Energy and its transformation.

Energy sources — We can classify them according to their availability: **renewable** or **non-renewable**; origin: **primary** or **secondary**; use in each country: **conventional** or **non-conventional**; environmental impact: **clean** or **polluting**.

1 Energy sources

The energy we consume has many different uses:

- **Household uses:** operating household appliances, heating systems, means of transport, etc.
- **Industrial uses:** the operation of factories and businesses, construction, agriculture, etc.

Energy sources are natural resources from which different forms of energy are obtained.

We can classify energy sources in several ways:

- **by availability in nature:** renewable or non-renewable
- **by origin:** primary or secondary
- **by use:** conventional or non-conventional
- **by environmental impact:** clean or polluting.

Electrical energy

- Generated at electrical power plants, which use a **turbine-alternator system**
- Transported by the **high voltage grid**

1.1. Electricity

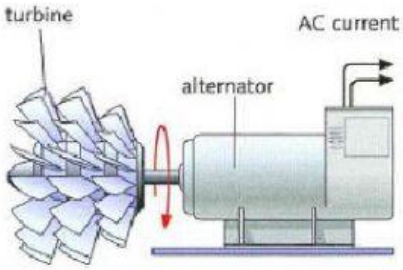
Electricity is the most widely used form of energy in industrialised societies for two reasons:

- its capacity to be easily transformed into other forms of energy
- the possibility of transporting it long distances at a low cost.

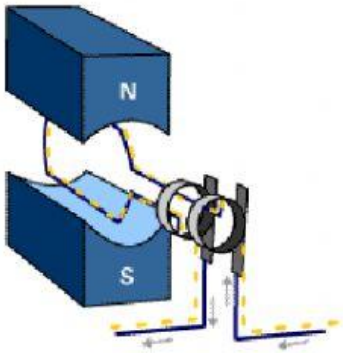
Electric power plants

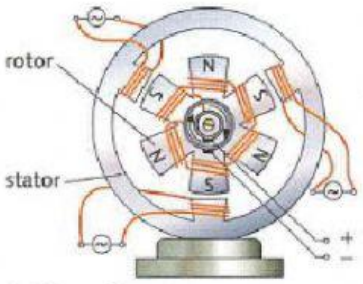
Electrical power plants use an external source of energy to produce electricity. To do this, they rely on a **turbine-alternator system**.

- The **turbine** converts mechanical energy into the rotating movement of a shaft.
- The **alternator** is connected to the turbine shaft. As the shaft moves, it produces **alternating electrical current.**

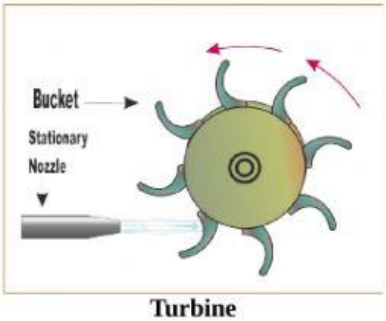


Turbine-alternator system

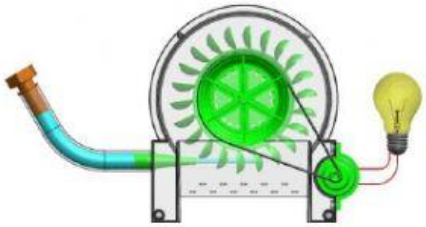


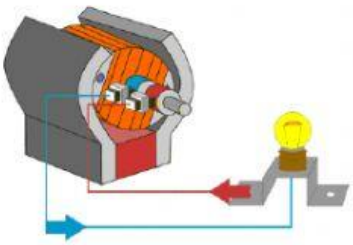


Inside an alternator

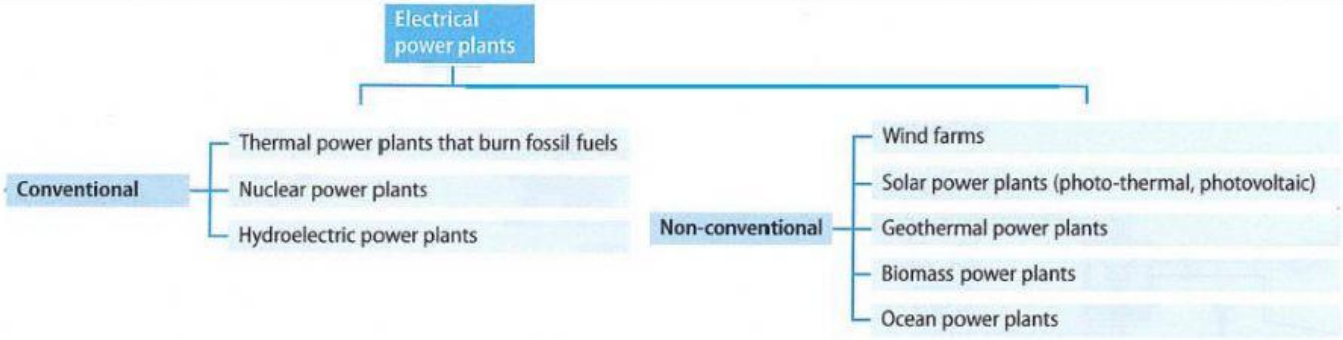


Turbine





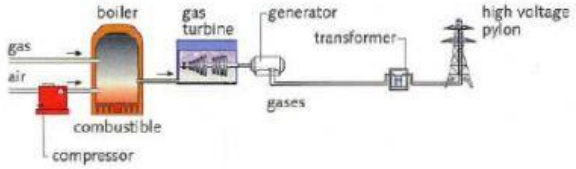
Once electricity is generated, it must be transported to towns, cities or industrial parks.



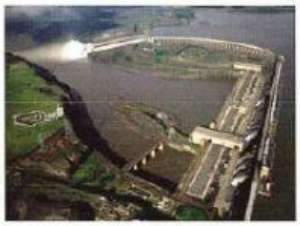
Conventional power plants

- In **thermal power plants,** water is heated in a boiler by the heat generated from the combustion of a fossil fuel (natural gas, coal or petroleum).

  The steam that is generated moves the turbine connected to the generator.



- **Nuclear power plants** use a nuclear fission reactor that produces heat to generate the pressurised steam needed to move the turbine rotor.
- **Hydroelectric power plants** use the potential energy provided by the height of the water stored in a dam, converting it into kinetic energy. This energy moves the blades of the turbine. There are two types: **gravity** and **pump.**

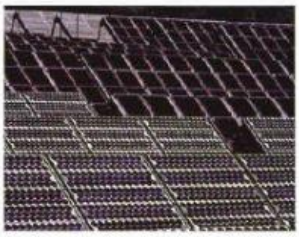


Hydroelectric power plant

Non-conventional power plants

The environmental problems caused by conventional power plants have led to the creation and development of **non-conventional** or **alternative** energy power plants.

- Wind **farms** use the **kinetic energy** of the wind to move the blades of a rotor at the top of a tower; this is referred to as a **wind turbine.**
- **Solar power plants** use the Sun's energy. There are two types: **photo-thermal power plants** are thermal power plants in which steam is produced by solar radiation, while **photovoltaic power plants** transform solar radiation directly into electricity, using panels of **photovoltaic cells.**
- **Biomass** consists of all organic compounds that are produced through natural processes. **Biomass thermal power plants** are thermal power plants that use **biomass** as fuel.
- **Geothermal power plants** use the heat found at deep layers in the Earth, while **ocean power plants** use the energy from the oceans and seas: tides, waves or **thermal gradient.**



Photovoltaic panels

Wind turbines at a wind farm

1. Select the corresponding boxes.

Energy source	Capacity for regeneration		Current importance		Environmental impact	
	Renewable	Non-renewable	Conventional	Non-conventional	Clean	Polluting
Hydraulic						
Geothermal						
Nuclear						
Wind power						
Solar						
Petroleum						
Coal						
Natural gas						
Biomass						
Tidal power						

T P
H P L
E O A
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L

(/taidol/ **energía de las mareas**)

2. **Listen to** the four **descriptions** of different types of **energy sources** and **decide** which **description** relates to which **source**. *(Drag and drop)* You can find below the disordered transcripts of the audios.

- **We can use** these energy **sources** in their **natural form** or **transform** them into **secondary sources**.
- These **sources are** not necessarily **abundant** *(abundantes)* and **are depleted** *(se agotan)* when **we use** them **up**.
- These **are alternative sources** and in general they'**re** still in the early *(primeras)* stages *(etapas)* of **development**.
- This type of energy **source doesn't produce harmful** *(nocivos)* **byproducts** *(subproductos)*.

1st	2nd	3th	4th
conventional	renewable	secondary	clean

3. **Copy and complete the sentences with the correct verbs:** ***found, formed, extracted, classified, produced.***

a) **Energy sources are** _____ into two groups **-renewable** and **non- renewable**.
b) **Nuclear energy is** _____ from the **nuclear reaction** of certain **atoms**.
c) **Coal was** _____ from the remain of **plants**.
d) **Petroleum is** _____ from **oil fields** deep **underground**.
e) **Natural gas is** _____ in underground **gas fields** and in **porous rocks**.

4. **Listen** and **complete**.

a) **Petroleum** and its **derivatives provide** _____ of the **energy** we use in **Spain**.
b) In 2.009, _____ % of our energy **consumption came** from **petroleum**.
c) This **was** _____ % less than in 2.008.
d) **Spain consumed** _____ millions tons of **petroleum** in 2.009.
e) **Spain produced** _____ thousands tons of **petroleum** in 2.008.
f) Most of the **petrol is imported** and **processed** in the _____ **refineries** in **Spain**,

5. **Listen** and **fill in** the gaps.

Electrical _____ ***can be produced*** *from* ***solar energy*** *in* ***heliostat fields*** *or by* ***using*** _____ ***panels***. ***Heliostat fields consist of mirrors*** *that* ***reflect*** *the* _____ ***rays*** *into a* ***collector tank*** *of water. When the* ***water is*** _____, *it* ***turns*** *into* _____, *which* ***moves*** *the* _____ *in a* _____ *that produces* ***electricity***. ***Solar panels contain photoelectric cells***, *which* ***transform*** *light* ***into*** _____. *This method of producing* ***energy is called photovoltaics***.

6. **Listen** and **fill in** the gaps.

In _____, *the world average consumption of* ***electric*** _____ ***was*** *297* ***watts*** *per* ***person***. *But if we* ***look at*** *consumption by* ***continent***, *we* ***can see*** *some very* ***big differences***. *The* ***continent*** *nearest to the average* ***are Asia*** *and* ***South America***, *with average* ***consumption*** *of just over 200* _____ *per* ***person***. ***Africa has*** *the lowest* ***consumption***, *about 100* ***watts*** *per* ***person***, *and* ***North America*** *the highest, nearly* _____ ***watts***. ***Oceania's*** _____ ***was*** *also high, over* _____ ***watts***. *But* ***Europe's*** *consumption* ***was*** *quite a bit lower, at about* _____ ***watts***.