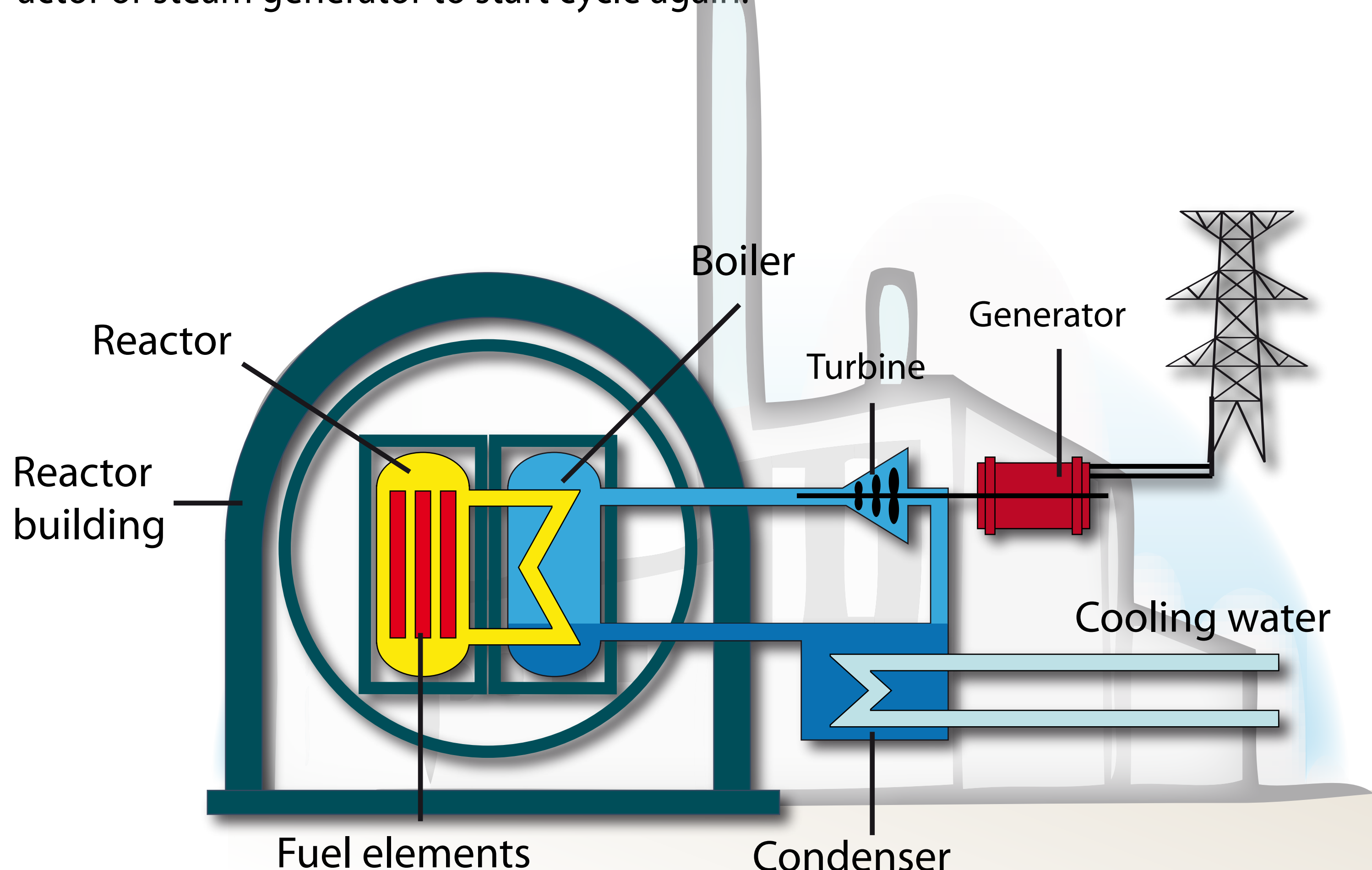


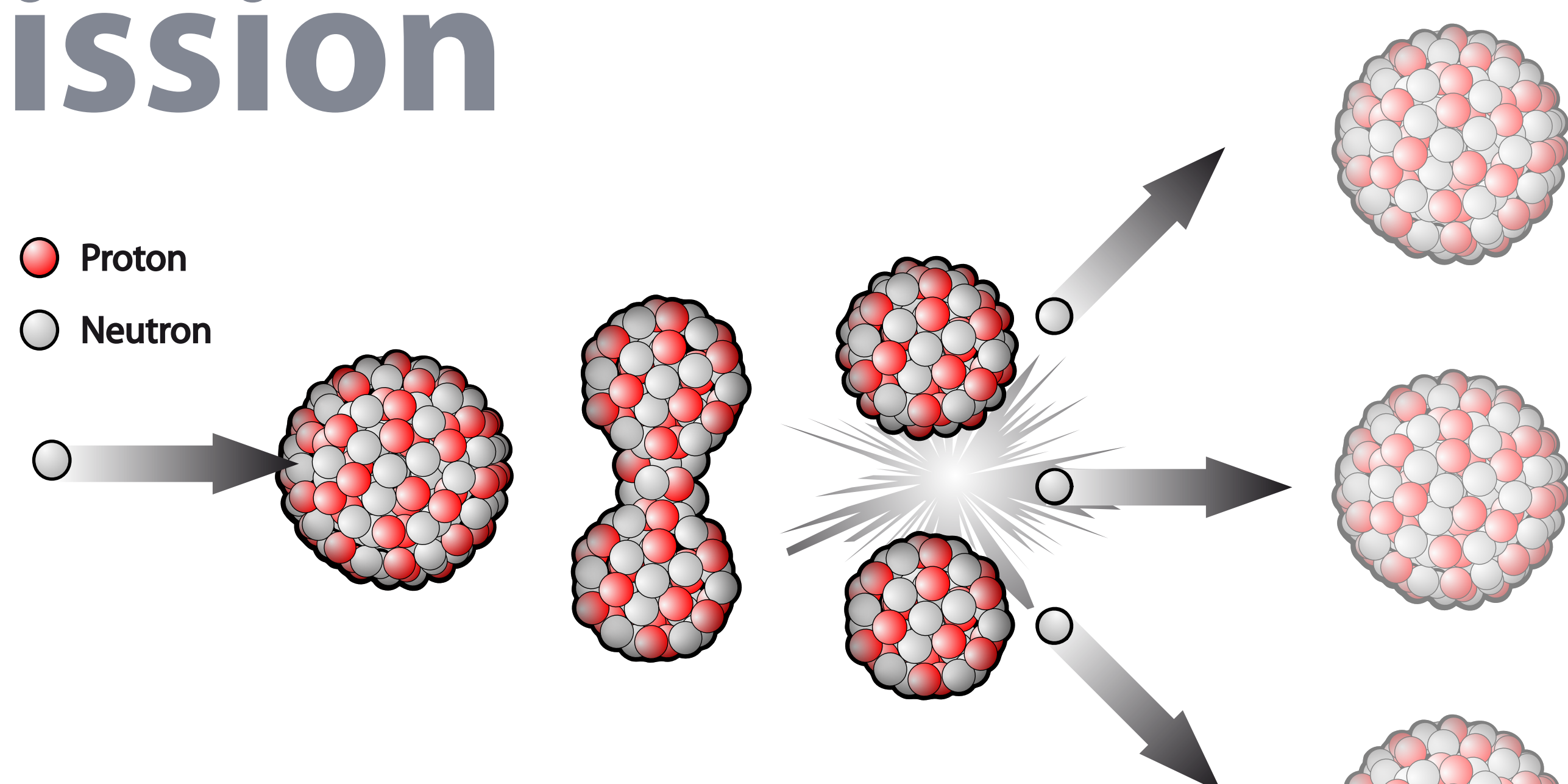
How it works

The structure of a nuclear power plant in many aspects resembles that of a conventional thermal power plant. In both cases, electricity is produced using a steam cycle. The first step in the cycle is that the heat produced in the boiler is transported by a coolant and used to generate steam. The steam drives the blades of a turbine. The rotating blades activate the connected generator, which produces electric energy. After passing through the turbine, the steam enters the condenser, which cools down the steam so it becomes liquid again. The water is fed back into the boiler, reactor or steam generator to start cycle again.



The main difference between a conventional and a nuclear power plant is how the heat in the boiler is produced. In a conventional plant, fossil fuel (oil, gas or coal) is combusted in the boiler, converting chemical energy into heat. In a nuclear power plant, nuclear reactions (fissions) produce the necessary heat to make steam.

Fission

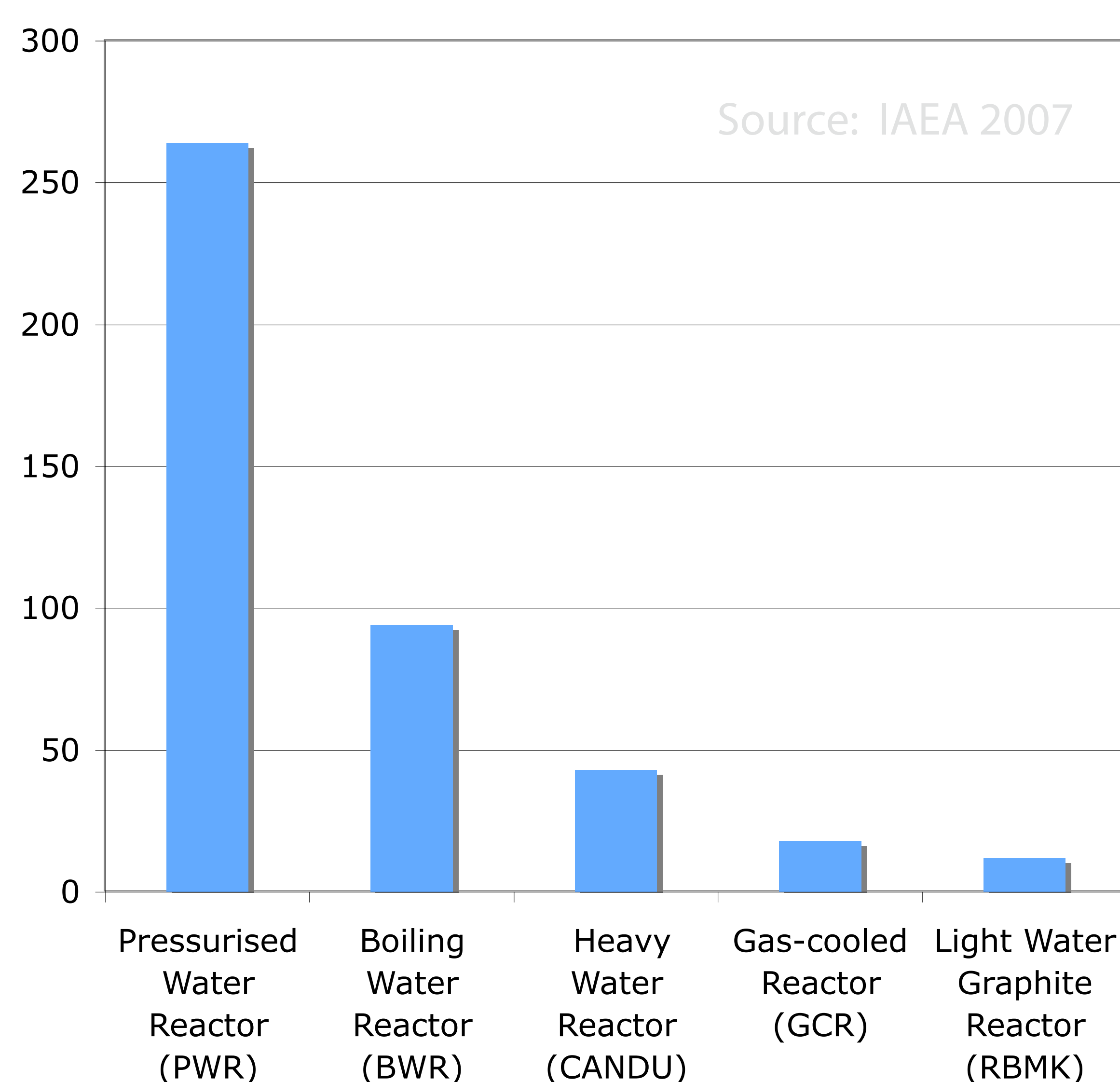


Fission is a slow, natural process. This process is accelerated in a nuclear reactor by shooting a neutron into an uranium-235 atom. When a nucleus fissions, it splits into several smaller fragments, the fission products. Two or three neutrons are also emitted. One of these neutrons splits a subsequent uranium, setting off a chain reaction. The sum of the masses of fission products is less than the original mass. This 'missing' mass (about 0.1 percent of the original mass) is converted into energy according to Einstein's equation $E=mc^2$. This energy is used to produce steam in a nuclear reactor.

Different types

Different types of nuclear power plant are used for electricity production around the world. The different types are usually classified according to the main features of the nuclear reactor: the coolant and moderator.

- The coolant is a liquid or gas circulating through the reactor in order to transfer the heat from it to produce steam.
- The moderator slows down the neutrons so they can be efficiently absorbed by the uranium atoms in the fuel. This is usually water, but may also be heavy water or graphite.



The most common types are:

- Light water reactors: both the moderator and coolant are light water (H_2O). Most nuclear electricity is generated using just two kinds of light water reactors: the pressurized water reactors (PWR) and the boiling water reactors (BWR) belong to this category. The difference between the two types is that in the BWR the reactor itself is the boiler; in the PWR the reactor and boiler are separated.
- Heavy water reactors (CANDU): both the coolant and moderator are heavy water (D_2O). These reactors use natural (not enriched uranium) as fuel.
- Graphite moderated reactors such as gas cooled reactors (GCR) and light water cooled reactors (RBMK).

Research Reactors

A special type of nuclear reactor is the research reactor, which is not used for the production of electricity. In research reactors, material properties are tested, and radioisotopes (radioactive materials) and nuclear medicines produced.