

# IOT BASED PHOTOVOLTAIC GREEN TREE

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**ABSTRACT :** This paper shows the design of IOT based photovoltaic green tree . Demand for energy is increasing with each period , to fulfil the required 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 , non-polluting , 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 . The recent huge interest in machine communication is known as the Internet of Things .

**KEYWORDS :** Solar energy , IOT , Silicon – crystalline Photo-Voltaic panel (SPV)

E = Energy

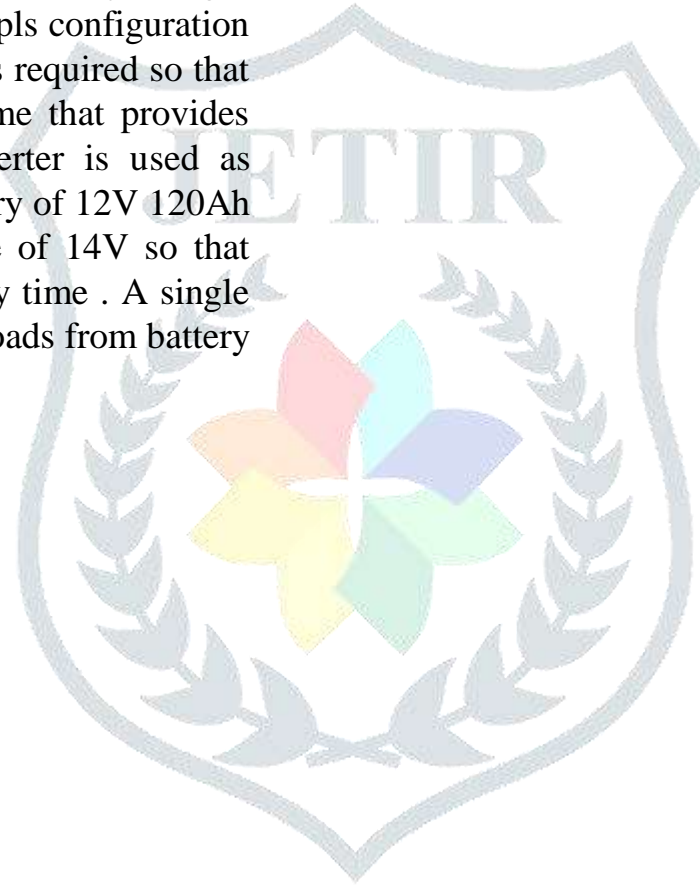
**INTRODUCTION :** Solar tree sounds like the perfect solution for our future energy needs. It is identified as an alternative electricity source with respect to the increase in energy demand and cost .The enhanced technology the solar tree is nothing but an artificial tree with photo-voltaic cells arranged in Fibonacci series manner in place of leaves, It is sunlight-based tree .

TREE represents T = Tree generating

R = Renewable

E = Electrical

The panels are arranged in a fashion in a tall tower/ pole. The “Photovoltaic green tree” produces light energy by the process called Power Generation . This presents design procedure of battery charger using solar power . The 3PV panels of each 40W in 3pls configuration will be naturally facing towards the sun at an angle as required so that they can fix up maximum solar energy in a day time that provides supply for battery charging applications . A converter is used as battery charging circuit to charge the Lead-Acid battery of 12V 120Ah . The converter output is regulated by the reference of 14V so that battery (12V) can be charged continuously during day time . A single phase boost inverter is used to provide supply to the loads from battery .



## BLOCK DIAGRAM

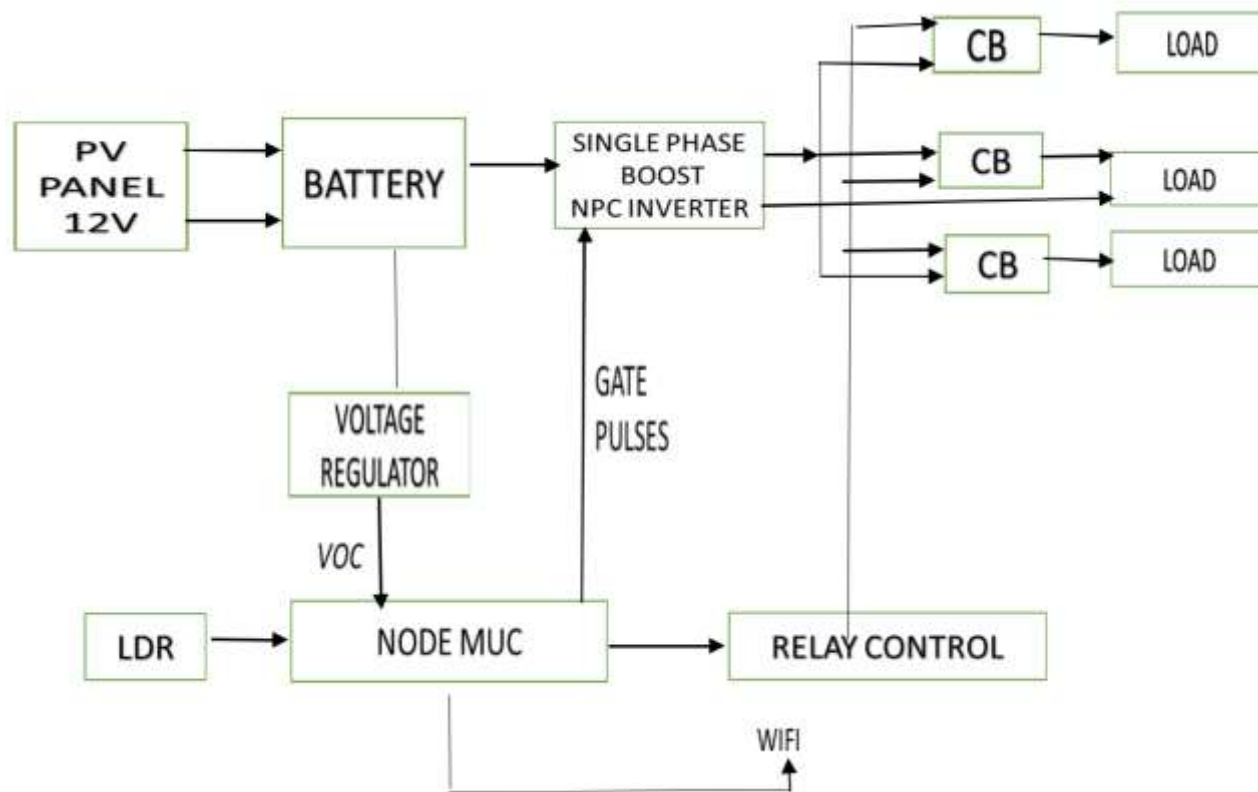


Figure 1: IOT based solar system

## WORKING :

One of the big challenges in the solar industry is to maximize solar electricity output while keeping down the installation cost.

How a tree produces food by the process called Photosynthesis, in a similar way our project “Photovoltaic green tree” produces light energy by the process called Power generation . The design procedure of battery charger using solar power.

INPUT AND OUTPUT: INPUT-sunlight OUTPUT :24V,40W(three panels connected in parallel )

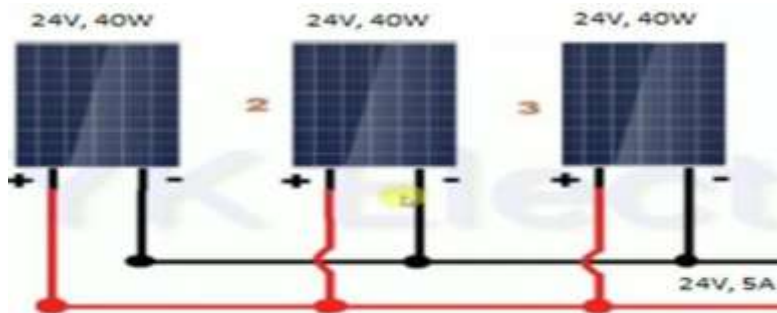
The solar tree consists of some important parts in its design . They are as follows:

- Solar panels
- Voltage regulator
- Battery
- LDR(Light Dependent Resistor)
- Relay Control Unit
- Sensors
- Inverter

## PHOTO VOLTAIC PANEL (PV Panel) :

Solar tree panels charge batteries during the day at dusk the solar tree automatically switches on its LEDs . Solar PV modules will be fixed throughout the pole having a pattern . When a solar panel exposed to sunlight , the light energized are observed by a semiconducting materials.

In this, 3 PV panels of each 40W in 3p1s configuration, where a photovoltaic (PV) panel is used to convert solar power into electricity and a DC/DC converter is used to control the output power of the PV panel and the charging current for the battery.3 PV panels of each 40W in 3p1s configuration provides the supply for the battery charging application. The PV output is provided as input for the buck converter in order to gate regulate the dc voltages so that the battery is to be charged



## BATTERY :

The simple buck converter is used as battery charging circuit to charge the Lead –Acid battery of 12v,120Ah. The Lead –Acid battery used for storing the PV generated power and also to provide supply to the load . The converter output is regulated by the reference of 14V which is provided to the voltage mode control circuit so that the battery (12v) can be charged continuously during day . The energy stored in the batteries can be used to store energy , when the PV power is not available and when the loads are turned on, so that we can used it at night and in cloudy day when no sunlight is there .

INPUT-12V(voltage regulator is used to convert 24V to 12V input).

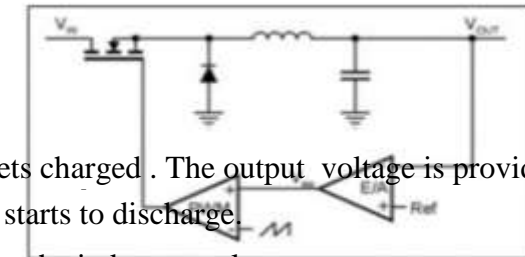
OUTPUT-12V(5V Voltage regulator is used to provide supply to inverter

## VOLTAGE REGULATOR

The buck converter circuit with control loop is provided below:

In this when switch is ON , the inductor gets charged . The output voltage is provided as  
When the switch is OFF , the Induction starts to discharge

In this case the voltage output is Equal to the inductor volt



## RELAY CONTROL UNIT :

The relay control unit is an electrical component that opens or closes a switch in order to allow current to flow through a conducting coil, with the coil not coming contact with the switch . Relay control are electromagnetic devices that typically control the power flow in circuits. The relay control unit will send trip signals and disconnect the loads during day time or as per the command from Android application interface . When there is the issues of high signals to relay control , the circuit breakers will be reconnected and hence the loads .

## SENSORS :

A electrical sensor is a device or integrated circuit that detects a specific physical parameter and converts it to an electrical signal . The sensor is used to measure the amount of light in atmosphere and triggers the solar lamps to switch ON automatically at sunset and OFF at sunrise . The output signal of the electrical sensors is processed and used to provide a measurement or to trigger an action Solar Tree is capable of functioning for tree consecutive days of cloudy or overcast weather.

## LDR (LIGHT DEPENDENT RESISTOR ) :

Light dependent resistor (LDR) output is HIGH during daytime in which the battery is charging and the LDR output is LOW when there is no solar energy is available . When the LDR output voltage is low , then the command signal send to the relay control unit . It is also controlled with the help of command given in android application .

## BOOST INVERTER :

The Boost NPC inverter provides boosted av voltage from the battery voltage to the loads . When the loads are connected the inverter will start to operate and when the loads are disconnected , the inverter will be idle .

## ADVANTAGES :

Renewable and pollution free

Reduce electrical bill

Less to no maintenance for years

More solar energy in summer

Solar panels have no moveable parts and very simple to use

Eco-friendly

Technology development

Decreases rates of non renewable energies

## DISADVANTAGES :

1. whether-dependent

2. Although Solar energy can still be collected during cloudy and rainy days the efficiency of the solar system drops....

## CONCLUSION :

This paper has presented the design and construction of solar tree , the unconventional energy sources such as geothermal , ocean tides , wind and sun is the option to meet future energy requirements .Sunlight based tree is an ideal beneficial interaction between spearheading plan and front line eco-good innovation. Cultivable land is the greatest crisis in major countries , it is 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 . This is the efficient way to produce electricity in large quantity without any maintenance or other activities and gives us a continuous output foe long time . Hopefully if this new model of solar tree plantation is adopted widely it would be possible to produce for the world keeping the best ecological balance and preserving the nature as it is

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