A Project Report On

"Conversion of Solar Energy into Electrical Energy"

Submitted

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Abstract

The solar photovoltaic cell is a solid-state device that exploits properties inherent in semiconducting materials to capture photons of light and use them to generate an electric current. They are constructed using microchip technology and have the same efficiency, whether in a tiny pocket calculator or in a central power station generating hundreds of megawatts. They are likely to become one of the cheapest forms of electricity generation within a decade, and probably offer the best long-term renewable source of energy and replacement for fossil fuel generation on the planet. Much of the global power generation capacity based on solar cells is found in rooftop installations on domestic and commercial buildings.

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Literature Review:-

A great deal of research and effort has been placed in solar energy harvesting using photovoltaic (PV) devices and systems. This has been mainly due to increasing demand for energy, price instability of fossil fuels, global warming, and environmental concern. Furthermore, among various sources of renewable energies, solar cells have a set of unique features of quiet operation, and mobility. Photovoltaic arrays also have short lead times to design, install and startup, as well as long expected life with low maintenance.

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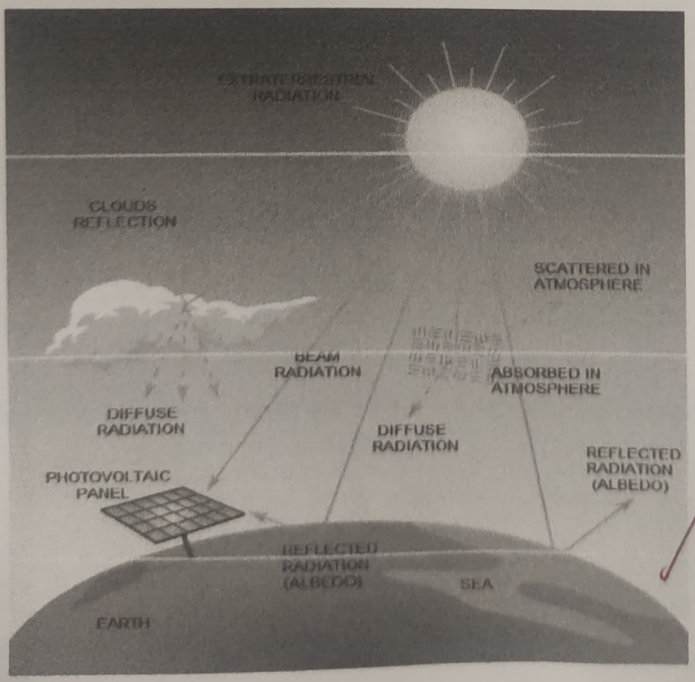
Introduction: -

Solar energy is the energy obtained by capturing heat & light from the sun. Energy from the sun is referred to as solar energy. Technology has provided a number of ways to utilize this abundant resource. It is considered a green technology because it does not emit greenhouse gases.

It all began with Edmond Becquerel, a young physicist working in France, who in 1839 observed and discovered the photovoltaic effect- a process that produces a voltage or electric current when exposed to light or radiant energy.

The sun is mankind's most abundant renewable energy source. The amount of solar radiation that strikes a position on the Earth depends on geographical location, local landscape, weather, the time of the year, and the time of the day. Radiation received by a surface will have two components, one of which is called a direct source. It is dependent on the distance the solar radiation has to travel through atmosphere. The second radiation component is called diffuse radiation, and this component comes from solar radiation that diffuses through clouds and dust in the atmosphere.



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Solar Spectrum: - The solar spectrum consists of a continuum with thousands of dark absorption lines superposed. The lines are called the Frauenhofer lines, and the solar spectrum is sometimes called the Frauenhofer spectrum. These lines are produced primarily in the photosphere.

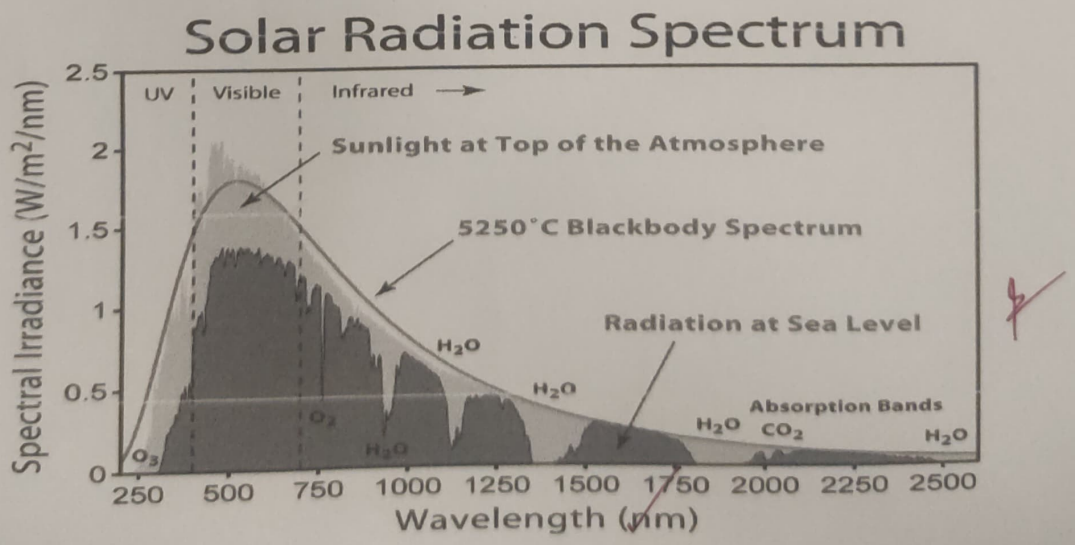
Customized Solar Spectra

We can see the solar spectrum for selected regions near the Balmer transitions, or to construct your own spectrum for an arbitrary wavelength region in the range 3000 - 54,000 Å.

- The Solar Spectrum (Custom, 3000 - 54,000 Å)
- Balmer H-alpha (6563 Å) region of the solar spectrum
- Balmer H-beta (4861 Å) region of the solar spectrum
- Balmer H-gamma (4340 Å) region of the solar spectrum

Photovoltaic:- Solar panels, sometimes also called photovoltaics collect energy from the Sun in the form of sunlight and convert it into electricity that can be used to power homes or businesses. These panels can be used to supplement a building's electricity or provide power at remote locations.

Photovoltaic Characteristics: - Three parameters that are very important in classifying the PV characteristics of a solar cell are the short circuit current (Isc), the open circuit voltage (Voc), and the maximum power point (Imp, Vmp). The short circuit current is the maximum current that can be delivered by the PV cell. The open circuit voltage is the maximum voltage that can be delivered by the PV cell. The maximum power point of the current voltage curve (IV curve) is the operating point at which the PV cell is delivering its maximum power.



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Objectives: - When the sun shines onto a solar panel, energy from the sunlight is absorbed by the PV cells in the panel. This energy creates electrical charges that move in response to an internal electrical field in the cell, causing electricity to flow.

Experimental Part: -

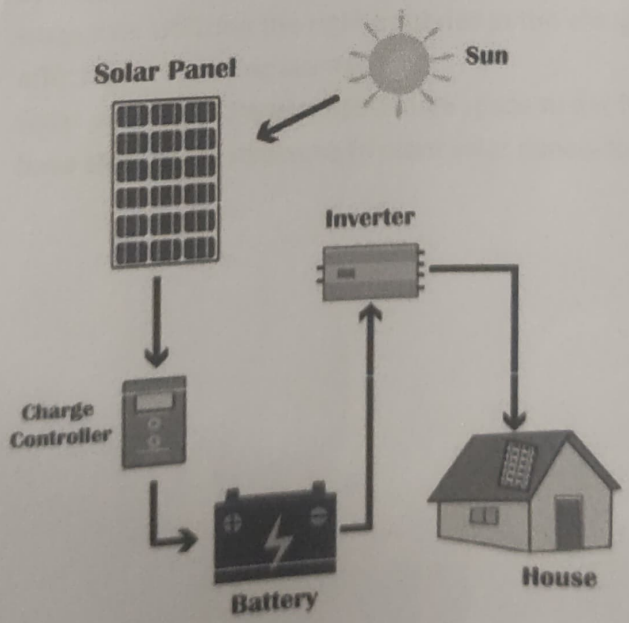
The four major components of a solar energy system are the panels, inverter(s) and solar battery storage unit(s). Solar panels are the most visible element of our system, which is why we're likely the most familiar with it. They are, in essence, the "face" of solar.

The way that solar panels work is that the panels generate DC electricity as sunlight, or solar irradiation, stimulates electrons to move though solar cells that are in-built into the solar panels.

A solar panel is made up of solar cells, the solar cell is the kind of beer matt sized black thing, black square, about 60 of which are put in a matrix to make up a solar panel. In the solar cell we've got atoms, all atoms are surrounded by electrons. Sunlight hits the solar cell, it dislodges these electrons.

Electricity is the flow of electrons around a closed circuit. So, what we've created with the light is a flow of electrons into that empty hole. Now, all we do is we capture those electrons in a closed circuit using wires, and we've got a flow of electrons around the closed circuit – i.e. we've got electricity.

If we combine lots of these solar cells together, we create a solar panel. If we put lots of the solar panels together, we create what we call a solar array – and we can actually get an incredible amount of electricity just from the light shining on the panels from the sun.



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Uses of Panel: - Energy from the sun referred to as solar energy, is captured by the solar panels and is then converted into electricity. The solar panel is composed of many solar cells.

Advantages & Disadvantages of Solar energy:-

- **Advantages :-**
  - Solar energy is a renewable source of energy which is accessible & harasses all areas of the world. Sunlight is available to earth for more than 5 Billion years which is utilized effectively in this time for a positive effect on the environment.
  - Solar energy helps to minimize electricity bills as the energy collected from the sun helps in forming electricity. Saving on electricity bills completely relies on the usage of heat or electricity and the solar system's size.
  - In maintaining solar panels or systems, huge costs are not required. The maintainace costs are extremely affordable and the most reliable production of solar panels offers 20-25 years of warranty.
  - Technological factors in the industry of solar power are continuously developing and advancing which is going to be intensified in the future. Innovation in quantum physics helps in maximizing the efficiency of solar panels.
- **Disadvantages:-**
  - One of the major drawbacks of solar energy is that it is climate-depended. On cloudy or winter days, the effectiveness of solar panels drops which creates difficulty in generating electricity.
  - Storage of solar energy is tremendously high and initial purchasing costs are excessive. Utilizing the right batteries in the charging of panels can be effective in reducing storage costs.
  - Solar panels (PV Panels) need huge space to get fitted. Many roots do not have the proper structure to plant solar panels for generating electricity.

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Conclusion:-

Solar energy is a superb source of energy because it doesn't contaminate the environment; it is inexpensive; and it is renewable. Save your time! Even though solar energy and panels seem very high-tech expensive, solar energy has proven to decrease bills due to electricity.

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