

Chapter 1: Overview

1.Introduction

At home, when we switch on a lamp, we use electricity. This electricity comes from a power plant. What are the different types of power plants? How does each one work? Which energy sources are used?

2.Power plant

A **power plant** is intended for [electricity generation](#). Power plants supply electricity, via the [power grid](#), to [consumers](#), whether private individuals or industrial users, located far from the plant.

3. Electricity generation

Electricity generation is carried out by converting into electrical energy a [primary energy](#) which can be: mechanical, chemical, nuclear or solar.

4. Types of electricity generation

There are two ways of classifying electricity generation:

a/ According to the primary energy

To supply power plants, there are 2 kinds of energy. Among them are renewable energies (these include the truly renewable energies such as biomass and those that are virtually inexhaustible such as solar, hydraulic or wind energy)

and those that are non-renewable resources whose availability is limited in time (fossil fuels or nuclear).

-Fossil fuels: these are still today the most widely used primary energies in the world for electricity generation. They are mainly coal, fuel oil and natural gas, which are burned either in boilers or in combustion turbines (gas turbines).

-Other fuels: biomass or waste (household refuse) can also be burned in specific boilers to produce electricity.

-Nuclear energy: the heat used to generate steam is produced by the fission of uranium.

-Solar energy: it is used either in solar boilers producing steam to drive a turbine, or in plants made up of a multitude of photovoltaic panels

-Hydraulic energy: in hydroelectric plants, it is either the force of river currents (run-of-river plants), or that of falling water (dams, penstocks) that is used to drive the turbine powering the alternator.

-Wind energy : the force of the wind can also drive an alternator to produce electricity.

b/ According to the technology

Electricity is mainly produced by converting mechanical energy by means of [alternators](#), using several turbine technologies, including:

-hydraulic turbine

- wind turbine

-steam turbine or gas turbine

- Chemical energy (oil, gas, wood, waste...)

- Nuclear energy

5. The alternator

- Converts mechanical energy into electricity.

- Used in all power plants, whatever the energy source used.

Alternator = rotor rotating inside a stator

(Fig 1, 2)

6. The transformer

Before being fed into the power grid, the voltage generated by the alternator is adapted by a transformer.

(Fig 3)

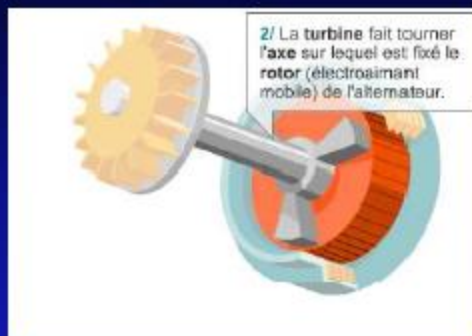


Exemple d'alternateur de forte puissance
1300 MW - 1500 t/min - 50 Hz triphasé

(Fig 1)

Example of a high-power alternator: 1300 MW – 1500 rpm – 50 Hz three-phase

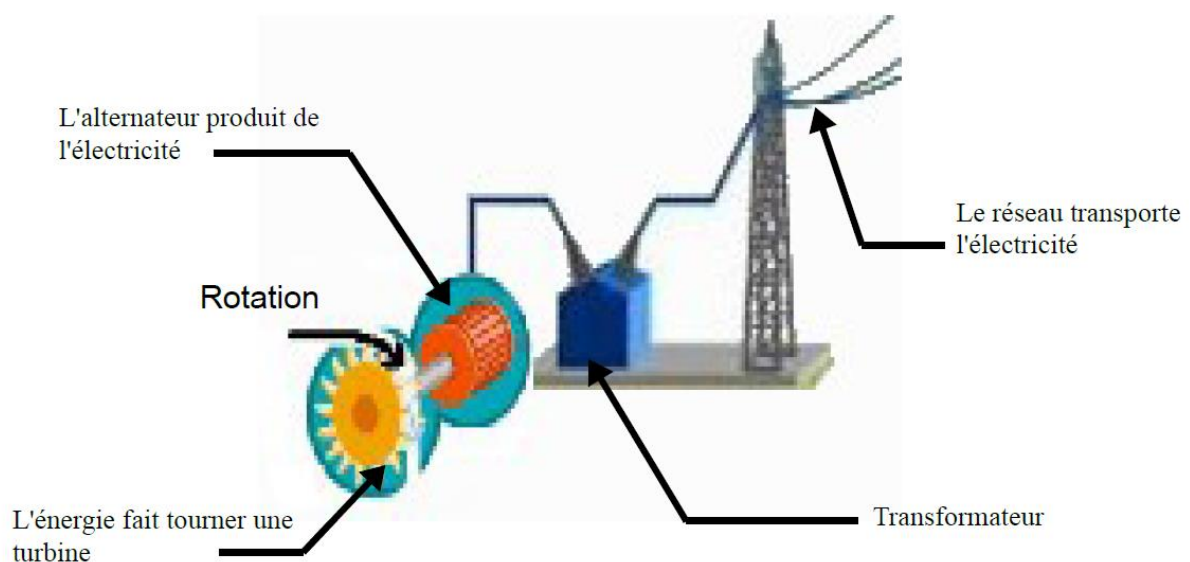
Le couple turboalternateur



A power plant is the starting point of our electricity consumption. There are many different kinds of power plants:

- Nuclear power plants,
- Hydroelectric power plants,
- Flame thermal power plants,
- Flameless thermal power plants,
- Wind turbines,
- Photovoltaic plants,

7. How power plants work



Steam or water sets the turbine in rotation

The wind sets the propeller, made up of 3 blades, in rotation

The turbine, once rotating, turns the generator shaft

The alternator (rotor + stator) generates the electric current.

The stator consists of a fixed coil

The rotor, made up of magnets, is set in rotation by the turbine

7. The different percentages of electricity generation

- The main electricity generation figures are:

- thermal power plants:

- flame (62.5% of world production)

- nuclear (17.5% of world production)

- renewable energies: hydroelectric, solar, geothermal, wind, tidal... (20% of world production)