

Design and Implementation of ON-Grid Solar Tree

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Abstract: *Vitality is the key component for the monetary advancement of nation. In creating nations the monetary development is in ease back pace because of absence of appropriate use of the vitality assets. That said, ideal use of the sustainable sources is extremely necessary. Sometimes, the planetary based vitalities might be costly but the sun based vitality can be made cheaper. Keeping that in mind, the ON-Grid Solar Tree can be one of the examples of the same. The ON-Grid Solar Tree will basically convert the DC power generated by the PV panels into AC power with the help of inverter and will then be supplied to the main grid to be utilized by various consumers. This can also help supply clean and green energy to the nearby houses and also eliminates excess energy supply problems. The Net Meter will help us understand the exchange of energy that takes place. The inverter used is a five level inverter. Eight MOSFETs are used and have eight equivalent gate circuits. The conversion of DC to AC is done more efficiently. The conversion takes place without any losses. The cleanliness of the energy is also maintained. PIC16F877a microcontroller is to control the whole circuit. Step down transformers are used. There are nine step down transformers in the inverter circuit. The step output is observed on the CRO. By utilizing the Voltage rectifier circuit, the detected voltage and current are given to the Microcontroller. The results from the microcontroller are shown on a display, an LCD display to be precise. NETMETER can be used in the future endeavors. It can be easily connected to the main grid and help in the distribution of the energy that is generated in excess, this renewable energy usage and this concept is implemented for the first time in this country.*

INTRODUCTION:

The sun is the most influential and abundant power source available to mankind. It is also clean and green and does not add to the pollution of today's world. To use the sun energy in the most efficient way, we need to have the following; sun based warm, sun oriented photovoltaic and sun oriented design. However, one of the major problems in using sun based vivacity is that it requires a lot of space. There is a solution to that as well. We can use the same number of panels to produce the same amount of energy by forming a Solar Tree. The only thing different from the traditional Solar projects is that the space used up is extremely less. The Solar Tree can use the sun energy in the most efficient and in the most effective way. These trees can decorate the surroundings as well. They can be hoisted in huge school

grounds or in public parks or bus stands. There are many people who find it hard to keep up their devices charged for an entire day. There are power banks which help them with their mobile phones but it is their personal computers and laptops which suffer. Here we are presenting a sun based solar tree which will produce clean and green energy to the people in need of it while they are on the move. The solar tree will produce electrical energy with the help of PV panels in the DC form and then the inverter will convert the energy in the AC form in the most controlled manner. These kinds of projects produce a huge amount of energy and provide to the nearest distribution grid which also helps the residential cause. The Net Meter actually helps understand the exact exchange happening between the production and the distribution of the energy between the tree and the grid. The Net Meter uses the microcontroller along with voltage and current sensors. The sensors have been utilized to detect current and voltage from inverter and residential heap of solidarity control factor. The detected voltage and current are given to microcontroller by utilizing voltage rectifier circuit and current counterbalance circuits. The controller does vital numerical estimations and yield result is shown utilizing LCD. "SPIRALLING PHYLLATAXY" is a technique that can be used to improve the arrangements and the efficiency of the tree.

1. Applications of on grid solar tree.

Solar tree can be applicable in following fields:

- Street light
- House supply
- Industrial power supply
- Continuous power supply
- Charging slots
- Energy on the go

2. ON-Grid SOLAR TREE

We know that trees produce their food by the process called photosynthesis. Likewise this solar tree will produce electrical energy using the sun rays. The main feature of this solar tree is that it will be directly connected to the main grid. Therefore the name, ON-Grid Solar Tree.

Solar Tree is another innovative product which will provide energy on the go. Its main inspiration comes from the nature itself. It will be majorly utilized in Malls, different kind of

Plazas, also in Townships and in hospitals. It will widely be used in the hotel industries as well.

3. Components ON-Grid solar tree have following parts:

- High efficiency PV panels
- Non corrosive structure designed to be a strong wind loads.
- Net Meter
- Microcontroller
- Inverter
- Batteries
- Fabrication and Design of Solar Tree
- LED

3. Construction and Working

(a) Solar Tree

This project is focusing upon renewable energy than any other. This project will manage the power in the most efficient way. In public places or in parks and huge college campuses there is need of some public energy availability. There are numerous people who struggle to get there gadgets working throughout the day without charging them. Though power banks help them with their phones but laptops is one of the main things. Here the solar tree that will constructed has ports which will provide green energy which can be instantly used by the passersby.

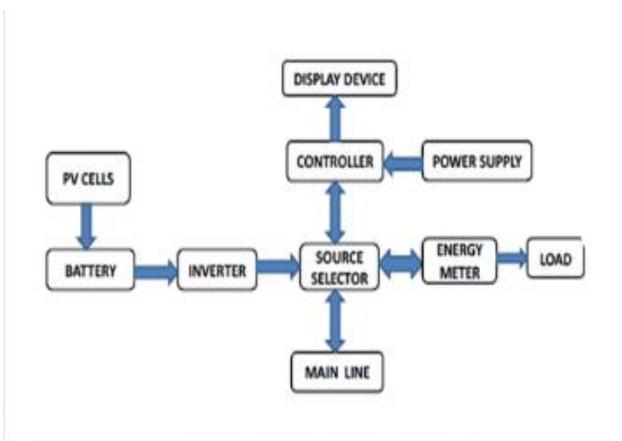


Fig.4.1. Block Diagram

As the figure shows, the PV cells will generate electricity throughout the day which will be fed to the battery bank which in turn will be inverted through the SPWM based inverter. Then the source selector comes into picture. In this project the energy supply will be by connecting it to the grid for excessive use if battery drains out. By the use of net

metering of solar rooftop which is similar to this application. Solar Rooftop encourages renewable energy resource as well as it reduces the transmission cost and the end users ultimate cost is also reduced significantly. Likewise, solar tree will have same applications but in even more efficient way considering public purposes.

(b) Inverter

The Solar Tree will be connected to the grid and always be measured by the meter connected to it. The energy produced by the solar tree will be instantly available to the users and the excessive energy when not used by the passersby will be fed to the grid. The PV panels will be of 12V and 38W. The PV cells will help to convert the sun rays into electrical energy. However, the electrical energy will be in DC form. As the DC form cannot be used directly, inverter comes into play. The inverter built is a unique five step output inverter. There are five levels, unlike the three level traditional inverters. There are two H-Bridges used here. In all eight MOSFETs are used and for those eight MOSFETs eight gate circuits are used. Those eight gate circuits help trigger the whole circuit together. Every gate circuit has a step down transformer connected to it. The microcontroller gives gate circuits 5V. The gate circuits give 12V to trigger the MOSFETs. One H-Bridge is connected to 24V DC input from the PV panels and as we have five levels and two H-Bridges, we get 48V AC peak to peak. And then further it is stepped up and connected to the grid.

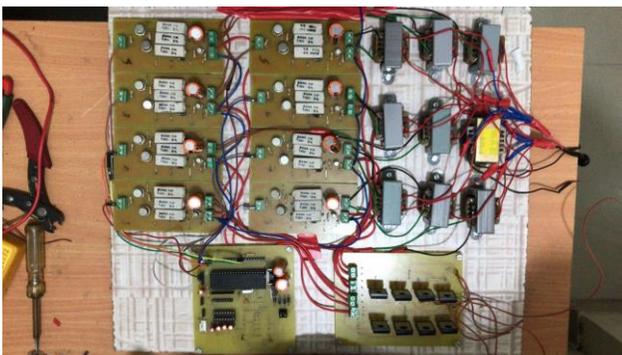
This whole circuit is controlled by a programmed PIC16F877a microcontroller. The reason for the usage of this very microcontroller is because it is easy to program. Also the structure of this PIC is easy to understand and easy to use. It has limited features as compared to the PIC18 family. However, it contains all the features required for this very function; the ON-Grid Solar Tree. The photos of the assembled inverter, also of the dissembled Solar Tree and the assembled solar tree are shown below.

(A) Solar Tree (photos)





(B) Inverter (photos)



4. Advantages

- No air pollution
- One wouldn't have to worry as much about future energy sources
- People in poor countries would have access to electricity
- People can save money
- Land requirement is very less
- Free Energy
- No greenhouse gases

5. Disadvantage

- Cost is high
- May cause hazards to the birds and insects
- Hazards to eyesight from solar reflectors

- Pollutants can affect the efficiency of panel
- Weather affects the solar panel efficiency

6. Conclusion

This undertaking satisfies the expanding vitality request of the general population and sparing of land. This venture can give free vitality and furthermore will be exceptionally useful for the general population. The additional vitality can be given to the lattice. By expressing the above focuses this report says that, there will be vitality in broad daylight parks, office and school grounds with no intrusions as this undertaking will likewise have lattice association.

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