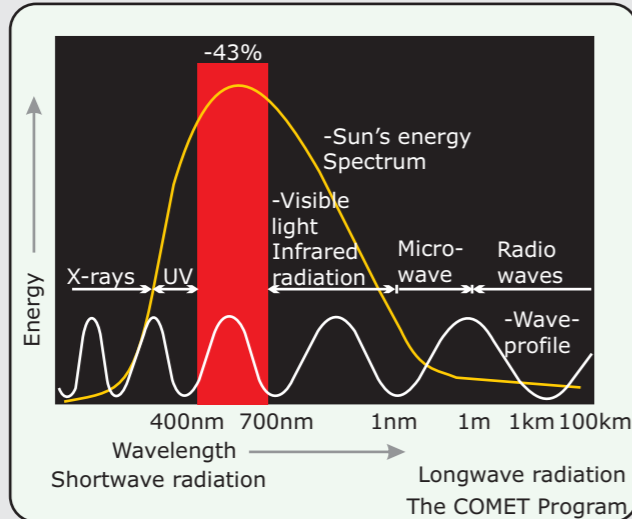




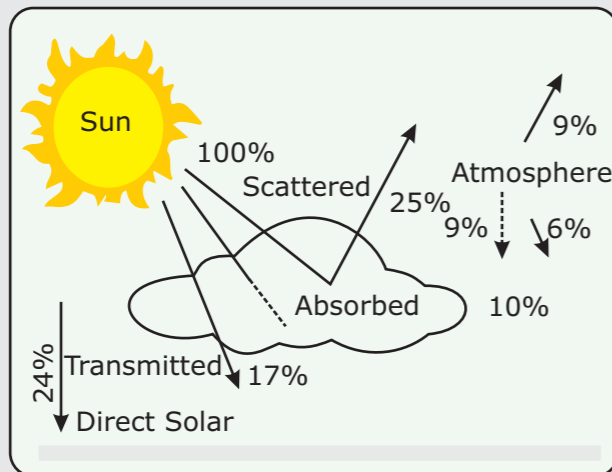
What is Solar Energy ?

- ! Originates with the thermonuclear fusion reactions occurring in the sun.
- ! Represents the entire electromagnetic radiation (visible light infrared, ultraviolet, x-rays, and radio waves)



How much Solar Energy ?

- ! About 47% of the total solar energy reaches the Earth Only this amount is usable.
- ! 15 percent of the radiant energy that reaches the earth is reflected back into space
- ! 30 percent is used to evaporate water, which is lifted into the atmosphere and produces rainfall



Advantages

- ! All chemical and radioactive polluting byproducts of the thermonuclear reactions remain behind on the sun, while only pure radiant energy reaches the Earth
- ! Energy reaching the earth is incredible. By one calculation, 30 days of sunshine striking the Earth have the energy equivalent of the total of all the planet's fossil fuels, both used and unused !

Disadvantages

- ! Sun does not shine consistently
- ! Solar energy is a diffuse source. TO harness it, we must concentrate it into an amount and form that we can use, such as heat electricity
- ! Addressed by approaching the problem through
- ! 1) Collection, 2) Conversion, 3) Storage.

Uses of Solar Energy

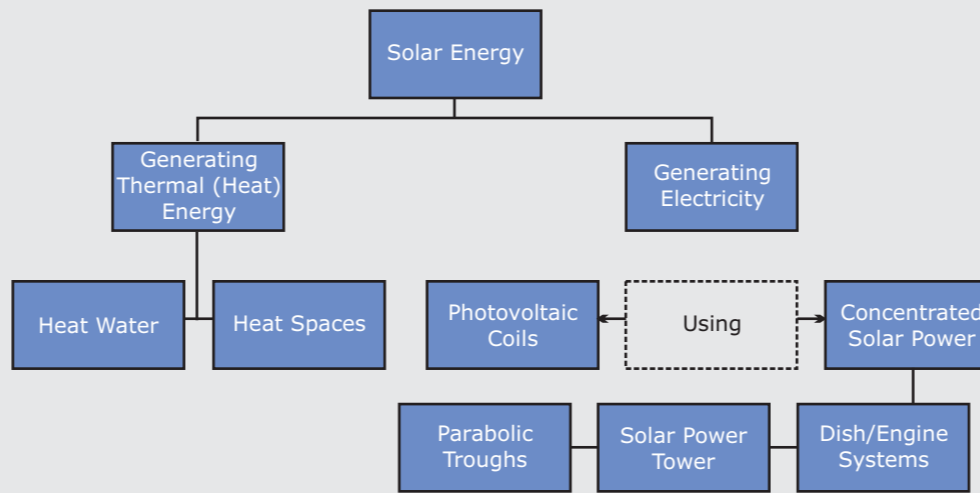
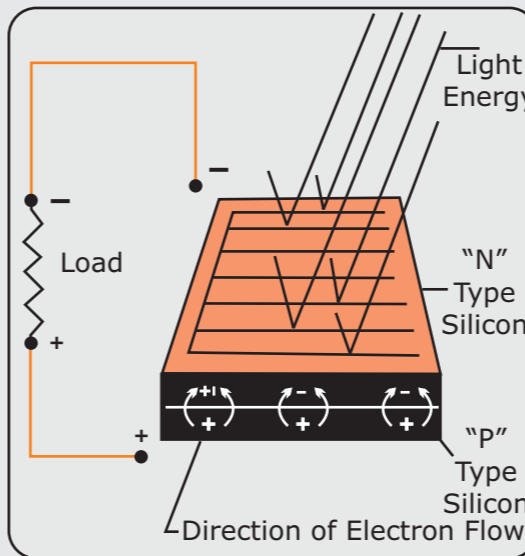
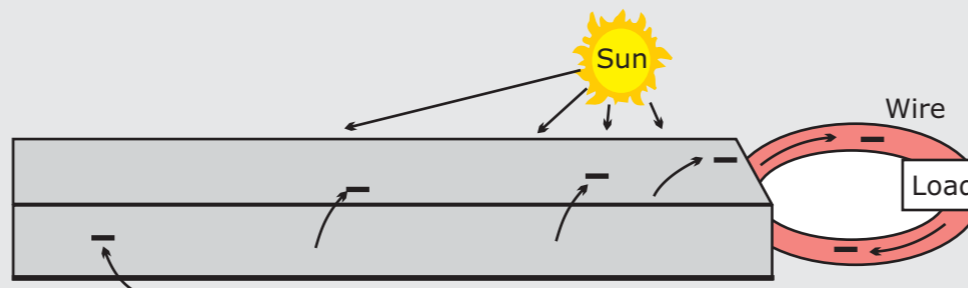


Photo Voltaic Cells (PV cells)

- ! Capable of directly converting Sunlight to Electricity
- ! A simple wafer of silicon with wires attached to the layers. Current is produced based on types of silicon (n-and p-types) used for the layers, Each cell = 0.5 volts
- ! Individual PV cells are grouped into panels and arrays of panels that can be used in a wide range of applications
- ! Battery needed as storage
- ! No moving parts, hence do no wear out, but because they are exposed to the weather, their



- + Proton
- Tightly-held electron
- Free electron
- Can accept and electron

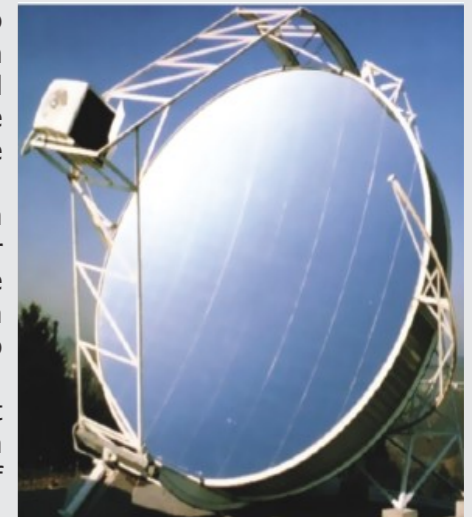


Efficiency and Disadvantages of Photovoltaic Cell

- ! Efficiency is for less than the 77% of solar spectrum with usable wavelengths.
- ! 43% of photon energy is used to warm the crystal
- ! Efficiency drops as temperature increases (from 24% at 0°C to 4% at 100°C)
- ! Light is reflected off the front face and internal electrical are other factors.
- ! Overall the efficiency is about 10-14%
- ! Cost of electricity from coal-burning plants is anywhere b/w 8-20 cents/IWh, while photovoltaic power generation is anywhere b/w \$0.50-1kWh
- ! Does not reflect the true costs of burning coal and its emissions to the non-polluting method of the latter
- ! Underlying problem is weighing efficiency against cost.
- ! Crystalline silicon-more efficient, more expensive to manufacture
- ! Amorphous silicon-half as efficient, less expensive to produce.

Concentrated Solar Power

- ! General idea is to collect the light from many reflectors spread over a large area at one central point to achieve high temperature
- ! Focus sunlight on a smaller receiver for each device; the heated liquid drives a steam engine to generate electricity
- ! The more recent facilities converted a remarkable 22% of sunlight into electricity.



Final Thought

- ! Argument that sun provides power only during the day is countered by the fact that 70% of energy demand is during daytime hours. At night, stored energy or traditional methods can be used,
- ! Goal is to decrease our dependence on fossil fuels.
- ! Currently, 75% of our electrical power is generated by coal-burning and nuclear power plants.
- ! Mitigates the effects of acid rain, carbon dioxide, and other impacts of burning coal and counters risks associated with nuclear energy.
- ! Pollution free, indefinitely sustainable



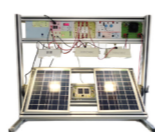
26001 On - Grid Solar Power Plant



26021 Solar Water Heater



26061C Solar Home Lighting System



46632 Solar Technology Trainer



55502 Solar Energy Trainer



55502A Solar Energy Trainer High



55504 Wind Energy Trainer



55790 Characteristics of a solar cell