mugla Sitki Kocman university PV outdoor test site. Current-voltage curves of thin film solar cells and modules are explained by single diode model, In a period of 12 months, the PV module exhibits different response to changes in solar irradiation and weather conditions[11].

Farshid Mostofi et al studied an optimization model of hybrid energy system for a hybrid system implemented in the north part of Iran is presented. The optimization solution is provided by HOMER software compared with a solution given by a genetic algorithm implemented in MATLAB software. The paper presents an interesting source for the implementation of hybrid systems in isolate areas. The main purpose of combination PV, wind, fuel cell and hydro units is to reach a reliable applying with minimum initial and operation cost. The results show that the optimized configuration produces high efficiency for LPSP of 1.23%. Implementation of this energy system will supply the area's demand as well as it has no emissions and reduces the environment pollutions [12].

3.Conculasion

Solar tree is designed to function both autonomously and with the synchronization with the public grid. Electric grid, it uses the energy generated by the solar panels during the to recharge the batteries or the power generated by the pannels which is in the form of DC is converted into ac with the help of inverter and it is fed to the synchronized public grid. At dusk, which is recognised by automatically monitoring the solar panel output, the LED sources are activated and remain lit until dawn (As long as the batteries remain charged). Solar tree is capable of functioning for three consective days of cloudy or overcast weather. When wired for co-ordinated functioning with the public lightening grid, it uses the energy generated by the solar pannel to recharge the batteries or the power is fed to the public grid through the inverter and activate / deactivate LEDs sources in synchronous with the grid, to which the surplus of stored current can be relinquished. Number of solar pannels are used to give the shape of a tree and arranged in a tall steel tower/ pole. The total number of pannels installed will depend on the power output which is the desired output power we need to produce . And according to that we have to connect the panels in series or paraallel. Major problems of the power system are the storage of electric energy. Solar tree panels generate power during the day time and this power is supplied to the grid during the day or it can be stored in the batteries but it is preferable to fed the generated power to the grid and if the LEDs are installed or load is connected then the solar tree automatically switches on its LEDs/ Load. A sensor is used to measure the amont of light in atmosphere and triggers the solar panels to switch "ON" automatically at sunset and "OFF" at sunrise.

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