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Renewable & Non Renewable Sources of Energy

Energy Resources can be of two types:

(i) Renewable (Non conventional Resources)	(ii) Non Renewable (Conventional)
* Resources which can be generated continuously in nature and are in-exhaustable	* Resources which have accumated in nature over a long span of time, cannot be quickly replenished when exhausted
Eg: Wood, Solar energy, wind energy, tidal energy, Hydropower, biomass, biofuels, geothermal energy, hydrogen.	Eg: Coal, petroleum, natural gas, nuclear fuels (Ur, KH)
* Can be used again & again in any endless manner.	* Cannot be reused or recycled.
* There is no harm to the envt by using these sources	* Huge harm done to the envt. because of the harmful emissions.

Solar Energy : • Source of Solar Energy is Sun.

• Nuclear fusion reactions occuring inside the Sun and release enormous quantity of energy in the form of heat and light.

• Solar Energy is received by the near Earth surface is appox. 1.4 KJ / s / m^2 is K/as Solar Constant. (1.4 K Watt / m^2)

But now a days there are separate energy for several techniques for enhancing the solar energy.

1) Solar heat Collectors :
2) Solar Cells
3) Solar Cooker
4) Solar water heater
5) Solar furnace
6) Solar Power Plant

1) Solar heat Collectors : Absorbs sun light to collect heat.

Flat plate collectors are most common type of nonconcentrating collectors for water and space heating in buildings

Concentrating collectors, area intercepting solar radiation is greater, than the absorber area.

2) Solar Cells (PV Cells or Photovoltic Cells)

- These cells are made of thin wafers of semiconductors materials like Ga, Si
- When solar radiation fall on them a potential diff is produced which causes flow of e^- and produced electricity.
- Si can be obtained from Silica or sand which is available in abundant & in expensive.
- By doping GaAs, CdS or B, efficienty of PV cells can be improved.
- The potential diff produced by a single PV cell of 4 cm^2 size is about 0.4 to 0.5 volts and produces a current of 60 mA.

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- A group of solar cells joint together in a definite pattern and form a solar panel which can produce a large amount of solar energy and can produce electricity to run street lights and irrigation water pumps.

Application of PV cells :

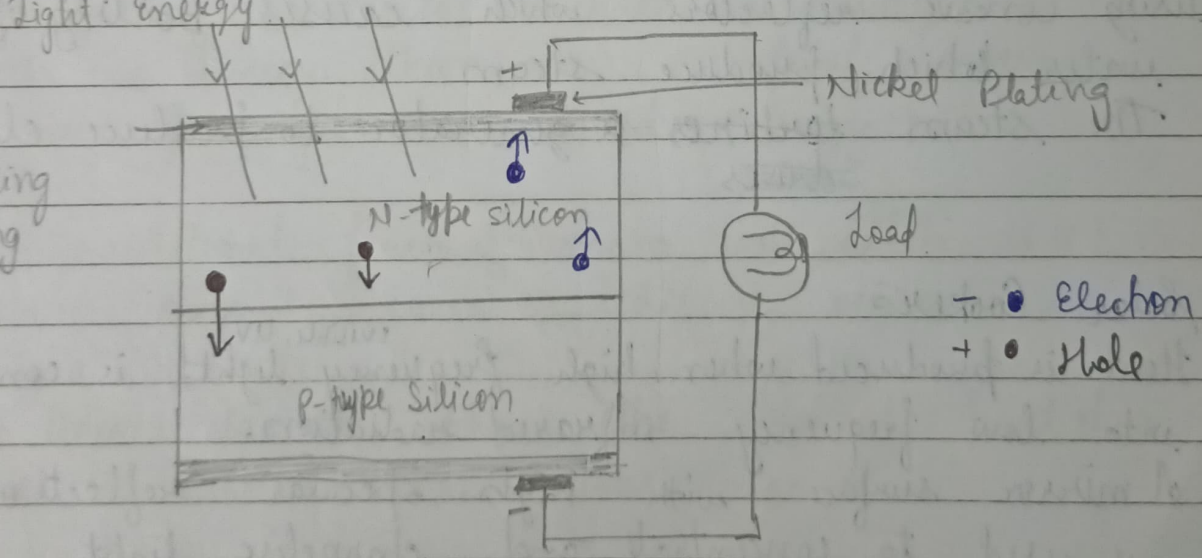
(i) Remote areas : PV cells can provide electricity to remote areas that don't have other sources, such as cotlage, parks.

(ii) Agriculture : Irrigation system

(iii) Transportation : Temporary traffic signs and roadway lighting.

(iv) Space exploration :
Space experiments, exploration bcoz they are light weight

(v) Solar farms that generates gigawatts of electricity.



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3) Solar water heater:

- It consists ~~solar~~ of an insluated box painted black from inside and having a glass lid. to receive and store solar heat.
- Inside the box it has black painted copper coil through which cold water is made to flow in which gets heated and flows out into the storage tank which is situated on the roof top is then supplied through the pipes into the buildings, hospital etc.

4) Solar furnace =

Here thousands of plane mirror arranged in concave reflector all of which collect Solar heat and produce as high temp as 3000°C

5) Solar Power Plant =

Solar energy can be produced on large scale by using concave reflectors which causes boiling of water which produce steam.

The steam ~~turbines~~ drives a generator to produce electricity

6) Solar Cooker =

Heat is produced when high frequency (visible, UV) light is converted into low frequency infrared radiation.

A mirror surface with high specular reflection is used to concentrate and channelise light from sun into a small cooking space.

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Wind Energy :-

Wind is used to produce electricity by converting the KE of air in motion into electricity.
Wind turbines, wind rotates the rotor blades.
20 megakW can be produced
but actually production is 1020 mega watt.

Hydropower = It is use of falling, fast running water to produce electricity, or to power machines. Achieved by converting the gravitational potentional of a water source to produce power.

- Method of Sustainable Energy.

Tidal Energy =

It is a renewable Energy that uses a rise and fall of tides to generate electricity.
Water is denser than air, so tidal energy is more powerful than wind energy.

The gravitational forces of moon and ~~earth~~ sun, to a lesser extent, causes tides to originate in oceans.
High tides = Occurs when the highest part of a wave or crest reaches a coast line.

Low tides = Occurs when lowest part of a wave, or tough, reaches the coastline.

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Ocean Thermal Energy = (OTE)

- The Energy available due to the diff in temp. of water at the surface of the tropical oceans and at deeper levels is called OTE.
- A diff of 20°c or more is required b/w surface water and diff deeper water of ocean for operating the OTEC powerplants
- The warm surface of ocean is used to boil a liquid like NH_3 (a low boiling fuel having a boiling point around -33°C at atm pressure)
- The high pressure vapours of the liquid form by boiling and then used to turbines generator and produce electricity.

The cold water from deeper ocean is pumped to cool and condense the vapour into liquid.

thus, process keeps in going for 24 hours in a day

Geothermal Energy =

- Extracted from Earth's Crust.
- It combines energy from formⁿ of planet and from radioactive decay.

- Best known natural displays are volcanoes, boric acid fumaroles and geysers, hot springs.
- Its current uses include heating buildings, raising plants in greenhouse, drying crops, heating water at fish farms.

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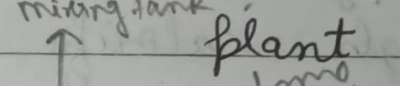
Biomass Energy: It is matter from living organisms which is used for bioenergy production.

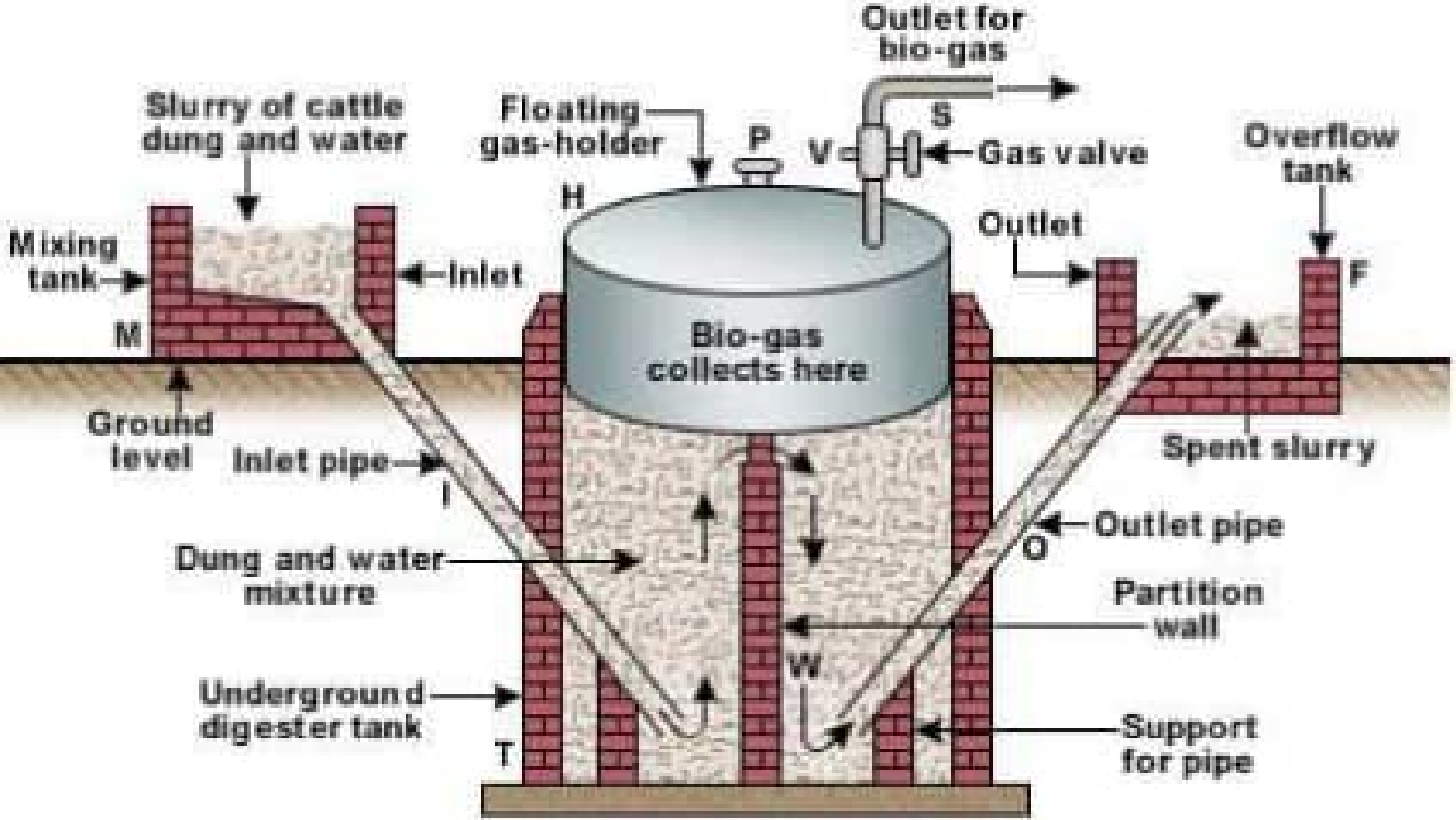
Eg= Wood, energy crops, organic wastes from households
Climate impact of bioenergy production

Biogas: It is a mixture of methane, CO_2, Hydrogen H_2S.
Biogas is produced by unacrobic degradation of animal waste, sometimes plant waste in the presence of water.
In India, two types of biogas plants are used

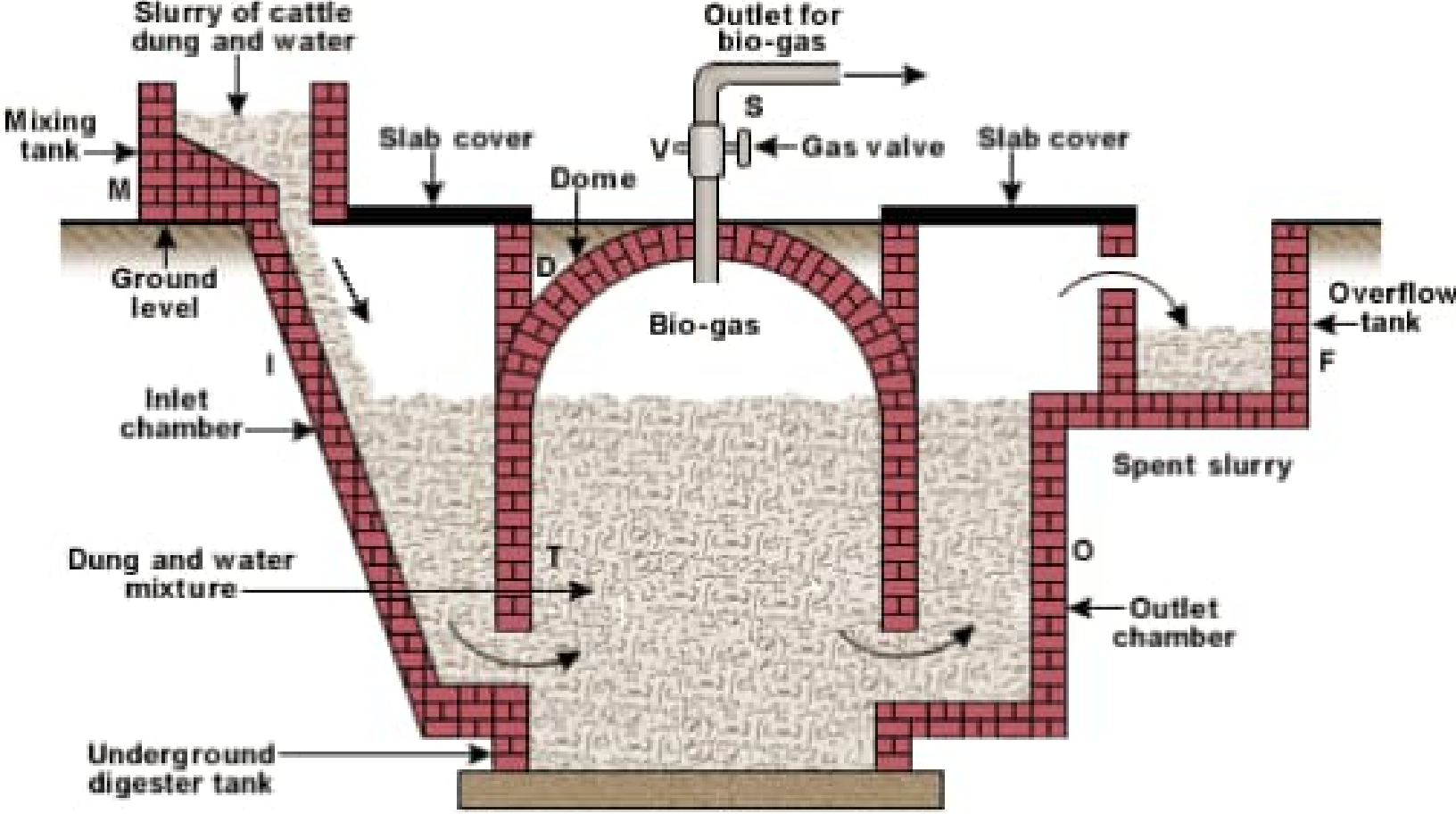
Floating Gas holder type Biogas Plant



Fixed dome type biogas plant



Floating gas-holder type bio-gas plant.



Fixed-dome type bio-gas plant.

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Biofuel =
Biomass can be fermentate to alcohol like samples like methanol, ethanol and gasohol which can be used as fuels.

- Ethanol = Easily produced from carbohydrate, rich substance like sugarcane, corn, sorgal
  It burns clean and non pollutant
- Gasohol = It is a mixture of ethanol and gasoline.
- Methanol = It is clean and non pollutating fuel and obtained from woody plants.

Hydrogen as a fuel:
It is known as future of fuel.
As hydrogen burns in air it combines with oxygen to water and large amount of energy appox. 150 KJ/gm is released.
Due to its high calorific value this hydrogen can start as excellent fuel.
It can easily produced by the thermal dissociation, photolysis and electrolysis of water.

Non Renewable Energy
① Coal ② petroleum ③ Natural Gas ④ Nuclear fuels

1) Coal = There are mainly 3 types of coals

Lignite	Bituminous	Anthracite
Brown Coal	Soft Coal	Highest Quality (hard coal)
70% C	80% C	90% C
		CV = 8700 kCal / kgm

C

Peat - 60% Carbon

② Petroleum

It is lifeline of global economy.
Crude petroleum is mixture of alkaline hydrocarbon and it can be purified or refined by fractional distillation process in which different constituent are saturate out at different temp. acc. to their boiling points.

LPG = Main component is Butane
other than are propane and ethane
This gas is odourless but in domestic gas cyclinders it gives false smell, by the presence of ethyl mercaptan which is a false smell added to LPG so that any leakage from lpg cylinder can be detected easily.

③ Natural Gas:

Main component is 95% methane and small amount of propane and ethane.
It is cleanest form of fossil fuel
Its calorific value is high i.e 50 kJ/gm and burns without smoke.

CNG (Compressed)
- Alternate of diesel, petrol

SNG (Synthetic)
- Mixture of CO + H

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⑨ Nuclear Energy :

Nuclear fission

- It is a chain reaction initiated by one neutron that bombards a Ur nucleus - Releasing a huge quantity of energy + 2 smaller nuclei of Ba + Kr + 3 neutrons

Nuclear fusion

- This rxn occurs b/w $2\,{}^{1}_{1}H$, Deut 2 nuclei, they will fused together, which take place at very high temp of 1 billion °C - releasing 1 neutron + 1 fusion nucleus of ${}^{3}_{2}He$ with a huge amount of energy.

Natural Resources :