

# A Review on: Experimental Analysis of Rooftop Solar PV modules installation in Educational premises

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**Abstract-** solar energy obtained totally free from sun. Countries such as India, USA, China, Germany etc. engrossed into solar energy as a means of modernizing PV Modules use and making available a large scale access to clean electricity while helping to find out energy cost, energy security and global warming problems related to petroleum fuels. Solar energy derived from sun are environment friendly alternative of electricity that have received significant attention as a possible renewable alternative fuels. There is notable research is going on to use various Straight PV Modules and their types of System on the basis of their operation as alternative of electricity. Solar power systems derive clean, pure energy from the sun. Installing solar panels on home helps combat greenhouse gas emissions and reduces our collective dependence on fossil fuel. Traditional electricity is sourced from fossil fuels such as coal and natural gas. In present assessment Installation of roof top solar PV modules for reducing Electricity bill by using On-grid power system by net metering. The burning of fossil fuels for production of electricity continues to rise producing high levels of carbon dioxide (CO<sub>2</sub>) which climatologists believe is a major cause of global warming. Similarly electricity from various Electricity Boards and manufactures hikes their prices by day by day which is effect the unbalanced in the cost and profits of the individuals and its show the impact on social economic life of the persons. Whereas solar energy which is get from Sun is in bulk and its cost nothing. Initial Cost and maintenance cost is low as compare to other source energy.

**Index Terms-** net metering, on-Grid System, PV Module, solar energy.

## I. INTRODUCTION

Solar energy is the sun's radiation that reaches Earth. When sunlight hits the photovoltaic (PV) cells inside solar panels, these cells transform the sun's radiation into electricity. Photovoltaics directly convert solar

energy into electricity. They work on the principle of the photovoltaic effect. When certain materials are exposed to light, they absorb photons and release free electrons. Based on the principle of photovoltaic effect, solar cells or photovoltaic cells made. They convert sunlight into direct current (DC) electricity. But, a single photovoltaic cell does not produce enough amount of electricity. Therefore, a number of photovoltaic cells are mounted on a supporting frame and are electrically connected to each other to form a photovoltaic module or solar panel. Commonly available solar panels range from several hundred watts up to few kilowatts. They are available in different sizes and different price ranges. Solar panels or modules are designed to supply electric power at a certain voltage (12v), but the current they produce is directly dependent on the incident light. As of now it is clear that photovoltaic modules produce DC electricity. But, for most of the times we require AC power and, hence, solar power system consists of an inverter. According to the requirement of power, multiple photovoltaic modules are electrically connected together to form a PV array and to achieve more power. [4]

There are different types of PV systems according to their implementation.

**PV direct systems:** These systems supply the load only when the Sun is shining. There is no storage of power generated and, hence, batteries are absent. An inverter may or may not be used depending on the type of load. [3]

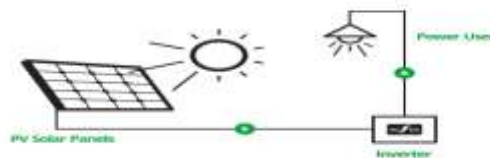


Figure 1: PV Direct System

Off-grid systems:

This type of system is commonly used at locations where power from the grid is not available or not reliable. An off-grid solar power system is not connected to any electric grid. It consists solar panel arrays, storage batteries and inverter circuits. [3]

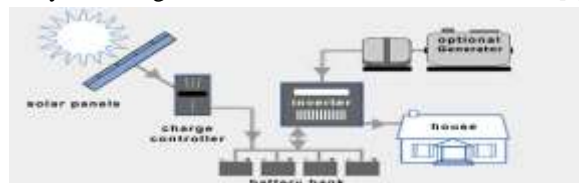


Figure 2: Off-grid Solar System

Grid connected systems:

These solar power systems are tied with grids so that the excess required power can be accessed from the grid. They may or may not be backed by batteries.[3]



Figure 3: grid connected Solar System

- Solar PV module
- DC cable
- Structures
- Inverters/PCU
- Earthing and Lightning arrestor

Net Metering

Net metering is a billing system that allows electric customers to sell to their electric utility any excess electricity generated by their Distributed Generation System (DG systems). Many different DG sources may be eligible for net metering credits, but rooftop solar installations are the most common type of DG promoted with net metering. While net metering policies vary by state, customers with rooftop solar or other DG systems usually are credited at the full retail electricity rate for any electricity they sell to electric utilities via the grid. The full retail electricity rate includes not only the cost of the power but also all of the fixed costs of the poles, wires, meters, advanced technologies, and other infrastructure that make the electric grid safe, reliable, and able to accommodate solar panels or other DG systems. Through the credit or payment they receive, net-metered customers effectively avoid paying these costs for the grid.

II. THEORY

Solar photovoltaic cells consist of a positive and a negative film of silicon placed under a thin slice of glass. As the photons of the sunlight beat down upon these cells, they knock the electrons off the silicon. The negatively-charged free electrons are preferentially attracted to one side of the silicon cell, which creates an electric voltage that can be collected and channeled. This current is gathered by wiring the individual solar panels together in series to form a solar photovoltaic array. Depending on the size of the installation, multiple strings of solar photovoltaic array cables terminate in one electrical box, called a fused array combiner. Contained within the combiner box are fuses designed to protect the individual module cables, as well as the connections that deliver power to the inverter. The electricity produced at this stage is DC (direct current) and must be converted to AC (alternating current) suitable for use in your home or business.

Basic components for grid connected system

III. LITERATURE REVIEW

Hina Fatima et al (2014): Studied the problems existing in conventional methods for generating electricity and overview of various renewable energy generation technologies developed for promote green energy. Also brief insight into the Indian power scenario with their advantages and disadvantages of conventional generation are outlined. A statistical analysis is carried out by using ANOVA and other statistical tools to verify the extent of greenhouse gas emissions by power sector. The development of renewable energies in India and world has also been analysed.

Justine Sanchez and Ian Woofenden (2011): They worked on the Photovoltaic modules (PV Modules) and focused their studied on the various component used for Installation of rooftop solar PV module. They simplified Various PV systems and their component. They also brief attention into on grid

Roof solar PV Modules with net metering DG System.

Mahmud Wasfi (2011): Enlighten that the spectrum of solar energy is quite wide and its intensity varies according to the timing of the day and geographic location. Solar energy conversion into electricity with particular emphasis on photovoltaic systems. Solar cells and how to store electricity.

Remli Aziz at el (2015): They focused on the study and control of a stand-alone PV-battery system. Modelling of the system components and the control principles are enlighten by them. Incremental conductance MPPT algorithm, used to optimize PV generated power, prove its effectiveness under the adopted conditions. The chosen load demand scenario shows the different operating mode and proves the role of battery storage bank to meet load demand.

Andreas Poullikkas at el (2013): They investigate the net metering mechanism for RES-E systems has carried out. In particular, net metering concept was examined with its benefits and misconceptions. A survey of the current operational net metering schemes in different countries in the world.

#### IV. CONCLUSION

The net metering based rooftop solar projects facilitates the self-consumption of electricity generated by the rooftop project and allows for feeding the surplus into the network of the distribution licensee. The type of ownership structure for installation of such net metering based rooftop solar systems becomes an important parameter for defining the different rooftop solar models.

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