Sources of Energy

Part 1

Classification of Energy Sources

Conventional sources of Energy

* Coal
* Oil
* Fuel Wood
* Thermal Power plant
* Nuclear Energy

Non-Conventional sources of Energy

* Solar Energy
* Wind Energy
* Tidal Energy
* Geothermal Energy
* Biomass

Fuel Woods

* Basically usead by the rural people for cooking food.
* Major disadvantage is causes deforestation.
* Deforestation can be avoided by planting more trees.

Coal

* Most abundantly available conventional source of energy.
* Formed when organic matter converts into lignite and then into anthracite.
* Used for heating houses, as fuels for boilers in steam engines and thermal plants.

Oil

Typical Composition of Natural Gas

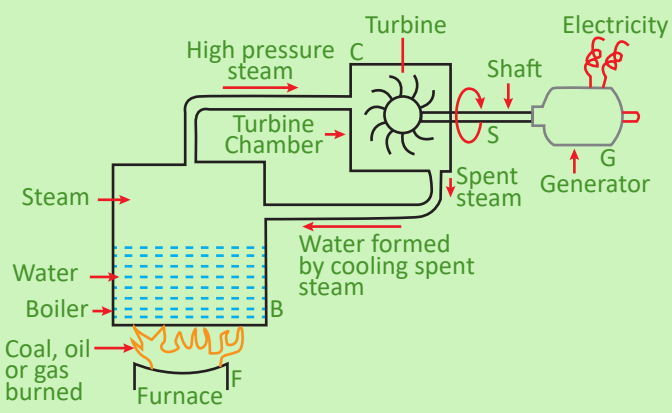
Name	Formula	Volume(%)
Methane	CH_4	>85
Ethane	C_2H_6	3-8
Propane	C_3H_8	1-2
Butane	C_4H_{10}	<1
Pentane	C_5H_{12}	<1
Carbon dioxide	CO_2	1-2
Hydrogen Sulfied	H_2S	<1
Nitrogen	N_2	1-5
Helium	He	<0.5

* Most abundantly used conventional source of energy.
* Petroleum is a mixture of hydrocarbons and cycloalkanes.
* Crude petroleum is refined and purified to obtain petrol, diesel, lubricating oil, plastic etc.
* Natural gas is very useful in household sector. It causes less air pollution as compared to other fossil fuel.

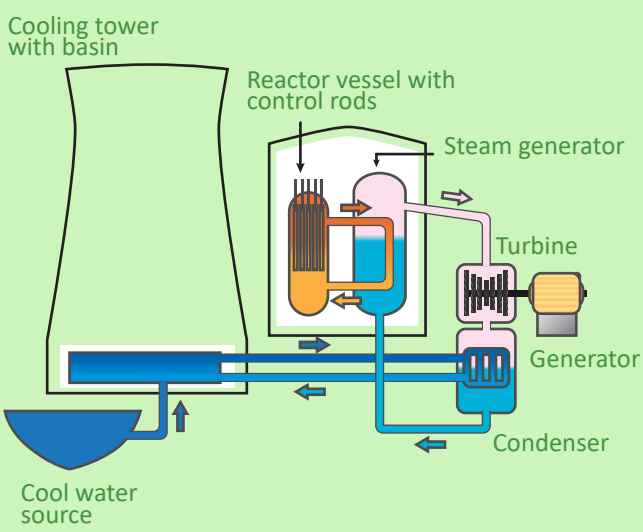
Thermal Power Plant

* Power stations burn fossil fuels to produce steam.
* Steam is fed into the turbine to generate electricity.

Thermal Power Plant



Nuclear Power Plant



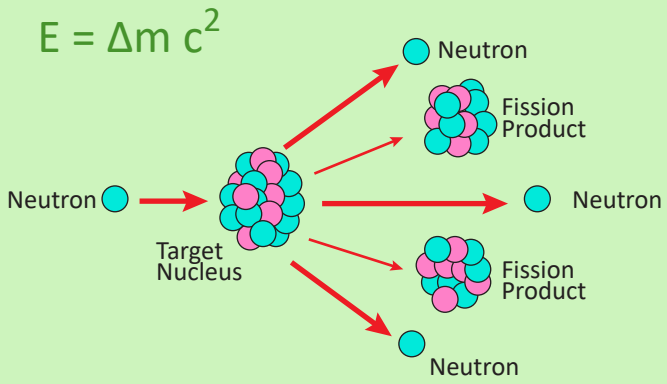
Nuclear Energy

* One of the most environmentally friendly energy source as the green-house gas emission is very low.
* Small amount of radioactive substance can produce a lot of energy.
* Major hazard is the storage and disposal of spent or used fuel.
* There is always a risk of accidental leakage of nuclear radiation.

How is Nuclear energy obtained?

* Nuclear energy is produced by nuclear fission or fusion reactions.
* Nucleus of heavy atom (Uranium) is bombarded with low energy neutron.
* The heavy atom or the target atom then splits into lighter nuclei.
* If the mass of the original nuclei is more than the sum of the masses of the individual products, then energy released is equivalent to,

$$E = \Delta m\, c^2$$



Nuclear Fission

Sources of Energy

Part 2

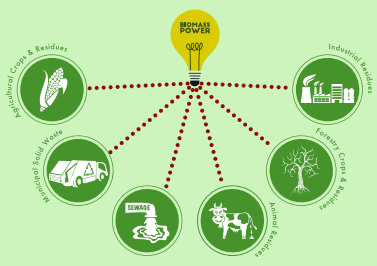
Need for non-conventional energy sources?

* With Increasing population, the energy consumption as well as the demand has increased tremendously.
* Nature has a very limited supply of the conventional sources of energy.
* In order to meet the increasing demand, renewable sources of energy is required.

Solar Energy

* Harnessed by converting solar energy directly into electrical energy using solar cells.
* Inspired by the Photosynthesis process in plants.

Biomass Energy



* The organic matter that originates from plants, animals, wood, sewage.
* Substances are directly burnt to produce heat energy, which is then used to generate electricity.
* Biomass usually consists of 25% lignin and 75% carbohydrates or sugar.
* Used for cooking and lighting too.
* Residue after removal of biogas is a good source of manure.

Wind Energy

* Harnessed by converting kinetic energy of the wind directly into electrical energy by the help of windmills.
* As wind increases, power output also increases.
* Wind speed is usually higher in higher altitudes.

Tidal Energy

* Converts the energy of tides into electricity.
* Helpful in areas where sea experiences waves and tides.

Geothermal Energy

* Heat energy that we get from hot rocks present in the earth's crust.
* Geothermal wells releases greenhouse gases trapped within the earth and but these emissions are much lower per energy unit than the fossil fuels.

Advantages of non-conventional energy sources

* They are renewable in nature.
* Cause little or no pollution as compared to the conventional sources of energy.
* Low maintenance cost.
* Cost saving option in the long run.

Dis-Advantages of non-conventional energy sources

* Initial setup cost is higher.
* Energy cannot be extracted 24/7, year round, because some days will be windier than the others, on some days sun will shine brighter.
* Energy has to be stored.
* Geographic locations can be challenging.

Which energy source should be used?

* The energy source to be selected depend on factors like:
* The ease and cost of extracting energy from the source.
* The efficiency of the technology available for
* using that source of energy.
* The environmental impact of using that source.

Is Nuclear energy renewable or non-renewable?

* Although nuclear energy itself is a renewable energy source, the material used in nuclear power plants is not.
* Uranium-235, used in nuclear reactors is a non renewable source of energy, and its supply is limited.
* Today, the amount of Uranium available inside the Earth is enough to fuel the earth for another 5 billion years.
* So, nuclear energy can also be considered as renewable energy.

Nuclear Fusion

* This reaction involves the combination or fusion of two light elements to form a heavier element and energy is released.

Nuclear Fission

* Fission (splitting) of nuclei of some heavy elements like uranium is called nuclear fission.