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COURSE NAME:19OE701 / SUSTAINABLE ENERGY FOR SMART CITIES
IV YEAR/VII SEMESTER

UNIT:1- CLASSIFICATION OF ENERGY

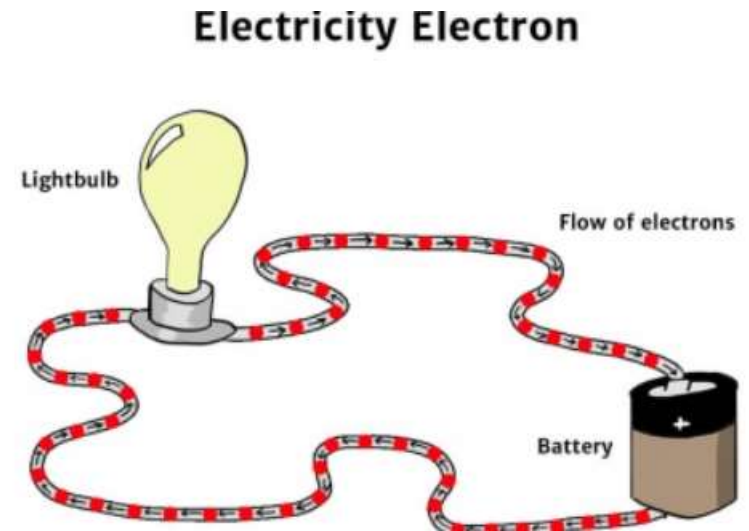
TOPIC:COMMON FORMS OF USABLE ENERGY

Introduction

Usable energy comes in various forms, each with its own specific applications and characteristics.

Electrical Energy: This is the most versatile form of energy and is used to power countless devices, machines, and systems. It is generated from sources like fossil fuels, nuclear power, and renewable sources like solar, wind, and hydropower.

Mechanical Energy: This energy is associated with the motion or movement of objects. It can be harnessed from sources like wind, water (hydropower), and even human or animal muscle power. Mechanical energy is used in transportation, manufacturing, and various machinery.





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Thermal Energy: Also known as heat energy, thermal energy is generated from the movement of particles within a substance. It is commonly derived from burning fossil fuels, nuclear reactions, and geothermal sources. Thermal energy is used for heating, cooking, electricity generation, and industrial processes.

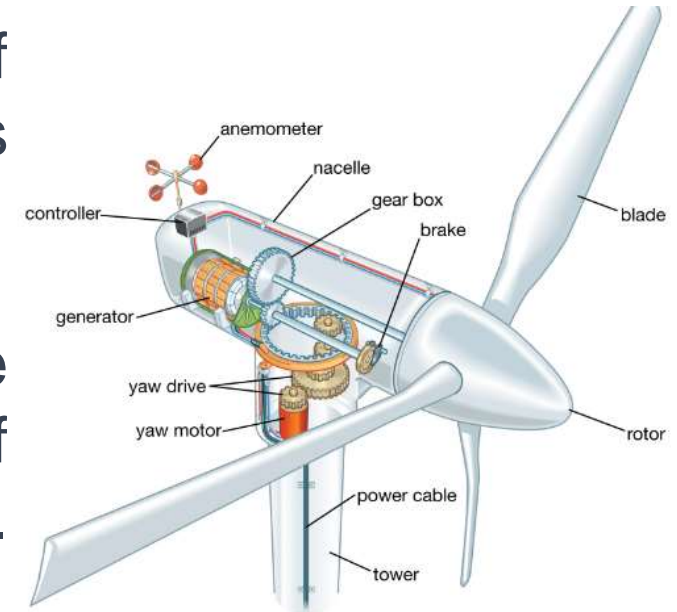
Chemical Energy: Stored within the bonds of chemical compounds, chemical energy is released when these bonds are broken during chemical reactions. Common sources include fossil fuels (coal, oil, natural gas) and biomass. Chemical energy is used in combustion engines, batteries, and many industrial processes.

Nuclear Energy: This energy is produced through nuclear reactions, either through fission (splitting of atomic nuclei) or fusion (combining atomic nuclei). Nuclear power plants use nuclear fission to generate heat, which is then converted into electricity. Fusion, while still under development, has the potential to provide clean and abundant energy.

Solar Energy: Derived from the sun's radiation, solar energy can be converted into electricity using photovoltaic cells or used directly for heating purposes in solar thermal systems. Solar energy is renewable and environmentally friendly.



Wind Energy: Wind turbines capture the kinetic energy of moving air and convert it into electricity. Wind energy is renewable and helps reduce greenhouse gas emissions.



Hydropower: This energy is generated from the movement of water, typically in rivers or dams. The flow of water turns turbines, which then generate electricity. Hydropower is a reliable and renewable source of energy.

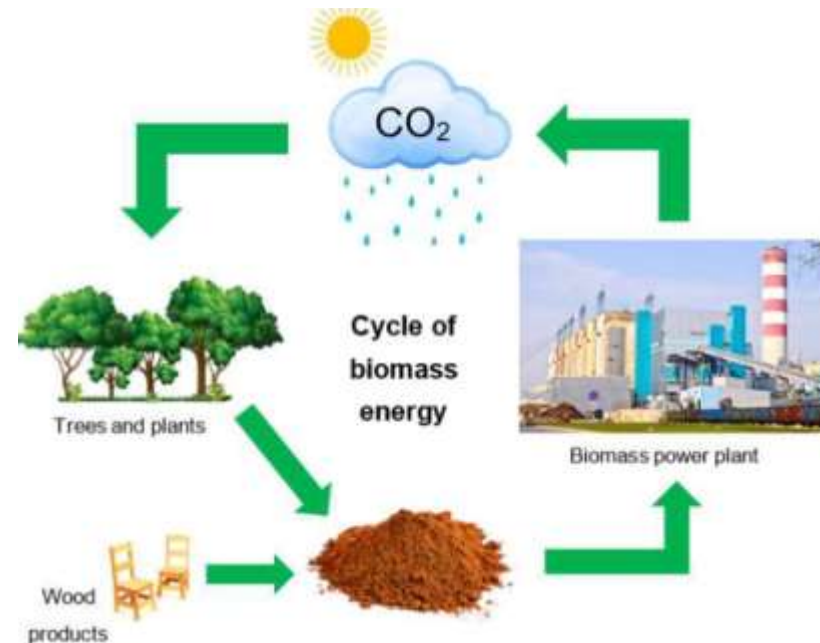
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Geothermal Energy: This energy comes from the heat within the Earth's crust. It's harnessed by tapping into natural geothermal reservoirs or using ground-source heat pumps for heating and cooling buildings.



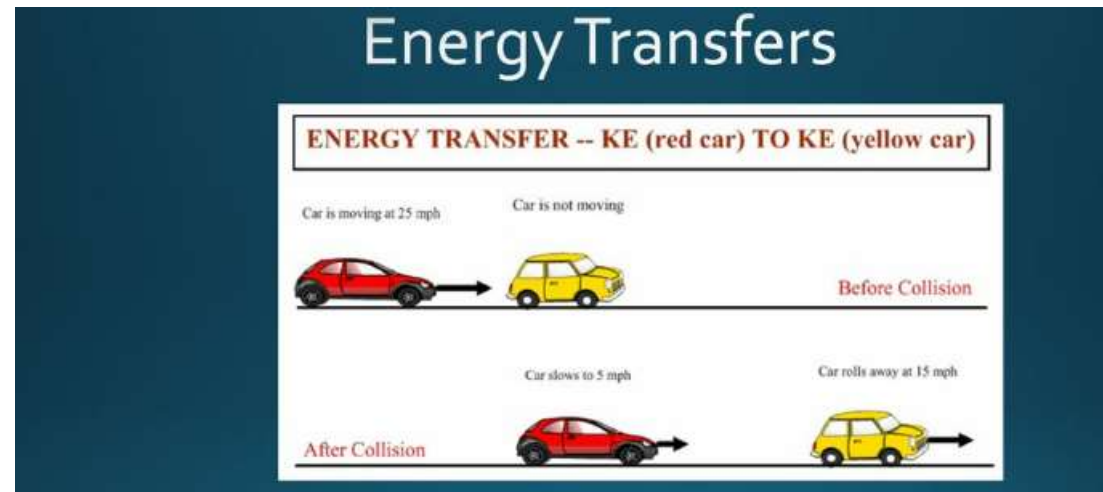
Tidal and Wave Energy: Tidal energy is derived from the gravitational interaction between the Earth, moon, and sun, causing tides to rise and fall. Wave energy is produced by the motion of ocean waves. Both forms of energy can be converted into electricity.

Bioenergy: This is energy derived from organic materials, such as wood, agricultural waste, and other biomass sources. It can be used for heating, electricity generation, and even as biofuels for transportation.



Energy Chain

An energy chain, also known as an energy flow or energy pathway, refers to the sequence of steps through which energy is transferred and transformed from one form to another within a specific system or process. It illustrates how energy moves from its source to its ultimate destination, undergoing conversions and transformations along the way. Energy chains are often used to understand and visualize the flow of energy in various contexts, such as ecosystems, industrial processes, and energy production systems.





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Primary Energy Source: This is the initial form of energy extracted from natural resources. Examples include fossil fuels (coal, oil, natural gas), renewable sources (solar, wind, hydro, geothermal), and nuclear energy (uranium).

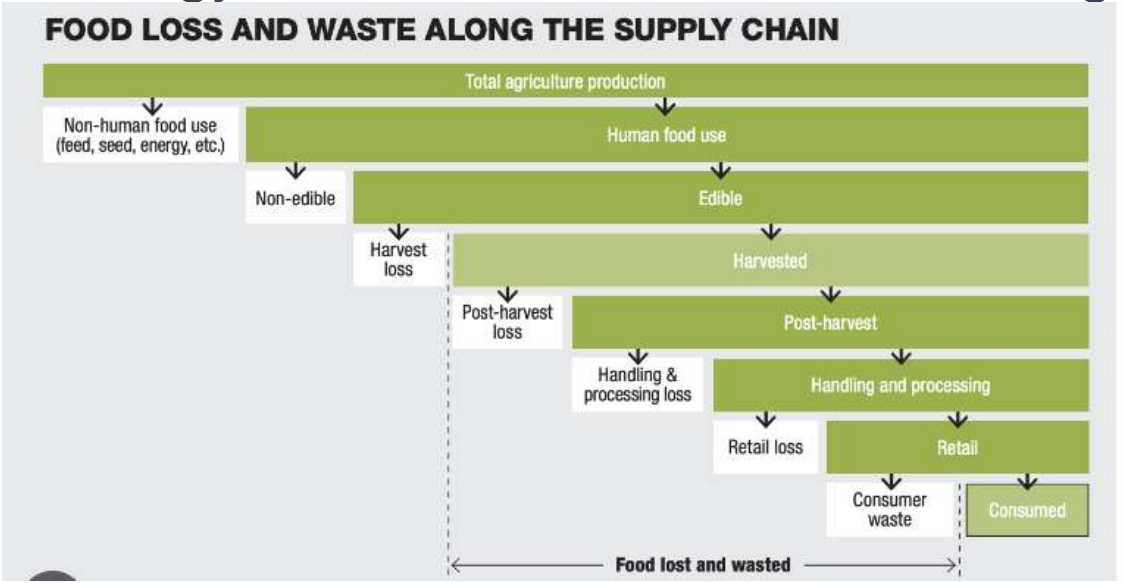
Conversion and Generation: Primary energy sources are converted into usable energy forms through various processes. For example, fossil fuels are burned in power plants to generate electricity, or solar energy is converted to electricity using photovoltaic cells.

Transmission and Distribution: Once energy is generated, it needs to be transmitted and distributed to where it's needed. Electricity, for instance, is transmitted through power lines and transformers to homes, businesses, and industries.

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End Use: At the final stage, energy is consumed by end-users for various purposes, such as lighting, heating, cooling, transportation, and industrial processes.

Waste and Losses: Throughout the energy chain, there are inevitable losses and waste. Energy is often lost as heat during conversion and transmission, and waste products or emissions.





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