

# Solar Energy & Solar Tracking System

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## ABSTRACT

*In today's world, as there is rapid growth of population and drastic change in technology so our need for energy is also increasing day by day. The inevitable increase in population and the economic development that must occur in many countries have implications for the environment. This is because energy generation processes (ex- generation of electricity, heating, cooling, and other uses) are harmful and therefore pollutes the ecosystem. Increasing price of fossil fuels is another major concern. Renewable energy sources eliminate these two major problems. It eliminates green house gas effect and are available in abundance [1]. Among various renewable energy sources, solar energy is one of the best options mankind have. We receive enough sun light to meet our energy requirements. In this paper, solar photovoltaic energy production, efficiency of solar pannels and the new technology advancements are highlighted.*

**Keyword :-** Carbon emission, Green House gas, Economic, Solar energy, Efficiency

## Introduction

Energy is the key requirement to sustainable development and poverty reduction efforts. It affects all aspects of development- social, economic, and environmental including livelihoods, agricultural productivity, health, education etc [1]. But, in most of the developing countries, the energy problems to be addressed are countering the high dependency on traditional energy resources, which supply more than 90% of total energy used causing rapid deforestation, decreasing soil fertility, etc [2]. So, to overcome this we need clean energy sources that can fulfill our requirements as well as save the climate. The World Energy Forum has predicted that fossil-based oil, coal and gas reserves will be exhausted in less than another 10 decades. Solar energy is the most abundant permanent energy resource on earth and it is available for use in its direct (solar radiation) and indirect (wind, biomass, hydro, ocean, etc.) forms. The amount of sunlight that strikes the earth's surface in an hour and a half is enough to handle the entire world's energy consumption for a full year. Solar technologies convert sunlight into electrical energy either through photovoltaic (PV) panels or through mirrors that concentrate solar radiation. This energy can be used to generate electricity or be stored in batteries or thermal storage.

## Solar Energy

Solar radiation is light – also known as electromagnetic radiation – that is emitted by the sun. While every location on Earth receives some sunlight over a year, the amount of solar radiation that reaches any one spot on the Earth's surface varies. Solar technologies capture this radiation and turn it into useful forms of energy. Solar energy originates as nuclear fusion taking place in the sun's super-hot core. The sun produces energy through the proton-proton chain reaction. While every location on Earth receives some sunlight over a year, the amount of solar radiation that reaches any one spot on the Earth's surface varies. Solar technologies capture this radiation and turn it into useful forms of energy. About 30% of the solar energy that reaches Earth is reflected back into space. The rest is absorbed into Earth's atmosphere. The radiation warms the Earth's surface, and the surface radiates some of the energy back out in the form of infrared waves. As they rise through the atmosphere, they are intercepted by greenhouse gases, such as water vapor and carbon dioxide. Solar energy is directly and indirectly involved in human life. From photosynthesis to Power generation, we need solar energy. Using solar energy as a source of primary energy is now our new goal. Solar energy has huge advantages over the conventional sources of energies. It produces clean energy, reduces green house effect hence reduces global warming. It is an all-in-one source of energy.

## Solar PV Cell

PV Cell also commonly known as solar is used to convert light energy of sun to electrical energy. A photovoltaic cell is comprised of many layers of materials, each with a specific purpose. The most important layer of a photovoltaic cell is the specially treated semiconductor layer. It is comprised of two distinct layers of p-type and n-type semiconductors. When photons strike a PV cell, they may reflect off the cell, pass through the cell, or be absorbed by the semiconductor material. Only the absorbed photons provide energy to generate electricity. When the semiconductor material absorbs enough sunlight, electrons are dislodged from the material's atoms and hence we get electricity. Currently, majority of street lights are working on solar energy in rural areas. Now, government is taking initiatives like, KUSUM is inspiring thousands of farmers to work in the field of solar energy production at local level. They are getting subsidies and government support to set up solar power plant. These kinds of step will definitely help India to achieve superiority in solar energy production and meet their energy demand. Other developed nations have also shifted their attention towards solar energy production and are working on development of more powerful solar panels. As a large percentage of sun light falling on PV cells gets deflected so, it has become a major issue for the efficiency of the solar panels. Solar Tracking System provides an upper hand in resolving this issue.

## Solar Tracking system

Solar tracking system helps to adjust the direction of solar panel such that it always faces towards sun and sun light keeps on striking the panel continuously. This system helps to increase efficiency of solar panel. As less light is reflected in this way, the panels trap a greater amount of solar energy. The narrower the angle of incidence will be, the higher the energy a solar PV panel can generate. These tracking system are of different types depending upon the methods used to move solar panel, direction of movement of panel. We have - Active solar tracker & Passive solar tracker based on methods used for movement of solar panel [2]. Active tracker uses additional mechanical energy for the movement of the solar panels whereas, Passive tracker doesn't need any external energy source, here gas are filled inside which expands on heating and creates a mechanical movement. Similarly, we have Single axial solar tracker & Dual axial solar tracker based upon motion of solar panel. Here, Single axial solar tracker makes movement in a single direction only whereas Dual axial solar tracker makes movements in both directions, vertical as well as horizontal. Solar tracking system uses, LDR (Light Detecting Resistor) which, tracks the intensity of sun light and feed signal to the controller unit to create mechanical movement and make panel face the sun. When the intensity of the light falling on the right LDR is more, the panel turns towards the right and if the intensity is higher on the left then the panel slowly turns towards the left side [3].



## Conclusion

Increase in use of solar energy production and making it our primary source of energy will have a huge impact on our environment as well as human life. As far as the efficiency of solar panel is concerned, a single-axis tracker can increase production between 25% to 35%. Dual-axis trackers can increase energy production by about 40%[4]. But when it comes to cost then, on large scale solar tracking system has high initial cost. Which becomes a key issue when it comes for the installation of solar tracker on large scale. Many researchers & engineers are working in this field and are giving their best to overcome the challenges and find a primary solution to meet increasing energy demand with clean energy. We will soon have a better experience of clean energy production.

## References

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