

RENEWABLE ENERGY



RENEWABLE SOURCES:-

SOLAR ENERGY

WIND ENERGY

TIDAL ENERGY

GEOTHERMAL
ENERGY

WAVE ENERGY

OCEAN
THERMAL
ENERGY

BIOGAS

NON-RENEWABLE SOURCES:-

COAL, COKE

PETROLEUM
AND ITS
DERIVATIVES

NUCLEAR FUEL

NUCLEAR GAS

Need for Renewable Resources

- **In the current scenario, the demand of fossil fuels is ever increasing. The globe is being affected very badly because of the emission of harmful gases by these fuels.**
- **Recent statistics state that if global warming continues at the same rate, then there would be 4 degree Celsius rise in the global temperature by 2100. Also India has overtaken America which was then the second largest producer of sulphur dioxide. This is very alarming and so we have tried our best to give a small contribution to save the nature.**

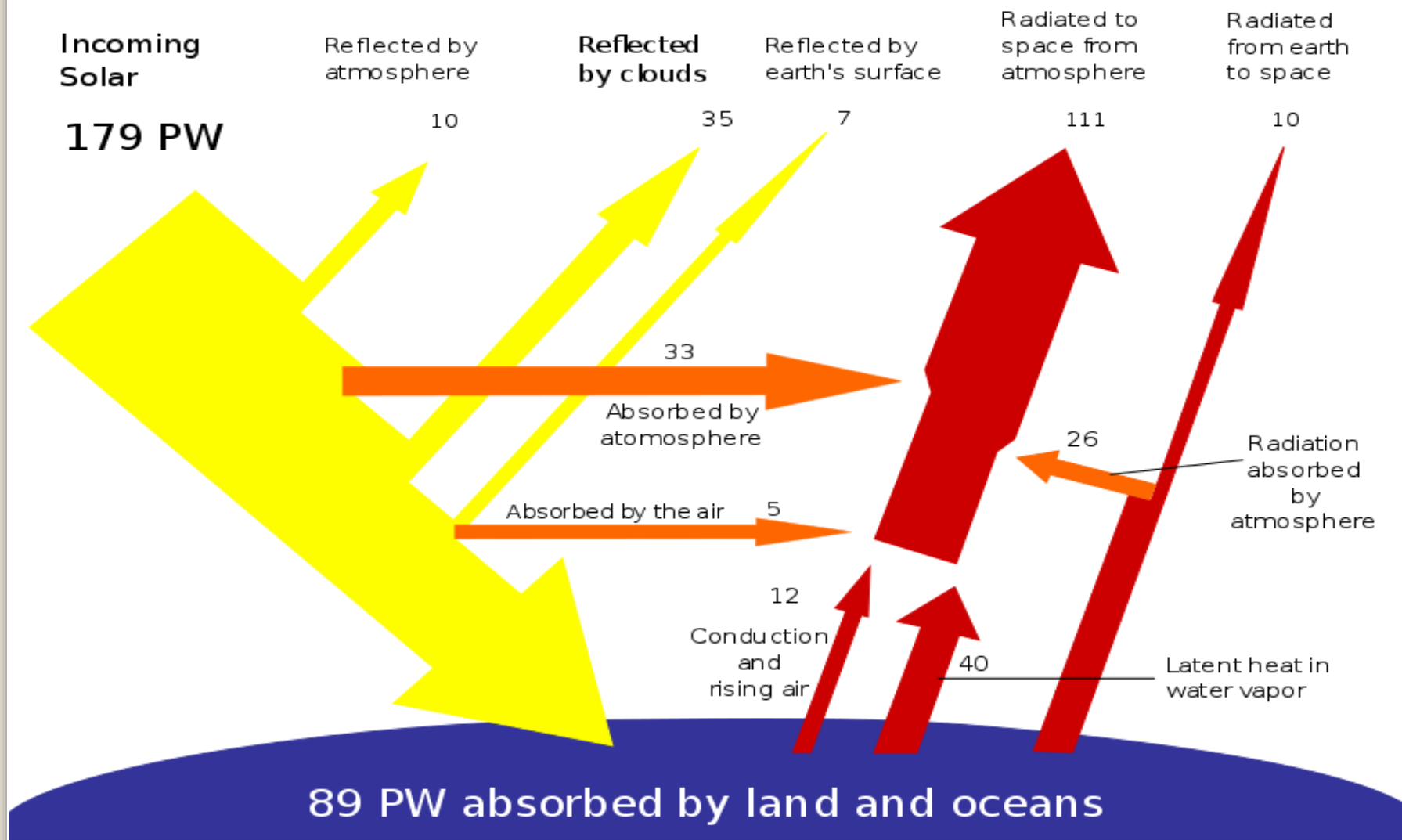
ADVANTAGES AND DISADVANTAGES OF RENEWABLE SOURCES OF ENERGY:-

ADVANTAGES:-	DISADVANTAGES:-
1. They have minimal impact on the environment.	1.They contain energy in diluted form.
2.They are widely available.	2. But, availability is uncertain or periodic.
4.Renewable energy facilities generally require less maintenance than traditional generators.	3. It is difficult to generate the quantities of electricity that are as large as those produced by traditional fossil fuel generators.
4.They are non polluting.	4. Their collection is expensive.

SOLAR ENERGY

INTRODUCTION

- 'Solar' is a Latin word for the sun and Energy is the ability to do work.
So, we can define solar energy as energy obtained from the sun.
- Nuclear fusion reactions taking place in the sun giving rise to electromagnetic radiations. 45% of these radiations, are absorbed by the earth.
- One of the basic and natural use of solar energy is photosynthesis.
- Solar energy is radiant light and heat energy from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis.



Reasons for using Solar energy:-

Solar energy is a major renewable energy source with the potential to meet many of the challenges facing the world.

1) Solar Power Is Good for the Environment

2) Combats Climate change

3) Solar Power Causes Less Electricity Loss



Advantages of Using Solar Energy

- Renewable energy source available free of cost
- Clean and pollution free
- The source does not deplete with use
- Available naturally in every consumer's premises



PAY LESS IN
ENERGY BILLS



BE A PART OF CLEAN
ENERGY EFFORTS



PROTECT AGAINST
EVER-RISING
ELECTRIC RATES



INCREASE THE
VALUE OF
YOUR HOME

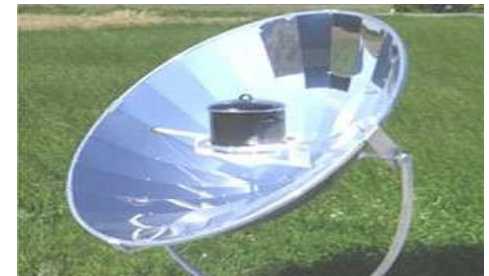
LIMITATIONS OF USING SOLAR ENERGY:-

- 1) Uneconomical
- 2) Weather Dependent
- 3) Solar Energy Storage Is Expensive
- 4) Uses a Lot of Space
- 5) Still in developmental stage



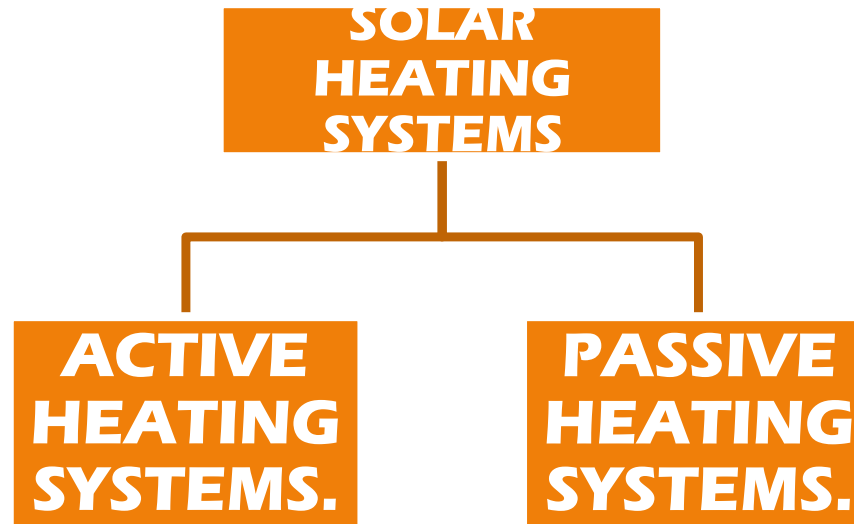
APPLICATIONS OF SOLAR ENERGY:-

- 1) Solar domestic heating purposes.
- 2) Solar cooking.
- 3) Electricity generation.
- 4) Solar thermal power production.
- 5) Solar furnaces.
- 6) Solar green houses.
- 7) Driving force for batteries

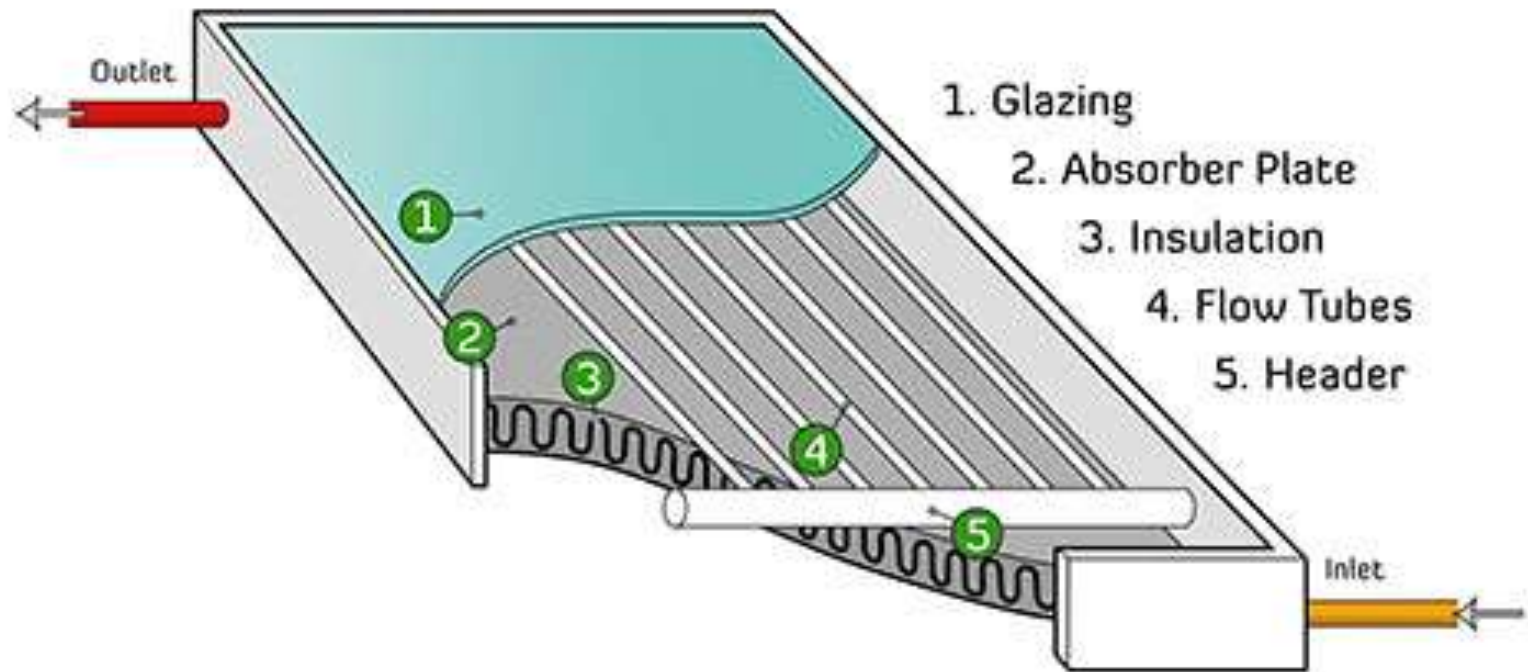


Solar Heating

- No conversion equipment or complex collection required for domestic heating
- Simple principle of black body principle (solar panels), flat plate collectors are used.



FLAT PLATE COLLECTOR:-



- It is a common type of solar “panel” is one that is used strictly for heat production, usually for heating water
- Consists of a black (or dark) surface behind glass that gets super-hot in the sun
- Upper limit on temperature achieved is set by the power density from the sun
 - dry air may yield 1000 W/m² in direct sun
 - using σT^4 , this equates to a temperature of 364 °K for a perfect absorber in radiative equilibrium (boiling is 373 °K)
- Trick is to minimize paths for thermal losses

- You want to channel as much of the solar energy into the water as you can
 - this means suppressing other channels of heat flow
- Double-pane glass
 - cuts conduction of heat (from hot air behind) in half
 - provides a buffer against radiative losses (the pane heats up by absorbing IR radiation from the collector)
 - If space between is thin, inhibits convection of air between the panes (making air a good insulator)
- Insulate behind absorber so heat doesn't escape
- Heat has few options but to go into circulating fluid

- Glass is transparent to visible radiation (aside from 8% reflection loss), but opaque to infrared radiation from 8–24 microns in wavelength
 - collector at 350 °K has peak emission at about 8.3 microns
 - inner glass absorbs collector emission, and heats up
 - glass re-radiates thermal radiation: half inward and half outward: cuts thermal radiation in half
 - actually does more than this, because outer pane also sends back some radiation: so 2/3 ends up being returned to collector

Efficiency-

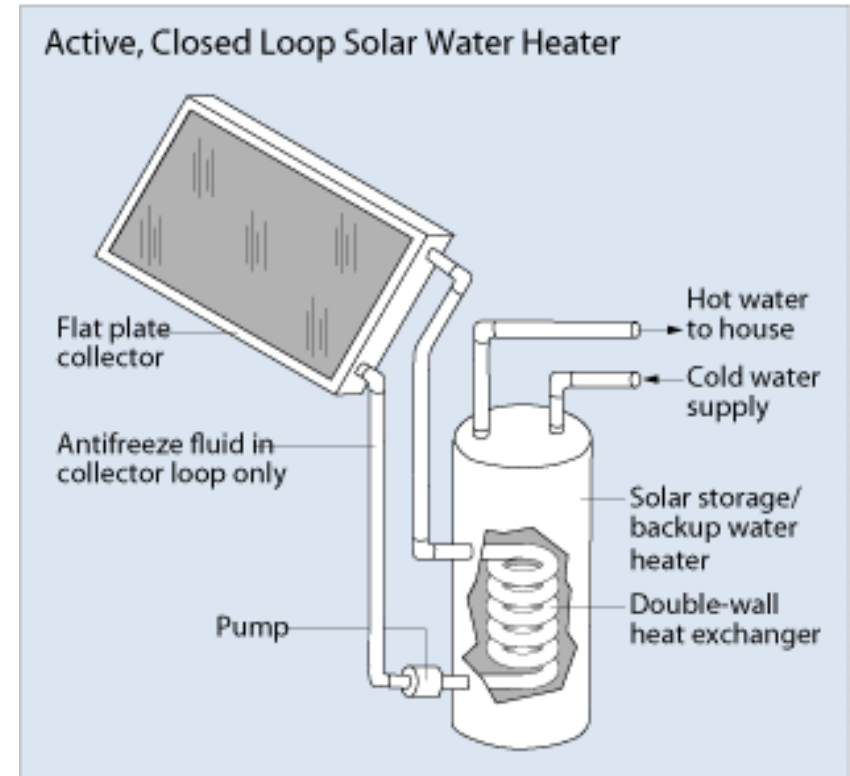
- Two-pane design only transmits about 85% of incident light, due to surface reflections
- Collector is not a *perfect* absorber, and maybe bags 95% of incident light (guess)
- Radiative losses total maybe 1/3 of incident power
- Convective/Conductive losses are another 5–10%
- Bottom line is approximately 50% efficiency at converting incident solar energy into stored heat
 - $0.85 \times 0.95 \times 0.67 \times 0.90 = 0.49$

Domestic use-

- Typical showers are about 10 minutes at 2 gallons per minute, or 20 gallons.
- Assume four showers, and increase by 50% for other uses (dishes, laundry) and storage inefficiencies:
 - $20 \times 4 \times 1.5 = 120$ gallons \approx 450 liters
- To heat 450 l from 15 °C to 50 °C requires:
 $(4184 \text{ J/kg/}^\circ\text{C}) \times (450 \text{ kg}) \times (35 \text{ }^\circ\text{C}) = 66 \text{ MJ of energy}$
- Over 24-hour day, this *averages* to 762 W
- At average insolation of 200 W/m² at 50% efficiency, this requires 7.6 m² of collection area
 - about 9-feet by 9-feet, costing perhaps \$6–8,000

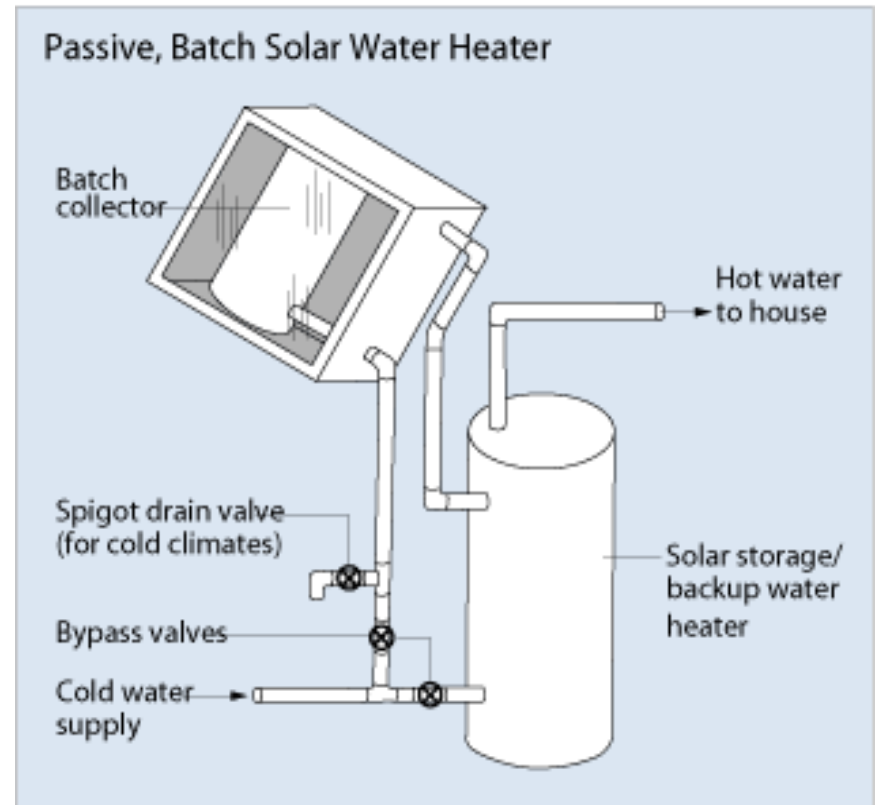
Active heating system

- a) Active systems use one or more pumps to circulate water and/or heating fluid. This permits a much wider range of system configurations.
- b) Easily controlled and higher efficiency
- c) Features like safety functions, remote access ,informative displays, backup, etc make it expensive



Passive heating system:-

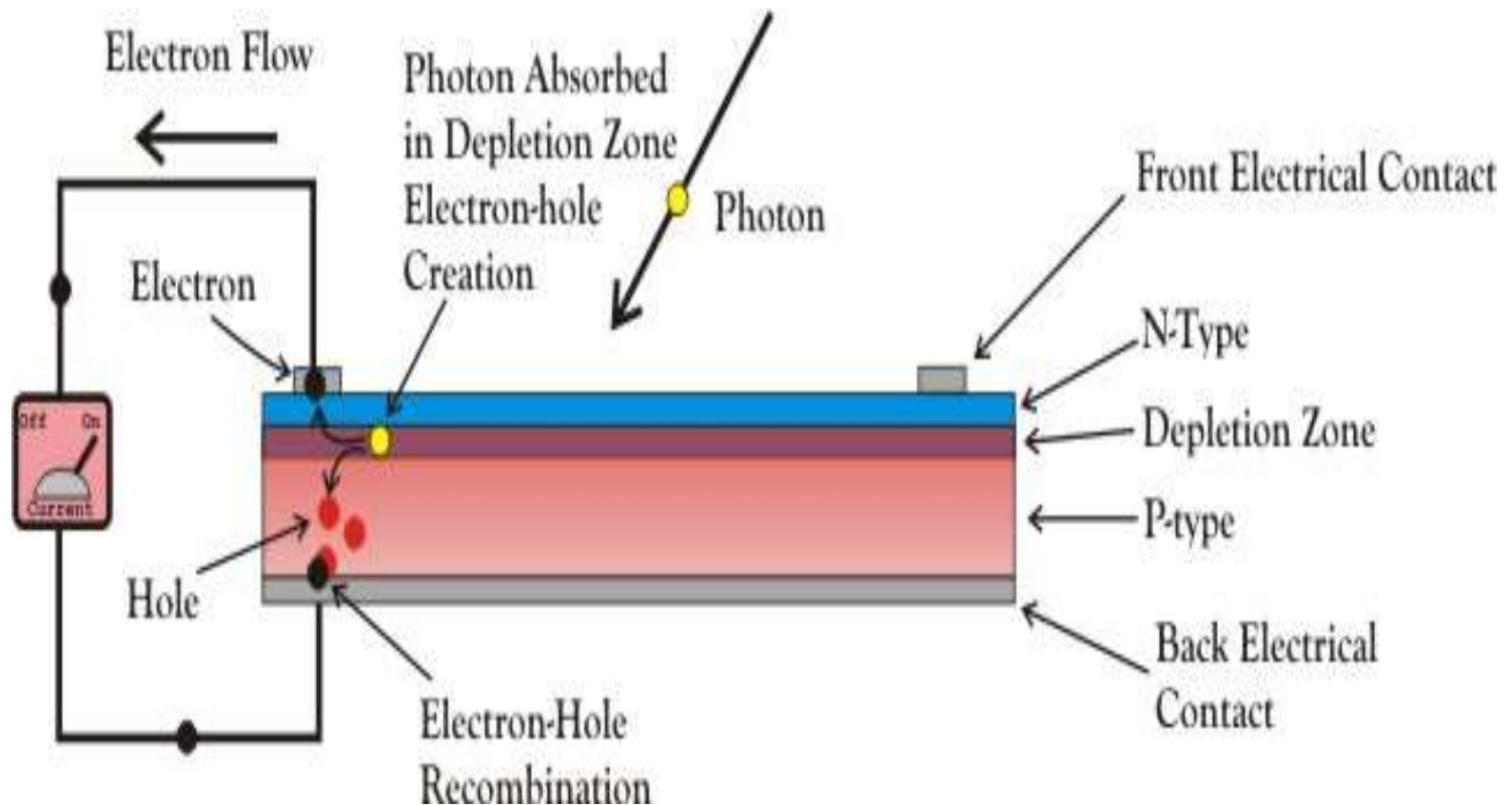
- a) Relies on natural convection for circulation
- b) Less expensive than active systems
- c) More reliable and may last longer



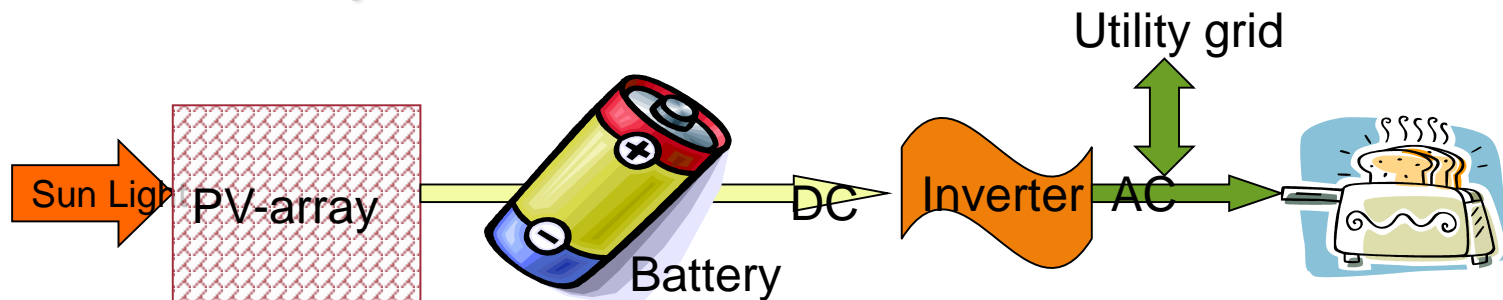
Production Of Electricity

- Photovoltaic cell
- Solar trough collector

Photovoltaic Cells:-



- Sunlight impinges on silicon crystal
- Photon liberates electron
- Electron drifts aimlessly in p-region
- If it encounters junction, electron is swept across, constituting current
- Electron collected at grid, flows through circuit (opposite current lines)



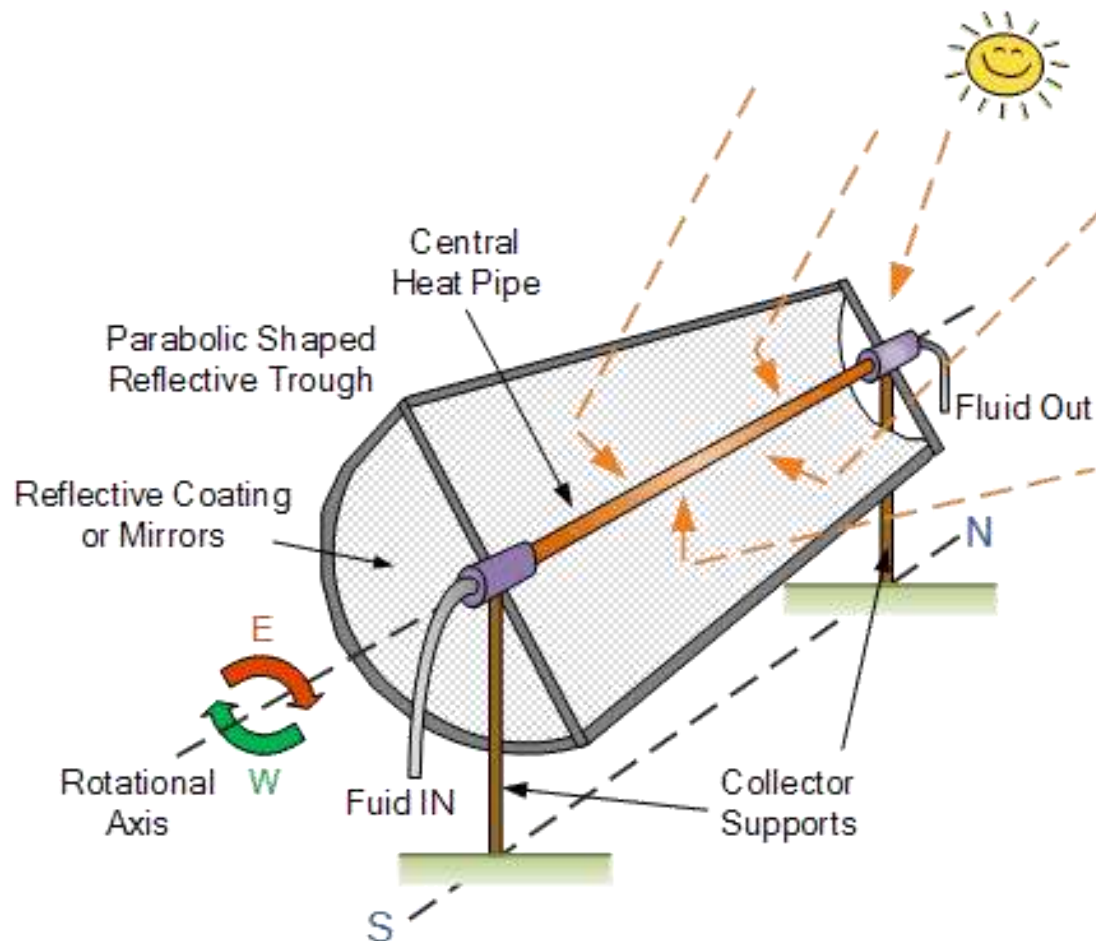
- Sunlight is turned into DC voltage/current by PV
- Can charge battery (optional)
- Inverted into AC
- Optionally connect to existing utility grid
- AC powers household appliances

- A solar cell, or photovoltaic cell , is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon
- Solar cells are described as being photovoltaic, irrespective of whether the source is sunlight or an artificial light. They are used as a photodetector for detecting light or other electromagnetic radiation near the visible range, or measuring light intensity.

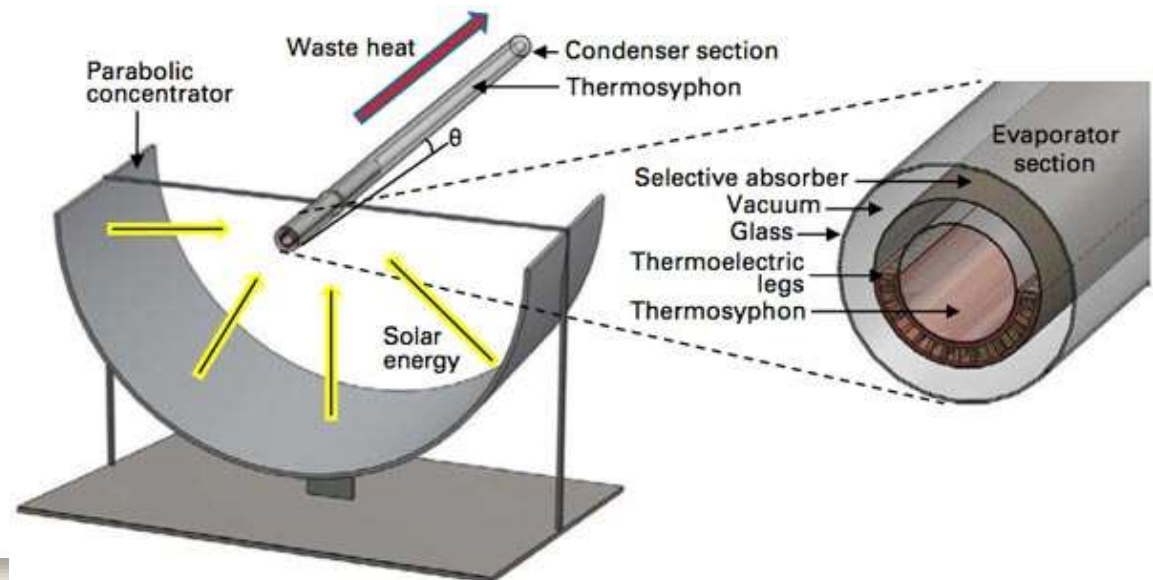
The operation of a photovoltaic (PV) cell requires three basic attributes:

- I. The absorption of light, generating either electron-hole pairs or excitons.
- II. The separation of charge carriers of opposite types.
- III. The separate extraction of those carriers to an external circuit.

Solar Trough Collector



A **parabolic trough** is a type of solar thermal collector that is straight in one dimension and curved as a parabola in the other two, lined with a polished metal mirror. The energy of sunlight which enters the mirror parallel to its plane of symmetry is focused along the focal line, where objects are positioned that are intended to be heated.



SOLAR PLANTS IN INDIA

- KAMUTHI SOLAR POWER PROJECT, TAMIL NADU: ONE OF THE LARGEST IN INDIA. OUTPUT: **648 MW**
- CHARANKA SOLAR PARK, GUJARAT: **LARGEST** IN ASIA AND SECOND LARGEST IN THE **WORLD**.
- HYBRID PLANT, LEH, JAMMU & KASHMIR.
- SINGLE AXIS TRACKER SOLAR PLANT, VELLAKOIL,TN.



**Panda Solar farm Datong, China
250Acre, 100MW Mega Project**

Advanced Technologies in Solar Energy Harnessing

AORA Solar came with this new concept of harnessing the solar energy. It has begun the construction of this solar-biogas power plant in Ethiopia. The concept is inspired by the Sunflower, by creating the Solar Panel that faces the Sun



Innovation in Solar Cells

Organic solar cells:-

- i. Made of titanium dioxide instead of silicon.
- ii. Silicon is a limited resource while TiO_2 is available in plenty.
- iii. TiO_2 is cheaper than silicon.
- iv. Organic solar cells can be made in normal conditions of temperature and pressure while normal solar cells require vacuum conditions for manufacturing.
- v. Efficiency is greater.



COULD THE WORLD BE



100% SOLAR?



All known fossil fuel reserves could be totally spent within the next 100 years, according to recent estimates.