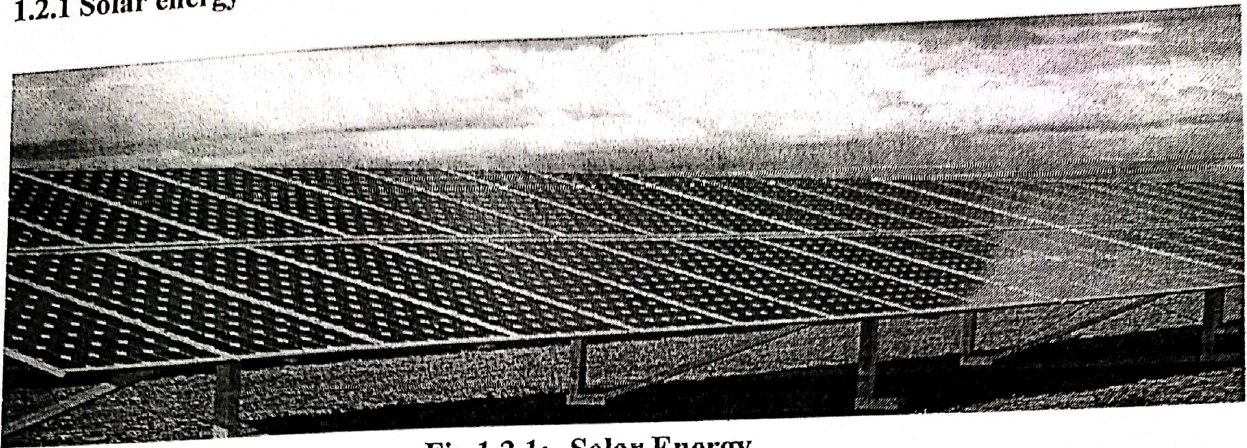


## 1.2.1 Solar energy

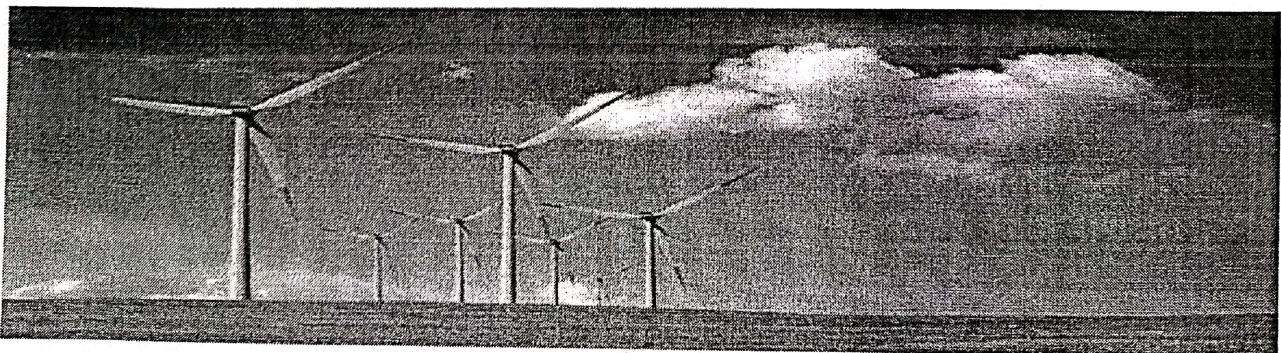


**Fig 1.2.1:- Solar Energy**

The word “direct” solar energy refers to the energy base for those renewable energy source technologies that draw on the Sun’s energy directly. Some renewable technologies, such as wind and ocean thermal, use solar energy after it has been absorbed on the earth and converted to the other forms. Solar energy technology is obtained from solar irradiance to generate electricity using photovoltaic (PV) and concentrating solar power (CSP), to produce thermal energy, to meet direct lighting needs and, potentially, to produce fuels that might be used for transport and other purposes “the total energy from solar radiation falling on the earth was more than 7,500 times the World’s total annual primary energy consumption of 450 EJ” (2).

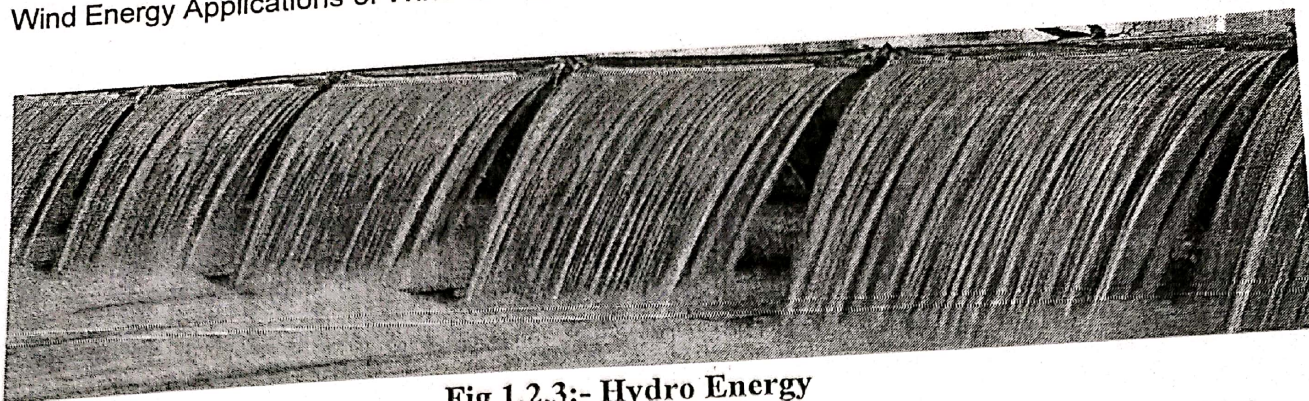
## 1.2.2 Wind energy

The method of using wind to generate electricity is known as wind energy. The kinetic energy in the wind is converted into mechanical power by wind turbines. Wind energy is a renewable energy source that determines the wind’s entire power. Wind power or wind energy is mostly the use of wind turbines to generate electricity (1).



**Fig 1.2.2:- Wind Energy**

## 1.2.3. Hydro energy

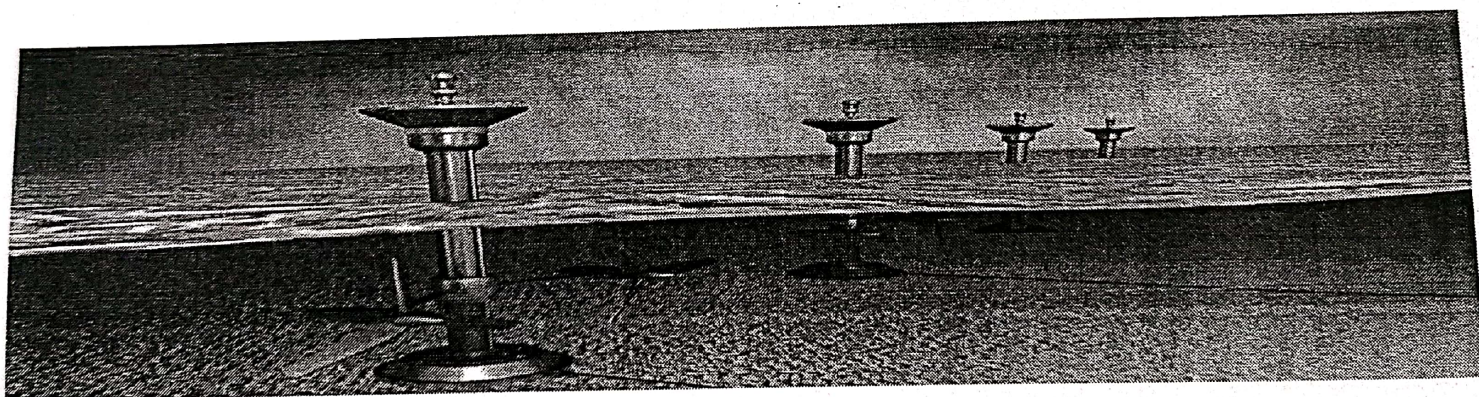


**Fig 1.2.3:- Hydro Energy**

Hydropower is an essential energy source harnessed from water moving from higher to lower elevation levels, primarily to turn turbines and generate electricity. Hydropower projects include Dam project with reservoirs, run-of-river and in-stream projects and cover a range in project scale. This energy source can often be more reliable than solar or wind power (especially if it's tidal rather than river) and also allows electricity to be stored for use when demand reaches a peak (2).

#### **1.2.4. Tidal energy**

This is another form of hydro energy that uses twice-daily tidal currents to drive turbine generators. Although tidal flow unlike some other hydro energy sources isn't constant, it is highly predictable and can therefore compensate for the periods when the tide current is low. Find out more by visiting our marine energy page.



**Fig 1.2.4:- Tidal Energy**

#### **1.2.5 Geothermal energy**

Geothermal energy is obtained naturally from the earth's interior as heat energy source. The origin of the heat is linked with the internal structure of the planet and the physical processes occurring there. Although heat is present in the earth's crust in huge quantities, not to mention the deepest parts, it is unevenly distributed, rarely concentrated,

and often at depths too great to be exploited mechanically (2).

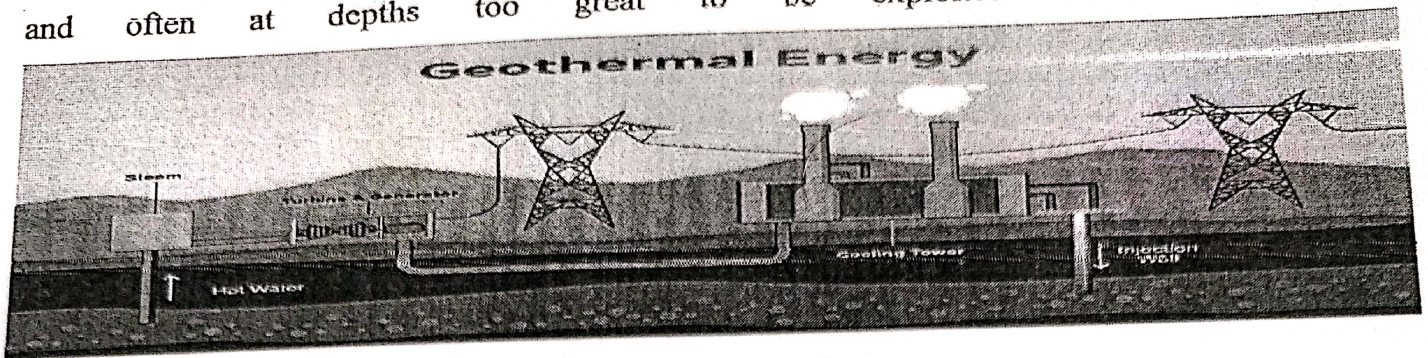


Fig 1.2.5:- Geothermal Energy

### 1.2.6 Biomass energy

Bioenergy is a renewable energy source derived from biological sources. Bioenergy is an important source of energy, which can be used for transport using biodiesel, electricity generation, cooking and heating. Electricity from bioenergy attracts a large range of different sources, including forest by-products such as wood residues; agricultural residues such as sugar cane waste; and animal husbandry residue such as cow dung. One advantage of biomass energy-based electricity is that fuel is often a by-product, residue or waste product from the above sources. Significantly, it does not create a competition between land for food and land for fuel (2).



Fig 1.2.6:- Biomass Energy

## Wind Energy Applications of Wind Energy

2015 and presently weather stations and LIDARs are being set up by NIWE at some locations. The first offshore wind farm is planned near Dhanushkodi in Tamil Nadu.

The manufacturing industry (IWTMA) is equipped with proven technology from Europe and USA with turbine size ranging from 250 KW to 2.5 MW of various technologies of stall, pitch, direct drive turbines with hub heights up to 120 meters and rotor size above 100 meters. The modern turbines are designed to harness even in low and medium wind regimes. Twenty manufacturers have over 50 models and with a manufacturing capacity of over 9500 MW per annum.

With the time tested legal and fiscal system and India as a growing fast track economy is considered as a favoured destination for industrial activity. This is proved by the fact that out of the 24 GW of wind power almost 95% is from private sector.

The entire wind energy industry is governed by solid foundations from the Electricity Act, viable regulatory procedures from CERC and other state regulatory policies.

The paradigm shift from retail market to the IPP market with major investors like Goldman Sachs, Black Stone, IDFC and others is proven demonstration of the interest of the private sector.

Capital cost in India is perhaps one of the lowest in the world and India is emerging as the fastest growing supply chain hub with many industries choosing for in-house manufacture of towers, blades, generators, convertors etc. The commercial arm of MNRE, IREDA and other financial and banking institutions has backed the industry as a stable market where there is assured off take and no marketing challenges. The Government of India has announced a laudable Renewable Energy target of 175GW by 2022 out of which 60GW will be coming from wind power. This will require an addition of more that 5GW per annum. The country would require over 7000 MW per annum of RE to achieve 15% by all renewable by year 2020 under the National Action Plan for Climate Change. The Government commitment to promotional tariff, incentivizing generation, plans to revitalize the REC market through RPO obligation will certainly make this market vibrant and self sustaining.