International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

DEVELOPMENT OF SOLAR PALM TREE FOR RURAL STREET LIGHTS

A.SHYAM JOSEPH[1], R.GEETHA[2], M.R.MONISHA[3]

[1]*Professor, Dept. of Electrical and Electronics Engineering, Sri Ramakrishna Engineering College, Coimbatore.*
[2, 3, 4]*Dept. of Electrical and Electronics Engineering, Sri Ramakrishna Engineering College, Coimbatore.*

Abstract - *Continuous advancement in technologies led to high demand of energy. "Development of solar palm tree for rural street lights" should be implemented to meet the energy demend.Solar energy is a renewable source of energy that is free, non-polluting, sustainable and inexhaustible. New technological development efficiency of solar cell is increasing every day and it is becoming cheap also for use in regular day. This system can withstand power for long time and work as energy efficient. For direct conversion of solar radiation into usable form, the routes are solar thermal, solar photovoltaic and solar architecture. However the main problem associated with tapping solar energy is the requirement to install large solar collectors requires a very big space. 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. To avoid this problem we can install a solar tree in spite of a no of solar panels which require a very small space. 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. Solar tree is a metal construction that resembles a real tree. Solar panels are mounted on top of each branch. Generated energy will be available to everyone and it will be used for street lights. To increase the efficiency, a technique called "Spiraling Phyllataxy"is employed and it provides the way to help the lower panels from the shadow of upper ones, so that it can track maximum power from sun. Maximum Power Point Tracking (MPPT) to be used to extract maximum power from sun when it is available. Three panels connected in parallel and one panel connected in series and each panel of 4Watts is mounted on the tree branches. When the irradiance strikes the panel, then the output voltage will be given to the controller to avoid over charging of the battery.LDR is used to detect the intensity of solar light. According to intensity of light solar panel is to get maximum intensity. Current sensor s is used to collect the current output data from the solar panel and battery. Voltage sensor collects data from the solar panel. Output of the LDR is used to operate the relay. Relay is used as switch.LCD displays the status of the load and some electrical parameters.*

***Key Words*:** Solar or PV cells, Solar Panel, MPPT, Spiralling Phyllataxy, Solar tree, Sensors, Fibonacci series.

1. INTRODUCTION

There is a big hue and cry over energy crisis from all over the world mainly for two reasons, firstly the natural resources are going to be exhausted very soon and the other is we should continue with the available natural resources of carbonaceous compound which is posing threat of greenhouse gas effect to human being every day. People are trying over different sources to find out non-conventional energies. A solar tree is most relevant and way of harnessing the solar energy. It can harness the energy occupying less space as compared to traditional methods. Solar energy is available in abundance and considered as the easiest and cleanest means of tapping the renewable energy. However the main problem associated with tapping solar energy is the requirement to install large solar collectors requires a very big space. To avoid this problem we can install a solar tree in spite of a no of solar panels which require a very small space. Basically from solar cell gives the DC voltage output store in the battery & through inverter circuit it gives 12v AC output which can use for building surrounding lights & stair case lights & as well as main load. A solar tree producing solar energy and also electricity. A solar tree uses four no of solar panels which forms the shape of a palm tree. Spiraling phyllataxy is a technique used in designing of solar palm tree. It provides the way to help the lower panels from the shadow of upper ones, so that it can track maximum power from sun. This project describes a microcontroller based PV (photovoltaic) system. Because the energy from the sun fluctuates with climate conditions, the impedance of the PV system must be adjusted to match the change in lighting condition. To do this, we employ a microcontroller which can handle both analog and digital circuits, to reduce the need for additional circuit elements. The controller is used as a programmable Maximum Power Point Tracking (MPPT) controller.

1.1 OBJECTIVE

- The aim of the project is to utilize the maximum solar energy through solar panel for this automated sun tracking is proposed. The main objective of solar palm tree design to reduce the size of the area and provide electricity for rural street lights.
- The proposed solar palm tree branches used to get high voltage as output because the branches of the solar tree panels are height, so that conversion of the solar energy by the solar panel is high.

1.2 LITERATURE SURVEY

[1] Deepak M. Patil, Santosh R. Madiwal, 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. Tracking system can be easily employed in Solar Tree hence its performance is better than flat mountings of solar PV system.

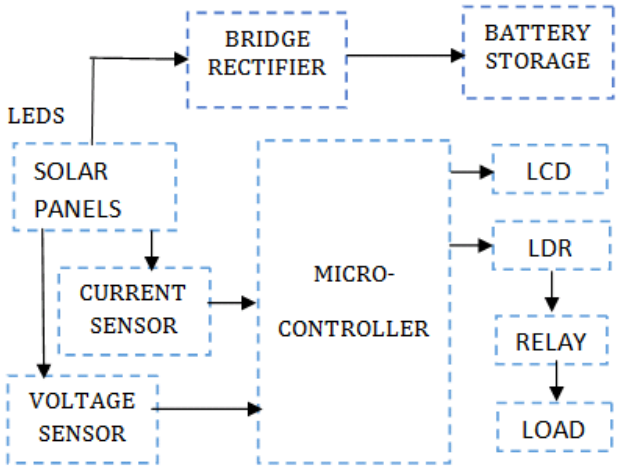
[2] Ayneendra B, Saubhagya Bista, Akhil J, Saifudheen C K , Dharma raj Kasaudhan,There is a big hue and cry

over energy crisis from all over the world mainly for two reasons, firstly the natural resources are going to be exhausted very soon and the other is we should continue with the available natural resources of carbonaceous compound which is posing threat of greenhouse gas effect to human being every day. People are trying over different sources to find out non-conventional energies.

1.3 BENEFITS

- The day to day running and maintenance costs are slashed.
- There is a positive environmental impact as opposed to a negative one.
- The lack of wiring to be installed minimizes the disruption caused to, for example, road users during installation.
- Power outages have no impact whatsoever on street lighting in the area.
- Solar street lights can be easily erected in almost all locations.

2. HARDWARE DESCRIPTION



2.1 RESULT

SOLAR	NUMBER OF PANELS	12V BATTERY
Fixed panels	4	3hrs 30 minutes of charging
Tree fabrication	**4**	3hrs charging

2.2 CALCULATION

PEAK WATT POWER

E=Energy requirement from PV module

E=1/Battery*charge controller*Wiring

=1/0.85*0.85*0.97=1.42

E=1.40(Approximately)

FL=Estimated average daily energy consumption in Wh/day

P array=FL*E

P array=228*1.4 =319.2Wh\day

P array=320(Approximately)

W peak=P array/average daily sun hour on titled surface at latitude

W peak=320/6

W peak=54W p

TOTAL ARRAY CURRENT

I dc=Peak watt rating (W peak)/system rating (V dc)

=54/12 I dc=4.5A

ARRAY SIZE

Number of modules in series N MP=I dc/I mpp

=4.5/2.8=1.607

Total no.of modules in series=2

Number of modules to be connected in parallel N MP

=12/2.1089=5.69=6 (Approximately)

Total no. of modules in parallel=6

Total array size =6*2=12

BATTERY CAPACITY

Total Load Requirement=P array/system voltage

Considering battery efficiency and depth of discharge equal to 80%

Battery capacity=10(0.2*0.8*0.8) =7.8A=8A (App)

CHARGE CONTROLLER CAPACITY (SYSTEM WIRING SIZE)

I cc=I SC*N pm*F safe

I cc=3.04*5.84*1.3=23.07A=24A (Approximately)

3. CONCLUSION

The solar panels can successfully produce sufficient amount of electricity which is stored in the battery and used to light up LEDs, powering up gadgets, to run dc motor and carry out

electrolysis. The model is environment-friendly, saves money, is cheap to use and can be installed anywhere. Although the initial installation will require planning and resources, we believe the long-term benefits would be totally worth it. Solar trees are the solution to the scarcity of the land, the solar tree can be built in any place and can be installed in any place in all over the world, since sun light is rechargeable to almost every corner of the earth, there is no place in which the most important aspect of the solar tree is that it requires solar tree cannot generate electrical power. And the most important aspect of the solar tree is that it requires very less space to install, there is no need for vast land to install the solar panels that generates same amount of electrical power. The solar tree only takes 1% of the total land that is required by the conventional methods.

4. SNAP SHOT OF PROJECT

FIG 4.1 Snap Shot Of Project

5. REFERENCES

- Kusakana, K. and Vermaak, H.J. Hybrid Diesel Generator/Renewable Energy System Performance Modeling. Renewable Energy, 67, 97-102.
- Wang, J. and Yang, F. Optimal Capacity Allocation of Standalone Wind/Solar/Battery Hybrid Power System Based on Improved Particle Swarm Optimization Algorithm. IET Renewable Power Generation, **7**, 443-448
- Nema, P., Nema, R.K. and Rangnekar, S. A Current and Future State of Art Development of Hybrid Energy System Using Wind and PV-Solar: A Review. Renewable and Sustainable Energy Reviews, 13, 2096-2103.
- Malla, S.G. and Bhende, C.N. Voltage Control of Stand-Alone Wind and Solar Energy System. Electrical Power and Energy Systems, 56, 361-373.
- J. Lee, B. Han and K.Chol, "High efficiency grid tied power conducting system for fuel cell power generation," power electronics and ECE asia (ICPE&ECCE), IEEE 8th international conference on pp,1492-1497.