DIFFERENT TYPES OF NEW ENERGY SOURCES

New energy sources

Different types of new energy sources

New energy sources (or) renewable energy resources

- Hydrogen energy
- Ocean Thermal Energy conversion
- Tidal and wave energy
- Geothermal energy
- Solar energy
- Wind energy
- Biomass energy

Difference between Conventional and renewable energy

Conventional/ Non renewable Energy

- Fossil fuels - coal, oil and gas - on the other hand, are non-renewable resources that take hundreds of millions of years to form.

- Fossil fuels, when burned to produce energy, cause harmful greenhouse gas emissions, such as carbon dioxide.

What is renewable energy?

- Renewable energy is energy derived from natural sources that are replenished at a higher rate than they are consumed.
- Sunlight and wind, for example, are such sources that are constantly being replenished.
- Renewable energy sources are plentiful and all around us.

1. HYDROGEN ENERGY

- Fuel that has potential of being widely used in the future is HYDROGEN (H2) gas
- Hydrogen fuel cells produce electricity by combining hydrogen and oxygen atoms.
- Reaction takes place in the electrochemical cell similar to that of battery o produce electricity.
- Combustion product is water $2H_2 + O_2 \dashrightarrow 2H_2O + 150\ KJ$
- H2 gas can be compressed in a fuel tank and used to power cars and buses.

Sources of Hydrogen:

- From water by electrolysis reaction
- From natural gas & biomass resources
- Green algae (a simple, non-flowering, and typically aquatic plant)
- Renewable power like solar and wind.

1. HYDROGEN ENERGY Contd….

Similar to batteries, a fuel cell is a device that converts energy stored in molecules into electricity through an electrochemical reaction. Composed of two electrodes (an anode and a cathode) separated by an electrolyte membrane, a typical hydrogen fuel cell works in the following way.

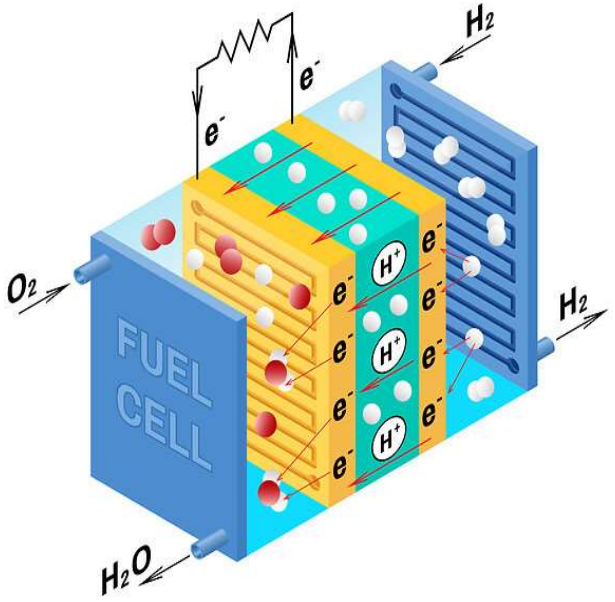
The process by which a fuel cell works can be summarized as follows:

1.Hydrogen atoms enter at the anode, while oxygen is fed to the cathode

2.The hydrogen atoms are separated into protons and electrons at the anode

3.The now positively charged protons pass through the membrane (or electrolyte) to the cathode, with the negatively charged electrons take a different route as they are forced through a circuit to generate electricity.

4.After passing through the circuit and the membrane accordingly, the electrons and protons meet at the cathode where they combine with oxygen to produce heat and water as by-products.



Applications of Hydrogen Energy

- Hydrogen is a Reagent used in many Industries including Chemicals textile fibre manufacturing glass electronic and metallurgy.
- This also used as a fuel for rocket launchers in electronics hydrogen is used as a carrier gas manufacture of electronic components.
- In industry hydrogen combines with nitrogen to produce ammonia for fertilizers good reagent for textile fibers like nylon.
- Hydrogen is used in Metallurgy for heat treatment process mechanical parts are to alter there properties.
- Atomic hydrogen welding is a type of arc welding utilizes a hydrogen environment.
- A mixture of hydrogen and nitrogen is used to prevent oxidation in flat glass production.
- Hydrogen is used to create semiconductors, LED's, display units.
- Hydrogen gas is used as a therapeutic gas for a number of diseases.
- Fuel cells uses hydrogen as a fuel in an electrochemical process to produce electrical energy with water and heat.
    - Two main applications of hydrogen fuel cells
      Stationery power sources this are used to power office buildings, data centers, grocery stores and telecommunication Towers. It is used as a part of UPS system
    - Hydrogen fuel cell vehicles
- Heat produced by the hydrogen fuel cell can be used for space and water heating or industrial process.
- Hydrogen fuel cell trains have now appeared
- Hydrogen fuel cells are found a number of marine applications

- How hydrogen fuel cell works | Fuel Cell Technology | Working principle – YouTube
- Hydrogen Fuel Cell: How It Works - YouTube

ADVANTAGES	DISADVANTAGES
1. RENEWABLE	VOLATILE- Highly flammable & volatile substance
2. CLEAN ENERGY SOURCE – no harmful byproducts	EXPENSIVE TO PRODUCE
3. NOT TOXIC – no damage to human health	DIFFICULT TO STORE – Compress it into liquid state and store in low temperature.
4. HIGHLY EFFICIENT- 3 times more powerful than fossil based fuel	DANGEROUS – Flammable, no sensors to detect

OCEAN THERMAL ENERGY CONVERSION (OTEC)

- OTEC MAKES USE OF NATURALLY OCCURING THERMAL GRADIENT (or) TEMPERATURE DIFFERENCE.
- MINIMUM DIFFERENCE REQUIRED IS 20 DEGREE CELCIUS OR MORE B/N SURFACE AND DEEP WATER.
- The deeper parts of the ocean are cooler because the heat of sunlight cannot penetrate very deep into the water.
- Here the efficiency of the system depends on the temperature difference.
- Greater the temperature difference, the greater the efficiency.
- The temperature difference in the oceans between the deep and shallow parts is maximum in the tropics, 20^{o} C to 25^{o} C.
- EFFICIENCY IS VERY LOW (<4%)
- CONTIUOUS ENERGY SUPPLY.

TU Delft - OTEC - YouTube

Ocean Thermal Energy Conversion (OTEC) - Animated and explained with 3d program - YouTube

Working Principle

- This plant works on the principle of a closed Rankine Cycle.
- Warm Water is used to evaporate working fluid like Ammonia or halocarbon Refrigerant.
- Evaporated Fluid expands in a low pressure turbine, which is coupled with a turbo alternator to produce electricity.

- OTEC…

ADVANTAGES	DISADVANTAGES
1. Continuous, renewable and pollution free	Capital investment high
2. Very little daily or seasonal variation – unlike solar energy	Small temp- difference – very low efficiency
3. Minimum environment effect	Uneconomical for small plants.
4. Can generate power at mid sea	
5. Power generated – used -Hydrogen production	

TIDAL ENERGY

- Tidal energy is a form of hydropower that converts the energy obtained from tides into useful forms of power
- Powered by the natural rise and fall of ocean tides and currents.
- Tides are created by the gravitational effect of the moon and the sun on the earth causing cyclical movement of the swell.

ADVANTAGES	DISADVANTAGES	Application
1. Continuous, renewable	Huge initial investment	Electricity can be generated
2. Doesn't need fuel	Possibility of damaging equipments frequently.	Used to store energy in a hydroelectric dam
3. Doesn't produce any harmful by products, since it's not using the fuel		Tidal barrages are capable of preventing damages to coast

Tidal energy | Class 10 | Geography | ICSE Board | Home Revise - YouTube

Geothermal energy

- Geothermal Technology extracts the heat sound within the subsurface of the year which can be used directly for heating and cooling or converting it to electricity
- The steam comes from the reservoirs of hot water found a few miles below the Earth surface rotate set turbine that activate your generator which produces electricity.
- Power plants of geothermal energy
- Geothermal power plant uses hydro thermal resources that have both water and heat
- geothermal power plants uses high temperature
- Hydro thermal resources that come from either dry steam wells are from hot water wells
- Generally we use this resources by drilling Wells into the earth and steam or hot water to the surface
- the hot water or steam rotates at turbine that generates electricity
- the depth of the geothermal Wells is as much as two miles

Types of geothermal power plants

There are 3 basic types of geothermal power plants

1. **Dry steam power plant**
   It uses steam directly from here geothermal reservoir to drive generators turbines
2. **Flash steam power plant**
   It takes high pressure hot water from deep inside the earth and Converse it into steam to drive generator turbine when the steam cools it condenses to water and is injected back into the ground to be used again most thermal power plants are flash steam plants
3. **Binary cycle power plants**
   it transfer the heat from geothermal hot water to another liquid the heat causes the second liquid to convert it into steam which is used to drive a generator start

Advantages of geothermal energy

- GT energy is environmentally friendly
- GT is a source of renewable energy
- The potential of GTE is huge
- GTE is natural

Disadvantages

- Location is restricted
- There are many other gases released into the atmosphere
- May cause earthquakes
- It is expensive resource
- Management is required to maintain sustainability

- Why geothermal energy is being viewed as a viable alternative to fossil fuels - Bing video

Geothermal Power Plant - YouTube

WIND ENERGY

- **Wind energy**

Air in motion is referred to as wind. wind has a lot of energy since it moves quickly. Didn't energy is the power that has been harnessed from the winds Force It is captured using wind turbines.

Wind energy harvesting

- Windmill
- windmill Converse wind energy into rotational energy by means of the blades.
- the winds impact causes the windmills blade to rotate in definitely
- Numerous machineries such as water pumps grain Mills And electric generators or powered by the blades rotation
- Wind farms
- When several windmills are built and join together in a specific way a wind farm is created wind farms provide a significant quantity of power.
  The lowest speed necessary for a wind generator to function properly is 15 km per hour

Advantages of Wind energy

- Wind is stable and endless renewable energy source
- Wind energy is inexpensive
- Using wind energy instead of fossil fuels minimizes carbon emission
- Low operating expenses

Disadvantages

- Production of electricity depends upon the speed and direction of the Wind
- Birds and marine life habitats may be harmed by wind turbines
- Building wind farms could be expensive

https://www.youtube.com/watch?time_continue=1&v=60onEs-QH68&embeds_euri=https%3A%2F%2Fwww.bing.com%2F&embeds_origin=https%3A%2F%2Fwww.bing.com&feature=emb_logo