

## Different types of new energy sources

- \* Hydrogen energy
- \* Ocean thermal energy Conversion
- \* Tidal & wave energy
- \* Geothermal energy
- \* Solar energy
- \* Wind energy
- \* Biomass energy
- \* AI
- \* Photovoltaics
- \* Distributed energy Storage Systems
- \* Grid integration
- \* Space technologies
- \* Norwegian Crystals
- \* Algal biofuels
- \* Body heat
- \* Dance flowers

### Hydrogen!

Hydrogen possess high calorific value. It is non-polluting, because the combustion product is water.



$\text{H}_2$  gas can be compressed in a fuel tank and used to power cars and buses.

### Sources of Hydrogen!

→ plentiful hydrogen is available from water ( $\text{H}_2\text{O}$ ). Water can be split into gaseous  $\text{H}_2$  &  $\text{O}_2$  by an electrolysis process.

→ Hydrogen can also be produced from

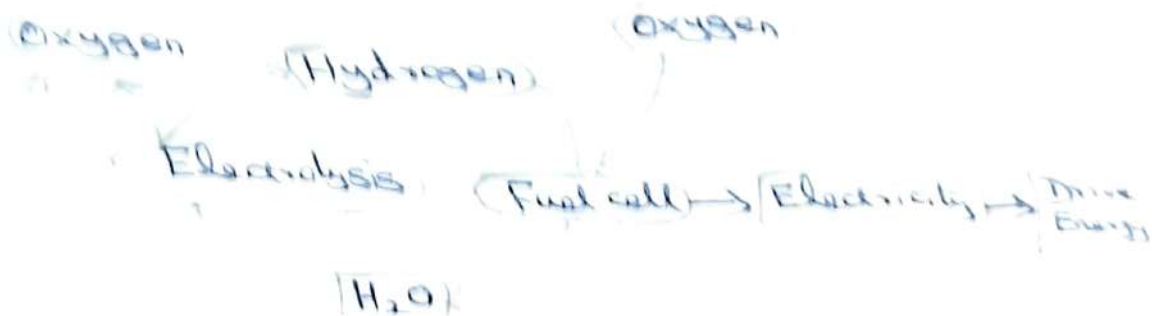
Natural gas and biomass resources

→ Ethanol reacts with high temperature to produce hydrogen

→ Biomass is converted into sugar rich fuel stocks that can be fermented to produce hydrogen

→ Microbes such as green algae consume water in the presence of sunlight and produce hydrogen as a by-product

Hydrogen fuel cell



Problem

- ✓ Safe handling is required
- ✓ Infrastructure to refuel these vehicles
- ✓ Highly inflammable and explosive in nature
- ✓ Difficulties in storing enough hydrogen for motor vehicles to run long distances

Ocean thermal energy (OTE)

There is often large temperature difference between the surface level and deeper level of the tropical oceans. This temperature difference can be utilized to generate electricity. The energy available due to the difference in temperature of water is called ocean thermal energy.

Condition

The temperature difference should be of 20°C or more in warm water between surface water

and deeper water.

### Significance of OTE:

- ✓ OTE is continuous, renewable & pollution free
- ✓ The use of cold deep water, as the chiller fluid in air-conditioning, has also been proposed
- ✓ Electric power generated by OTE can be used to produce hydrogen.

### Tidal Energy (or) Tidal Power

Tidal energy is a renewable energy powered by the natural rise & fall of ocean tides and currents.

### Significance:

- \* Tidal power plants do not require large areas of valuable lands as they are on the bays
- \* It is pollution-free energy source, as it does not use any fuel & also does not produce any wastes.

### Geothermal Energy

The heat produced deep in the Earth's core is called Geothermal Energy.

The energy harnessed from the high temperatures present inside the earth can be used to produce electricity.

### Significance:

- \* The power generation level is higher for geothermal than for solar & wind energies.
- \* Geothermal power plants can be brought

on line more quickly than most other energy

sources.



## Solar energy:

Solar energy is derived by capturing radiation energy from sunlight and converting it into heat, electricity or hot water.

### Significance:

- \* Solar cells are noise & pollution free.
- \* Solar water heaters, cookers, require neither fuel nor attention while cooking food.
- \* Solar cells can be used in remote and isolated areas, forests.

### Wind energy:

Moving air is called wind. Energy received from the force of wind is called wind energy.

The energy possessed by wind is because of its high speed. The wind energy is harnessed by making use of wind mills.

### Significance:

- \* The generation period of wind energy is low and power generation starts from commissioning.
- \* It is made available easily in many off-shore, on-shore & remote areas.

### Bio-mass energy:

Biomass is the organic matter, produced by plants (or) animals used as sources of energy. Most of the biomass is burned directly for heating, cooling & industrial purposes.

Ex: wood, crop residues

## Significance:

→ The Cost of obtaining bio-energy through bio-gas plant is less than the cost of obtaining energy from fossil fuel.

→ Biomass consumes more CO<sub>2</sub> than is released during combustion of biomass.

## Artificial Intelligence (AI) in the energy sector

Artificial intelligence used to forecast demand and manage the distribution of resources to ensure that power is available at the time & place it's needed with a minimum of waste.

AI plays an essential role in the world's transition to clean energy. AI is particularly important in the renewable energy industry, where it often can't be stored for long periods of time & has to be used close to the time & location where it is generated.

## Photo voltaics (PV)

Solar companies are integrating PV systems to minimize the need for additional land usage. As a result, integrated PV, floodvoltaics and agrivoltaics are logical shift in trends. Now thin film PV cells are being developed to make solar panels flexible, cost effective, light weight & environment friendly.

## Distributed energy storage systems (DESS)

A distributed energy storage system is a packaged solution that stores energy for use at a later time.



Components:

- \* DC charged batteries
- \* Bi-directional inverter.

Grid integration:

Grid integration is the practice of developing efficient ways to deliver variable renewable energy to the grid.

Space technologies:

\* Harvesting hydrogen from the moon to power fuel cell on earth.

\* Orbiting solar rays that absorb around the clock direct sunlight to send the energy back down to stations on the ground via radio

Norwegian crystals:

→ Low carbon mono crystalline Silicon ingots, is a type of crystal, used for high performance photovoltaic devices

→ Gallium doped ingots, that increases the lifetime of the solar cells.

Algal biofuels:

Algae is an alternative to liquid fossil fuel. It offers huge commercial potential. Like fossil fuel, algae fuel releases CO<sub>2</sub>, when burned. But unlike fossil fuel, the CO<sub>2</sub> released by algae fuel is removed from the atmosphere via, Photosynthesis as the algae (or) plant grows.

Body heat:

## Carbon Ammonia

### Definition:

The body heat, liberated by humans in the crowded area like central station, market place is channelled through the Stations Vent System. Then it is used to warm up water in Underground tanks & pumped through the heating system.

### Dance floors:

The kinetic energy of the dance floor is converted to electricity that lights up the dance floor itself.

Pavegen, a London based company is demonstrating this with its development of the energy harvesting "Smart Street".