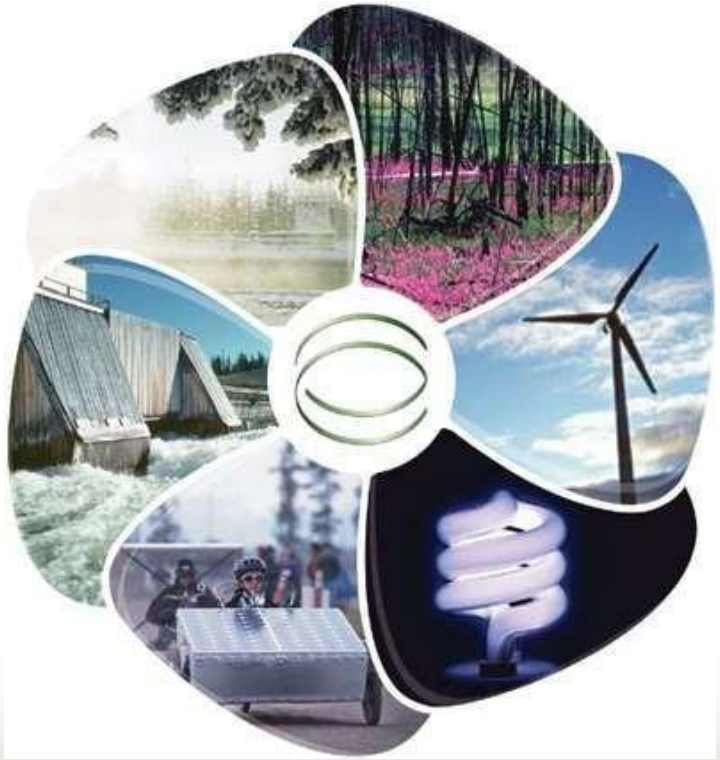
SOURCES OF ENERGY

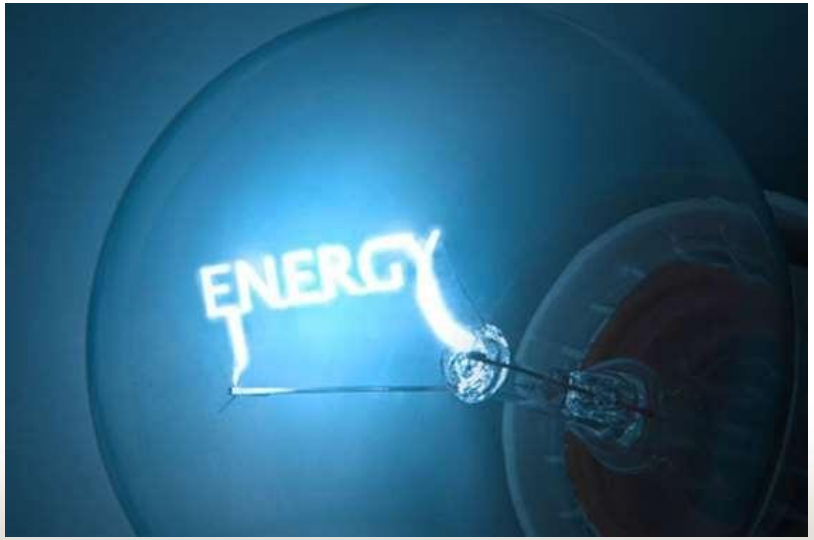


Energy

- Energy is the capacity of a physical system to perform work. Energy exists in several forms such as heat, kinetic or mechanical energy, light, potential energy, electrical, or other forms.

>> Sources of Energy:

1. **Conventional Energy Sources**
2. **Renewable Energy Sources**



Conventional Energy Sources

- The term "Conventional" means "not unusual or extreme or ordinary." Conventional energy sources are the traditional sources of energy like coal and petroleum. Conventional energy sources are finite. They will not last forever.

Natural Gas

Natural gas in its purest form is pure methane but before it is refined, it also contains varying amount of ethane, propane, butane and carbon dioxide. When refined, it is colorless and odorless but can be burned to release large amounts of energy.

Conventional Energy Sources

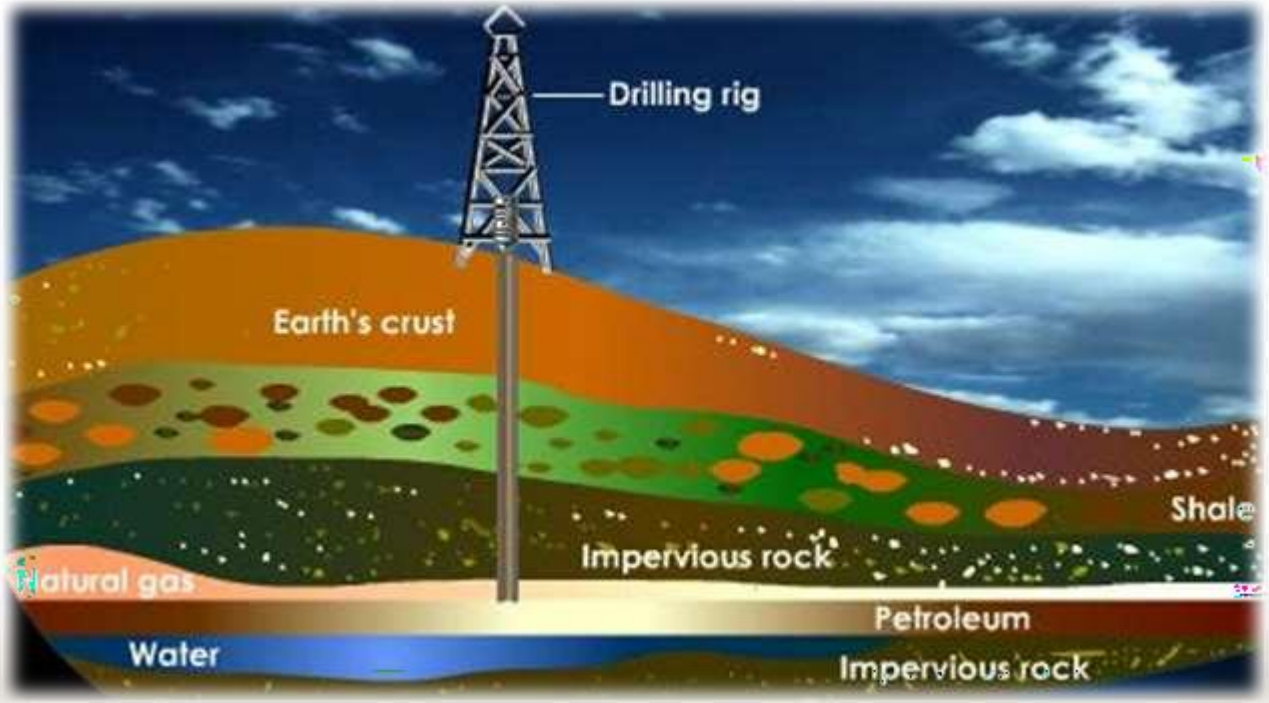
Coal

Coal releases large amounts of energy when it is burned because of the density of hydrocarbons in the material. Coal is formed by dead plants being put under significant pressure and temperature for millions of years. There are four grades of coal: lignite, subbituminous, bituminous coal and anthracite. Bituminous coal is the best for releasing energy and is the most commonly mined type of coal .

Conventional Energy Sources

Petroleum

Petroleum is formed from the compression of animal and plant remains over millions of years. Petroleum has to be drilled for because it is usually located deep below the earth's surface and is then refined to produce a number of different products including gasoline, heavy fuel oil and diesel fuel.



Conventional Energy Sources

Advantages of Conventional Energy Sources

Conventional energy sources are proven technologies which can provide energy regardless of the weather conditions unlike solar and wind power which may go for days without being able to produce substantial amounts of power. Currently, the financial costs are much lower than alternative energy sources.

Conventional Energy Sources

Disadvantages of Conventional Energy Sources

- Petroleum, gas and coal are non renewable energy sources which means that they will eventually run out.
- These energy sources also release greenhouse gases like carbon dioxide into the atmosphere which contribute to global warming.
- Other pollutants released include sulfur and nitrogen oxide, which can lead to acid rain and mercury, which is harmful to humans when ingested.

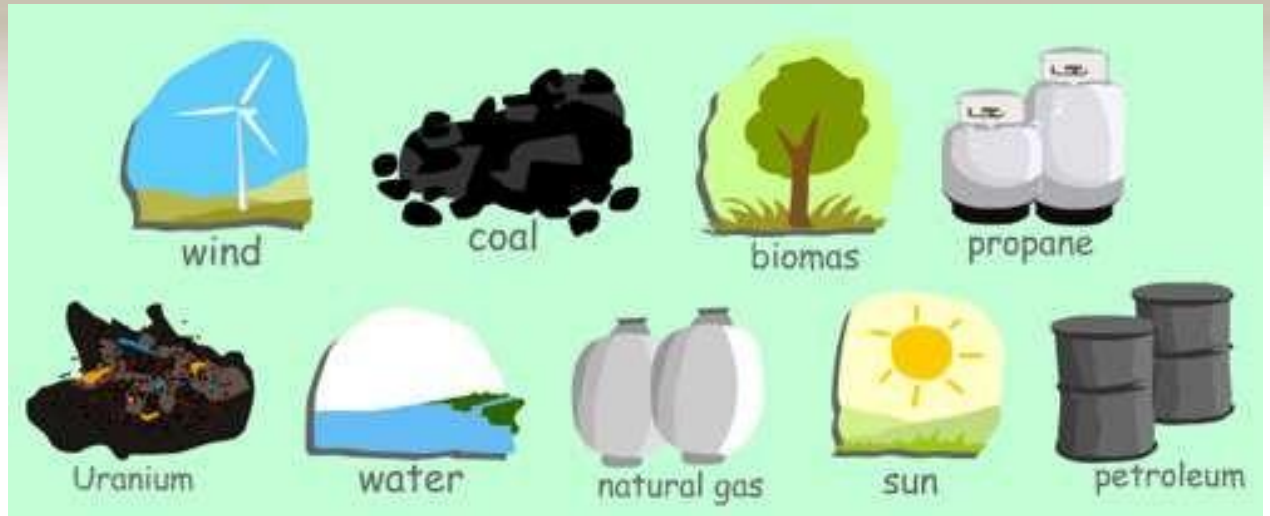
Renewable Energy Sources

- Renewable energy is natural energy which does not have a limited supply. Renewable energy can be used again and again, and will never run out.
- Renewable energy is energy which comes from natural resources such as sunlight, wind, rain, tides and geothermal heat, which are renewable (naturally replenished.)
- Renewable energy is an alternative to fossil fuels and nuclear power, and was commonly called alternative energy.

Renewable Energy Sources

A list of renewable energy sources:

- Biomass
- Hydro
- Geothermal
- Solar
- Tidal
- Wave
- Wind
- Wood



Renewable energy replaces conventional fuels in four distinct areas:

- power generation,
- hot water/ space heating,
- transport fuels and
- rural (off-grid) energy services.

WIND ENERGY

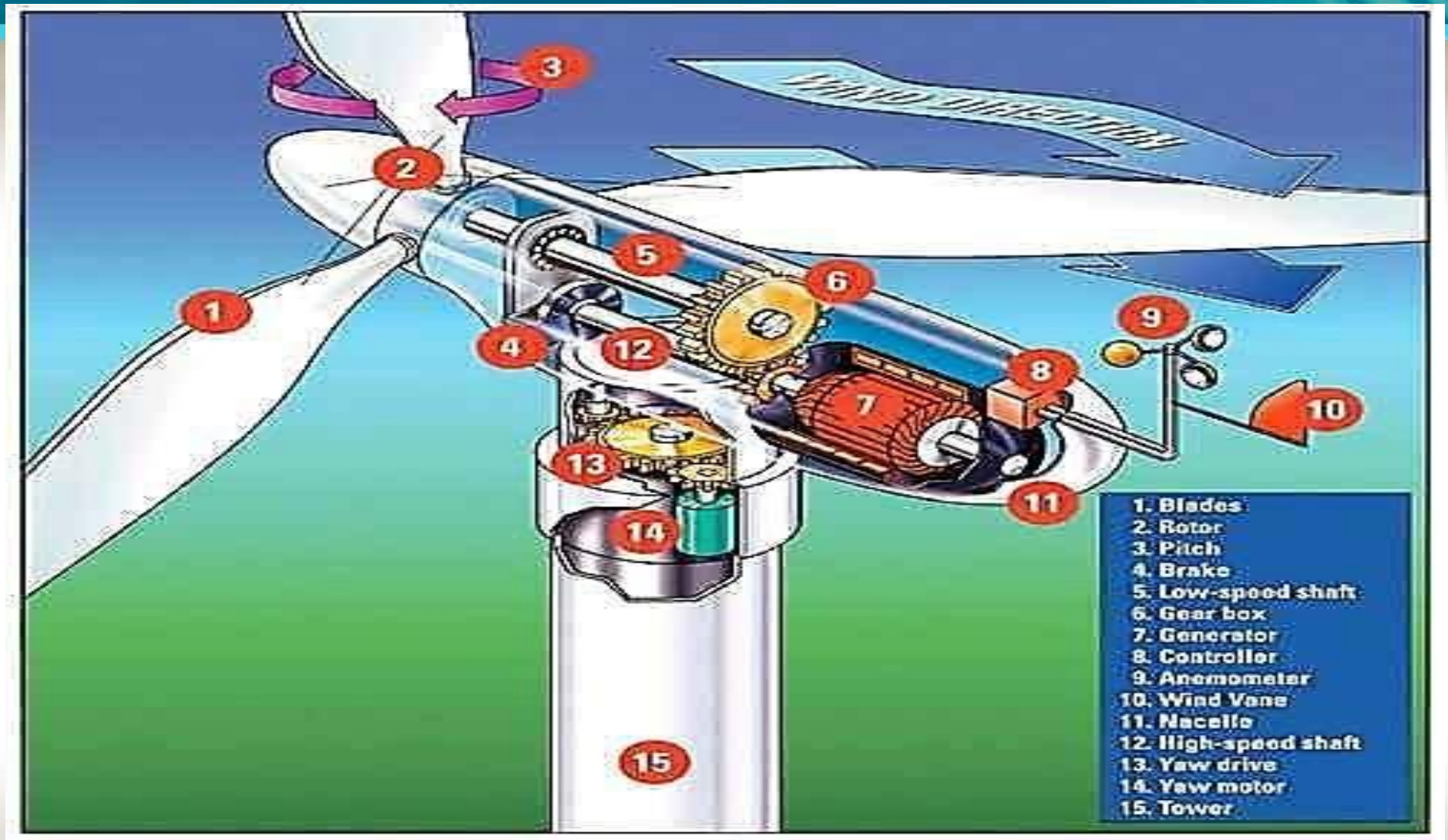
Wind power

- Airflows can be used to run wind turbines. Modern wind turbines range from around 600 kW to 5 MW of rated power, although turbines with rated output of 1.5–3 MW have become the most common for commercial use; the power output of a turbine is a function of the cube of the wind speed, so as wind speed increases, power output increases dramatically.

WIND ENERGY

- Areas where winds are stronger and more constant, such as offshore and high altitude sites, are preferred locations for wind farms. Typical capacity factors are 20-40%, with values at the upper end of the range in particularly favorable sites.

WIND ENERGY



WIND ENERGY

- Globally, the long-term technical potential of wind energy is believed to be five times total current global energy production, or 40 times current electricity demand. This could require wind turbines to be installed over large areas, particularly in areas of higher wind resources. Offshore resources experience mean wind speeds of ~90% greater than that of land, so offshore resources could contribute substantially more energy.

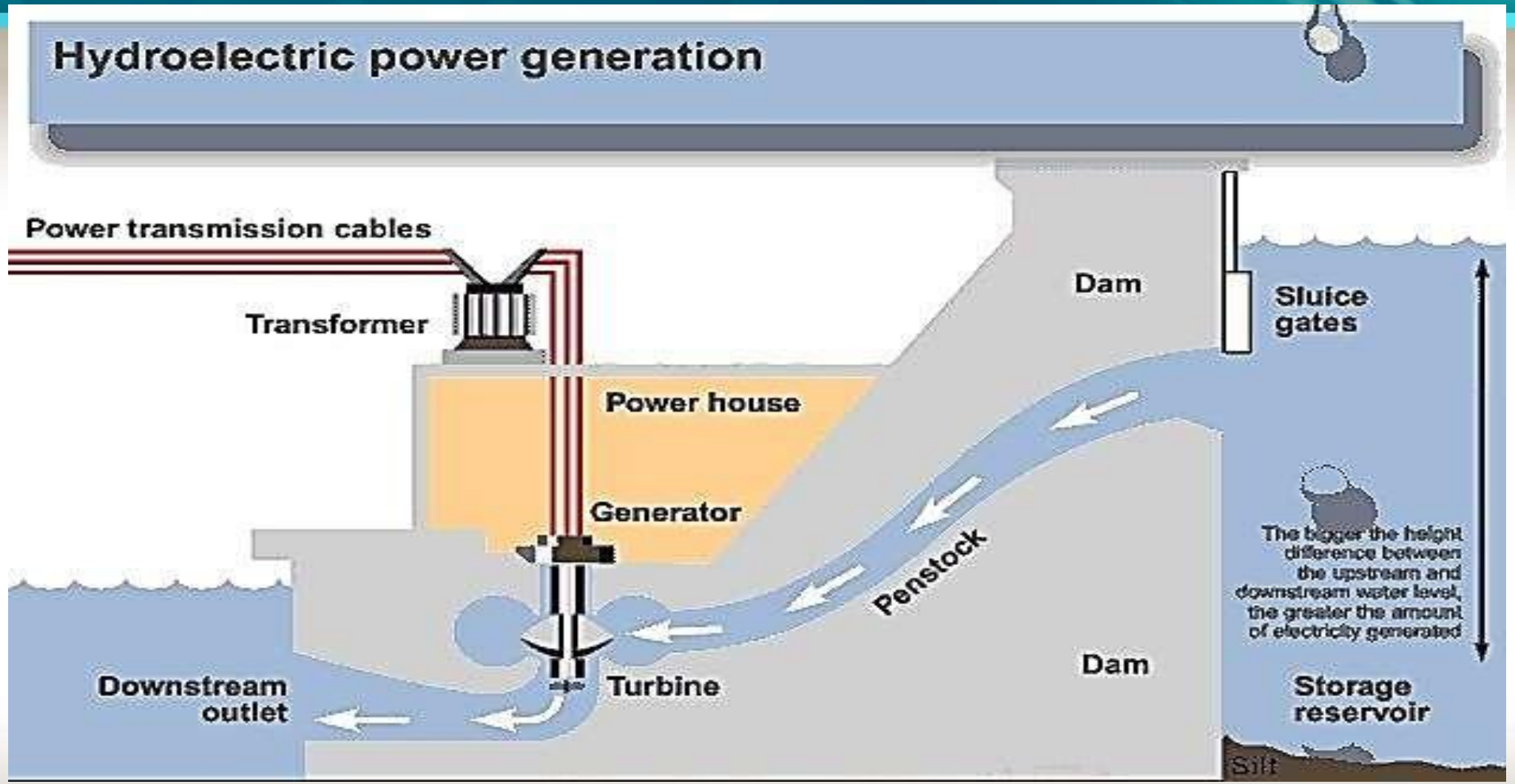
Hydropower

- Energy in water can be harnessed and used. Since water is about 800 times denser than air, even a slow flowing stream of water, or moderate sea swell, can yield considerable amounts of energy.
- There are many forms of water energy:

Micro hydro systems are hydroelectric power installations that typically produce up to 100 kW of power. They are often used in water rich areas as a remote-area power supply (RAPS). There are many of these installations around the world, including several delivering around 50 kW in the Solomon Islands.

Damless hydro systems derive kinetic energy from rivers and oceans without using a dam. Ocean energy describes all the technologies to harness energy from the ocean and the sea. This includes marine current power, ocean thermal energy conversion, and tidal power.

Hydropower



Hydropower

Solar energy

- Solar energy is the energy derived from the sun through the form of solar radiation. Solar powered electrical generation relies on photovoltaic and heat engines. A partial list of other solar applications includes space heating and cooling through solar architecture, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes.

Solar energy

- Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.

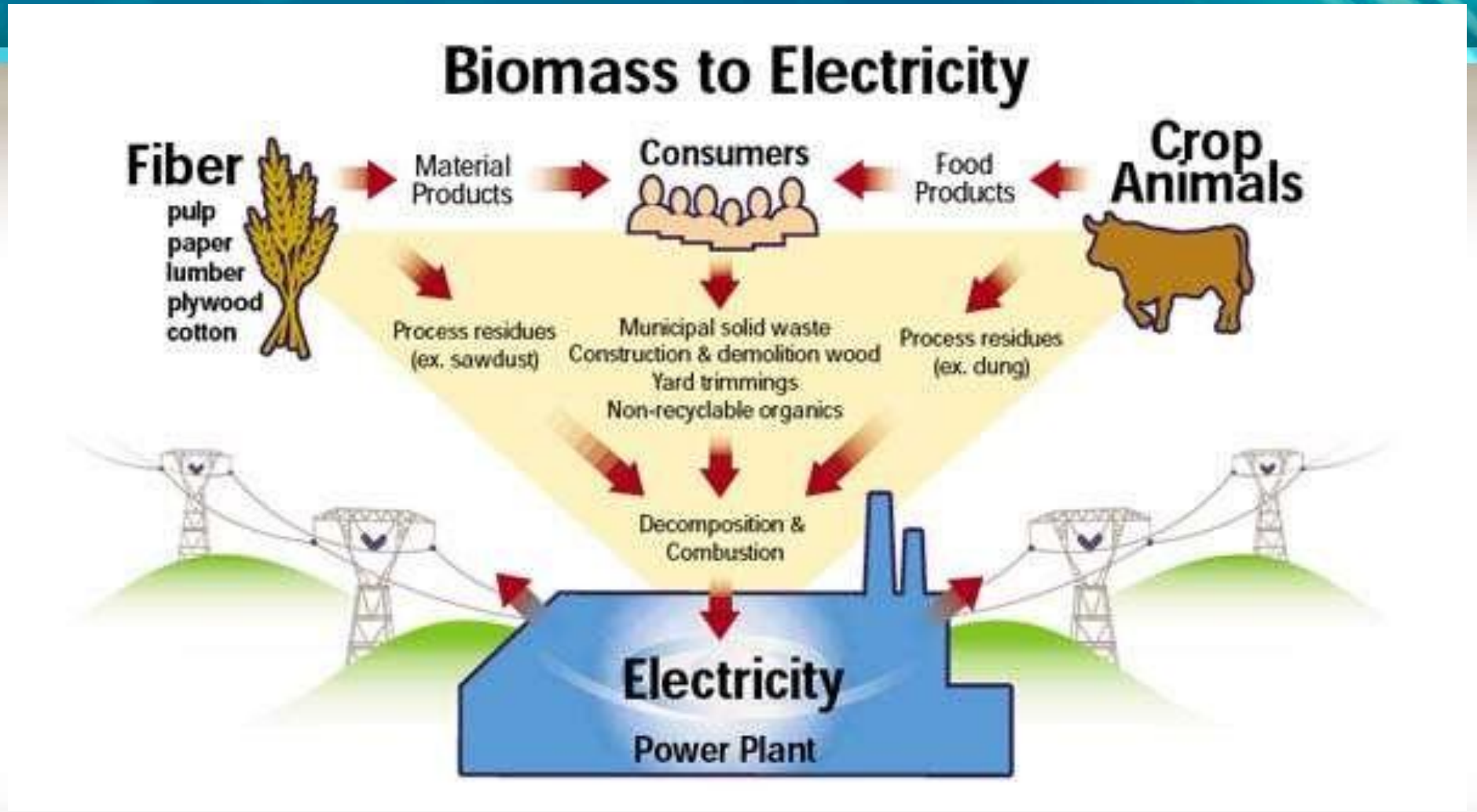
Biomass

Biomass (plant material) is a renewable energy source because the energy it contains comes from the sun. Through the process of photosynthesis, plants capture the sun's energy. When the plants are burned, they release the sun's energy they contain. In this way, biomass functions as a sort of natural battery for storing solar energy. As long as biomass is produced sustainably, with only as much used as is grown, the battery will last indefinitely.

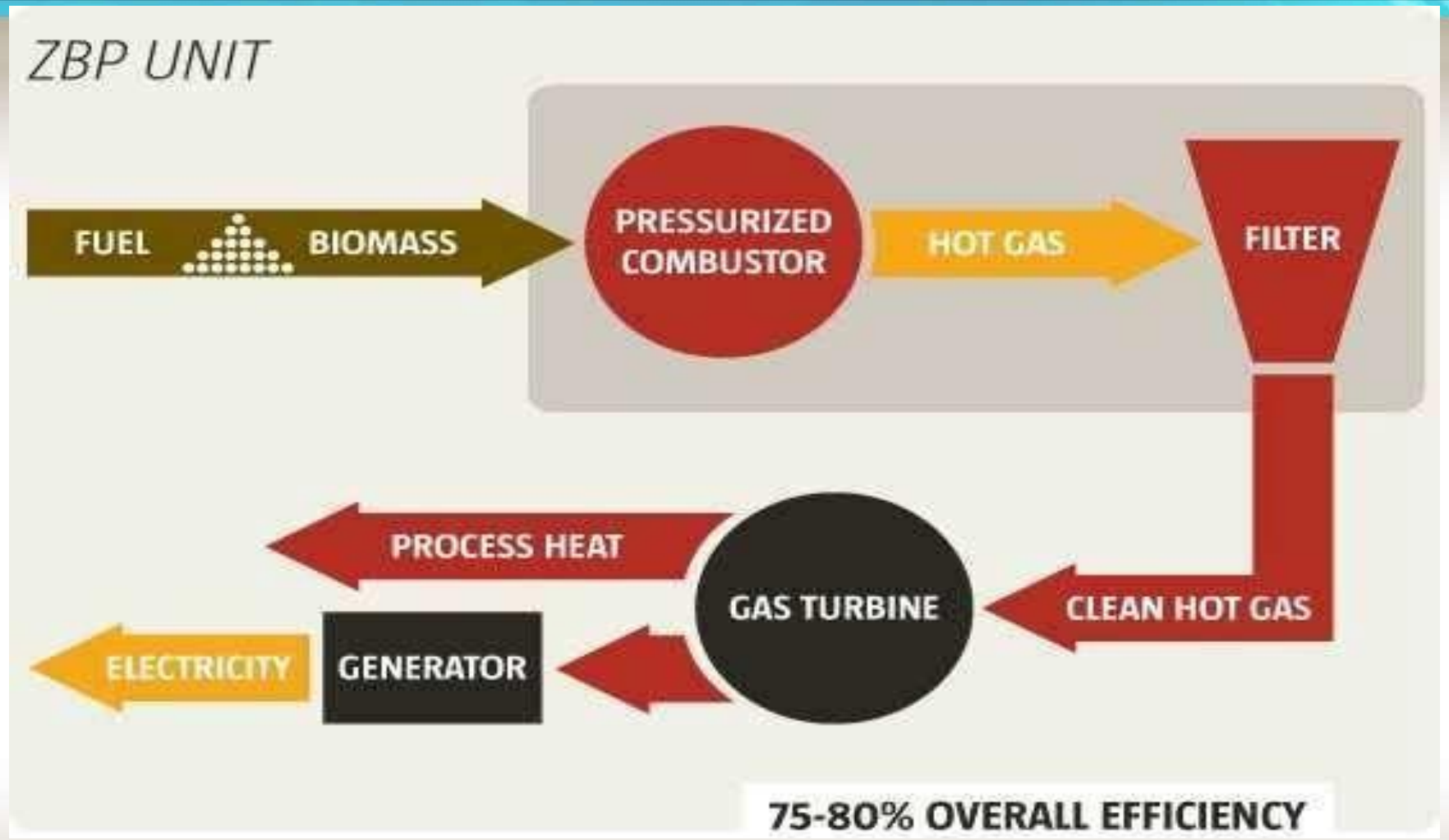
In general there are two main approaches to using plants for energy production: growing plants specifically for energy use, and using the residues from plants that are used for other things. The best approaches vary from region to region according to climate, soils and geography.

Biomass

Biomass

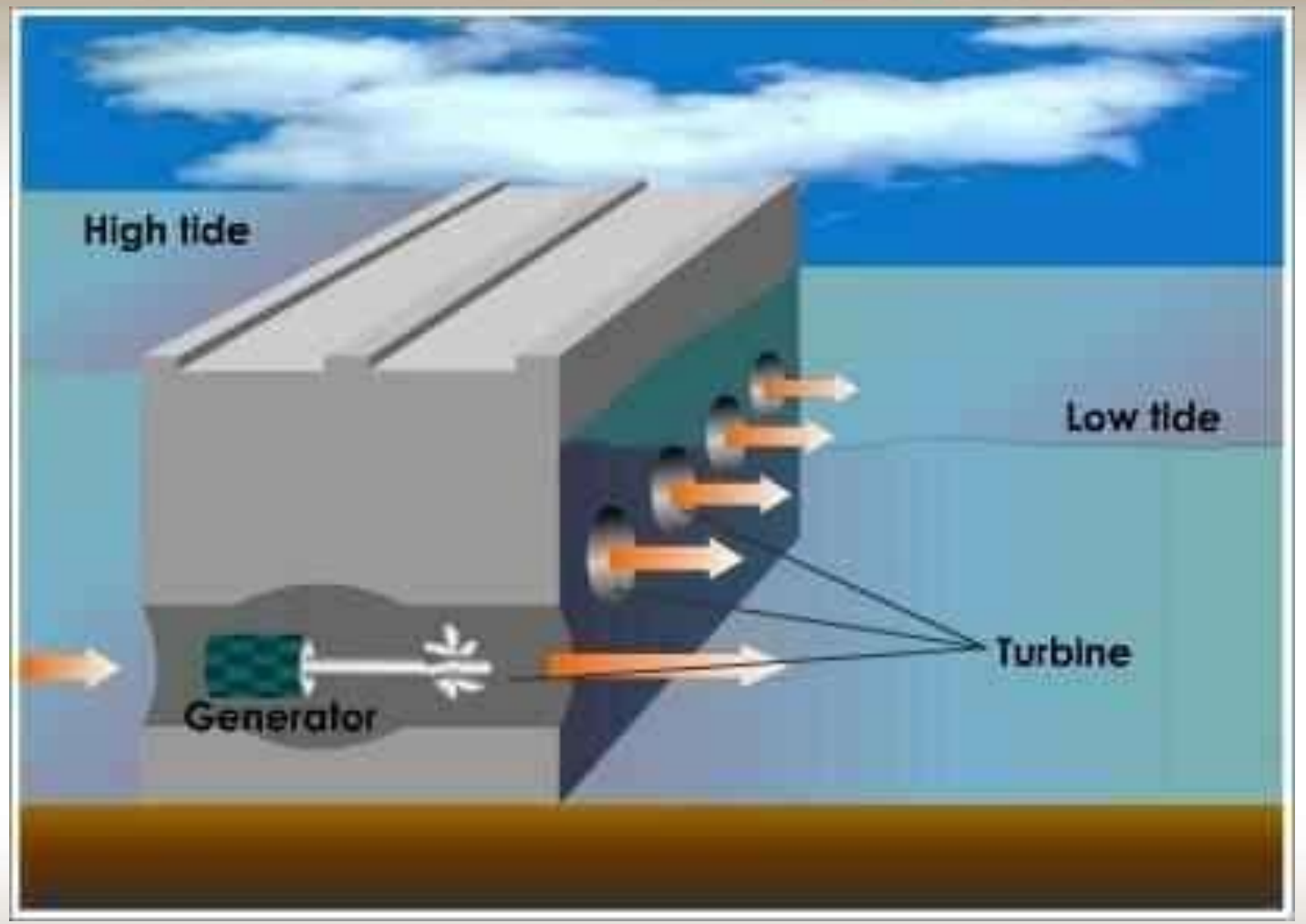


Biomass

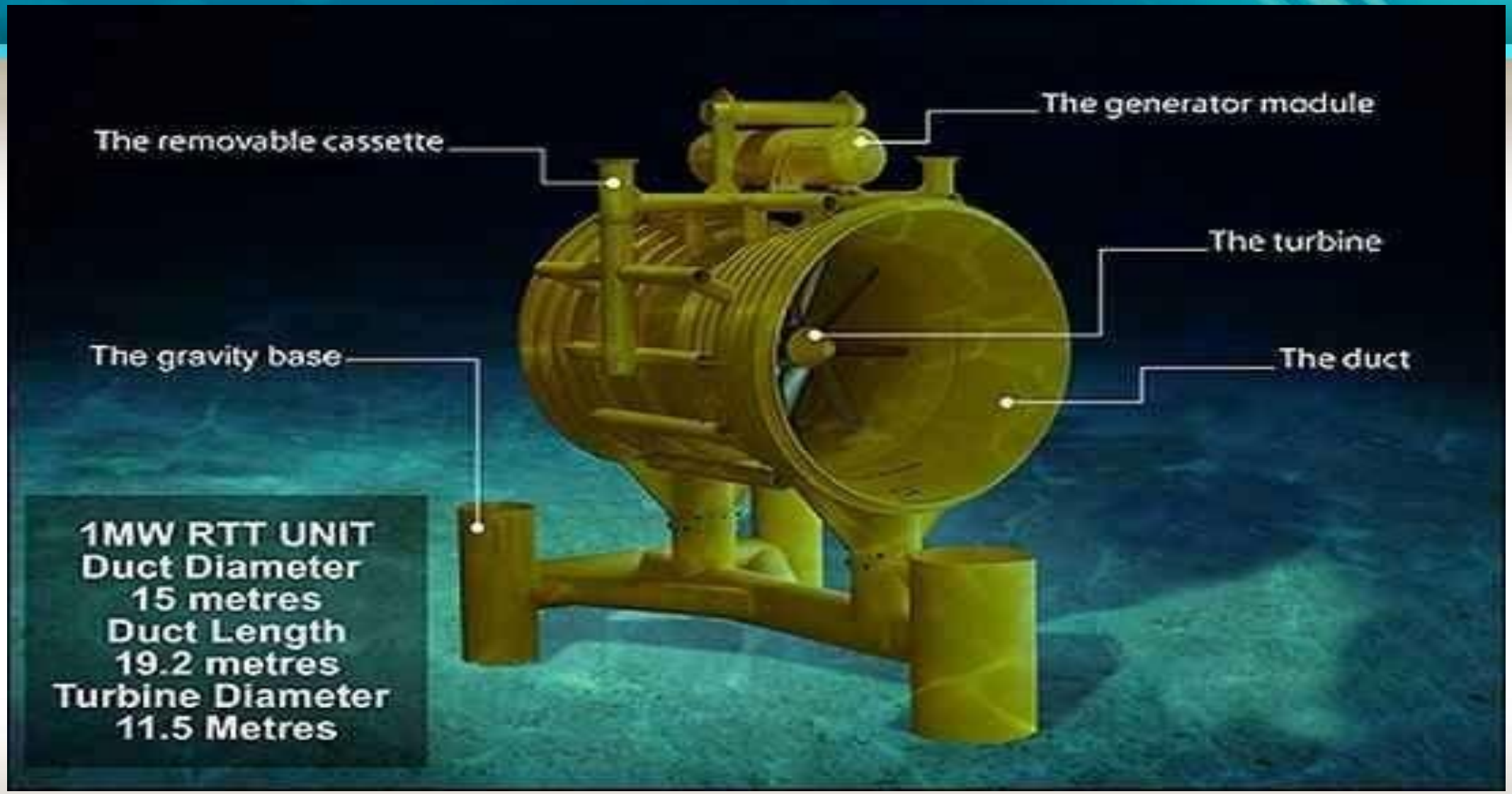


Tidal Energy

- This is another unlimited and inexhaustible source of energy. The Gulfs of Kutch is preferably suited to build up electricity from the energy produced by high and lofty tides entering into slender creeks.



Tidal Energy

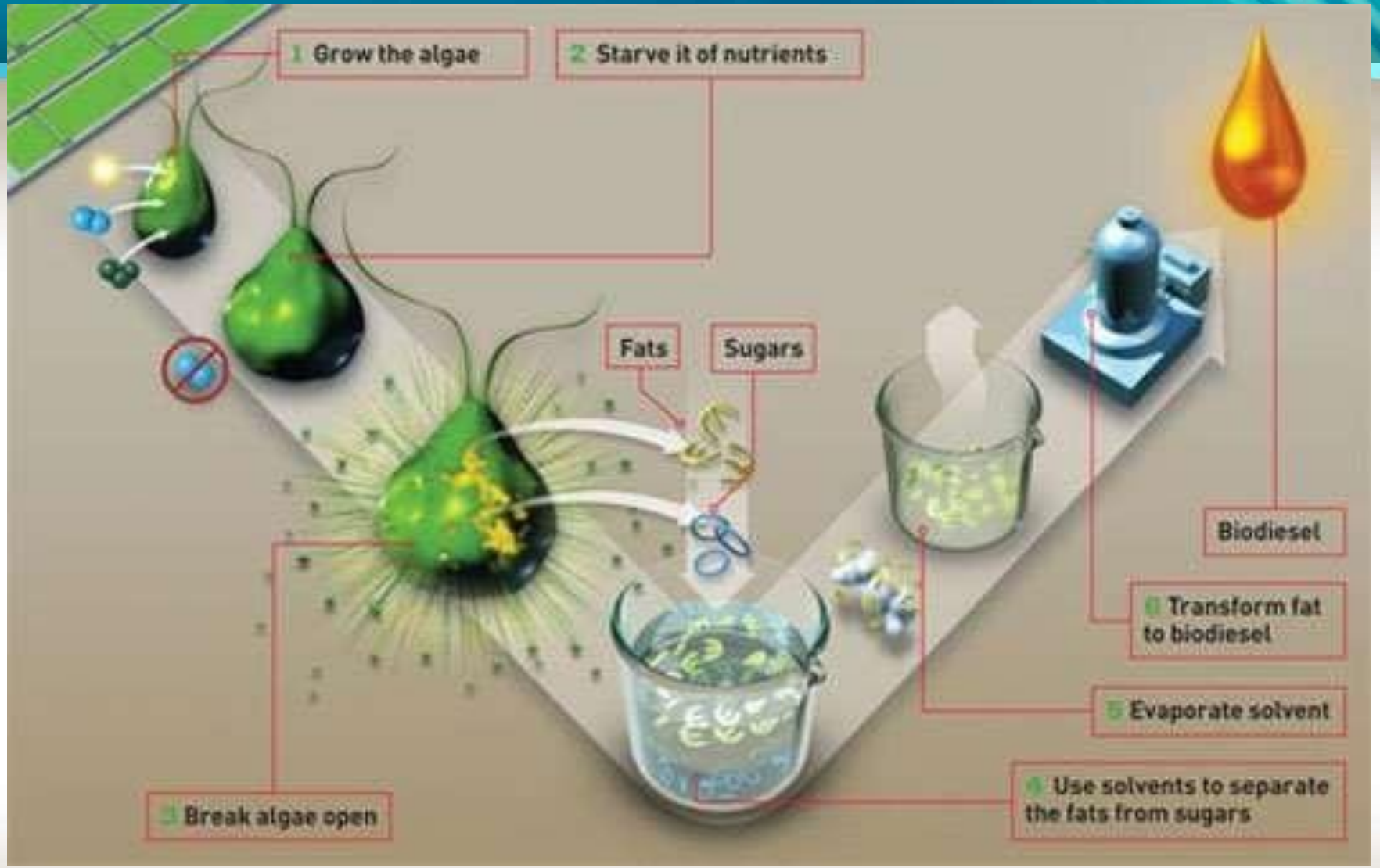


Tidal Energy

Biofuel

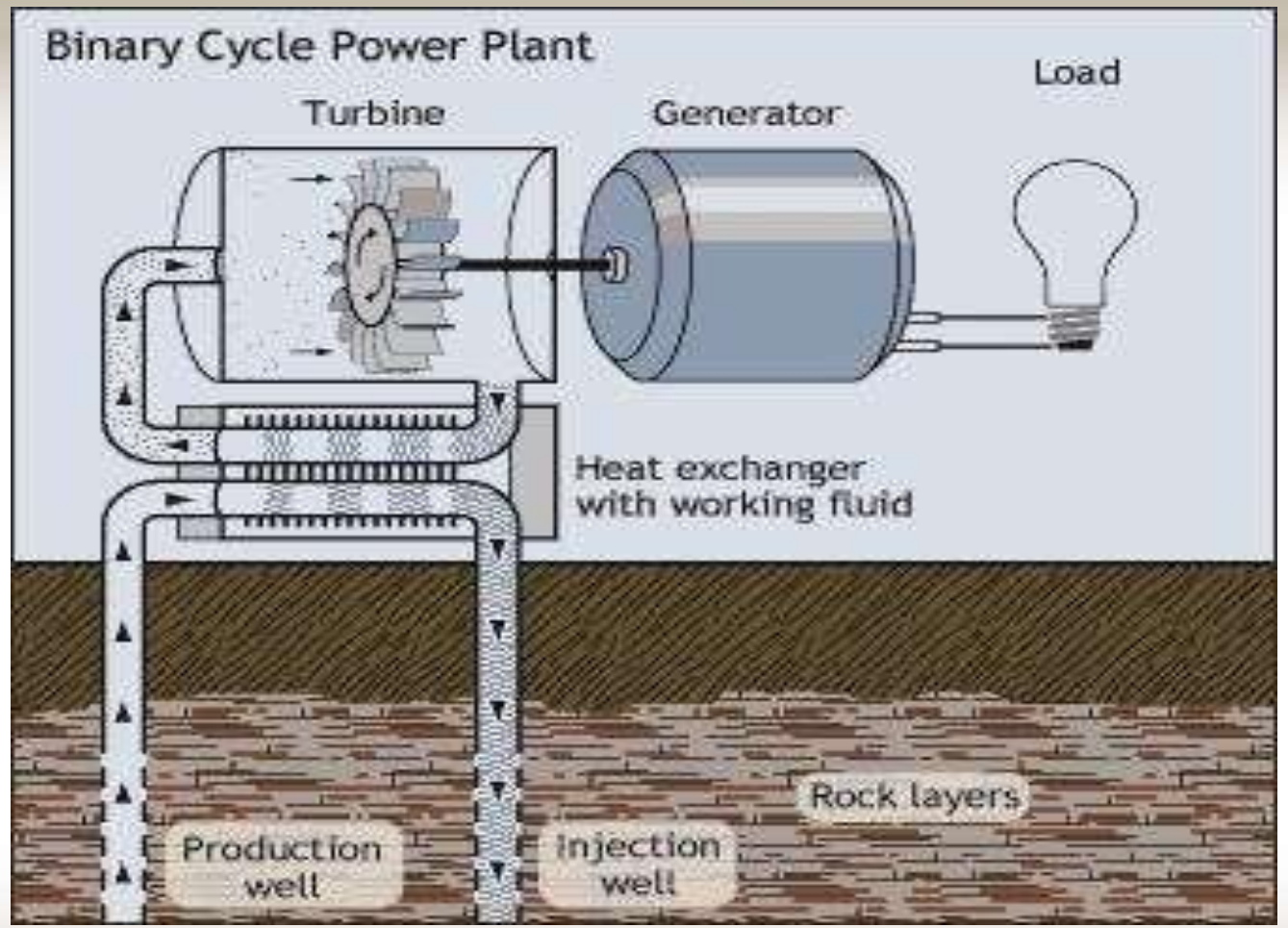
- Liquid biofuel is usually either bio alcohol such as bioethanol or an oil such as biodiesel. Bioethanol is an alcohol made by fermenting the sugar components of plant materials and it is made mostly from sugar and starch crops. With advanced technology being developed, cellulosic biomass, such as trees and grasses, are also used as feedstock for ethanol production. Ethanol can be used as a fuel for vehicles in its pure form, but it is usually used as a gasoline additive to increase octane and improve vehicle emissions.
- Biodiesel is made from vegetable oils, animal fats or recycled greases. Biodiesel can be used as a fuel for vehicles in its pure form, but it is usually used as a diesel additive to reduce levels of particulates, carbon monoxide, and hydrocarbons from diesel-powered vehicles. Biodiesel is produced from oils or fats using trans esterification.

Biofuel



Geothermal energy

- Geothermal energy is energy obtained by tapping the heat of the earth itself, both from kilometers deep into the Earth's crust in volcanically active locations of the globe or from shallow depths, as in geothermal heat pumps in most locations of the planet. It is expensive to build a power station but operating costs are low resulting in low energy costs for suitable sites. Ultimately, this energy derives from heat in the Earth's core.



Geothermal energy

- Three types of power plants are used to generate power from geothermal energy: dry steam, flash, and binary.
- Dry steam plants take steam out of fractures in the ground and use it to directly drive a turbine that spins a generator.
- Flash plants take hot water, usually at temperatures over 200 C, out of the ground, and allows it to boil as it rises to the surface then separates the steam phase in steam/water separators and then runs the steam through a turbine.
- In binary plants, the hot water flows through heat exchangers, boiling an organic fluid that spins the turbine. The condensed steam and remaining geothermal fluid from all three types of plants are injected back into the hot rock to pick up more heat.
- The geothermal energy from the core of the Earth is closer to the surface in some areas than in others. Where hot underground steam or water can be tapped and brought to the surface it may be used to generate electricity.

Advantages of renewable energy sources

- Renewable energy sources consist of solar, hydro, wind, geothermal, ocean and biomass. The most common advantage of each is that they are renewable and cannot be depleted.
- They are clean energy, as they don't pollute the air, and they don't contribute to global warming or greenhouse effects.
- Since their sources are natural the cost of operations is reduced and they also require less maintenance on their plants.

Disadvantages of Renewable energy sources

A common disadvantage to all is that it is difficult to produce the large quantities of electricity their counterpart the fossil fuels are able to. Since they are also new technologies, the cost of initiating them is high.

- wind : turbines are expensive. Wind doesn't blow all the time, so they have to be part of a larger plan.
- Solar :panels are expensive. Governments are not all willing to buy home generated electricity. Not all climates are suitable for solar panels.
- waves : different technologies are being tried around the world. Scientists are still waiting for the killer product.
- tides : barrages (dams) across river mouths are expensive to build and disrupt shipping. Smaller turbines are cheaper and easier to install.

Disadvantages of Renewable energy sources

- Rivers : Dams are expensive to build and disrupt the environment. They have also caused earthquakes.
- Geothermal : Difficult to drill two or three kilometers down into the earth.
- Biofuel : Often uses crop lands and crops (like corn) to produce the bio-alcohol. This means that more land has to be cleared to grow crops, or there is not enough food, or that food becomes more expensive.

Advantages of Renewable Energy

Renewable Energy	Non-renewable Energy
Continuous supply.	Limited supply.
Can be replenished within a short period time.	It takes a longer time (millions of years) to be replenished.
Most of the resources are fairly non-polluting and available locally.	Cause pollution and global warming.

Any questions?

THANK YOU ☺