

SM Department

English Module

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L2Physics

Lesson 07: Solar Energy

❖ Solar energy definition:

Is a radiation from the Sun capable of producing heat, causing chemical reactions, or generating electricity. The total amount of solar energy incident on Earth is vastly in excess of the world's current and anticipated energy requirements. If suitably harnessed, this highly diffused source has the potential to satisfy all future energy needs.

❖ A brief review of solar energy:

In the 21st century solar energy is expected to become increasingly attractive as a renewable energy source because of its inexhaustible supply and its nonpolluting character, in stark contrast to the finite fossil fuels coal, petroleum, and natural gas.

Solar energy is an essential source of renewable energy, and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power, and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.

❖ Solar Energy Types:

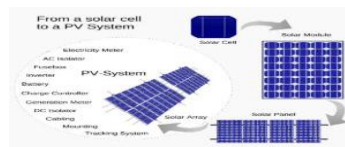
1) **Thermal energy:** Among the most common devices used to capture solar energy and convert it to thermal energy are flat-plate collectors, which are used for solar heating applications. A **Flat Plate Collector** is a heat exchanger that converts the radiant solar

energy from the sun into heat energy using the well-known greenhouse effect. It collects, or captures solar energy and uses that energy to heat water in the home for bathing, washing and heating, and can even be used to heat outdoor swimming pools and hot tubs.

2) Electricity Generation: Solar radiation may be converted directly into electricity by solar cells (photovoltaic cells). A **photovoltaic** power system “*PV system*” is designed to supply usable solar power by means of photovoltaics. It consists of an arrangement of several components, including a solar panel array to absorb and convert sunlight into electricity, a solar inverter, as well as mounting, cabling and other electrical accessories to set up a working system. The array of a photovoltaic system produces direct current (DC) power which fluctuates with the sunlight’s intensity.

In such cells, a small electric voltage is generated when light strikes the junction between a metal and a semiconductor (such as silicon) or the junction between two different semiconductors. The power generated by a single photovoltaic cell is typically only about two watts. By connecting large numbers of individual cells together, however, as in solar-panel arrays, hundreds or even thousands of kilowatts of electric power can be generated in a solar electric plant or in a large household array. The energy efficiency of most present-day photovoltaic cells is only about 15 to 20 percent, and, since the intensity of solar radiation is low to begin with, large and costly assemblies of such cells are required to

produce even moderate amounts of power.



❖ Other Solar Energy applications

Solar energy is also used on a small scale for purposes other than those described above. In some countries; solar energy is used for producing salt from seawater by evaporation. Similarly, solar-powered desalination units transform salt water into drinking water by converting the Sun’s energy to heat, directly or indirectly, to drive the desalination process.

Solar technology has also emerged for the clean and renewable production of hydrogen as an alternative energy source. Mimicking the process of photosynthesis, artificial leaves are

silicon-based devices that use solar energy to split water into hydrogen and oxygen, leaving virtually no pollutants. Further work is needed to improve the efficiency and cost-effectiveness of these devices for industrial use.

❖ **Advantages of solar energy:**

- 1- It is a renewable energy source, because it can be harnessed in all areas of the world and is available every day.
- 2- It has diverse applications such as; distilling water in regions with limited clean water supplies, powering satellites in space, and it can also be integrated into the materials used for buildings.
- 3- Low maintenance costs, because it doesn't require a lot of maintenance. All you need is to keep them relatively clean.
- 4- It is a sign of technology development.

❖ **Disadvantages of solar energy:**

- 1-it costs high because it includes paying for solar panels, inverter, batteries, wiring, and for the installation.
- 2- The other disadvantage through using solar energy is weather problem, which means that few cloudy, rainy days can have a noticeable effect on the energy system .without forgetting that solar panels are dependent on sunlight to gather solar energy.
- 3-the more electricity you want to produce, the more solar panels you will need. This means that it uses a lot of space, because using solar panels requires a lot of space and roofs
- 4- Although pollution related to solar energy system is far less compared to other sources of energy, solar energy can be associated with pollution through transportation and installation of solar systems.

❖ **Glossary:**

Solar energy: طاقة شمسية **photovoltaic:** الكهروضوئية **fossil fuels coal:** الوقود

Flat plate collector : جامع لوحة مسطحة **renewable energy** : طاقة متجددة

Solar panels: الألواح الشمسية **concentrated solar power** : الطاقة الشمسية المركزة

Solar water heating : تسخين المياه بالطاقة الشمسية