

UNIT – III ENERGY RESOURCES AND MAINTENANCE:

1. Renewable and Non-Renewable Energy Resources:

- **Renewable Energy Resources:** These are sources of energy that are naturally replenished on a human timescale, such as solar, wind, hydro, geothermal, and biomass energy.
- **Non-Renewable Energy Resources:** These are finite resources that are not naturally replenished, including fossil fuels like coal, petroleum, and natural gas.

2. Growing Energy Need:

- The increasing global demand for energy due to population growth, urbanization, and industrialization.
- The environmental and economic challenges associated with meeting this growing demand.

3. Solar Radiation and Its Spectral Characteristics:

- Solar radiation refers to energy emitted by the Sun in the form of electromagnetic waves.
- Spectral characteristics describe the distribution of solar radiation across different wavelengths, including visible light and ultraviolet radiation.

4. Fossil Fuels Classification:

- Fossil fuels are hydrocarbon-based energy sources formed from the remains of ancient plants and animals.
- Common fossil fuels include coal (solid), petroleum (liquid), and natural gas (gaseous).

5. Composition of Fossil Fuels:

- **Coal:** Primarily composed of carbon, along with varying amounts of hydrogen, sulfur, oxygen, and nitrogen.
- **Petroleum:** A mixture of hydrocarbons (compounds of hydrogen and carbon), with different compositions leading to various types of crude oil.
- **Natural Gas:** Mostly composed of methane (CH_4) with smaller amounts of ethane, propane, and butane.

6. Physicochemical Characteristics and Energy Content:

- Characteristics such as calorific value, density, and combustion properties.
- Energy content per unit volume or mass for each fossil fuel type.

7. Principle of Generation and Conservation of Energy:

- The law of conservation of energy states that energy cannot be created or destroyed, only transformed from one form to another.
- Efficient energy use and minimizing energy waste are key principles in energy conservation.

8. Conventional and Non-Conventional Energy:

- Conventional energy sources include fossil fuels and nuclear power.
- Non-conventional sources encompass renewable energy sources like solar, wind, and hydroelectric power, as well as unconventional fossil fuel extraction methods (e.g., fracking).

9. Energy from Biomass and Biogas:

- Biomass energy involves using organic materials like wood, crop residues, and waste to produce heat, electricity, or biofuels.
- Biogas is generated through the anaerobic digestion of organic matter, often from agricultural waste or sewage.

10. Energy Use Patterns and Future Projections:

- Examining the distribution of energy consumption across residential, commercial, industrial, and transportation sectors.
- Projections for future energy needs based on population growth and technological advancements.

11. Energy Conservation Policies:

- Government policies and regulations aimed at promoting energy efficiency, reducing greenhouse gas emissions, and transitioning to cleaner energy sources.

Understanding these topics is crucial for addressing global energy challenges, including climate change mitigation, sustainable energy development, and the conservation of finite resources. It forms the basis for informed decision-making in energy policy and technology development.