

جامعة الانبار
كلية العلوم التطبيقية - هيت
قسم البيئة - المرحلة الرابعة

Renewable Energy

Tidal, Geo, and biomass Energies

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Other types of Non-conventional Renewable energies

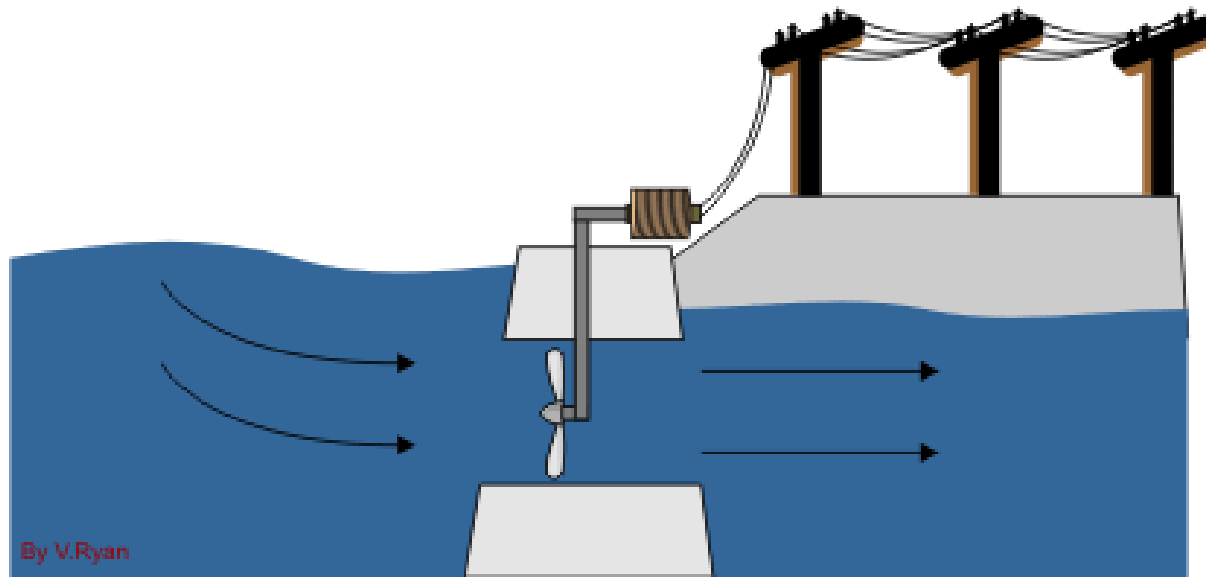
- 1. Tidal energy**
- 2. Geothermal**
- 3. Biomass energy**
- 4. Biofuels**
- 5. Wave Power**

Tidal energy

Tidal energy is the energy due to the water waves created in the ocean. The tidal energy is also called hydropower.

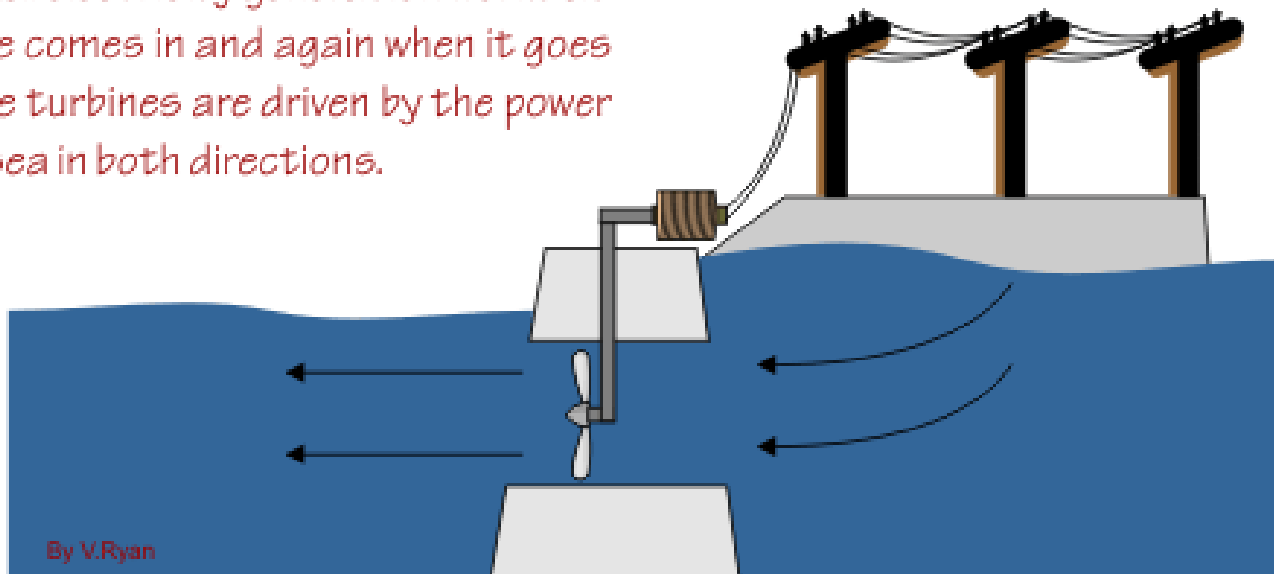


- It is a hydropower due to raise and fall of water wave in ocean. The raise and fall of water wave is due to the gravitational forces of the moon and sun as well as the revolution of the earth
- The raising and falling *waves* are used to *rotate the turbines* and hence the electricity is produced.



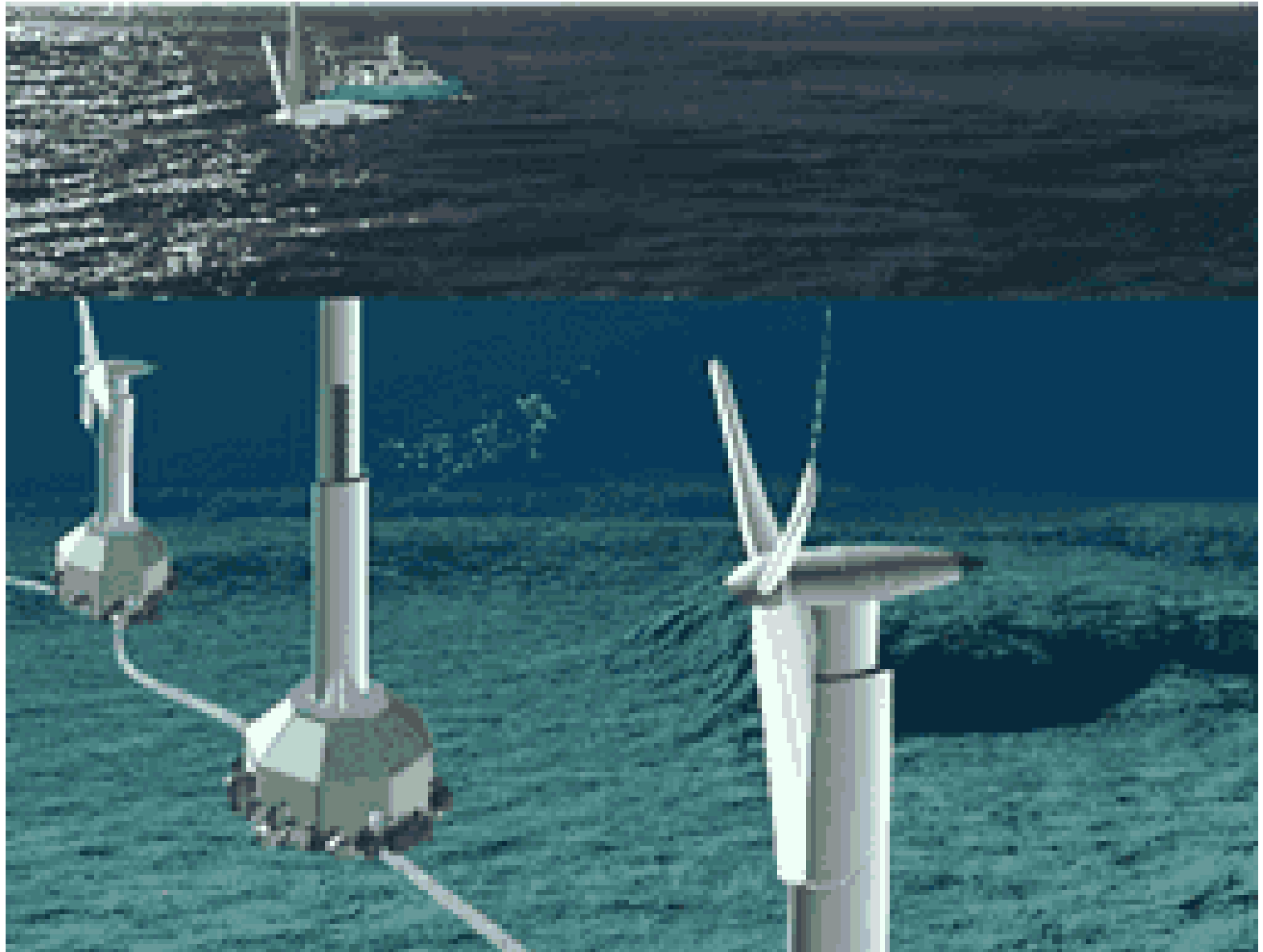
TIDE COMING IN

This tidal electricity generation works as the tide comes in and again when it goes out. The turbines are driven by the power of the sea in both directions.



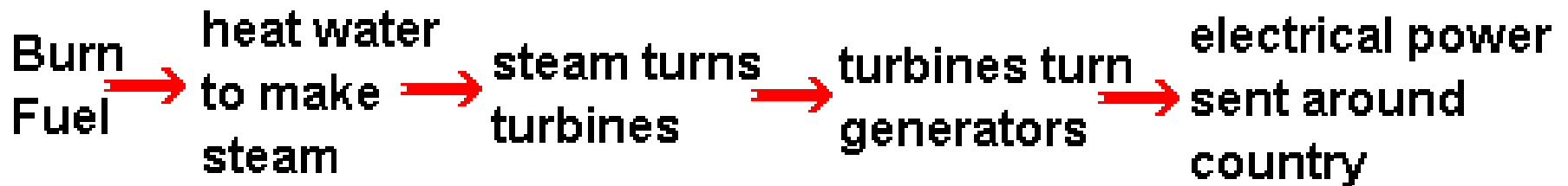
TIDE GOING OUT

Turbine rotation due to Tidal

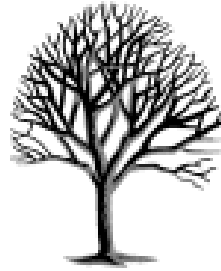


Biomass energy

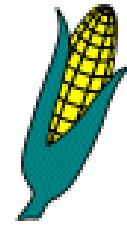
Biomass energy (or) bioenergy, is the energy stored in non-fossil organic materials such as wood, straw, vegetable oils and wastes from the forest, agricultural and industrial sectors.



Types of Biomass



Wood



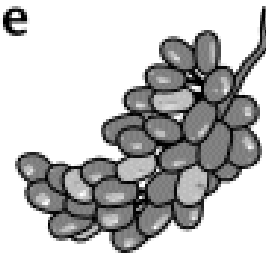
Crops



Garbage



Landfill Gas



Alcohol Fuels

Jatropha

- Biodiesel from Jatropha
- Seeds of the Jatropha nut is crushed and oil is extracted
- The oil is processed and refined to form bio-diesel.

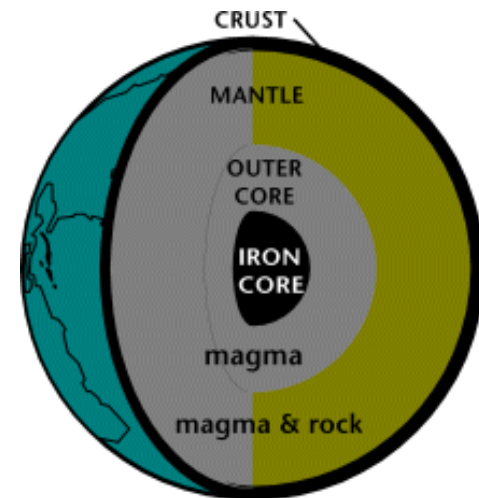
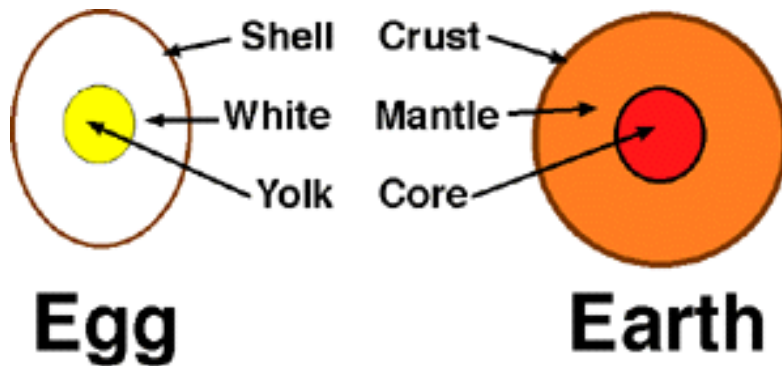


Geothermal energy

The word **geothermal** comes from the Greek words **geo** (earth) and **thermal** (heat). So, geothermal energy is heat from within the earth. We can use the steam and hot water produced inside the earth to heat buildings or generate electricity.



The earth can be compared with egg. The outer layer of the earth is called crust and the center layer is called Mantle and inner layer is called Core (Iron).



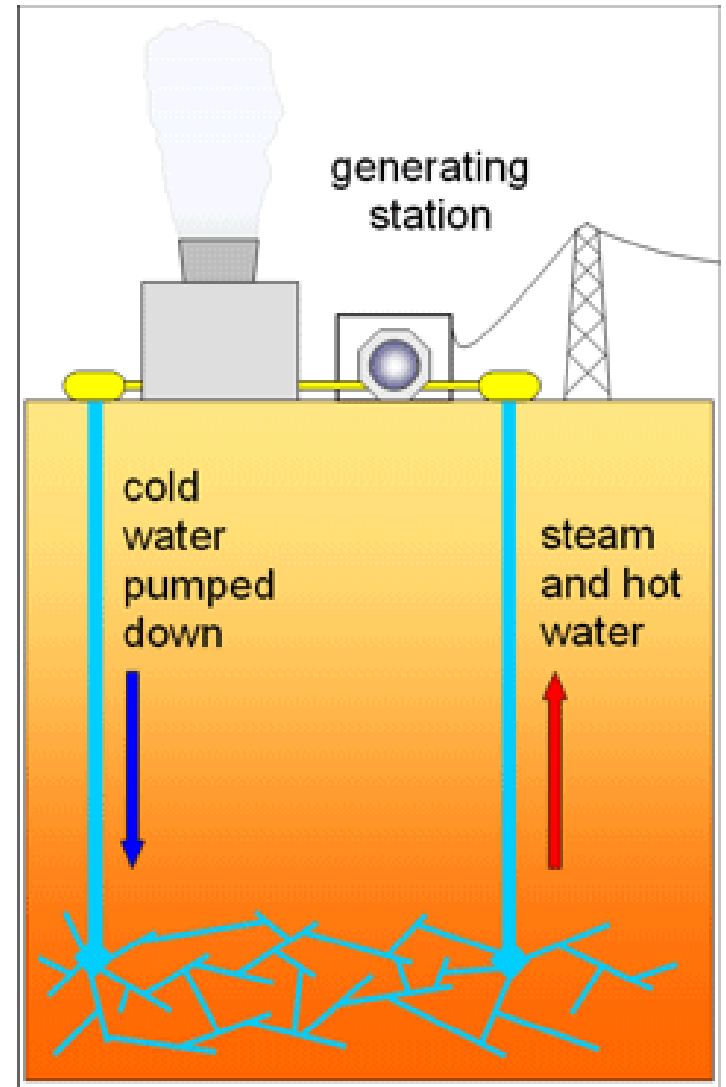
THE EARTH'S INTERIOR

- Below the crust of the earth, the top layer of the *mantle* is a *hot liquid rock* called magma.
- The crust of the earth floats on this liquid magma mantle.

- For every *100 meters* you go below ground, the temperature of the rock increases about 3 degrees Celsius.
- **Quiz:** How much depth in the ground where the temperature would be enough to boil water?
- in some depth the temperature reaches more than *148°C*.

- This is hotter than boiling water (100°C). It doesn't turn into steam because it is not in contact with the air.

- When this *hot water* comes up through a crack in the earth, we call it a hot spring and it is used to *rotate the turbines and the electricity is produced.*





- The most active *geothermal resources* are usually *found* along major tectonic plate boundaries where *earthquakes and volcanoes* are concentrated.
- Most of the geothermal activity in the world occurs in an area called the ***Ring of Fire***.

BIOFUEL

1. Plants use [photosynthesis](#) to grow and produce [biomass](#). Also known as biomatter, biomass can be used directly as fuel or to produce liquid [biofuel](#).
2. Agriculturally produced biomass fuels, such as [biodiesel](#), [ethanol](#) and [bagasse](#) (often a by-product of [sugar cane](#) cultivation) can be burned in [internal combustion engines](#) or [boilers](#).
3. Typically biofuel is burned to release its stored chemical energy. Research into more efficient methods of converting biofuels and other fuels into electricity utilizing fuel cells is an area of very active work.

LIQUID BIOFUEL



- Liquid biofuel is usually either a bio alcohol such as [ethanol fuel](#) or a bio-oil such as [biodiesel](#) and [straight vegetable oil](#).
- Biodiesel can be used in modern diesel vehicles with little or no modification to the engine and can be made from waste and virgin vegetable and animal oil and fats ([lipids](#)).

LIQUID BIOFUEL

Virgin vegetable oils can be used in modified diesel engines. In fact the Diesel engine was originally designed to run on vegetable oil rather than fossil fuel. A major benefit of biodiesel is lower emissions. The use of biodiesel reduces emission of carbon monoxide and other hydrocarbons by 20 to 40%.