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REVIEW ARTICLE **OPEN ACCESS**

Overview of Solar Tracking System

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ABSTRACT
The purpose of solar tracking system is to obtain optimization of captured energy. Solar tracker allows more energy to be captured and by the solar panel produced because the solar array isable to remain aligned to the sun since fixed facing of solar panel is widely used and may not effective for high power consumption. The average solar energy harvested by the conventional solar panels during the course day is not always maximized which is due to the static placement of the panel which limits their area of exposure. From the point of this review, it was obvious that the research through the invention of the solar tracking system including the improving system for obtaining optimum sun energy are very much recommended as tracking of sun position could be performed via many methods.
KEYWORD: solar tracker, solar tracking system

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INTRODUCTION

Currently, renewable energy solutions are becoming increasingly popular. Renewable energy contributes to efficient energy collection, efficient storage and transport and efficient energy conversion. Among the renewable energy sources, typically solar energy affords great potential for conversion into electric power, able to ensure an important part of the electrical energy needs of the planet [1]. Solar energy has been widely used in human life, and it's expected to grow up in the next years. Solar energy is rapidly advancing as an important means of renewable energy resource. Solar energy is rapidly gaining notoriety as an important means of expanding renewable energy resources [5]. Solar energy systems have emerged as a viable source of renewable energy over the past two or three decades, and are now widely used for a variety of industrial and domestic applications [6]. Solar energy can be used as an electrical energy to operate an electrical appliances and devices. Nowadays, humans are becoming more conscious in seeking new energy sources that cause less pollution and do not threaten or harm the environment. This brought the solar energy as an ideal for generating electricity due to nonpolluting, free energy and inexhaustible energy [2]. Various methods in converting solar energy from the sun into electrical energy has been developed and use which most commonly through the use of a solar panel; so called photovoltaic. Solar panel or photovoltaic is now the biggest usage of solar energy around the world [4]. Photovoltaic cells are presently being used to convert solar energy into electrical energy as this energy is freely available and clean, therefore it is a source of energy that needs to be developed. An aspect affecting the performance of a photovoltaic cell is the angle of which the incident light form the sun strikes the plane of the panel. The output is maximized when the light strikes the face perpendicularly. If the light from the sun can be kept perpendicular to the panel at all times, the power output of the cell would increase, and the number of cells needed to meet a demand would decrease. This minimizing the cost and increases the efficiency of the solar array.

SOLAR TRACKER

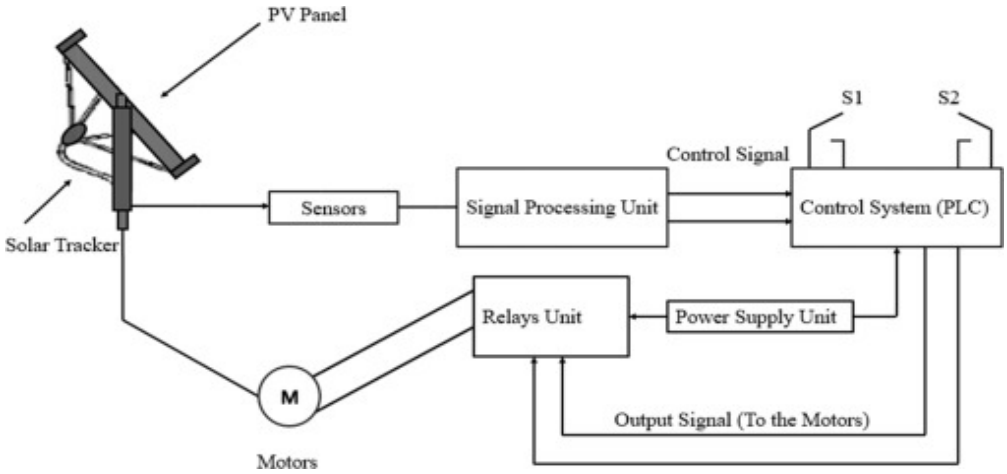

Fig: 1: Solar Tracker Instrumentation

A solar tracking system is a specific device intended to move the PV modules in such a way that they continuously face the sun with the aim of maximizing the irradiation received by the PV array. A solar tracking system is composed of three well-differentiated components: the mechanism, the driving motors, and the tracking controller. The mechanism is the part of the tracking system responsible for providing the follower with precision in tracking. This part must be designed to withstand harsh weather conditions and it must also have an estimated useful life equal to or similar to that of the PV module. Taking into account the type of mechanism, solar tracking systems can be classified into one-axis trackers or two-axis trackers, Because solar tracking implies moving parts and control systems that tend to be expensive, single-axis tracking systems seem to be the best solution for small PV power plants. A single-axis solar tracking system uses a tilted PV panel mount and one electric motor to move the panel on an approximate trajectory relative to the Sun's position. The rotation axis can be horizontal, vertical, or oblique. one-axis tracker showing both the rotation axis (unit vector e) and the collector plane (unit vector normal to the collector plane). The angle between these two unit vectors is usually kept constant in this type of tracker.

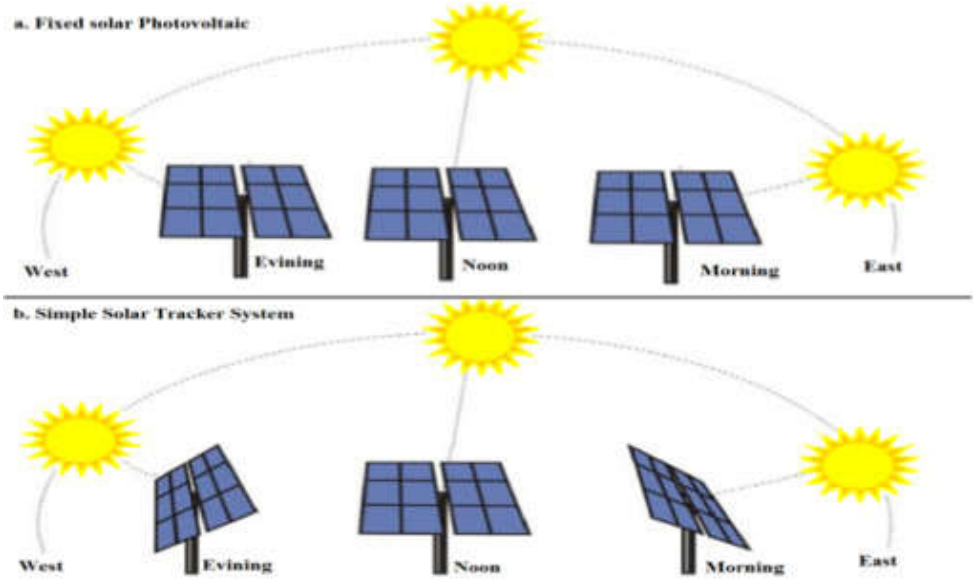

Fig 2: two-axis trackers, maximum energy collection can be achieved because, due to its total freedom of movement (north–south and east–west), the tracker can face the sun's rays throughout the day.

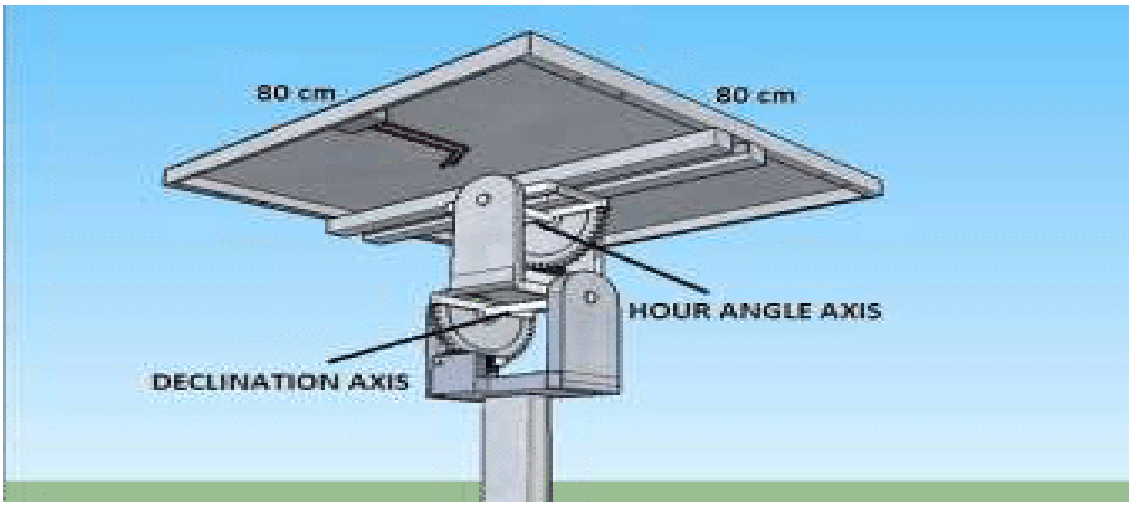

Fig: 3: Solar Tracker Panel

Solar trackers represent apparatuses that may significantly improve electric power production of photovoltaic panels. For detecting solar position, the trackers use different sensors such as photo resistor, photodiode receiver, phototransistor and etc [2]. In solar tracking systems, solar panels are mounted on a structure which moves to track the movement of the sun throughout the day. Unlike the classical fixed solar panels, the mobile ones driven by solar trackers are kept under optimum insolation for all positions of the sun, boosting thus the solar conversion efficiency of the system [19]. Maximizing power output from a solar system is desirable to increase efficiency. In order to maximize power output from the solar panels, one needs to keep the panels aligned with the sun [6]. Solar trackers are devices used to orient photovoltaic panels, reflectors, lenses or other optical devices toward the sun. Since the sun's position in the sky changes with the seasons and the time of day, trackers are used to align the collection system to maximize energy production.

COMPONENTS OF SOLAR TRACKER

The main elements of a tracking system are as follows [3]:

- Sun tracking algorithm: This algorithm calculates the solar azimuth and zenith angles of the sun. These angles are then used to position the solar panel or reflector to point toward the sun. Some algorithms are purely mathematical based on astronomical references while others utilize real-time light-intensity readings.
- Control unit: The control unit executes the sun tracking algorithm and coordinates the movement of the positioning system.
- Positioning system: The positioning system moves the panel or reflector to face the sun at the optimum angles. Some positioning systems are electrical and some are hydraulic. Electrical systems utilize encoders and variable frequency drives or linear actuators to monitor the current position of the panel and move to desired positions. The standard DC motor is not an acceptable method of controlling a solar tracking. This is due to the fact that DC motors are free spinning and subsequently difficult to position accurately. Thus, stepper motors are the most suitable as stepper motors are commonly used for precision positioning control applications with motion of angle by angle.
- Drive mechanism/transmission: The drive mechanisms include linear actuators, linear drives, hydraulic cylinders, swivel drives, worm gears, planetary gears, and threaded spindles.
- Sensing devices: For trackers that use light intensity in the tracking algorithm, sensors are needed to read the light intensity. Ambient condition monitoring for pressure, temperature and humidity may also be needed to optimize efficiency and power output.

CONCLUSION

Fixed facing of solar panel is widely used but the capability for high power consumption of several load appliances are not efficient and stable. The conventional solar panels used during the course day are not always maximized which is due to the static placement of the panel which limits their area of exposure. In order to maximize power output from the solar panels, the panels has to be aligned with the sun. Tracking is carried to maximize the capturing of solar energy by solar panel. Hence tracking capabilities may help certain system due to the application usage of electricity.

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