

Net zero pole streets light by solar PV module

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Abstract—People have started to move non-conventional energy source. The energy generated from non-conventional energy source should be used in effective manner. It is also eco-friendly and viable for the environments. The solar street light is an innovation take for the sustainable growth through many policies like make in India. This paper proposes a net-zero pole streets lighting by solar PV module and the mean of net-zero is that no power demand from the grid. The proposed system consists of a PV panel, LEDs lamp, and micro-inverter. In this project we have used LEDs lights due to many advantages as compare to other lamps. This LEDs lighting is very efficient (very high efficiency) and cost effective (long life). In additional in this project we used micro-inverter. This micro-inverter is converted DC supply from the PV module into AC supply and its AC supply is feed to the grid through a net-meter. In this project battery is not required.

Keywords—Solar Panel, micro-inverter, net-meter, Street light (LEDs lamp) and MCB.

I. INTRODUCTION

The energy demand are increasing in day by day in overall world, therefore the overall energy demand pressure goes to the conventional energy source (oil, gas, nuclear, coal etc.). But we know that the fossil-fuel based energy sources are limited in quantity and also cause environmental pollution [1]. Therefore the people have started to move non-conventional energy source.

Recently large production of electricity by solar PV system. Due to some advantage as compare to conventional grid first one is does not produce any pollution like CO₂, NO₂ etc. &second one is it does not required fossil fuels. Third one is does not harmful for people. And like generation of electricity by solar PV system is eco-friendly. The

Efficiency of PV module is depends upon the which materials are used to made solar cell. And the material is mono-crystalline (24%) and poly crystalline (12%). The solar photovoltaic cell or module is directly converted sun radiation into the electrical energy. The conversion process of solar PV cell or module depends upon PV effect. In this project does not required battery because some disadvantage of battery first one is high

maintenance required. Second one is the life of battery is less. Third one is in India aspect security problem. Therefore analysis of these point we have required inverter (dc to ac converter) system. DC supply provided by PV module is converted into AC supply. And its ac supply feed to the grid through by net-meter. In day time electricity generation by PV module is feed to grid because in day street light are not required. And in night time street light load consumed power by the grid through net-meter. The net-meter is two way communication systems it provide a reading, like import (kwh) & export (kwh). Export means how many electricity unit generated feed to grid. And import mean how many electricity unit consumed by LED load. Street light we have used LEDs light due to many advantages as compare to other lamp. First one it does not produce any pollution second one it is less power consumed, high intensity and cost of LEDs lamp is also less.

II. BLOCK DIAGRAM

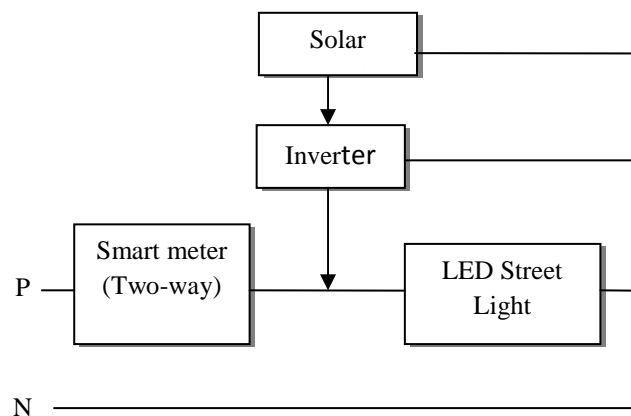


Fig. 1:

III. PHOTOVOLTAIC CELL

Each Individual Solar cell made out of a semiconductor material like silicon, crystalline silicon etc. Solar Cell is connected in series and parallel as required. When required high voltage solar cell connected in series and required high current the solar cell connected in parallel.

A PV cell consist a lot of combination of single & multi-junction have been experimental in order to obtain high solar cell efficiencies, therefore the highest efficiency of

14.6% has been demonstrated by triple junction solar cells.

IV. PHOTOVOLTAIC MODULE

The PV module is consist more than one cell, and the combination of more than one cell is also called photovoltaic module.

V. SOLAR ARRAY

Solar array consist a more than one PV module and the combination of the more than one PV module is called a solar array

VI. GRID- CONNECTED PV SYSTEM

The grid-connected PV system is very popular because their application in distribution generation & for effectively using the PV array power. In the grid-connected PV system the battery are not required.

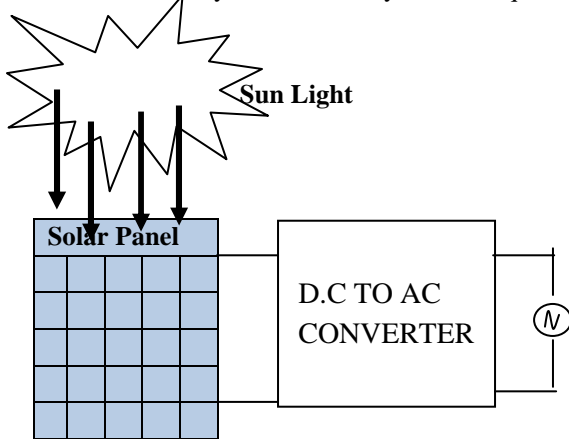


Fig. 2:

VII. STREET LIGHT SYSTEM

In Overall Street light load of India is 10% to 15% and the street light power losses is more therefore the voltage regulation of conventional grid is poor. In this project we have use street light (LEDs) by solar PV module. This project approach to reduce street light load of India. In this project we have use LDR as a sensor. In night time the darkness on the LDR sensor & the LEDs are glowing. In day time the no darkness on the LDR sensor therefore the LEDs are not glowing. This street lighting are glowing & taking power from solar PV module.

Advantage of Solar PV LEDs Street lighting system as compare to conventional LEDs lighting system

- In the Solar PV LEDs street lighting is less power consumed as compare to conventional LEDs lighting system.
- The cost of Solar PV LEDs street lighting is less as compare to conventional LEDs lighting system.
- Solar PV LEDs street lighting is no pollution.

- Solar PV LEDs street lighting is more efficient as compare to conventional LEDs lighting system.
- Solar PV LEDs street lighting is more 50,000 hours.
- Solar PV LEDs street lighting is lower maintenance required.
- Automatically turn ON/OFF with darkness.

VIII. INVERTER

Inverter converts the variable direct current (DC) into a fixed Alternating current. The DC output of PV module is converting into a utility frequency alternating current (AC). That can be feed into a commercial electrical grid or used by a local. It i

s a critical component in a PV system allowing the use of ordinary AC power equipment solar inverter has special function adapted for use with PV array. Many solar inverters design to be connected to a utility grid and will not operate when they do not detect the presence of the grid they content special circuitry to precisely match the voltage frequency and phase of the grid.

IX. WIRING DIAGRAM

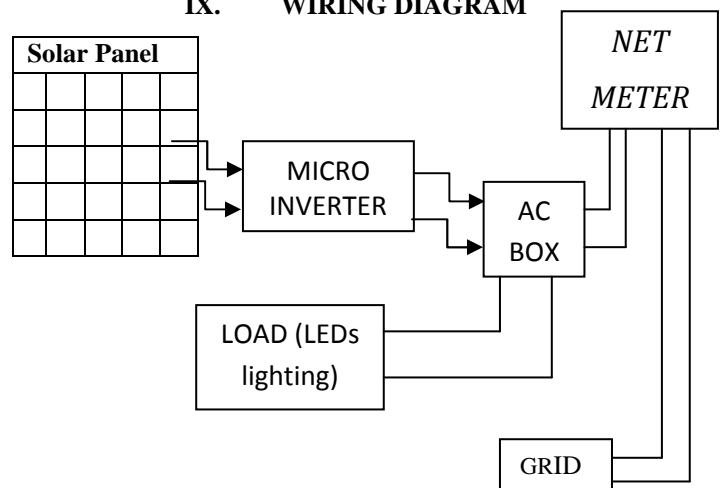


Fig. 3:

X. WORKING

Solar:-

Collect the sun radiation & generated a dc the solar panel absorb the sun radiation in form of heat & this heat energy is connected into electrical energy (dc) by PV module.

Inverter:-

The dc supply form the PV module is converted into the ac supply for useful of commercial, domestic purpose.

The solar panel collect a energy through a sun radiation and generated a dc supply and it's DC output of solar panel in connected to inverter (input) and obtain output in

AC. The output of AC is connected to net-meter with inverter. Net-meter receiving energy from grid. Other terminal of net-meter is connected to the grid to transfer the energy in the grid by the PV module.

In day time the transfer the energy to grid by PV module. And at night time the load receiving a energy through the grid and glow the street light.

XI. CONCLUSION

In Indian aspect One of the major region of failure this street light project is that the theft of the batteries. Therefore analysis and remove these problems we have use DC to AC converter and remove the batteries system. Energy generated to PV module is DC. It's DC converted into AC using converter and in day time this AC supply feed into a grid and the export electricity unit (kwh) reading is shown in net-meter. The street light is directly connected to a grid. In night time the power consume by LEDs load from the grid and the import the electrical unit (kwh) reading is shown in net meter. It will also ensure the net zero power consumption of street light.

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