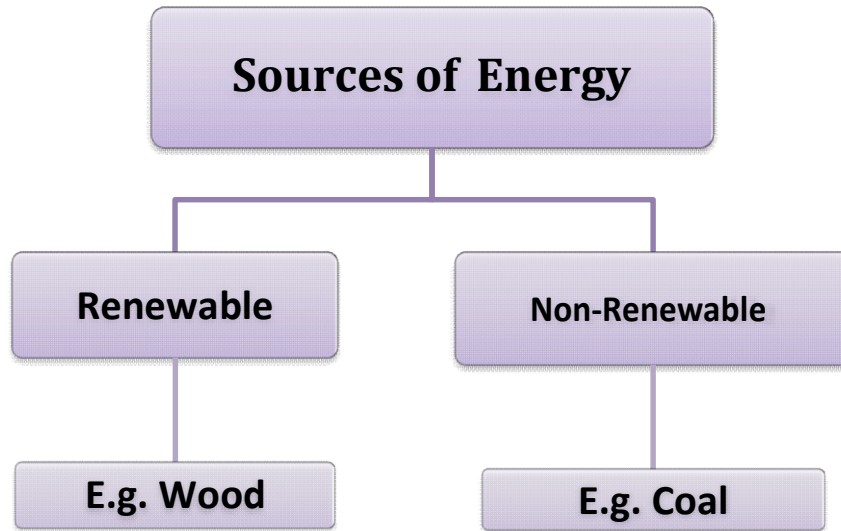


Sources of Energy

A **source of energy** provides adequate amount of energy over a long period of time.



Renewable Sources of Energy

Renewable source of energy

- They are inexhaustible.
- They are being produced continuously in nature.

Non-Renewable Source of Energy

Non-Renewable source of energy

- They are exhaustible.
- They are not produced continuously in nature.

A good source of energy would be one which would:

Do a large amount of work per unit volume or mass	
Be easy to transport from one place to another	
Be easily accessible	
Be economical	

The materials which can be burnt to produce heat energy are known as **fuels**. Wood, coal, petrol, kerosene etc. are fuels.

Sources of energy can also be categorised as conventional sources of energy and non-conventional sources of energy.

Conventional Sources of Energy

The traditional sources of energy which are familiar to most people are known as conventional sources of energy.

The types of conventional sources of energy are

Fossil Fuel

- Natural fuel formed deep under the Earth from the remains of living organisms is called **fossil fuel**.
- Coal, petroleum and natural gas are fossil fuels.

Thermal Power Plant

- A thermal power plant generates electric power from heat produced by burning fossil fuels, i.e. coal and petroleum.

Hydro Power Plants

- Hydropower plants utilise the kinetic energy of flowing water to generate electricity.

Bio-Mass

- **Biomass** is the fuel obtained from dead parts of plants and waste material of animals.
- This fuel does not produce much heat on burning and a large quantity of smoke is given out when it is

burnt.

- **Biogas** is obtained when cow dung, sewage and various plant materials (such as vegetable waste and residue of crops after harvesting) are decomposed in the absence of oxygen. It is popularly known as **gobar gas**.
- Biogas contains 75% methane and hence is an excellent fuel.

Wind Energy

- Air in motion is called **wind**.
- It possesses kinetic energy. Thus, it can be used to produce electricity.
- **Windmills** are used to generate electricity from wind energy.
- A windmill is a simple machine with a structure similar to a large fan erected at some height. The rotatory motion of the windmill is utilized to run the turbine of the electric generator, thus producing electricity.

Non-Conventional Sources of Energy

Sources of energy which are not familiar to most people are known as non-conventional sources of energy.

The types of non-conventional sources of energy are

Solar Energy

- The Sun is the most powerful source of radiation energy. It has been radiating energy for the past 5 billion years and will continue to do so for the next 5 billion years.
- India receives approximately **5000 trillion kWh** of solar energy per year.
- The **solar constant** is the solar energy reaching unit area at the outer edge of the Earth's atmosphere exposed perpendicularly to the rays of the Sun at an average distance between the Earth and the sun. Its value is approximately equal to **1.4 kJ per second per m² or 1.4 kW/m²**.
- A device which either uses solar energy directly as heat or converts it into electricity is called a **solar energy device**. For example, solar cooker, solar cell, solar water heater etc.

Energy from the Sea

Tidal Energy

- Tidal energy is the energy derived from the rising and falling tides in the ocean. It is a renewable source of energy.

Wave Energy

- Sea waves have both kinetic and potential energy as they rise and fall. The energy possessed by these waves is called **wave energy** and it is a renewable source of energy.

Ocean Thermal Energy

- The energy available due to the difference in the temperature of water at the surface of the ocean and at deeper levels is called ocean thermal energy.
- The Ocean Thermal Energy Conversion (OTEC) is the process of utilising OTE. The devices used for this purpose are called **OTEC power plants**.

Geothermal Energy

- Geothermal energy is the heat energy from hot rocks present inside the Earth.
- It is a source of energy which does not come directly or indirectly from solar energy.

Nuclear Energy

- The energy obtained from the nucleus of an atom is called nuclear energy.
- **Nuclear fission** is the phenomenon of splitting of an unstable nucleus of a heavy atom into two medium weight nuclei with the liberation of an enormous amount of energy
- A nuclear reaction in which the particle which initiates the reaction is also produced during the reaction and it carries the reaction further is called a **nuclear chain reaction**.
- An uncontrolled nuclear chain reaction is the basis of the **atom bomb** and a controlled nuclear chain reaction is the basis of a **nuclear power plant**.
- **Nuclear fusion** is the phenomenon of combining two or more lighter nuclei to form a more stable heavy nucleus with the liberation of a large amount of energy.
- Uncontrolled nuclear fusion is the basis of the **hydrogen bomb**.
- The sum of the masses of products of a nuclear reaction is somewhat less than the sum of the masses of the reactants. The difference in mass appears as **mass defect (Δm)**. It is this mass defect which appears in the form of energy according to **Einstein's mass-energy relation, $E = (\Delta m)c^2$** .

Environmental Consequences

Factors to be kept in mind while choosing a source of energy are:

- The economics of extracting energy from the source
- The efficiency of the technology available
- The damage to environment which will be caused by using that source

Some environmental consequences of the increasing energy demands are:

- Burning fossils causes air pollution
- Assembly of solar cell causes some environmental damage
- The cutting down of trees from the forests causing soil erosion and destroys wild life