

Commercial Sources of Energy

1. Fuels. Fuel minerals include mainly the non-renewable fossil energy resources such as coal, petroleum (oil) and natural gas, all of which exist in large quantities and lie buried under the ground. Due to their great importance in the generation of energy, these natural resources are receiving utmost attention. It is estimated that with the ever-increasing use of energy in present industrial—urban complexes, up to the year 2000, global energy requirement would rise by 58 per cent. If energy production fails to keep pace with the growth rate of our consumption, a catastrophic situation may arise. Fast depletion chances of these fuels and the impacts of their extraction and utilization on the environment are certain other serious problems.

2. Coal.

- Generally, coal is regarded as the most plentiful and useful fossil fuel. This is largely carbon, mixed with the incombustible mineral matter of the earth's crust.
- Coal is formed by the transformation of layers and layers of decomposed vegetable and animal matter under the combined effect of heat and pressure of the earth.
- Coal deposits are probably being formed even today as in the Ganga river delta of our country. Coal deposits occur in abundance and are fairly evenly distributed over the various continents of the world.
- Soviet Union, China and the United States contain about 80 per cent of the world's total reserves. The rate of coal consumption in the world as calculated in 1976, was 3.7 billion short tons per year.
- On this basis, our total reserves would last for 212 years and recoverable resources for approximately 1700 years. Coal is the only long-run fossil fuel which is the long-run source of gas and many coal-tars and petroleum products that can be derived from it.

3. Petroleum, oil and natural gas.

- The organic deposits of these fossil fuels were probably formed from tiny microorganisms rather than from the debris of large plants as was the case with coal. When these microscopic creatures settled on the ocean floor and were later covered with mineral sediments, tiny droplets of body oil were squeezed out of them.
- This oil was trapped into large deposits during formation and was altered chemically by heat and pressure. According to an estimate, the recoverable amount of petroleum of the world is approximately 2000 billion barrels.

- Of these, 339 billion barrels have already been produced, 646 billion barrels are reserves, and slightly over 1000 billion barrels are to be discovered as yet. About 60 per cent of the total world's reserves are concentrated in the Persian Gulf and South-West Asian countries.
- The industrialized nations, excluding the USSR, with the highest rate of petroleum consumption have the smallest reserves and resources. In comparison to other countries of the world, India's reserves of oil and production of crude petroleum are quite meagre.
- India produced only 21.7 billion barrels of oil in 1976. It is estimated that if the present oil production rate remained constant, global supply would last about 30 years and the entire resources no longer than 77 years.
- However, before we reach that stage, we will undoubtedly have ravaged the great oil-laden shale deposits. A wide variety of laminated solidified mixtures of inorganic sediments and organic matter, called **oil-shales**, have the property of yielding oil on destructive distillation.
- Certain countries such as Brazil, China, USSR, Zaire and Scotland exploit this resource to get oil. It is speculated that 15,200 billion barrels of high-grade oil (25 to 100 gallons per ton shale) and 3,18,000 billion barrels of low-grade oil (10 to 25 gallons per ton material) constitute the total resources.
- Likewise, **tar sands** (also known as oil sands, bituminous sand and bituminous rocks) contain a heavy asphaltic, viscous substance called **bitumen** (petroleum). These occur in Canada and have 731 billion barrels of in-place oil. Natural gas is another energy resource. USA is its largest producer as well as the consumer. About 50 trillion cubic feet natural gas was obtained in 1976 and if this pace continues constantly in future, the world's reserve of natural gas would last about 45 years.



An Atomic power Reactor

4. Nuclear fuels.

- The nuclear energy of the atoms has been harnessed by three types of reactors: fission reactor, fast breeder reactor and nuclear fusion reactor. While fission and fast breeder reactors are based on the splitting of uranium and plutonium, the nuclear fusion reactor is the latest and most powerful and involves the fusion of hydrogen nuclei.
- Nuclear reactors produce enormous energy for driving ships and generating electric power. Our planet is estimated to have 4900 thousand short tons of uranium, out of which 3510 are known from the USA. These can fuel 800 gigawatts (800 billion watts) of light water reactor plants.
- In comparison to oil and gas, uranium represents a resource of limited potential under the present state of technologies. However, new enrichment technologies may prolong these supplies.
- In fact, utmost care needs to be exercised to produce energy from nuclear fuel, radioactive contamination is a significant biological hazard. Any accidental fall-out or escape from nuclear wastes can produce long-lasting disasters often lethal effects on man and other biotic components of the biosphere.

5. Electric energy production. The various sources of electric energy are (i) atomic (nuclear) power reactors; (ii) lignite; (iii) lean gas; (iv) hydropower plants ; (v) coal plants, and (vi) small (microhydel plants).

6. Atomic power reactors. Atomic power has become a principal source of energy in recent years, since the fossil fuel reserves are depleting very fast. A small quantity of radioactive material can produce an enormous amount of energy. For example, one tonne of uranium ⁻²³⁵ (U²³⁵) would provide as much energy as by three million tonnes of coal or 12 million barrels of oil. Besides getting the electricity, atomic power is also used as fuel for marine vessels, heat generation for chemical and food processing plants and for spacecraft. For the generation of atomic energy, one requires a **nuclear reactor**. The decay of fissionable matter produces a great amount of heat. This heat is used to make steam which is channelled through a turbine connected to **electric generator**.

- **Hydroelectric energy.** Moving water has been harnessed as a source of energy for many years. Waterfalls turned paddle wheels to grind corn or wheat in early Europe, America and India. Later, moving water was backed up behind great dams and then released to turn turbines of huge generators for **hydroelectric energy**. Hydroelectric power is the most important renewable energy source. It is the cheapest source of power generation since land is free and

environmental costs are seldom calculated. It is regenerative, thus, helps in the conservation of fossil fuels. Potential of such hydroelectric energy is being developed in India through large-scale projects in the Himalayan region in North and North-East regions. Recently, however, these megaprojects have been criticized and vehemently opposed by the environmentalists such as **Sunder Lal Bahuguna** and **Medha Patekar**, for these have resulted (during development of their infrastructure) into deforestation, wildlife destruction, increased soil erosion and other socio-political and economic problems.

- **Micro-hydels.** In India, there is great scope for the development of micro-and mini hydel power schemes. Micro-hydels are proper means of generating electricity in remote areas. Such installations are usually developed on the run-off-the river schemes and do not require much infrastructure. They are safer environmentally and are very useful for local people. In fact, they do not involve approach roads, no bondage, no loss of vegetative cover, and are free from pollution hazards.