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A Review on Solar Energy Based Electricity Production

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Abstract- The solar energy is generated by the Sunlight is a sustainable renewable energy source that doesn't harm the environment. The earth receives enough solar energy per hour to cover all of the world's energy needs for a full year. In the modern era we require electricity on a daily basis. This solar energy is produced for commercial, residential and industrial uses. It can readily absorb energy from direct sunshine. As a result it is highly effective and pollution free. We have analyzed solar energy from sunlight and spoken about its future developments and characteristics in this essay. Additionally, the page attempts to clarify how different types of solar panels operate and highlights the numerous uses and strategies for promoting the advantages of solar energy.

Keywords- Solar Panel, Renewable energy, solar energy.

I. INTRODUCTION

These days, the last 10 years have grown increasingly significant for the cost per watt of solar energy devices due to the decline in renewable energy supplies. In the upcoming years it will undoubtedly become more affordable and develop into a better technology in terms of both cost and applications. Sunlight reaches Earth every day at a rate of about1366 W. This is a free limitless energy source. The ability to directly convert sunlight into solar energy using the tiniest photovoltaic (PV) solar cells is the main advantage of solar energy over other traditional power sources.

Numerous studies have been conducted to develop solar cells, panels and modules with high conversion rates in order to integrate the Sun's energy process. The greatest benefit of solar energy is that, in contrast to the cost of various fossil fuels and oils over the last ten years it is freely accessible to the general public and readily available in huge amounts. Furthermore compared to traditional energy production techniques solar energy requires far less labour.

Solar Energy:

Solar energy is the quantity of energy in the form of heat and radiation. Displayed in Fig.1variety of constantly evolving technologies including solar thermal energy, solar architecture, solar heating, molten salt power plants and artificial photosynthesis use the sun's radiant light and heat as a natural source of energy. The abundance of solar power makes it a very desirable source of electricity. The ocean, clouds and land masses absorb the remaining solar radiation with 30% (about) returning to space.

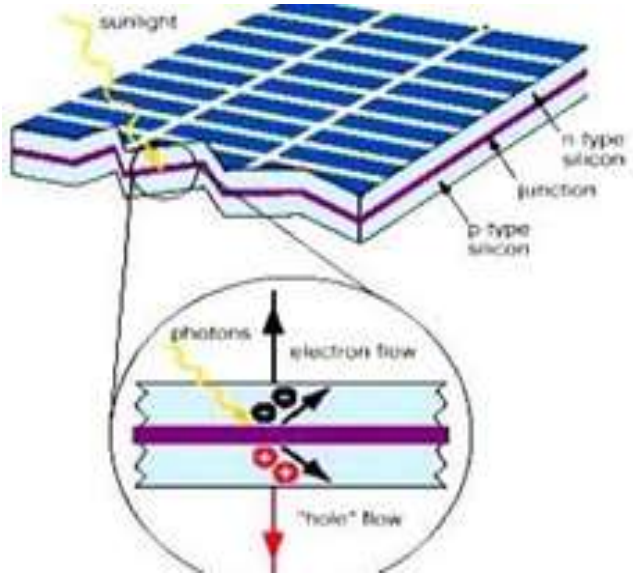

Figure 1 Solar energy

b. Working of solar energy:

PV cells Transform sunlight into direct current (DC) power. Charge controllers regulate the power coming from solar panels which might lead to damage to the panels. When there is no sunshine, such as at night a battery system is utilized to store electricity. This system is linked to an inverter to change direct current (DC) into alternating current (AC). in fig.2

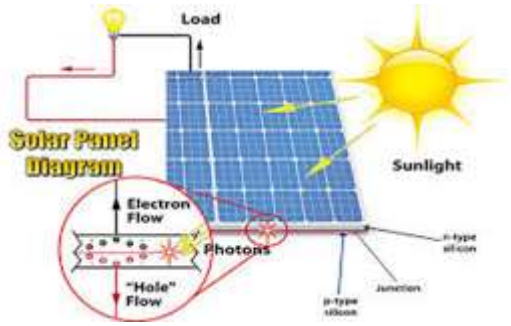

Figure 2 working of solar energy

c. Modelling of PV Panel:

Solar cell (Photovoltaic cell)

The solar radiation was directly transformed into electricity by the cells. It is made up of a variety of semiconductor materials. As seen in Figure it comes in two varieties positive charge and negative charge. Solar cells with high conversion efficiency and low cost are designed using this cell technology. A grid of metal conductors pulls electrons away from silicon atoms when the cell absorbs photons from sunlight, causing an electric direct current to flow. PV solar cells are composed of several substances. fig.3

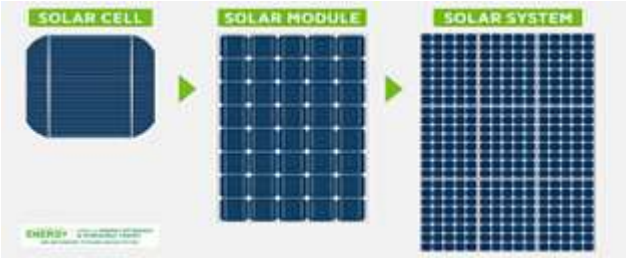

Figure 3 Photovoltaic Cell

Photovoltaic module:

A PV module is the basic component of a PV system and is made up of solar cell circuits sealed in an environmentally friendly laminate. Sizes typically range from 60W to 170W. To meet the energy requirements a number of PV modules are often placed in parallel and series.

Figure 4 Photovoltaic module

Photovoltaic Panel:

It consists of one or more PV modules put together as a field-unstable pre-wind unit. PV cells are connected in series in this panel. Individual photovoltaic cells are linked to form solar panels.

Figure 5 Photovoltaic Panel

Photovoltaic Array:

It is made up of several PV cells connected in parallel and series. While parallel connections are in charge of raising the array's current series connections are in charge of raising the module's voltage. In direct sunlight it may produce up to 180W. The array will generate more solar electricity if its entire surface area is larger.

Figure 6 Photovoltaic Array

II. SOLAR CONCRETE COLLECTOR

Parabolic trough reflectors It has a linear parabolic reflector that focuses light onto a receiver that is placed along the focal line of the reflector. It is made up of a fluid with a working fluid and a receiver which is a tube placed directly above the centre of the parabolic mirror. A working fluid is utilized as a heat source for a power generation system after being heated to between 150 and 350 degrees Celsius as it passes through the receiver.

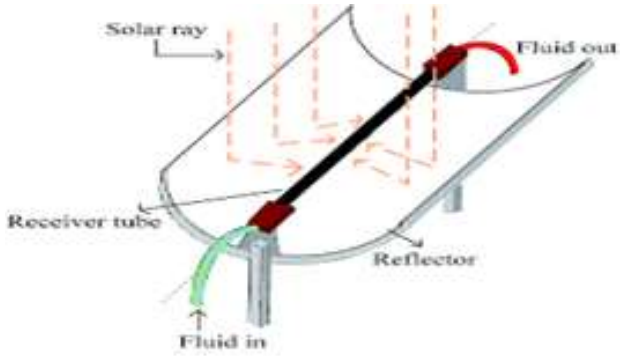

Figure 7 Solar Concrete collector

Fresnel:

Refraction occurs in the surface of a Fresnel lens but there are no refraction issues with the vast material between the two surfaces. In addition to being utilized in furnace heating, it will boost the temperature more than a typical one Metallic materials have had their surfaces altered by its installation. This apparatus uses solar energy in areas with extremely high temperatures. It just takes a few seconds to reach these temperatures. A significant drawback of the Fresnel concentrator was the 20minute series of action performance required for human adjustment in order to track the sun which resulted in a 34.3% reduction in reflecting surface when compared to a parabolic of the same diameter.

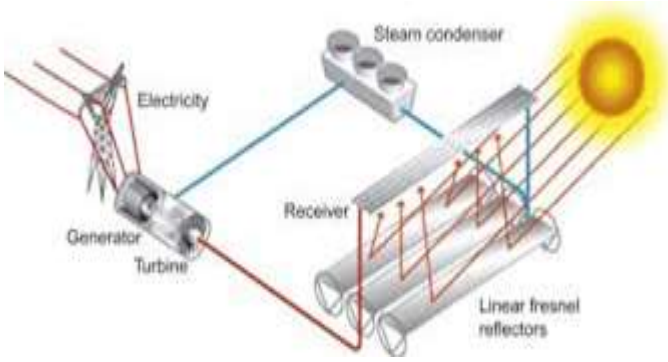

Figure 8 Fresnel refraction

Parabolic dish:

It resembles a giant satellite dish in appearance but the focal point is an absorber and mirror like reflectors. Dual axial sun tracking was employed. 30% efficiency has been attained. In a solar facility this dish produces at the MW level. This is the concentrating solar power technology's maximum conversion performance.

Figure 9 Parabolic dish

Central receiver:

It is mostly utilized in large scale facilities that typically produce more power. Another name for it is "Power Tower" It works by directing a field of thousands of mirrors onto a receiver situated atop a tower in the middle. The heat transfer fluid from the sun is collected by the receiver and utilized to power a stream turbine at the base of the tower that produces electricity.

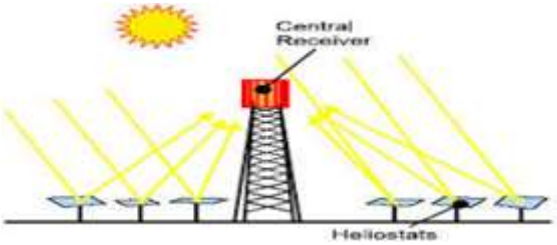

Figure 10 Central receiver

Merits of Solar energy:

It can save energy expenses by up to 20%. It is useful in remote areas. Simple installation (i.e.no wires cords etc. are needed) Rooftop means that all users whether residential or commercial can produce their own electricity without the need for additional space. Sunlight is a readily available free renewable and environmentally beneficial resource. It uses just sunlight as fuel and has no moving parts to generate electricity. Fuel and water are not required.

Demerits of solar energy:

When the sun isn't shining, no energy is produced. The initial outlay is substantial. Large amounts of power require more space. Inverters are needed for both night-time storage and alternating current (AC) applications. Single silicon crystal PV system production is time-consuming energy intensive and technically difficult.

Application of solar energy:

Electricity evaporation, water heating, building heating and cooling food preparation, water pumping and many other uses are there.

Figure 11 Solar water heater

Figure 12 Solar water pump

III. CONCLUSION

Non-renewable energy sources are known to the majority of people. Due to its financial advantages solar energy has grown in popularity. Solar energy can even supply electricity around-the-clock even on overcast days and at night thanks to battery backup. This is also utilized in intergrid systems that provide a continuous power source. Compared to other energy sources like fossil fuels and petroleum resources it offers greater advantages. It is a viable and reliable alternative to satisfy the rising demand for energy. Solar cell and solar energy research has potential for the future on a global scale.

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