

ENERGY RESOURCES

ENERGY DISTRIBUTION IN THE WORLD

- Developed countries like USA and Canada constitute only 5% of the world's population but consume 25% of the world's available energy.
- Energy consumed by a person in a developed country for a single day is equal to energy consumed by a single person in a poor country for one year.
- Developed country GNP increases and energy consumption increases. In the poor country GNP and energy consumption are less.

TYPES OF ENERGY RESOURCES:

1. Renewable energy resource (or) Non-conventional energy resources
2. Non-renewable energy resources (or) Conventional energy resources

RENEWABLE ENERGY SOURCES: Energy which can be regenerated.

Merits of renewable energy resources

1. Unlimited supply
2. Provides energy security.
3. Fits into sustainable development concept.
4. Reliable and the devices are modular in size.
5. Decentralized energy production.

Types of renewable energy resources

1. Solar energy: Nuclear fusion reaction of sun produces enormous amount of energy. Several techniques are available for collecting, storing and using solar energy.

a. Solar cell (or) Photovoltaic cell (or) PV cell:

- Solar cell consists of p- type semiconductor (Si doped with B) and n-type semiconductor (Si doped with P). P-type forms top layer and n-type forms bottom layer.
- Solar rays fall on the top layer, the electrons from valence band promoted to the conduction band which crosses the p-n junction into n-type semi Environmental Science 29 AITT & H&S conductor. Potential difference between the two layers is created which causes flow of electrons.

Uses: It is used in calculators, electronic watches, street light, water pumps etc

b. Solar battery: Large number of solar cells connected in series is called solar battery. It is used in remote areas where continuous power supply is a problem.

c. Solar water heater: It consists of insulated box painted with black paint with glass lid. Inside the box black painted copper coil is present. Cold water is allowed to flow, it is heated up and flows out into a storage tank from which water is supplied through pipes.

2. Wind energy: Moving air is called wind. The energy recovered from the force of the wind is called wind energy. Its speed is high.

a. Wind mills: When a blowing wind strikes the blade of the wind mill, it rotates continuously. And rotational motion of the blade drives number of machines like water pump, flour mills and electric generators.

b. Wind farms: When a large number of mills are installed and joined together in a definite pattern – it forms wind farm. It produces large amount of electricity.

Condition: Minimum speed for wind generator is 15 Km/hr

Advantages:

1. It does not cause air pollution
2. Very cheap
3. Ocean energy:

Tidal energy (or) Tidal power: Ocean tides are due to gravitational force of sun and moon which produce enormous amount of energy. High tides – rise of water in the ocean. Low tides – fall of water in the ocean. Tidal energy can be used by constructing a tidal barrage. During high tides sea water enters into the reservoirs and rotates the turbine, produce electricity. During low tides water from reservoir enters into the sea rotate the turbine produce electricity.

Ocean thermal energy: Temperature difference between surface water and deeper level water in ocean generates electricity. The energy available due to the difference in temperature of water is called ocean thermal energy.

Condition: Temperature difference should be 200C.

Process: Ammonia is converted into vapours on the surface of warm water, it increases the vapour pressure which rotate the turbine and generates electricity. Deeper level cold water is pumped to cool and condense the vapour in to liquid.

3. Geo thermal energy: Temperature of the earth increases at a of 20 –750C per/km when we move down the earth. The energy utilised from the high temperature present inside the earth is called geothermal energy.

Natural geysers: Hot water or steam comes out of the ground through cracks naturally is called natural geysers.

Artificial geysers: Artificially a drill hole up to the hot region and by sending a pipe into it. The hot water or steam is used to rotate the turbine and generate electricity.

4. Bio mass energy:

Bio mass: Organic matter produced by plants or animals used as source of energy

Bio gas: Mixture of methane, carbondioxide and hydrogen sulphide. Methane is the major constituent. It is obtained by anerobic fermentation of animal dung (or) plant wastes in the presence of water.

Bio fuels: Fuels obtained by the fermentation of biomass.

Ex: Ethanol, methanol

Ethanol: Produced from sugar cane. Calorific value is less.

Methanol: Obtained from ethanol Calorific value too less.

Gasohol: Mixture of ethanol and gasoline India trial is going on to use gasohol in cars and buses. Hydrogen fuel: Hydrogen produced by pyrolysis, photolysis and electrolysis of water. It has high calorific value. Non-polluting one because the combustion product is water.

Disadvantages:

1. Hydrogen is highly inflammable and explosive.
2. Safe handling is required.
3. Difficult to store and transport.

NON RENEWABLE ENERGY SOURCES:

Energy which cannot be regenerated is called as non-renewable.

1. Coal: It is a solid fossil fuel.

Disadvantages:

1. When coal is burnt large amount of CO₂ is released which causes global warming.
2. S, N produces toxic gases during burning.

2. Petroleum: Crude oil is a liquid consists of more than hundreds of hydrocarbons and small amount of impurities. The petroleum can be refined by fractional distillation. In the world level 25% of oil reserves are in Saudi Arabia. At present rate of usage, the world crude oil reserves are expected to get exhausted in just 40 years.

3. Liquefied petroleum gas (LPG): Petroleum gases obtained during FD and cracking can be easily converted into liquid under high pressure as LPG. It is colorless and odorless gas, but during cylindering mercaptans are added to detect leakage.

4. Natural gas: These are found above oil in oil wells. It is a mixture of methane and other hydrocarbons. Calorific value is high. There are two types. Dry gas and wet gas.

5. Nuclear energy: Dr.H.Bhabha is a father of nuclear power development in India. 10 nuclear reactors are present in India. It produces 2% of India's electricity. Nuclear energy can be produced by two types of reactions. Nuclear fission and nuclear fusion.

Nuclear fission; It is a nuclear change in which heavier nucleus split into lighter nuclei on bombardment of fast moving neutrons. Large amount of energy is released through chain reaction.

Ex: Uranium with fast moving neutron gives barium and krypton in addition to three neutrons; in the second stage it gives nine neutrons and so on. This process of propagation of the reaction by multiplication is called chain reaction.

Nuclear fusion: It is a nuclear change in which lighter nucleus is combined together at extremely high temperature (1 billion °C) to form heavier nucleus and a large amount of energy is released.

Ex: Isotopes of hydrogen combine to form helium molecule.

CASE STUDY

Wind energy in India: India generating 1200 MW electricity using the wind energy. Largest wind farm situated near Kanyakumari in Tamilnadu. It produces 380 MW electricity.

Hydrogen fuel car: General motor company of china discovered a experimental car (fuel H₂) can produce no emission only water droplets and vapors come out of the exhaust pipe. This car will be commercially available by 2010.