PRODUCTION, TRANSPORT AND STORAGE OF ELECTRICAL ENERGY

Energy

Electrical energy

IS

The most in-demand type of energy used in the industrialised world.

WE DEPEND ON IT FOR

- Transport, communications, food and keeping offices, factories and all sorts of facilities running.
- Well-being and quality of life in our homes.

IS MADE FROM

Both renewable and non-renewable energies, in different types of power stations.

CANNOT BE STORED

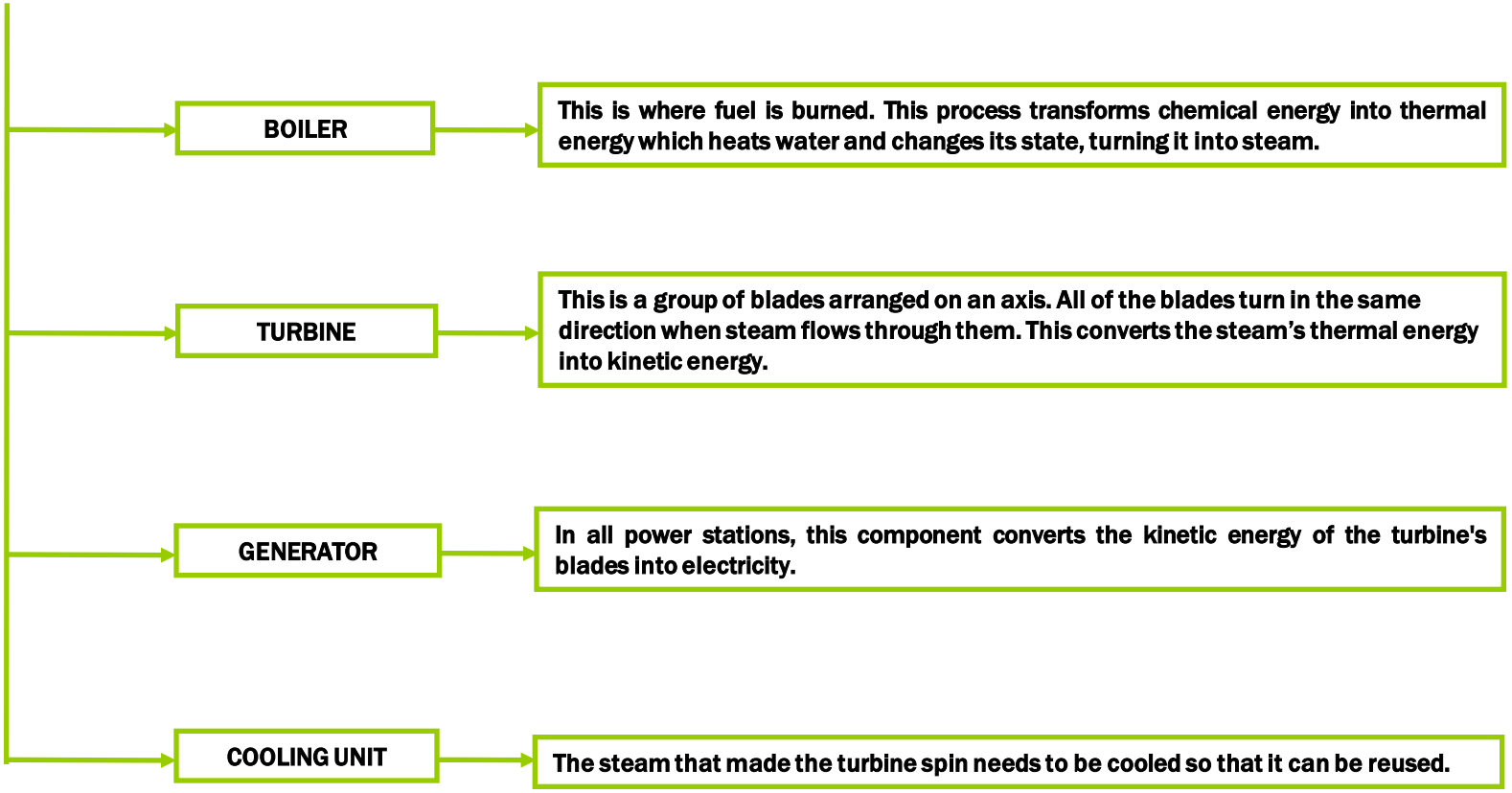
Unlike coal and oil, electrical energy cannot be stored. This creates the need for a large and complex network which delivers generated energy to consumers and is able to supply electricity during periods of high demand.

HAS DRAWBACKS

Even though electrical energy is clean, its production has negative consequences for the environment.

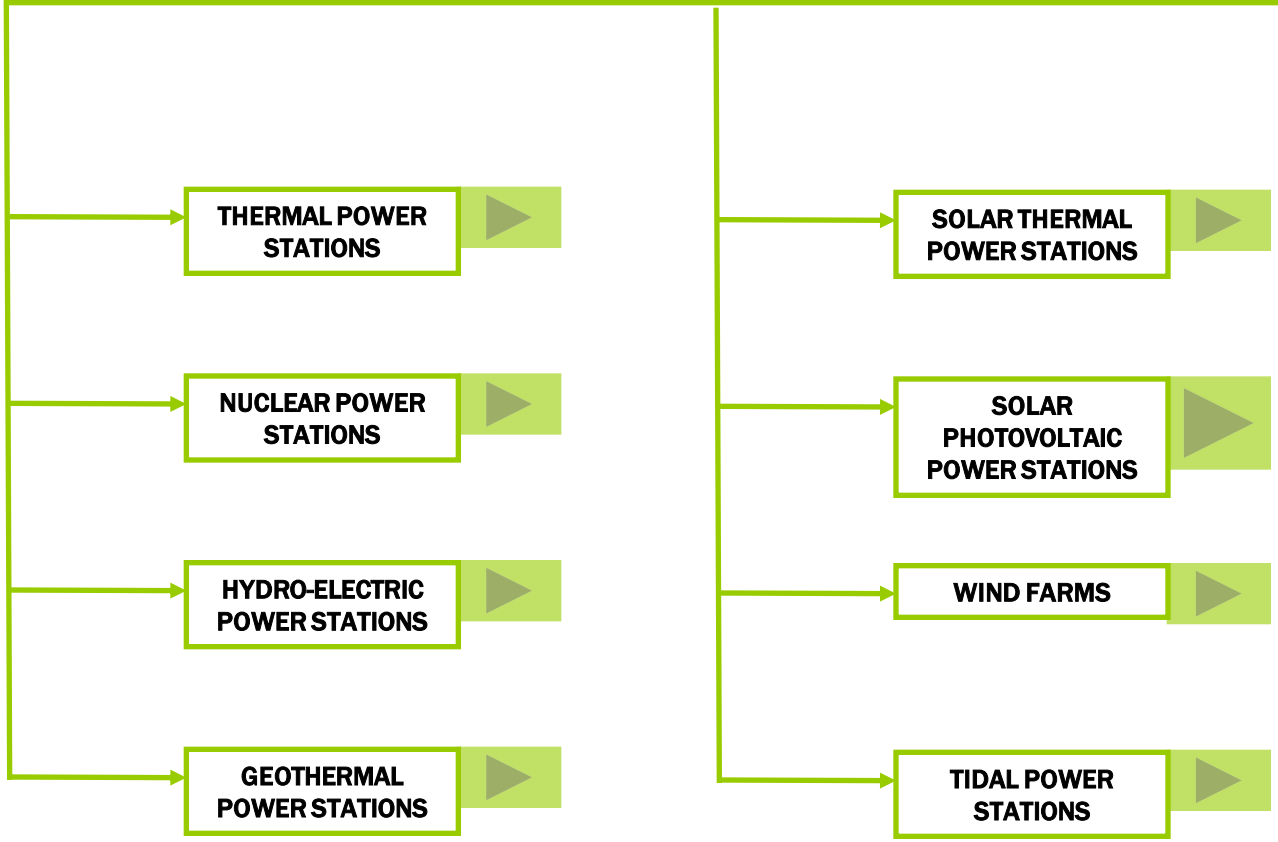
Energy

Primary energy sources (both renewable and non-renewable) are used to produce electricity in power stations, which usually share a similar structure made up of:



Energy

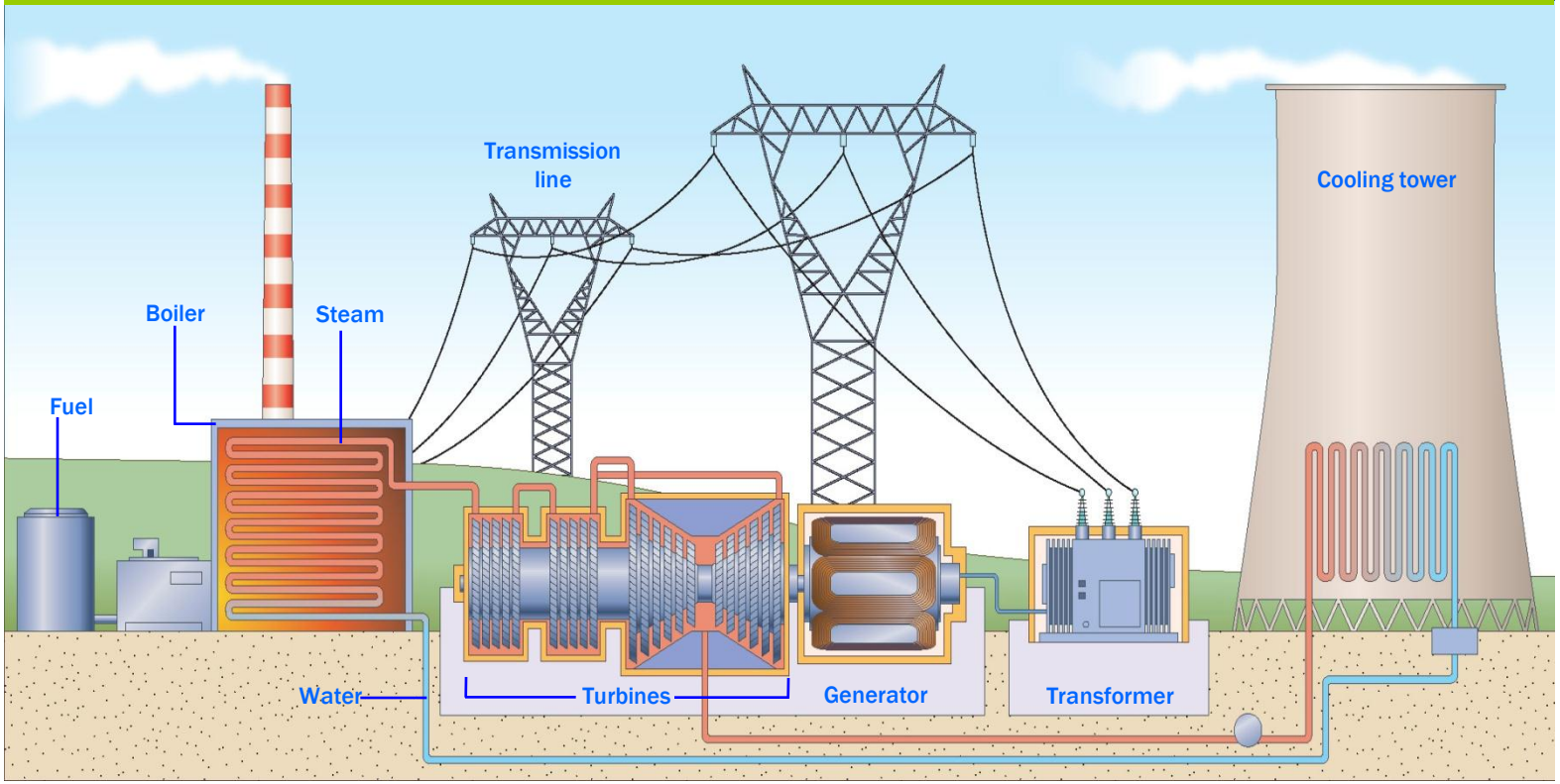
What are these different types of electrical power stations like?



Energy

Thermal power stations generally use fossil fuels (which are non-renewable) as primary energy. Besides their use of non-renewable sources of energy, another drawback to thermal power stations is that they release harmful gases into the atmosphere.

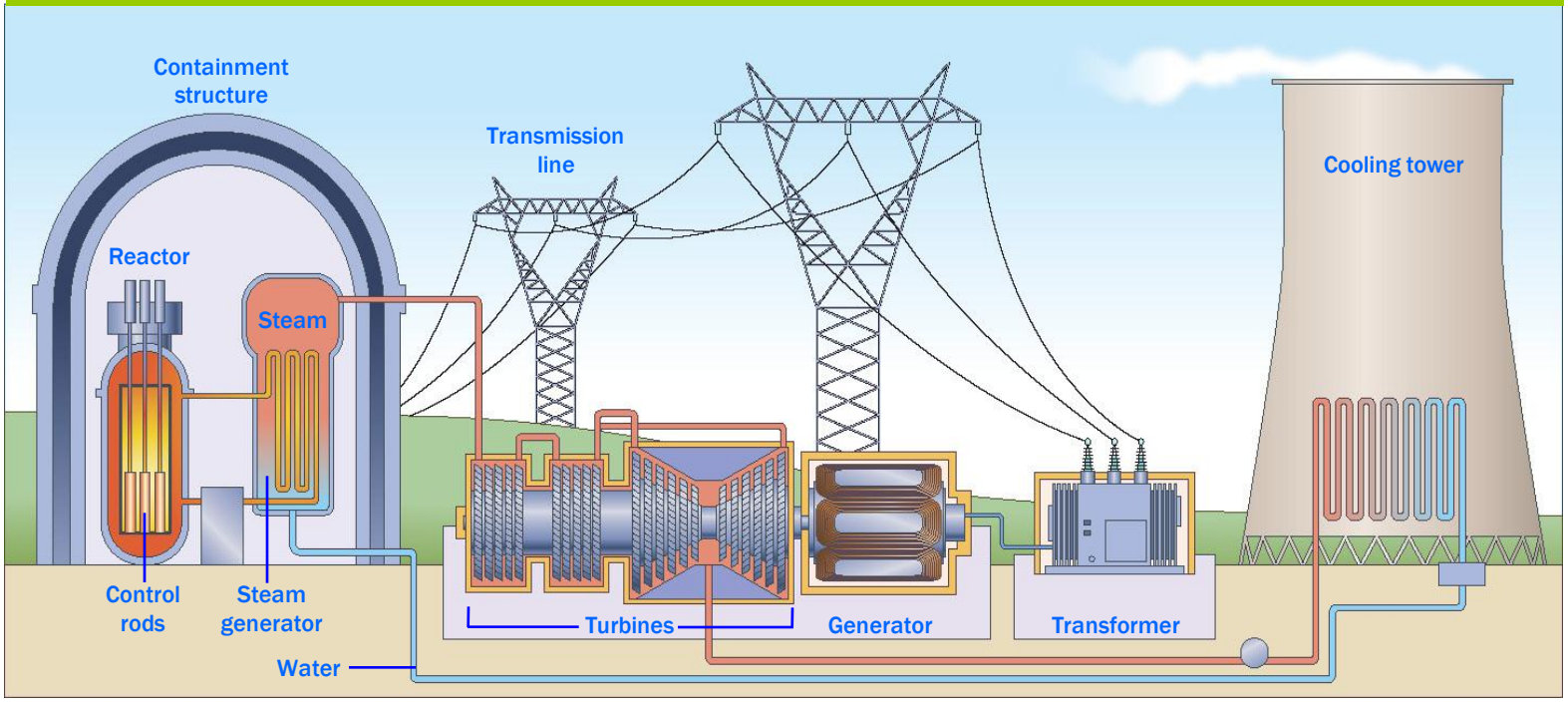
Diagram of a thermal power station



Energy

Nuclear power stations work similarly to thermal power stations, except that the fuel used here is uranium, which releases a large amount of energy through a nuclear reaction. The advantage of nuclear power plants is that they do not emit contaminant gases and produce inexpensive energy. The disadvantage is that they produce nuclear waste that is deadly to human beings.

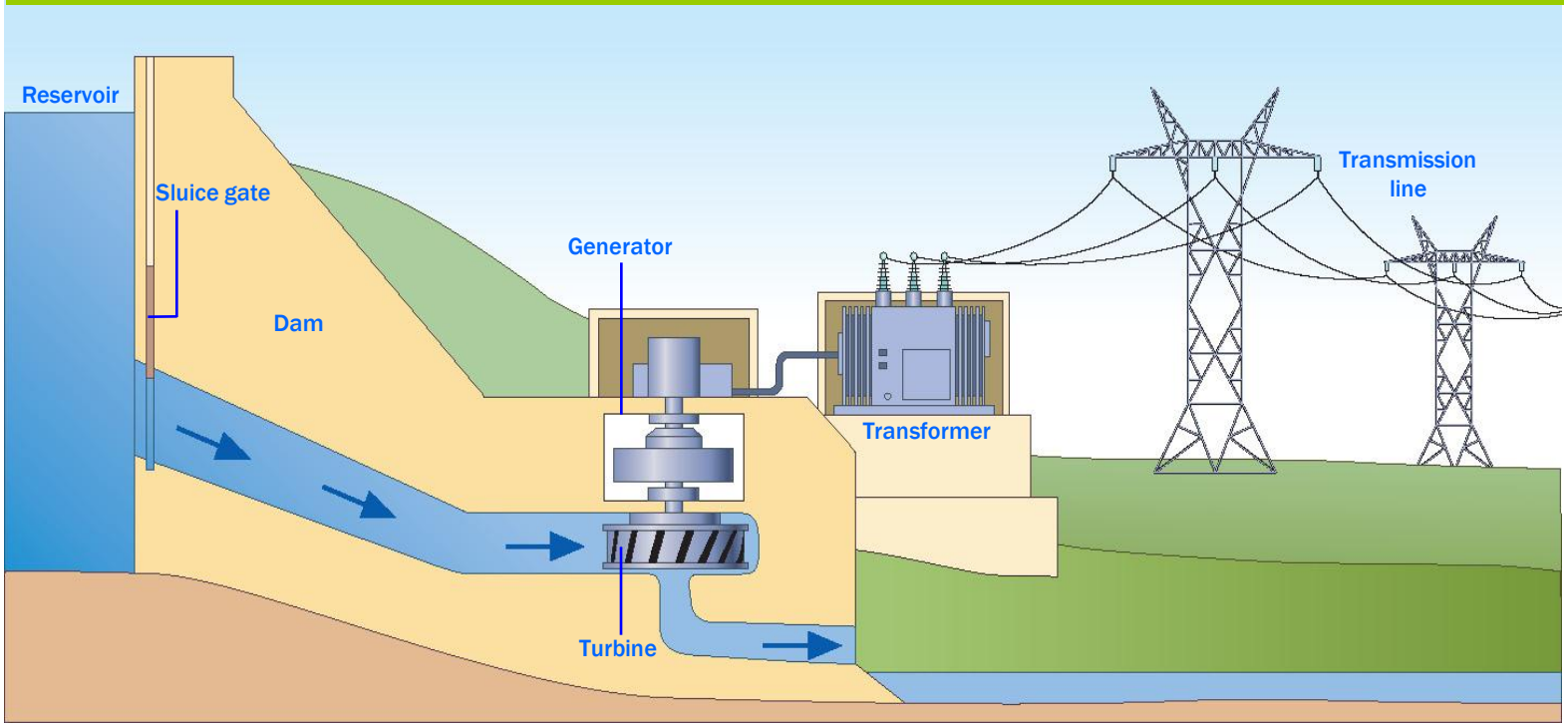
Diagram of a nuclear power station



Energy

Hydro-electric power stations use renewable energy, as the water stored in reservoirs, which is the primary energy used in these power stations, is replenished through the water cycle. Along with thermal and nuclear power plants, these are currently the most widely used power stations.

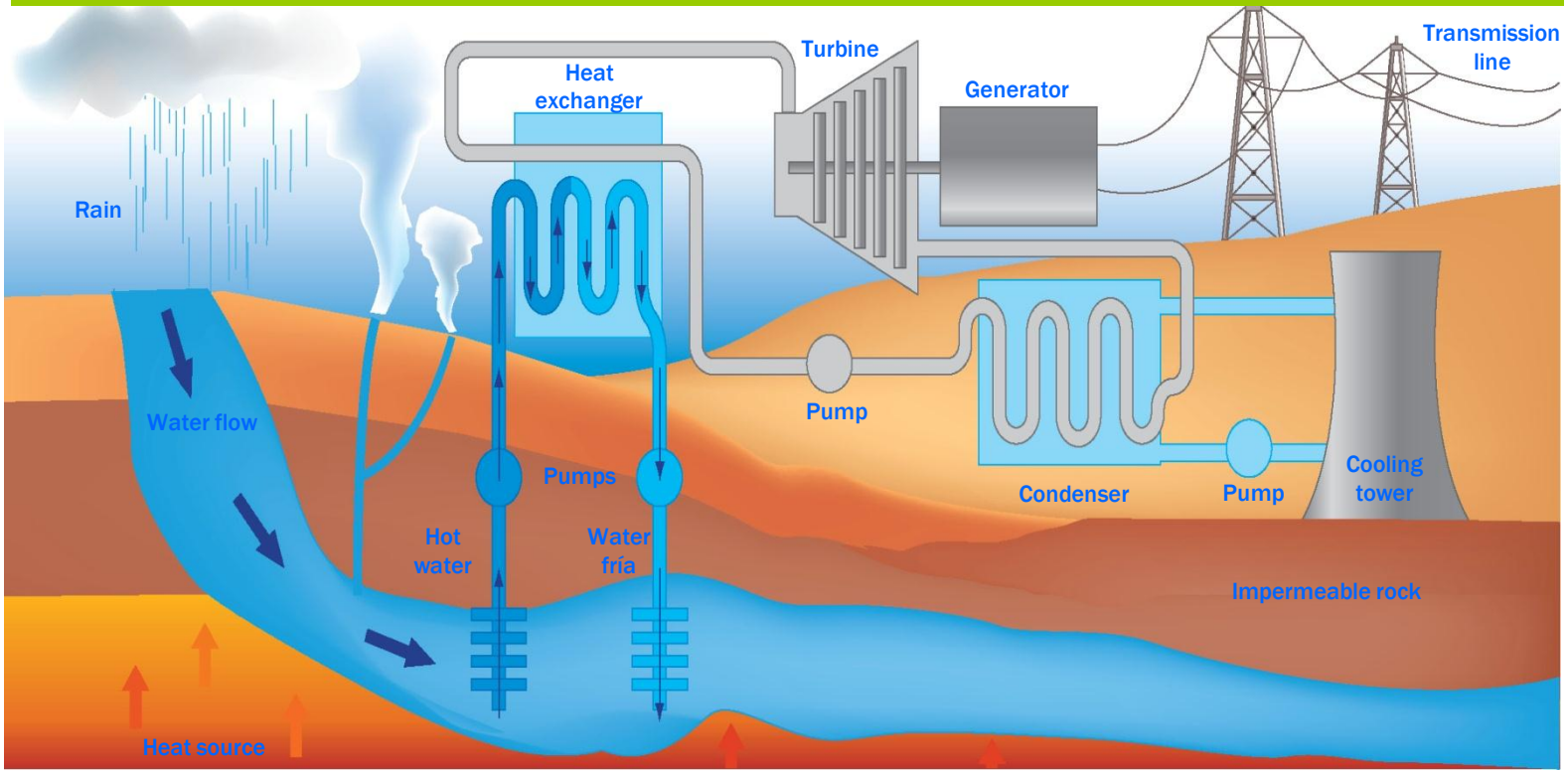
Diagram of a hydro-electric power station



Energy

Geothermal power stations can only be built in regions where geothermal resources such as geysers and volcanoes are near the surface. For this reason, they are not widely used.

Diagram of a geothermal power station



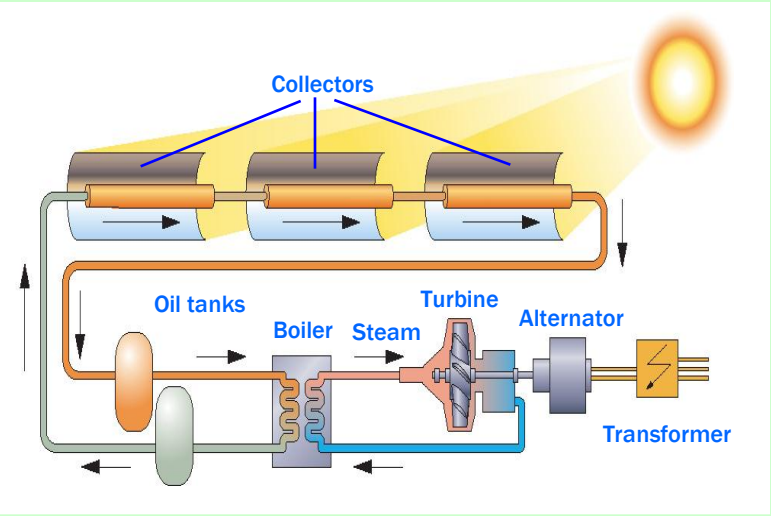
Energy

Solar thermal power stations consist of a field of heliostats, a large surface covered in mirrors that capture sunlight and focus it on a receiver, usually a tower, which houses a turbine and a receiver.

Diagram of a solar thermal power station

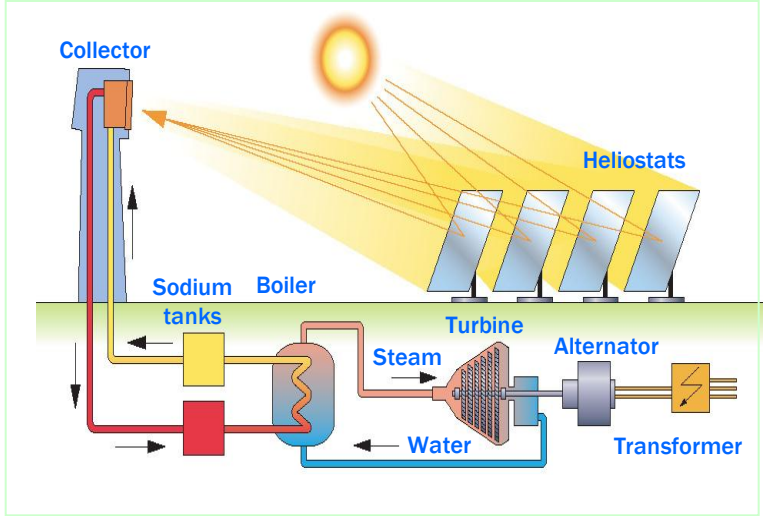
Medium-temperature solar power station

Collectors capture sunlight and focus it on a receiver with a very small surface. The receiver can reach temperatures of of up to 300 °C.



Medium-temperature solar power station

Here, sunlight reaches a field of heliostats (large mirrors) which focus it onto a receiver, usually a tower, which contains a turbine and a generator.



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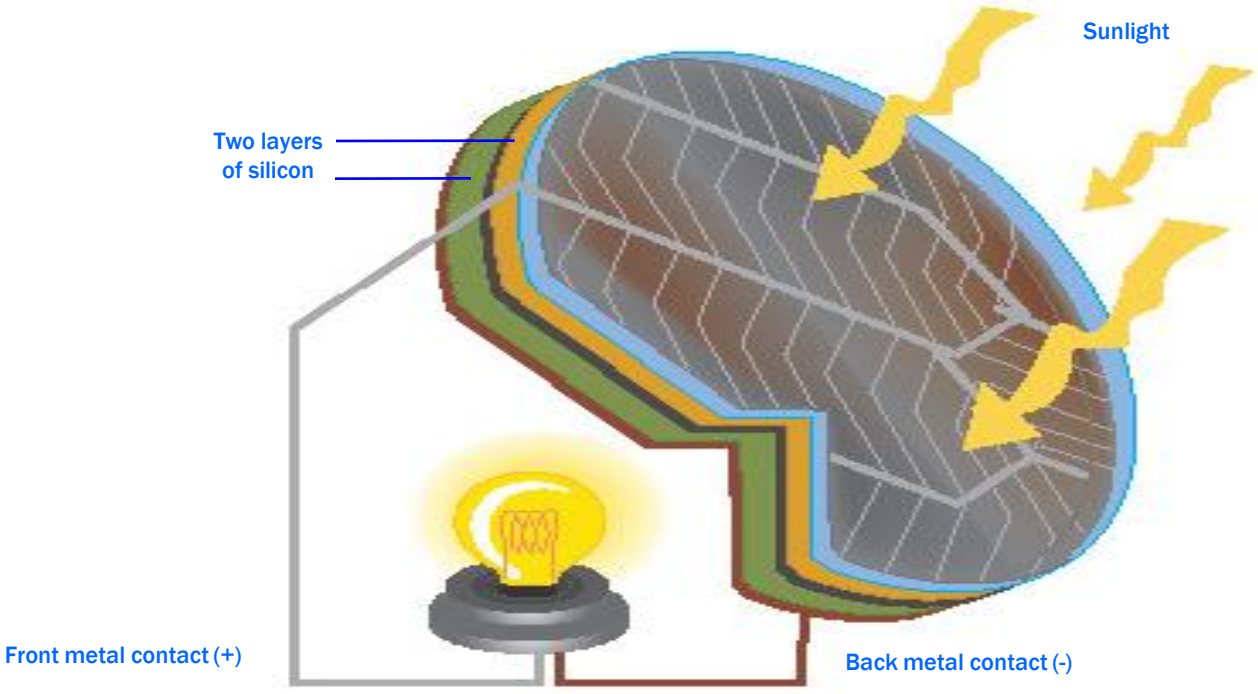
Solar photovoltaic power stations convert solar energy into electricity directly, without the need for any mobile component, thanks to photovoltaic cells, which are made of silicon. They are also used to supply satellites and space stations with electricity.

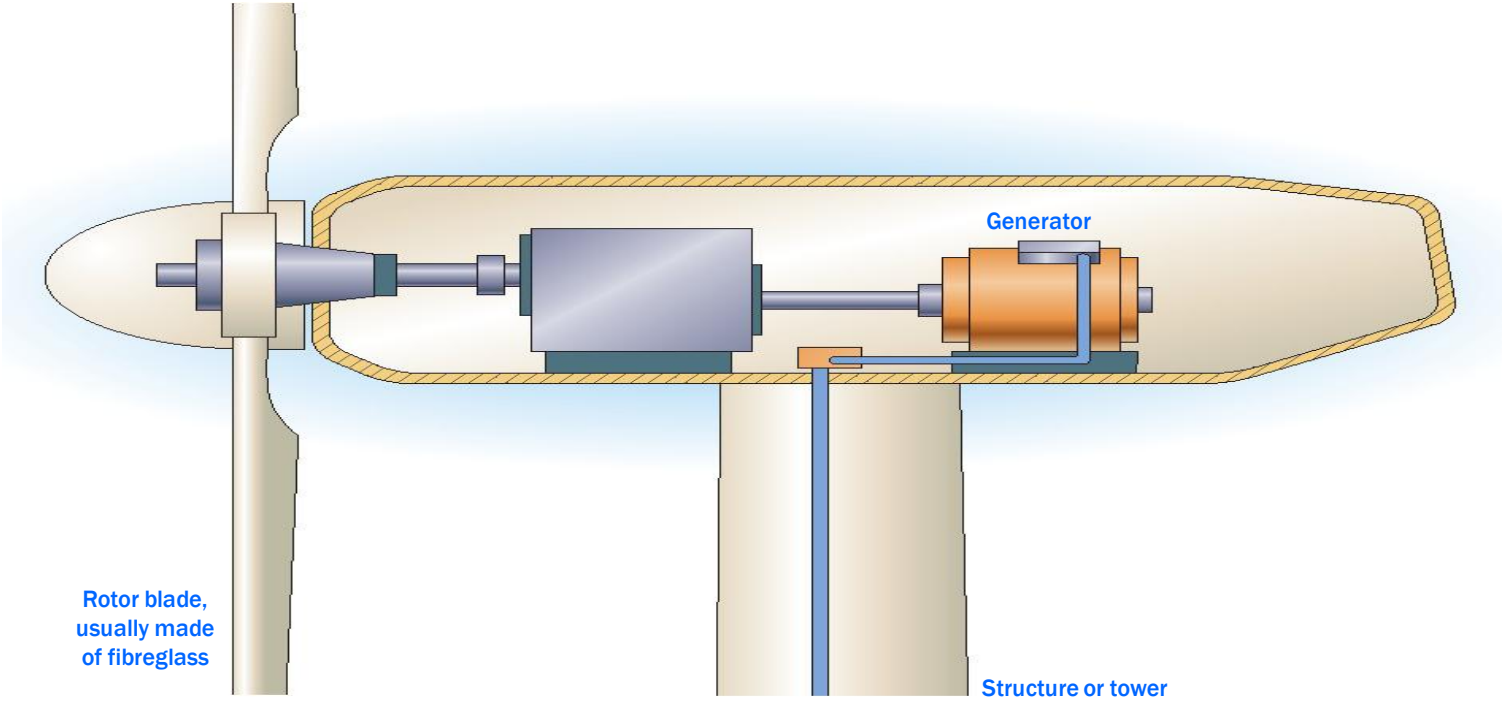
Diagram of a solar cell



Energy

Wind farms use wind power to produce electricity. There are some drawbacks, including their visual impact and their interference with migratory routes. They are also dependent on weather conditions.

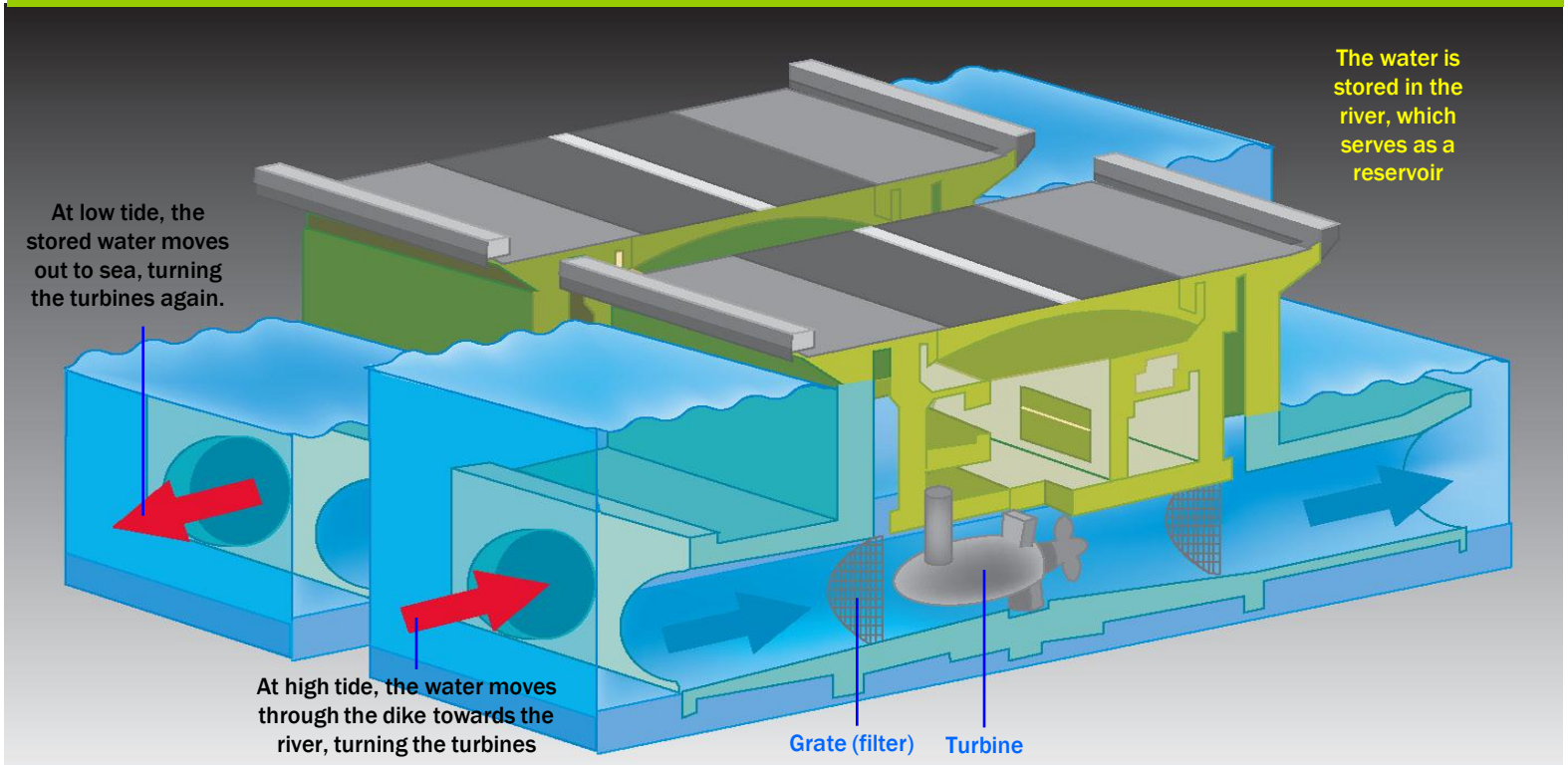
Diagram of a wind turbine



Energy

Tidal power stations use the energy of the huge bodies of moving water that make up seas and oceans. Currently, there is one tidal power station, located in France, because although seas contain an enormous amount of energy, it is very hard to harness it.

Diagram of a tidal power station



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Transporting electrical energy:

Electric transmission networks, or electrical grids, are composed of the elements needed to transport electricity generated in different power stations over long distances to consumers.

This grid is made up of a very large and interconnected network of 34,700 km of power lines and high-voltage towers and 3,400 substations that transform high voltage to voltage that can be used by industrial or residential consumers.

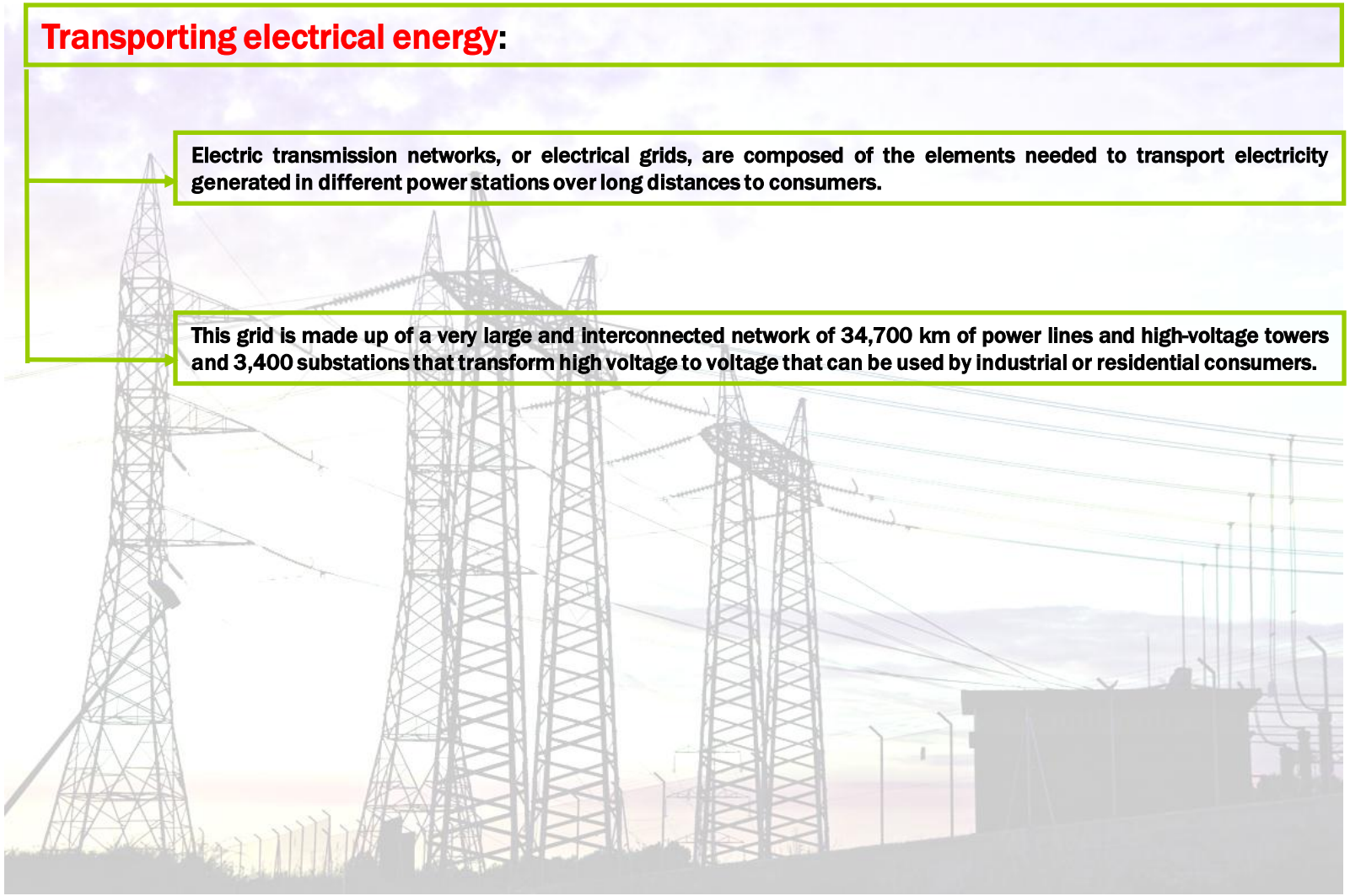

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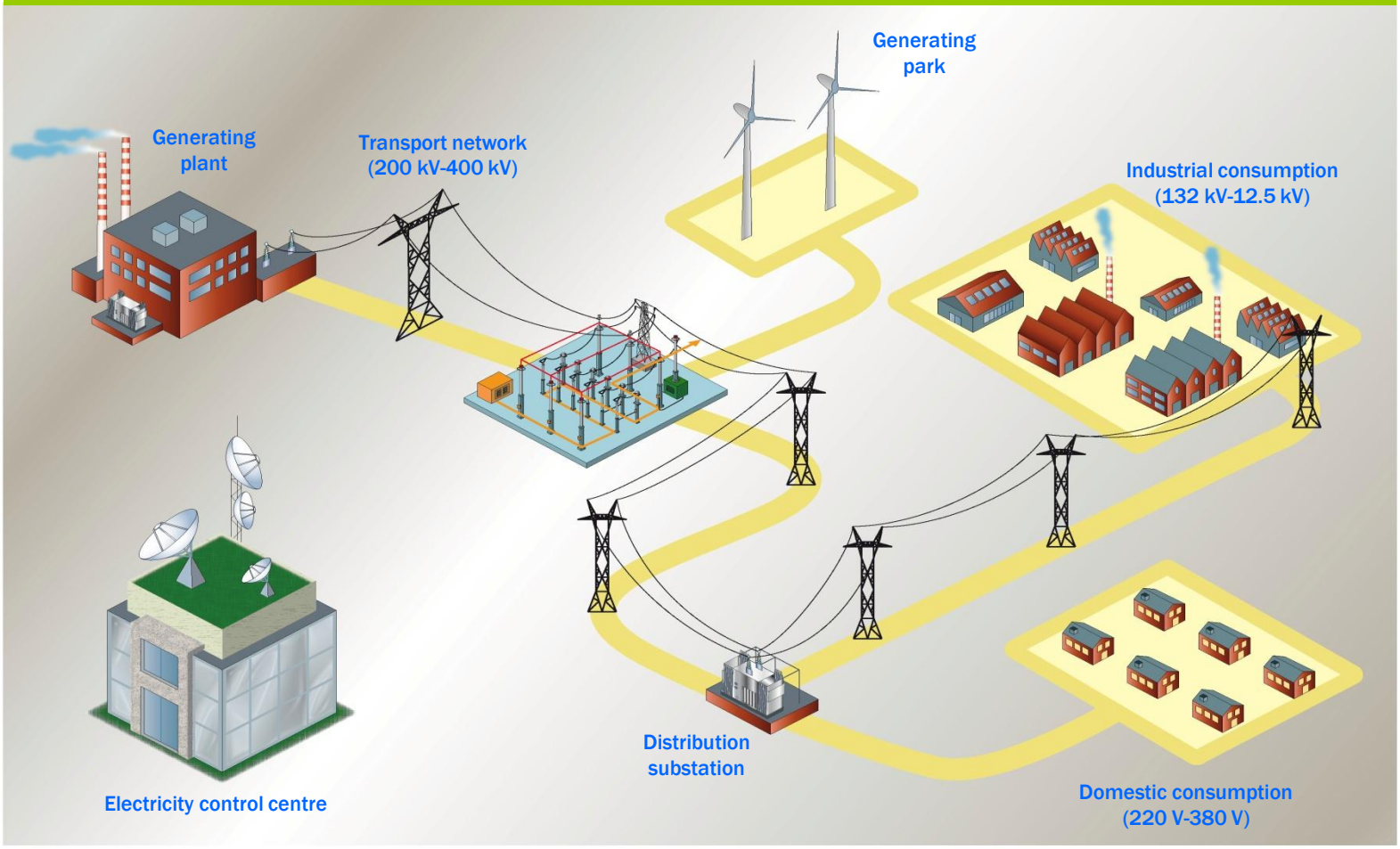
Diagram of an electrical grid



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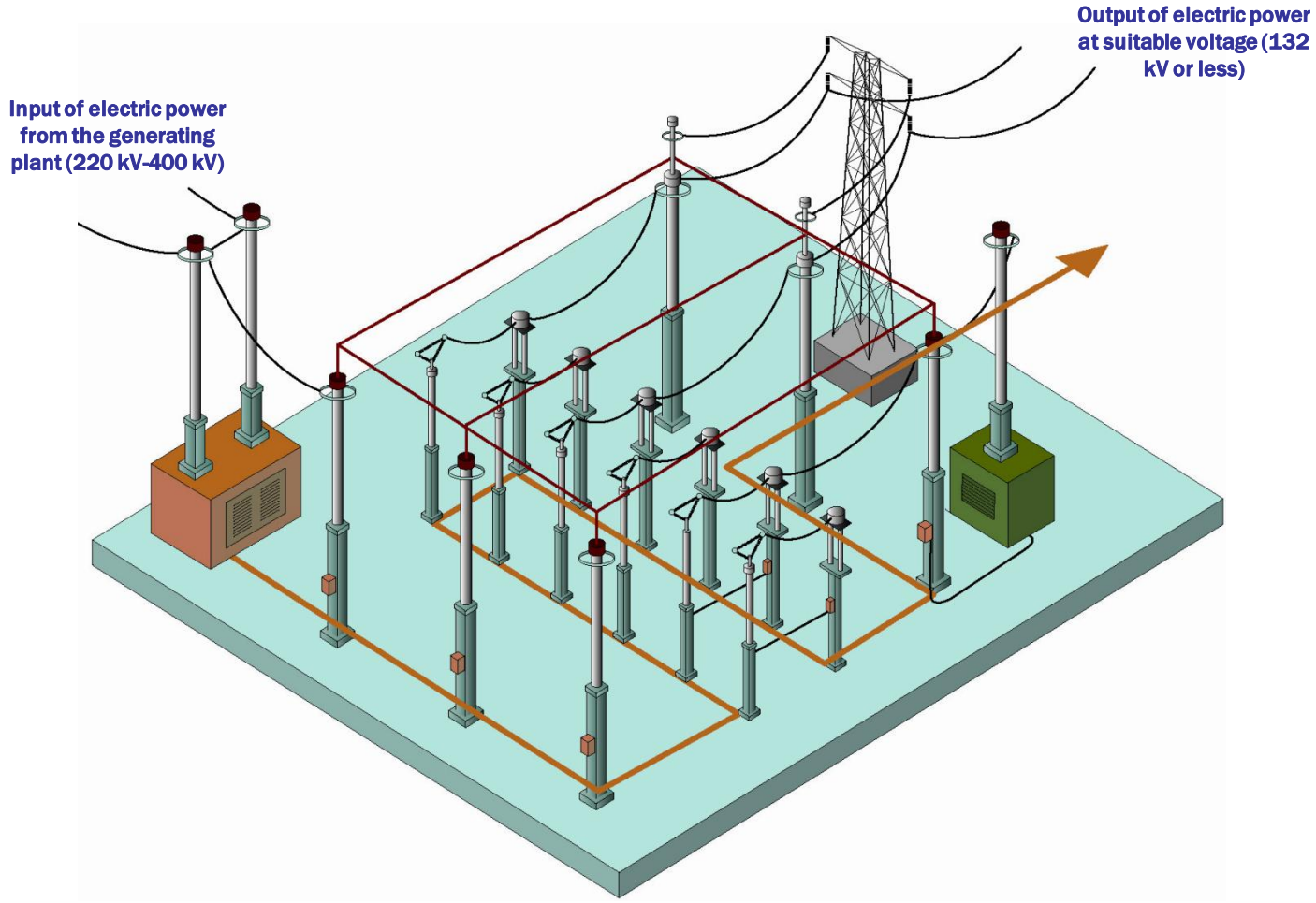
An **electrical transmission line** or high-voltage power line is the physical path through which electrical energy is transmitted.
It is made up of conductors, usually copper or aluminium wires, and support structures, which are towers or poles.

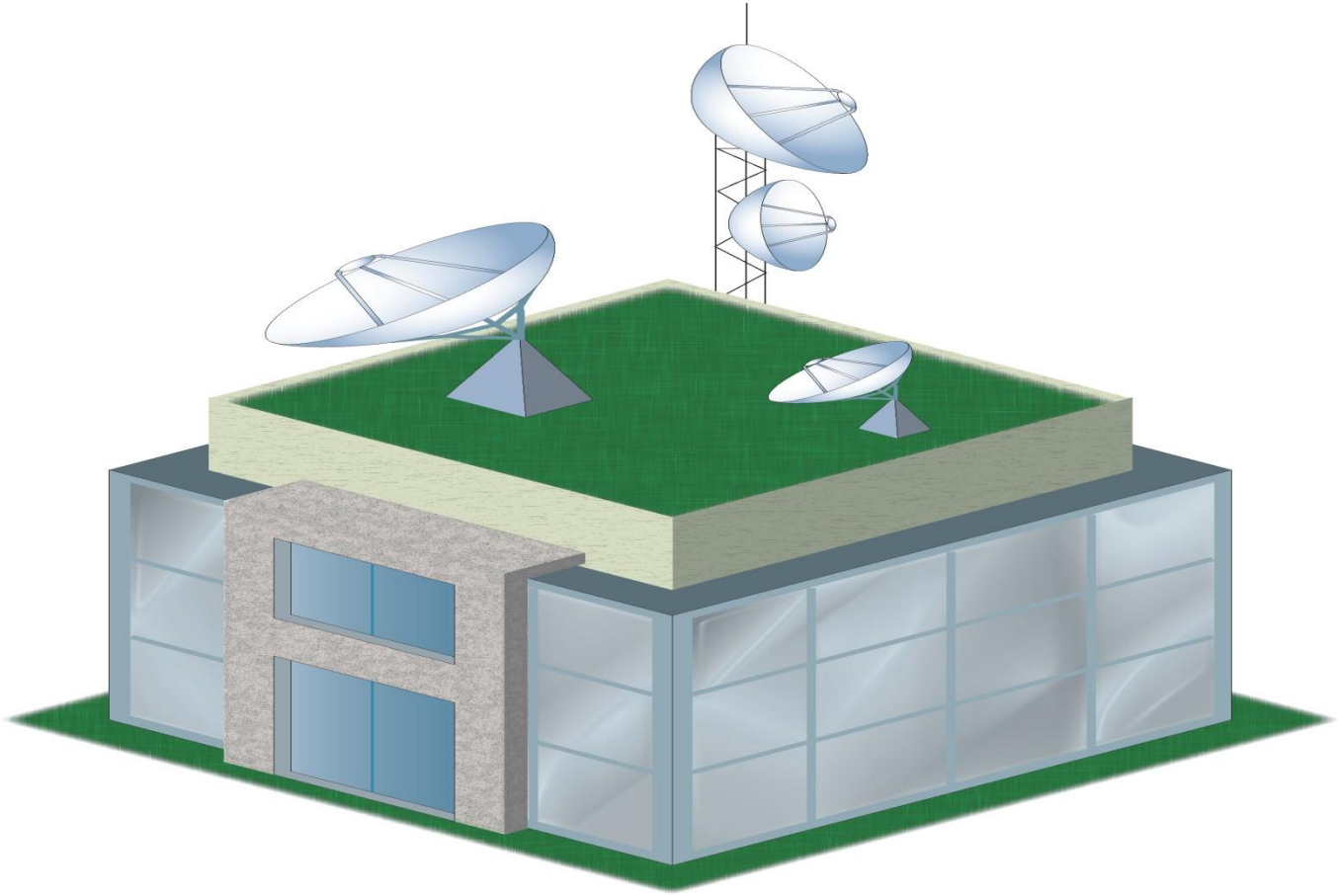
Energy

The energy that reaches the transmission network has a high voltage, which enables it to cover long distances. In the substation, the voltage is decreased with a transformer in order to begin distribution.



Energy

The **electricity control centre** is responsible for the coordinated, real-time operation and supervision of the facilities that generate and transmit electricity in Spain.
With the information gathered from substations, control centres check that the entire power system is working properly and make decisions as to how to make modifications or corrections if necessary.



Energy

Problems with producing and transmitting electricity:

Electricity is a clean energy which, once obtained, has very little environmental impact, but its production and transport have very negative consequences for the environment, including the following:

- Water vapour and other gases are released into the atmosphere. These gases contribute to the greenhouse effect, acid rain, water pollution and the destruction of fertile soil.
- High-voltage power lines and wind farms have a visual impact on the landscape.
- Aquatic flora and fauna are altered by reservoirs.
- Radiation leaks and thermal pollution of rivers.