Sources of Energy

- Since electrical energy is produced from energy available in various forms in nature. These sources of energy are :

(i) The Sun

(*ii*) The Wind

(*iii*) Water

(*iv*) Fuels

(*v*) Nuclear energy.

- ✓ Out of these sources, the energy due to Sun and wind has not been utilised on large scale due to a number of limitations.
- ✓ At present, the other three sources *viz.*, water, fuels and nuclear energy are primarily used for the generation of electrical energy.

(i) The Sun.

- The Sun is the primary source of energy. The heat energy radiated by the Sun can be focussed over a small area by means of reflectors.
- This heat can be used to raise steam and electrical energy can be produced with the help of turbine-alternator combination. However, this method has limited application because :

(*a*) it requires a large area for the generation of even a small amount of electric power

(*b*) it cannot be used in cloudy days or at night

(*c*) it is an uneconomical method.

- Nevertheless, there are some locations in the world where strong solar radiation is received very regularly and the sources of mineral fuel are scanty or lacking.
- Such locations offer more interest to the solar plant builders.

(*ii*) The Wind.

- This method can be used where wind flows for a considerable length of time.
- The wind energy is used to run the wind mill which drives a small generator. In order to obtain the electrical energy from a wind mill continuously, the generator is arranged to charge the batteries.
- These batteries supply the energy when the wind stops. This method has the advantages that maintenance and generation costs are negligible. However, the drawbacks of this method are

(a) variable output,

(*b*) unreliable because of uncertainty about wind pressure and

(*c*) power generated is quite small.

(*iii*) Water.

- When water is stored at a suitable place, it possesses potential energy because of the head created. This water energy can be converted into mechanical energy with the help of water turbines.
- The water turbine drives the alternator which converts mechanical energy into electrical energy.
- This method of generation of electrical energy has become very popular because it has low production and maintenance costs.

(*iv*) Fuels.

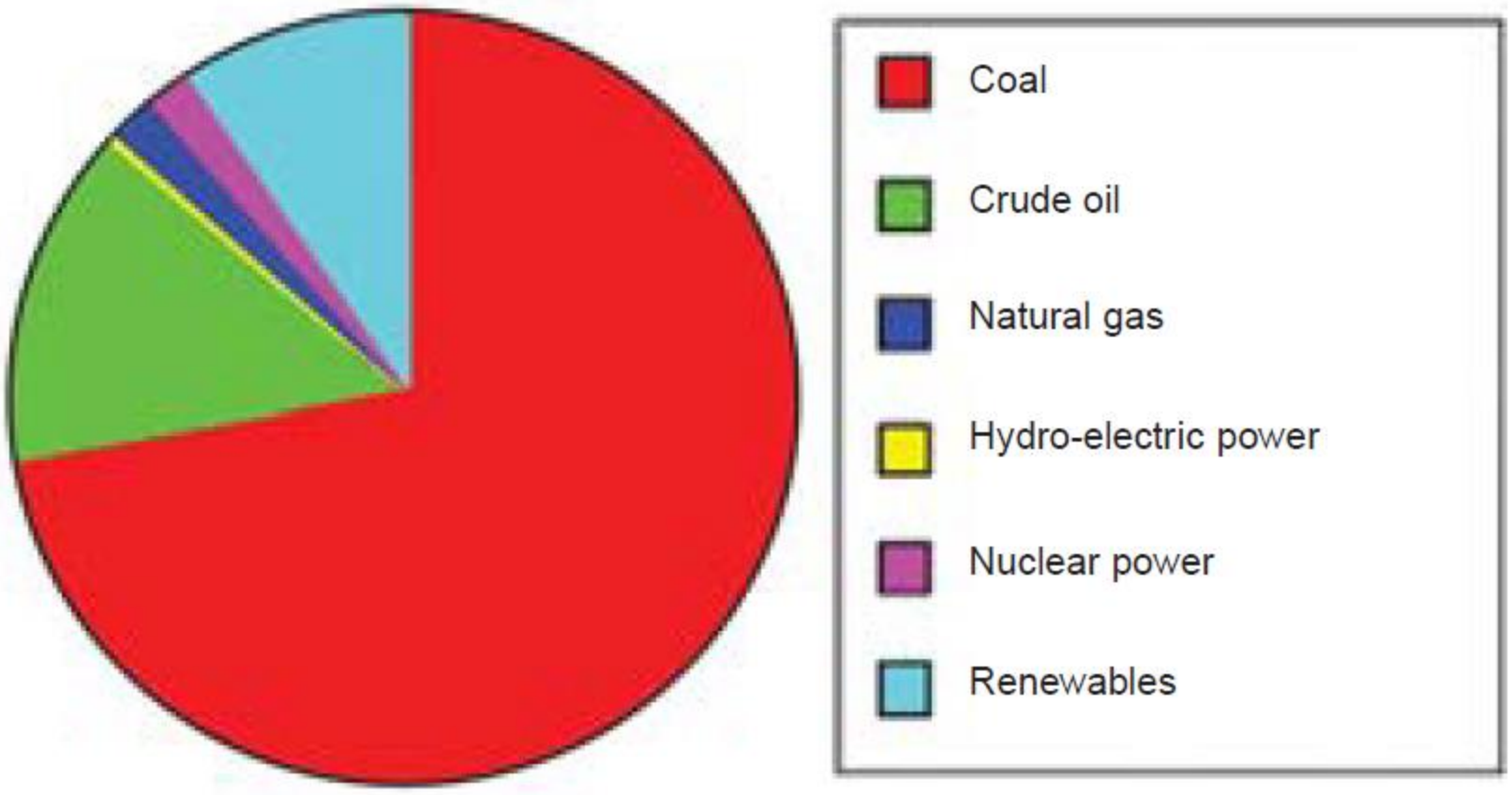
- ✓ The main sources of energy are fuels *viz*., solid fuel as coal, liquid fuel as oil and gas fuel as natural gas.
- ✓ The heat energy of these fuels is converted into mechanical energy by suitable prime movers such as steam engines, steam turbines, internal combustion engines etc.
- ✓ The prime mover drives the alternator which converts mechanical energy into electrical energy.
- ✓ Although fuels continue to enjoy the place of chief source for the generation of electrical energy, yet their reserves are diminishing day by day.
- ✓ Therefore, the present trend is to harness water power which is more or less a permanent source of power.

(*v*) Nuclear energy.

- ✓ Towards the end of Second World War, it was discovered that large amount of heat energy is liberated by the *fission* of uranium and other fissionable materials.
- ✓ It is estimated that heat produced by 1 kg of nuclear fuel is equal to that produced by 4500 tonnes of coal.
- ✓ The heat produced due to nuclear fission can be utilised to raise steam with suitable arrangements.
- ✓ The steam can run the steam turbine which in turn can drive the alternator to produce electrical energy. However, there are some difficulties in the use of nuclear energy.
- ✓ The principal ones are

(a) high cost of nuclear plant

(*b*) problem of disposal of radioactive waste and dearth of trained personnel to handle the plant.



Energy Utilisation

Comparison of Energy Sources

- The chief sources of energy used for the generation of electrical energy are water, fuels and nuclear energy.
- Below is given their comparison in a tabular form :

S.No.	Particular	Water-power	Fuels	Nuclear energy
1.	*Initial cost*	High	Low	Highest
2.	*Running cost*	Less	High	Least
3.	*Reserves*	Permanent	Exhaustable	Inexhaustible
4.	*Cleanliness*	Cleanest	Dirtiest	Clean
5.	*Simplicity*	Simplest	Complex	Most complex
6.	*Reliability*	Most reliable	Less reliable	More reliable