Kurdistan regional government

Kurdistan Engineers Union

Electric Power Plants

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The purpose of writing the report is to change the title of the engineering rank from licensed to consultant.

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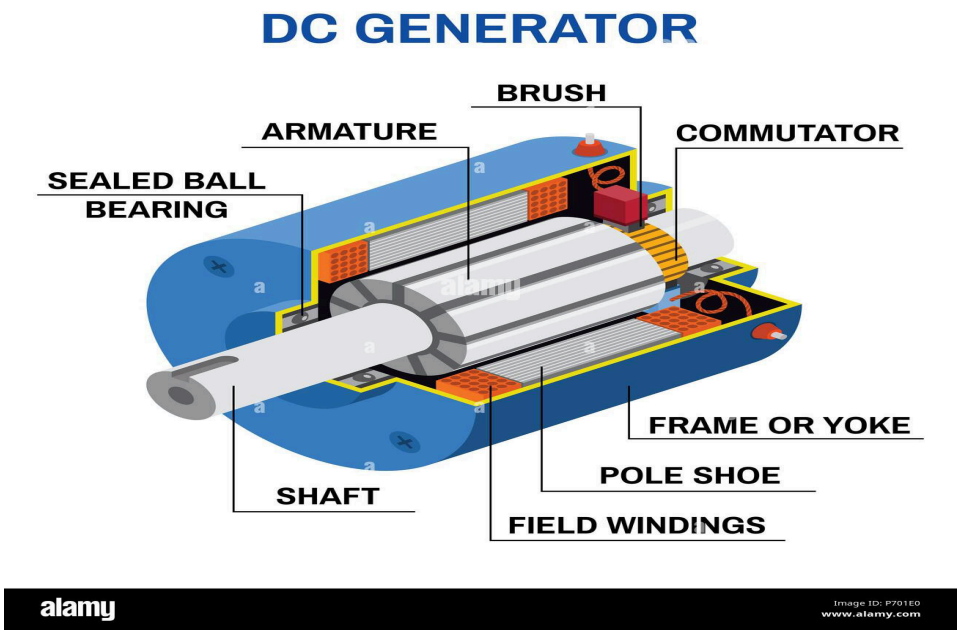
Electric Power Plants

Definition of Power Plant :

A power generation station is a facility that produces electrical energy, where the energy (thermal, water, or wind...) used in the station is converted into movement energy to operate the electric generator, which is the main element that all the elements of the station operate in order to operate it .

Definition of generator :



An electric generator is a mechanical device that converts kinetic energy into electrical energy in the presence of a magnetic field. The electric generator works on the principle of electromagnetic induction, which is the basis for generating induction current. The industry of electric generators has developed a lot in terms of producing rectified induction current to a very high degree, and the electric generator directs the electric current to flow through an external electrical circuit, and the sources of the electric generator are many, including what is a reciprocating engine, including turbines that use steam engines in their work, or by The way water falls into turbines, which is known as hydropower, internal combustion engines, wind turbines, hand elbows, compressed air, or any other source of mechanical energy. Electric generators feed almost all electrical networks.

Types of electric power plants :

The most important power plants are divided into :

١. Hydropower station .

٢. Thermal power station .

٣. A solar power station .

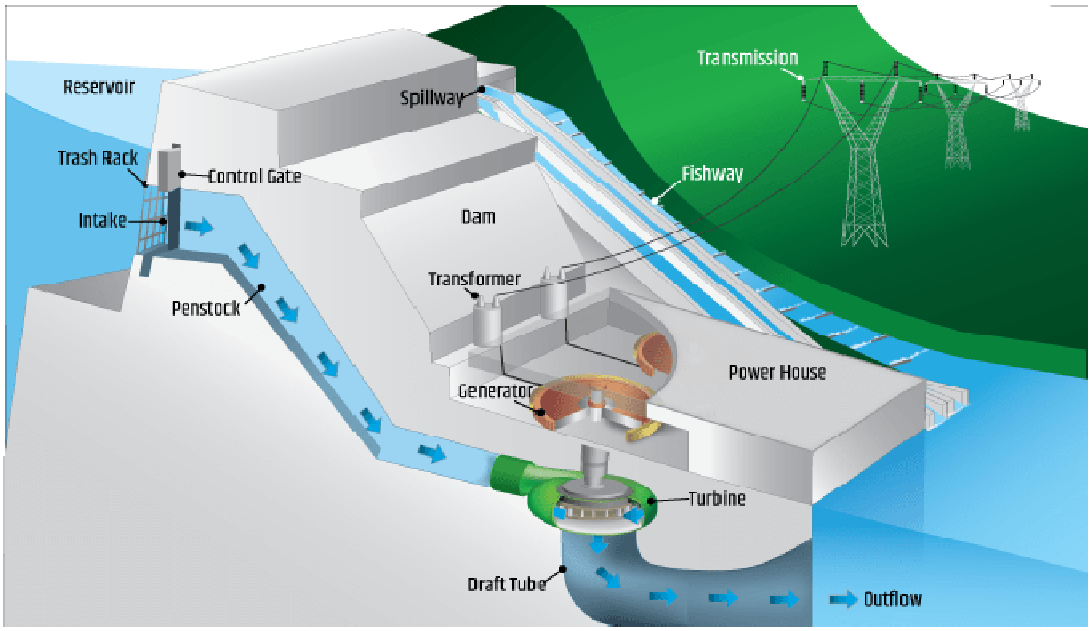
٤. Wind power station .

٥. Sea waves power station .

٦. Nuclear station .

١. Hydropower station :

In this station, the potential energy stored by the water in high areas, such as the tops of dams and waterfalls, is converted into kinetic energy to drive a water turbine, which in turn runs the electric generator , as shown in the image below :



The hydropower plant generally consists of the following main parts :

١. Waterfalls :

It is a large pipe or more that is at the bottom of the dam or from the top of the waterfall to the entrance of the turbine and flows into the water very quickly. There is a (gate valve) at the beginning and another at the end to control the amount of water that rotate the turbine . It should be noted that the dams, control gates and water channels connected to the inclined pipes differ according to the amount of water and its locations .

٢. Turbine :

The turbine and generator are usually in one place mounted on one vertical axis. The generator is installed above the turbine. And when the gate opens at the bottom of the inclined pipes, the water flows very quickly into the concave cavities, so it rotates quickly and drives the rotating member in the generator with it, where the electrical energy is generated on the edges of this generator .

٣. The intake :

After the flowing water works in rotating the turbine, it must be pulled out quickly and easily so as not to hinder the rotation. So to shape tubes are placed to pull out the necessary speed .

٤. Auxiliary equipment and machinery.

٥. Hydropower plants need many auxiliary machines, such as pumps, gates, switches, rotational speed regulating equipment, and others .

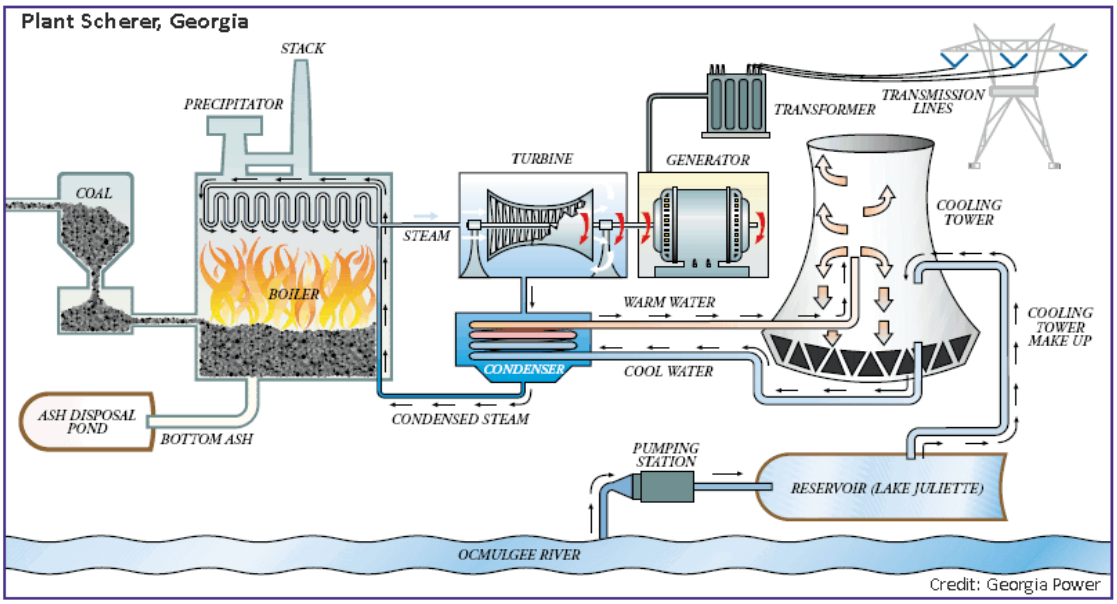
٢. Thermal power station :

It is the one in which thermal energy is converted - which often results from the combustion of fuel - into rotational kinetic energy to generate electricity, and this type of station is prevalent in the world .

Thermal stations are divided into :

a. Steam plants: using a steam turbine .
b. Internal combustion plants: gas turbines are used .
c. Nuclear reactor plants: Nuclear fuel uses uranium .
d. Geothermal plants: Geothermal energy is used .
e. Waste stations: Industrial waste is used as fuel .

In the picture below, a layout of one of the thermal stations, which uses coal (charbon) to heat water.



٣. Solar power station :

Solar cells are used to convert sunlight directly into electricity, and this method may need to convert the current into alternating current to transmit it to the consumer, but it is characterized by the absence of intermediate mechanical parts to convert energy.

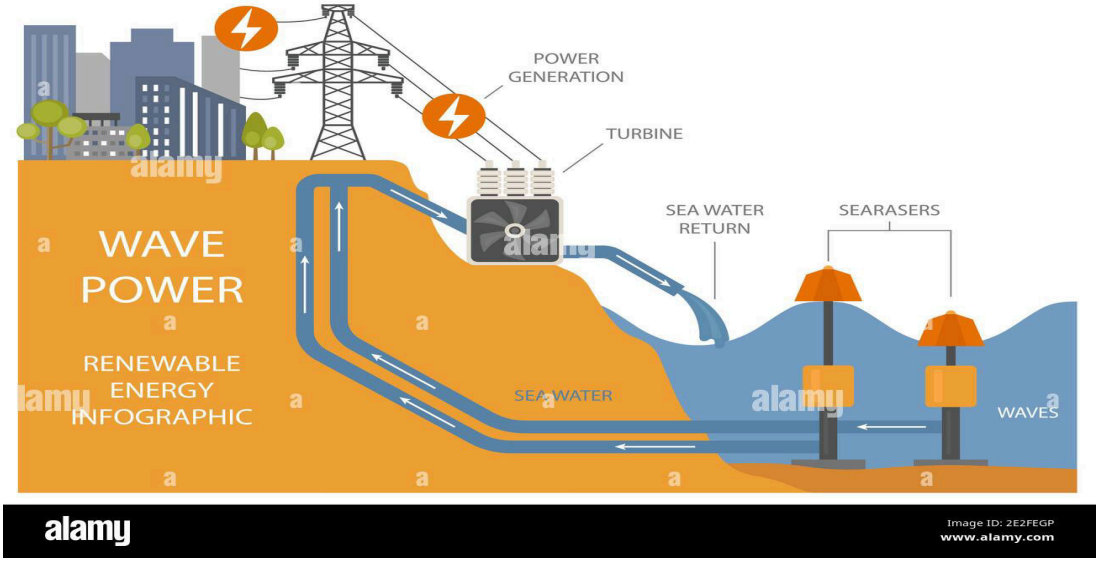
There are other types of solar power plants, such as collecting sunlight to heat water and then exploiting the same idea as thermal plants to rotate the electric generator.

There are stations in the central tower that use mirrors to collect sunlight and heat the air, which in turn rises to the top in a tower that contains electric generators that rely on this hot air to rotate and can store this heat in a substance such as sodium to be used to generate energy in the absence of the sun .

٤. Wind power station :

Wind energy can be used in areas that enjoy fast and strong winds to rotate windmills, which in turn are used to generate electric power. This energy is distinguished by being completely clean and does not result in any pollution, but its disadvantage is that it needs large areas and that the places for exploiting wind energy are limited and far away .

٥. Sea waves power station :



To generate electricity, wave power plants extract the kinetic energy of sea and ocean water and use it to rotate a turbine .

Winds and pressure fluctuations under the surface of the water are the main factors in the emergence of waves , but the intensity of these waves changes from one area to another of the water bodies, In some places of the oceans the waves are regular and have great energy .

Research is being conducted in order to develop these stations, and scientists have estimated the energy that can be generated from the waves at two million megawatts, which is more than twice the energy currently generated in the world .

These stations are considered one of the types of renewable energy generation stations, and they are zero-emissions, and they are completely different from tidal energy .

This renewable technology also differs from wind renewable technologies, mainly because the water density is (٨٠٠) times more than the air density, which makes the wave energy density several times more than the wind energy density .

These stations are usually classified according to the method used in extracting wave energy, and they can also be classified according to the place of placement or according to the method of connection with the network , as the systems installed offshore are suitable for deep waters with depths exceeding (٤٠) meters .

Wave power plants share that the moving part of them must be close to the surface of the water “near the waves”.

There are many such stations, including :

١. Wave suppression device :

It is installed perpendicular to the path of the waves and absorbs wave energy. These devices are suitable for beach use or in places close to the beach. Models of these devices have recently been developed that are able to float to suit the installation far from the beach “ installation in a sea ” .

٢. Oscillating Water Column Devices :

It is similar to a wave dampening device, in which water enters through an opening under the surface of the water into a chamber containing air, and as a result of the movement of waves, the water level rises or it goes down inside the room as if it were a carpet that forces the air to move through an opening connected to a turbine so that the air circulates it and generates electricity .

٣. Point Absorber Devices :

The farms of these devices are similar to the farms of wheat ears, which move with air blowing on them back and forth. They consist of a floating head attached to a stem. This head connects to hydraulic pistons located in the last part, which is the root, which contains openings for sea water to enter. When the head moves, the stem moves with it. He, in turn, moves the pistons that pump sea water from the hole through pipes to the shore and then to a turbine installed on the beach .

٤. Sea Snakes “Attenuators” Or “Pelamis” :

They are long, multi-cylinder floating structures connected to each other by joints connected to hydraulic pumps. These devices are placed in parallel with the movement of the waves. The difference in wave length along the device causes bends in the contact areas of these cylinders “joints”, which in turn lead to the work of the hydraulic pumps. .

Each of these devices contains three Walid units that give a total capacity of (٧٥٠) kilowatts .

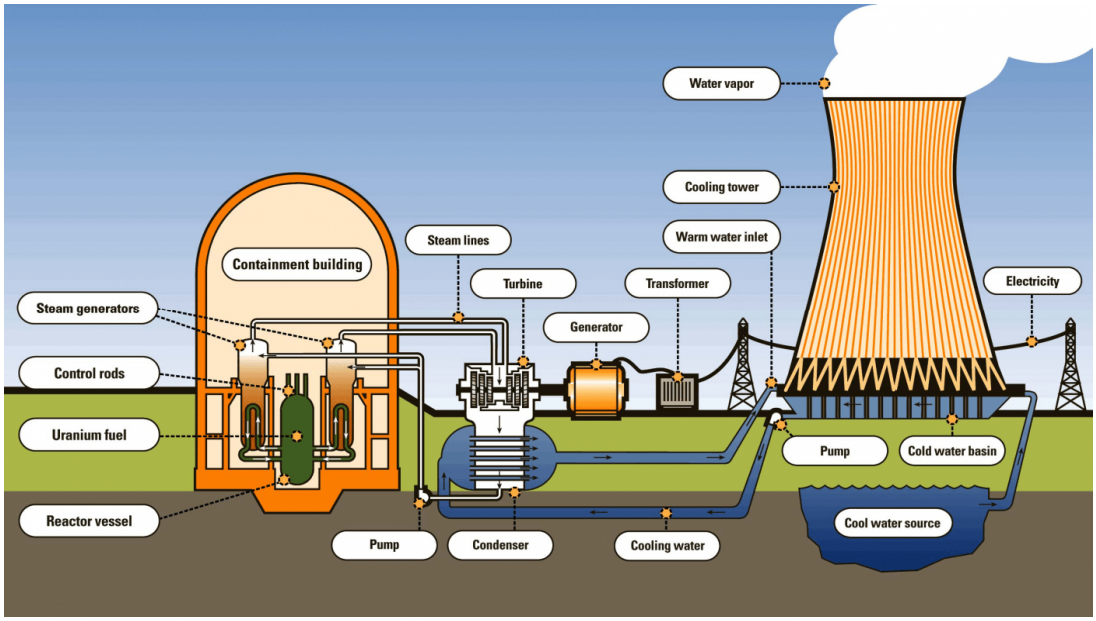
٥. Overtopping Devices :

It contains a reservoir that is filled by incoming waves, so that its water reaches a level higher than the average level of ocean water. After the water level rises in this reservoir, the water returns due to gravity to the ocean through openings containing water turbines .

These devices are installed on the beaches, and there are modern devices called marine vessels that are installed in the open sea .

٦. Nuclear station :

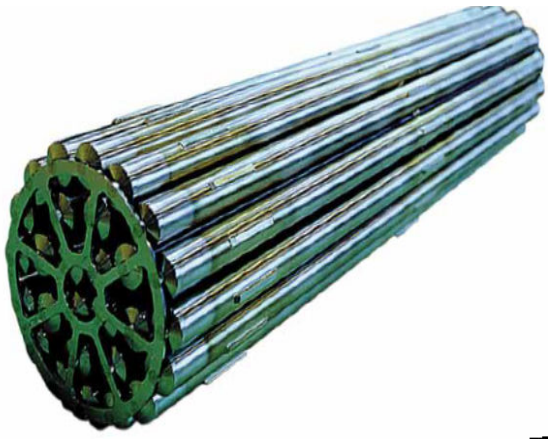
Nuclear energy is the energy that is generated in the reactions of fission or fusion of atoms such as uranium and plutonium atoms .



The nuclear plant is an industrial site for the production of heat through the nuclear fission of atomic nuclei, in order to use it to produce electricity, and this use is the main one in the field of using civil nuclear energy.

The nuclear plant consists of one or several nuclear reactors whose power ranges from a few to thousands of megawatts (١٥٠٠) megawatts in some reactors .

In (٢٠٠٩) , the number of energy-producing reactors was estimated at (٤٣٩) in (٣١) countries, producing approximately (١٤٪) of the world's electric power .



A (٥٠) cm nuclear fuel package needed will provide enough electricity to power (١٠٠) homes for one year , and a simple nuclear fuel pellet can power the average household for six weeks .

This type of plant uses uranium to produce heat, which is then used to convert water into steam , (٩٢) elements that make up the Earth. Uranium is one of them that contains the largest atoms, and therefore it is in its essence that it has more than one chance of splitting .

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