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Chapter 1

Sources of Electrical Energy

Per capita energy consumption is considered as an index for the standard of living of the people of a country. The demand of electrical energy is doubling every ten years.

Energy consumption of a nation is mainly in the following sectors:

- Domestic sector
- Transportation sector
- Agricultural sector
- Industrial sector

1.1 Classification of Electrical Energy Sources

Electrical Energy resources can be classified in various ways.

1.1.1 Based on Traditional Use

Conventional Energy Sources

Conventional Energy Sources are those which are being traditionally used for many decades. For example:

1. Fossil fuels: Coal, petroleum products, natural gas.
2. Nuclear resources: Uranium
3. Hydro resources

Advantages

1. They are still cheaper than Non-conventional energy sources.
2. Storage of sources is easy and convenient. Thus energy availability is ensured for certain period of time.
3. Harnessing energy from the sources is convenient as technologies are available for decades.

Disadvantages

1. Availability of fossil fuels is limited.
2. Fossil fuel causes air pollution.
3. Fossil fuels are also used in petrochemical industries for different products. It is desirable to conserve them for future needs.
4. Availability of nuclear fuels is limited.
5. Sophisticated technology is required to harness nuclear power.
6. Waste of nuclear plants may be hazardous to mankind.
7. There is possibility of accidental leakages in such plants.
8. Large hydro power plants require large land area which leads to
   (a) deforestation which affects wild life.
   (b) dislocation of a large population and their rehabilitation.
   (c) ecological disturbances such as earthquakes.

Non-conventional Energy Sources

Non-conventional energy sources are those which are not considered for large scale use before the oil crisis of 1973. As the storage of fossil fuels and nuclear sources is diminishing day by day, presently great emphasize is given to non-conventional energy sources. Non-conventional energy sources is the only solution for the future energy requirements.

For example:

1. Solar energy
   (a) Solar thermal technology
   (b) Photopholtaic technology
2. Wind energy
3. Tidal energy
   (a) Single basin system
   (b) Double basin system
4. Geothermal energy
5. Magnetohydrodynamic generation
6. Biomass energy
7. Ocean energy
   (a) Tidal energy
   (b) Wave energy
   (c) Thermal energy conversion
      i. Open cycle system
      ii. Closed cycle system

Advantages

1. They are available in nature free of cost.
2. They causes no (or very little) pollution.
3. They are inexhaustible.
4. They have low gestation period.

Disadvantages

1. They are available in dilute form.
2. Cost of harnessing energy from the sources is high.
3. Availability is uncertain.
4. Difficulty in transporting such form of energy.

1.1.2 Based on Long term Availability

Renewable Energy

Renewable Energy resources are those which are renewed by nature again and again and will never get depleted in near future. For example: solar, wind, hydro, geothermal etc.

Non-renewable Energy resources

Non-renewable Energy resources are those which are finite and will get depleted in near future. For example: fossil fuels, uranium etc.

1.2 Advantages of Electrical Energy

Advantages of Electrical Energy are as follows:

- It is called **Clean and Green energy**. **Clean** because it doesn't produce any byproducts and **green** because it doesn't cause any kind of pollution.
- Electrical Energy can be easily converted to other form of energy.
- It is much cheaper than other forms of energy.
- It can be easily transmitted to various location very conveniently and efficiently.
- This form of energy can be controlled and monitored easily.

1.3 Uses of Electrical Energy

Uses of electrical energy is interwoven with human civilization in such a way that we hardly notice them. Some of the most notable uses of electricity on daily basis are listed below:

Uses of Electricity in Entertainment All the modern sources of entertainment for example mobile phones, MP3 players, Television, movies theaters runs on electricity.

Uses of Electricity in Healthcare For proper lighting of operation theatres and other modern surgical activities require electricity.

Uses of Electricity in Engineering Constructions of houses, installing gates and windows, welding of materials require electricity to operate the machines.

Uses of Electricity in Agriculture For irrigation, cultivating the land and processing the agricultural produces electricity is required.

Uses of Electricity in Transport and Communication Reaching places by car, train or aeroplane within a short period of time from a different corner of the world is only possible due to electricity.

Uses of Electricity outdoors The street lights on the road, swimming pools to heat the water in colder regions, lawn mowers, water sprinklers for the grass on the lawn use electricity.

Uses of Electricity in Household In households, we use several electrical gadgets to make our life simple and easy. For example: toaster,refrigerator, microwave, washing machine, dishwasher, electrical chimney etc.

Uses of Electricity in commercial places For the production of various materials, the factories use different heavy machinery to produce their products which always run on electricity. The electro-magnets are used for lifting heavy metals.

Uses of Electricity in Office In offices, the lights, lifts, AC, coffee machine, Id card reader, biometric scanners and everything run on electricity.

Uses of Electricity as fuel: Electric cars and bikes runs on electricity.

Uses of Electricity in Space: The satellites which are sent for space expeditions run on electricity.