# SOURCES OF ENERGY

**What is Energy?**

- Energy is the ability to do work.
- Energy can neither be created nor be destroyed but it can be converted into one form of energy into another.
- For example, we can derive energy from the natural sources such as sun, ocean, winds etc and then it can be converted into another form that we consume in our daily life like cooking, electricity etc.

**Classification of sources of energy:**

Sources of energy can be classified into two groups. These are as follows:

| Sr. No. | Sources of energy | Explanation | Types |
|---|---|---|---|
| 1 | Renewable source of energy | The energy which is sustainable or can not be finished. It can not be run out. It also termed as Non Conventional source of energy For example : Sun | 1. Solar energy<br>2. Wind energy<br>3. Hydro energy<br>4. Tidal energy<br>5. Geothermal energy<br>6. Biomass energy |
| 2 | Non-Renewable source of energy | The energy which is not sustainable or can be finished after use. It also termed as a Conventional source of energy For example: Coal | 1. Fossil fuels<br>2. Coal<br>3. Petroleum<br>4. Natural Gas<br>5. Nuclear Energy |

**What is a good source of energy?**

A good source of energy is the one who satisfied the following characteristics:

- Gives maximum output.
- Economical
- Accessible
- Easy to store.
- Easy to transport
- Pollution-free

**A. Conventional source of energy**

Conventional source of energy is that source which is not sustainable. It is also called Non Renewable source of energy. It can be run out if used consistently. For example Fossil Fuels, Thermal power plants, Hydro power plants etc.

**1. Fossil Fuel:**

- Fossil fuels are formed from the remains of dead plants and animals that lived millions of years ago.
- Fossil fuels have high carbon content.
- If consumed continuously, we would get out of energy soon.
- Alternate source of energy should be explored.
- Some examples of fossil fuels are oil, coal, petroleum, natural gas etc

**Disadvantages of burning fossil fuel**

- The byproduct of burned fossil fuels can cause air pollution
- Harmful oxides of carbon, sulphur, nitrogen emerged out from burning fossil fuels which lead to Acid rain.
- Cause Greenhouse effect.
- Cause Global warming.

**2. Thermal Power Plant:**

- In the thermal power plant, fuel is burnt to produce heat energy which is converted into electrical energy.
- It heat up water to produce steam which further runs the turbine to generate electricity.
- Usually, thermal power plants are set up near coal or oil fields.

**Characteristics of Thermal Power Plant**

- Use coal, petroleum to generate electricity.
- Steam produced in the process used to run turbines.

**3. Hydro Power Plant:**

- A traditional source of energy was to obtain the kinetic energy of flowing water or the potential energy of water at a height.
- Hydropower plants convert the potential energy of falling water into electricity.
- Hydropower plants are mainly associated with dams or waterfalls.
- The falling or flowing water moves the turbine, which converts mechanical energy into electrical energy.

**Disadvantages of Hydro Power plant**

- Expensive
- Environmental problems
- A threat to human habitation

**B. Non-Conventional Sources of energy**

Non Conventional source of energy is that source which is sustainable. It is also called Renewable source of energy. It can not be run out if used consistently. For example solar energy, wind energy, hydro energy, biomass energy, tidal energy etc.

**1. Biomass:**

- Fuels which are plant and animal products, the source of these fuels are said to be bio-mass.
- Biomass is the source of energy derived from living things (organic matter). For a long time, we relied on wood for the source of heat energy.
- In India, we make fuel out of bio-waste such as cow dung due to the availability of a thriving population of livestock.
- Volatile materials present in it get removed and charcoal is left behind as the residue when the wood is burnt in a limited supply of water and oxygen. Charcoal burns without flames and is smokeless.
- Biogas: It is the mixture of gases produced during the decomposition of biomass in the absence of oxygen.

**Mechanism of Biogas Plant**

- In India cow dung, sewage waste, plant matters are decomposed in the absence of oxygen to produce biogas.
- A biogas plant is a dome-like structure built with bricks where cow dung and other bio waste are mixed with water to form a slurry and put into a digester.
- The digester is a sealed chamber with anaerobic bacteria which breaks down the slurry.
- This decomposition process releases gases like methane, $CO_2$, hydrogen sulfide and hydrogen.
- These gases are drawn via pipes which are transmitted to a turbine for the production of electricity.
- The produced gas is also termed as gobar gas.

**2. Wind Energy:**

- The wind is the natural phenomenon caused by pressure difference due to unequal heating of land and water masses on the surface of the earth.
- Wind Energy is the environment-friendly source of energy.
- It is a very efficient source.
- Here, mechanical energy is converted into electrical energy.
- The harnessed kinetic energy is used in various purposes like to lift water, working of windmills etc.

**Mechanism of windmills**

- The wind energy is harnessed by windmills which are rotatory in structures.
- Windmills have huge blades or fans attached very high on a rigid support that is attached to turbines that rotate due to high speeds of wind and generate electricity.
- A single windmill has a low output and therefore, several windmills are comprised together in the wind farms to get high output.

**Advantages**: Renewable, Eco friendly

**Disadvantages**: Needs a large area, Wind speed might not uniform, expensive.

**3. Solar Energy:**

- Energy taken from the sun is called solar energy.
- The Sun has been radiating an enormous amount of energy.
- Only a small part of solar energy is able to reach the outer layer of the earth's atmosphere.
- Nearly half of it is absorbed while passing through the atmosphere and the rest reaches the earth's surface.

**Mechanism of Solar cooker:**

- Solar cookers use solar energy to do work.
- Solar cookers have a black coating inside it because black surfaces absorb more energy than other surfaces.
- They use reflecting surfaces like mirrors to focus the sun's rays.
- It is covered with a glass plate thereby establishing the greenhouse effect by trapping heat inside the cooker.

**Advantages:**

- Renewable
- Economic
- Nutritional food is prepared.

**Disadvantages**

- Silicon cells are expensive
- Cooking takes a lot of time.
- Can not be used at night or cloudy days.

**4. Energy from sea:**

The seas and oceans and other water bodies are a source of kinetic and potential energy. Due to the immense volume of water and the motion of waves we can get energy from these water bodies.

**(A) Tidal Energy:**

- Due to the gravitational pull of the moon, the level of water in the water bodies gets lowered or gets high.
- The phenomenon of rise and fall of water level gives tidal energy.
- Tidal energy is harnessed by constructing dams near the narrow openings of the sea. When the tide sets in, it moves the turbine which directly produces electricity.

**(B) Wave Energy:**

- Waves possess a lot of kinetic energy which helps to produce electricity.
- Waves are produced by strong winds blowing over the sea.
- Its disadvantage is that it is limited to places with strong winds.
- Various devices have been designed to capture this energy.

**(C) Ocean Thermal Energy:**

- The difference in surface temperatures of water and water at a certain depth in oceans is exploited to obtain ocean thermal energy.
- Temperature difference must be 20∘ between the surface and water up to depths of 2 km to operate the plants.
- Warm water from the surface is used to boil volatile ammonia to form vapors that move the turbine.
- Cold water at the depth is used to condense the vapor back to liquid.

**5. Geothermal energy:**

- Molten rocks from Earth's core sometimes come up and get trapped in hotspots.
- Energy harness from this source is called geothermal energy.
- Underground water gets heated due to the hotspots and gets converted to steam which escapes from the surface of the earth in the form of hot springs.
- This steam is used to rotate turbines and generate electricity.

**6. Nuclear energy:**

- The Energy released when some changes take place in the nucleus of an atom is called nuclear energy.
- Electricity can be generated through nuclear energy by means of nuclear fission.

**Nuclear fission:**

The process where a heavy atom is bombarded with neutrons that split the atom to give lighter nuclei is called **nuclear fission**. Heavy atoms may be uranium or Plutonium. This process releases tremendous amounts of energy.

**Nuclear fusion:**

The process of combining lighter nuclei to produce a heavier nucleus is called **nuclear fusion**. For example, hydrogen or hydrogen isotopes fuse to create helium.

**Advantages:**

- Give large outputs
- Energetic process

**Disadvantages:**

- Leads to pollution.
- Health risk due to nuclear waste leakage
- Expensive