Non-Conventional Sources of Energy

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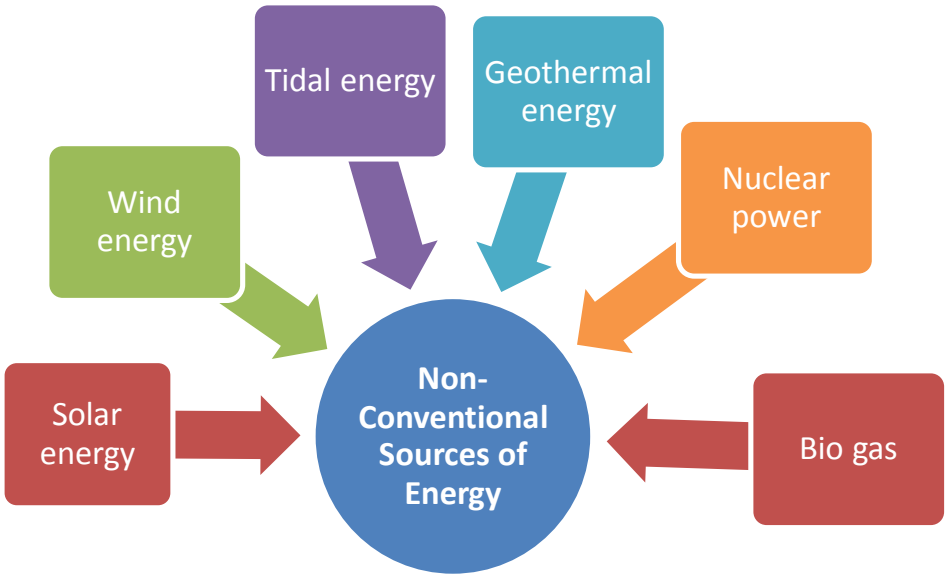
Non-conventional sources of energy are also known as renewable or alternative sources of energy. These resources have been developed in the recent past as an alternative to conventional or non-renewable sources of energy. Some examples are wind energy, solar energy, geothermal energy, tidal energy and bio gas. Non-conventional resources are known as energy resources of the future.



Solar Energy

India is a tropical country which gets adequate sunlight. Most parts of the country have 300 clear sunny days in a year.
In India, solar energy is generated in the following ways:

Solar cells

Also known as photovoltaic cells, the solar cells are made of thin wafers of semi-conductor materials from silicon and gallium. When sun's energy falls on them, electricity is generated.

- Solar cells are widely used in calculators, electronic watches, street lightening, traffic signals and water pumps.
- A group of solar cells joined together in a solar panel can give a large amount of solar energy.

Solar cells are joined together to form a solar panel for generating a large amount of solar energy.

Solar Cooker

- The solar cookers use solar heat by reflecting solar radiations with the help of a mirror on to a glass sheet which cover the black insulated box.

- The raw food is kept in the black insulated box in the solar cooker. The box is insulated from outside so that heat does not escapes.
- The heated box emits red radiation which is retained because of the opaque glass. As a result, the significant amount of the energy entering the oven is retained.
- Of late, spherical reflectors are being used instead of plane mirror because the former has more heating effect and has greater efficiency.

Solar Water Heater

- Water can be heated using solar energy. Sunlight is allowed to fall on flat plate collectors which are shallow rectangular trays filled with water.
- It consists of an insulated box painted black from inside with a glass lid to collect and store solar heat.
- In the box, there is black painted copper coil through which the cold water flows in. When the coil gets heated, the water too gets heated and flows into a storage tank.

Many housing societies have started installing solar panels on the top of their house for lightening lobbies and heating water.

Advantages of Solar Energy

- It is a cleaner and a renewable source of energy.
- It can be used for various purposes such as to produce electricity in areas which do not have an access to energy grid and to distill water in regions which have limited clean water supplies.
- Solar energy systems do not require a lot of maintenance.
- It saves fossil fuels such as coal and petroleum and also reduces energy bills.

Wind Energy

Wind is an inexpensive, reliable and a cleaner source of energy.

Generation of Wind Energy

- Windmills are used for generating electricity. The blades of the wind mill rotate due to the force of the wind. This rotational motion of the blades is used for driving a number of machines such as water pumps, flourmills and electric generators.
- Several windfarms are installed in a definite pattern in clusters called 'wind farms'. Wind farms are generally installed in coastal regions, open grasslands and hilly regions. The Indian wind programme is the fifth largest in the world.
- In India, largest wind farm cluster is located from

The largest wind farm in India is situated from Nagarcoil to Madurai in the state of Tamil Nadu

Nagarcoil to Madurai in Tamil Nadu. Important wind farms are also located in the states of Andhra Pradesh, Gujarat, Kerala, Lakshadweep and Maharashtra.

Advantages

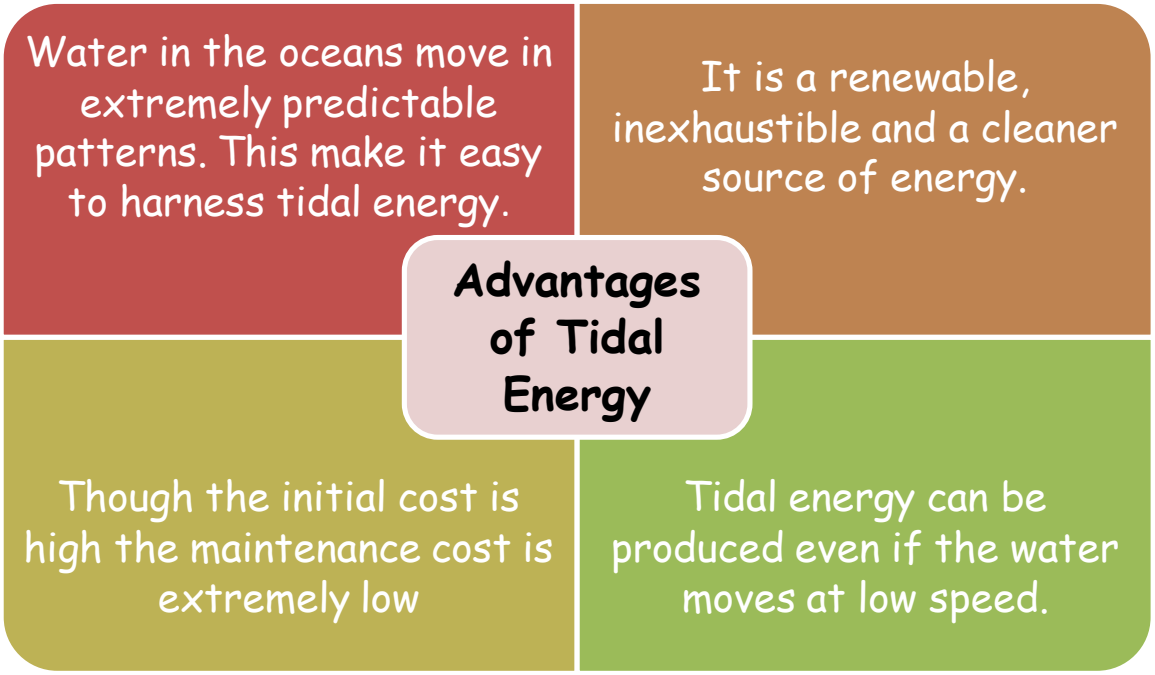
- It is a renewable source of energy.
- It does not produces pollution. Thus, it is a cleaner source of energy.
- It reduces our dependence on the fossil fuels.
- Wind turbines can be built on existing agricultural farms. This greatly benefits the economy in rural areas, where most of the best wind sites are found.
- Land owners can earn additional income by installing wind turbines on land that can be used for domestic consumption.

Tidal Energy

Tides are caused due to the periodic rise and fall of ocean waters produced by the attraction of the moon and the sun. This rise and fall of ocean waters produces a large amount of energy known as **tidal energy**.

Generation of Tidal Energy

- The tidal energy is harnessed by constructing a tidal barrage.
- During high tide, the sea water flows into the reservoir of the barrage and turns the turbine which in turn produces electricity by rotating generators.
- The reverse process takes place during the low tide. The sea water stored in a barrage reservoirs flows out into the sea. During this process, the flowing water turns the turbines.
- In India, the prospective site for exploiting tidal energy are Gulf of Kutch, Cambay and Sunderbans. Other suitable sites are located near Lakshadweep Islands and Andaman and Nicobar Islands.



Geothermal Energy

When the heat obtained from the earth is used for generating electricity, it is known as geothermal electricity. As the interiors of the Earth are hot, the heat energy may at times surface itself in the form of hot springs. This energy can be used for the generation of electricity.

Generation of Geothermal Energy

- The extremely high temperatures in the deeper geothermal reservoirs are used for the generation of electricity.
- Hot water is pumped from deep underground through a well under high pressure.
- When water reaches the surface, the pressure is dropped that causes the water to turn into steam. The steam spins the turbine which then rotates a generator and produces energy.
- The steam cools off in the cooling tower and condenses back to water. The cooled water is then pumped back again under the surface of the earth to begin the process again.

Advantages

- Because of its extensive distribution, geothermal energy is easily accessible.
- It is environment friendly because of the low sulphur emission, carbon dioxide and greenhouse gases.
- It is not influenced by weather and seasons.
- It is independent of external supply and demand effects and fluctuations of exchange rates.

Distribution

- India has a potential to produce about 12,000MW of geothermal energy.
- In India, geothermal plants are located in Manikaran in Himachal Pradesh and Puga valley in Ladakh. The hot springs have been grouped together and termed as different geothermal provinces.
- These regions are the Himalayan geothermal province, Naga-Lushai geothermal province, Andaman and Nicobar Islands geothermal province and Cambay graben, Son-Narmada-Tapti graben, West coast, Damodar Valley, Mahanadi Valley and Godavari Valley.

Nuclear Power

Nuclear power is obtained from energy stored in the nuclei of atoms of naturally occurring radioactive elements such as uranium, thorium and plutonium.

Generation of Nuclear Energy

- Nuclear fission is the process in which a large nucleus splits into two smaller nuclei with the release of energy.
- Nuclear fission produces heat which is then used for heating water and producing steam.
- The steam turns the turbine which in turn is used to run generators resulting in the production of electricity.

- Two main types of reactors used to generate electricity are the pressurised and boiling water reactors. In the former, because the water is pressurised, it does not boil.
- This heated water is circulated through tubes in generators which then turns the turbine.
- In boiling water reactor, the water is boiled due to the heat produced by nuclear reaction and turns into steam to turn the turbine.
- Water is reused in both systems.

Distribution

Nuclear power is the fourth largest source of electricity in India. India has 21 nuclear reactors. Uranium and thorium are used for generating nuclear power. The Monazite sands of Kerala are also rich in thorium.

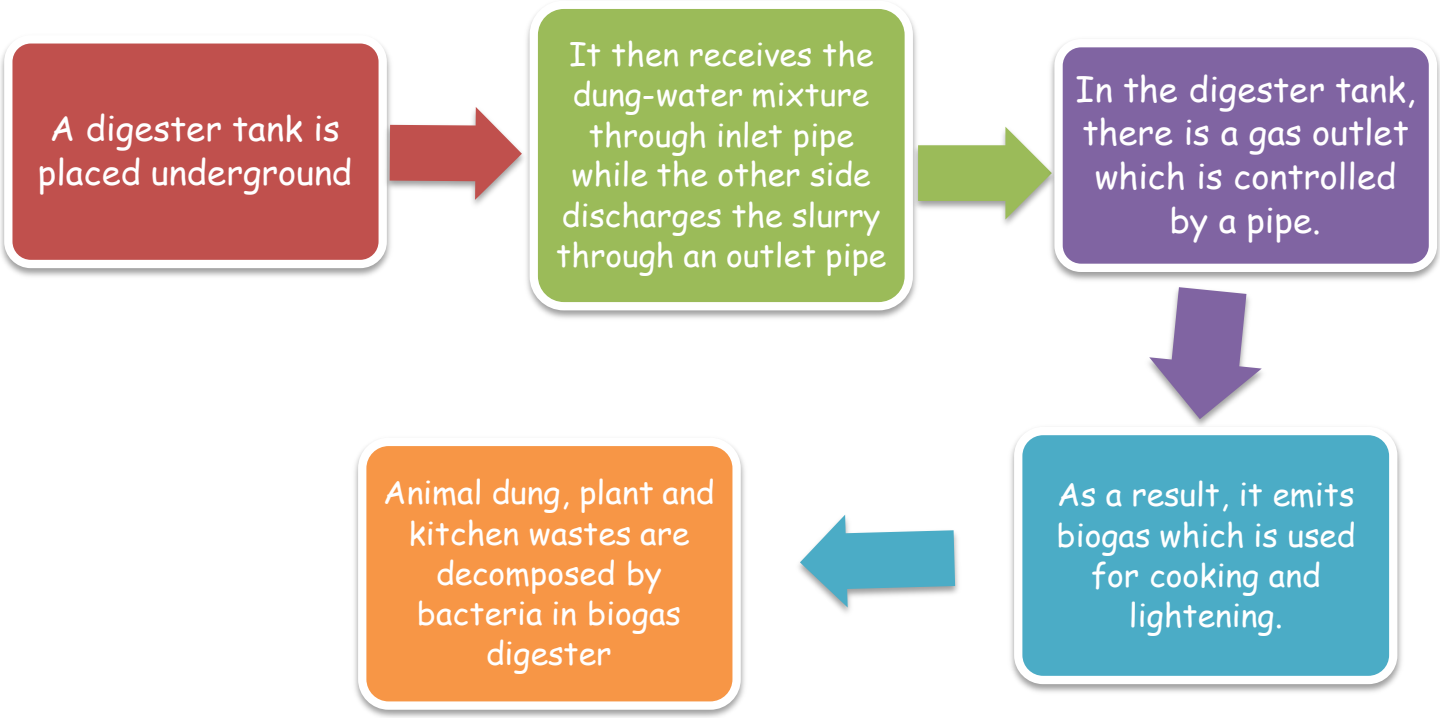
Advantages

- Nuclear energy is a renewable source of energy and it reduced the dependency on fossil fuels for the generation of energy.
- It saves on the cost of raw materials. Its transportation and handling cost is also minimal.
- It initiates a continuous process of energy production. A nuclear power plant generates electricity for almost 90% of annual time.
- It reduces price vitality of other fuels such as petrol.

Biogas

Biogas is a renewable source of energy which is generated by anaerobic degradation (breaking down of organic matter by bacteria in the absence of oxygen) of plant and animal wastes in presence of water. Biogas is composed of methane, carbon dioxide, hydrogen and hydrogen sulphide.

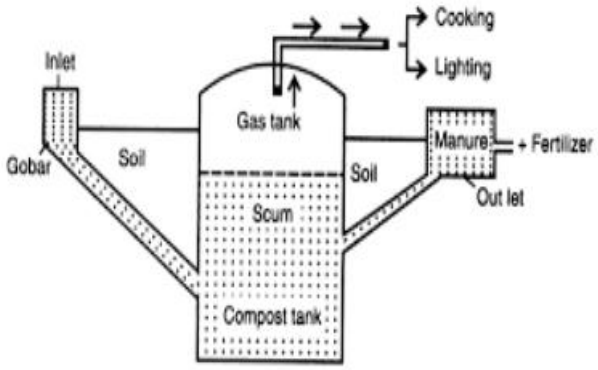
Generation of Biogas



Advantages

- Biogas is a clean, non-polluting and cheap source of energy.
- There is direct supply of gas from the plant, therefore, there is no storage problem.
- The sludge left behind is a rich fertiliser containing bacterial biomass.

The Ministry of Non-Conventional Energy Sources has been promoting the Biogas Pragramme in India. It has set up a number of bio gas plant across the country.



A diagram explaining the formation of bio gas