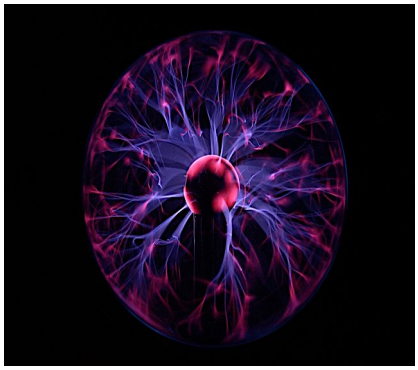
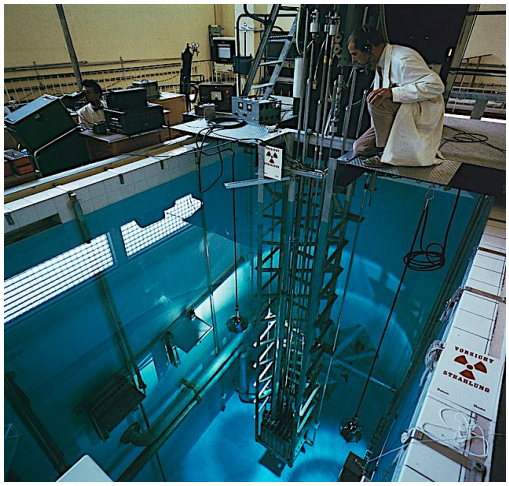
The power of the atom

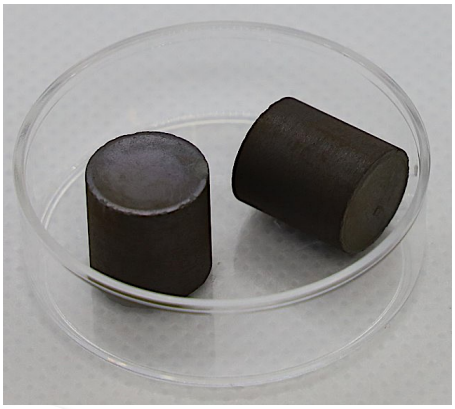


Nuclear fission occurs when a large unstable nucleus of a uranium atom is bombarded by a neutron. This causes the nucleus to split and release other neutrons that then bombard other nuclei, causing them to split. The splitting of these nuclei releases vast amounts of energy. The growth in the chain reaction is very rapid. In each of the 2 million uranium pellets that are held in the reactor core, there are 5 million fission reactions per second. These many million reactions produce enormous quantities of thermal energy. The hot water from a pressurised nuclear reactor is at 300°celsius.

The moderator and the control rods

The reactor pool is just water. The water slows the reactions down so that the process can be controlled.
Another mechanism to control the reaction is the use of control rods – to soak up the excess neutrons being produced by the fission reactions.
The blue colour – Cherenkov Radiation – is due to radiation particles travelling faster than the speed of light.



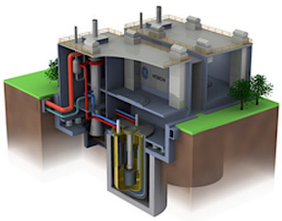


Uranium dioxide

The pellets of uranium are 1cm in size and held in fuel rods in the reactor core. Uranium is a plentiful metal - as common as tin, it can even be found in seawater.
It is the instability of the uranium atom that creates the radioactivity – thermal energy. The problem of disposal of radioactive waste is solved by deep burial in sealed bunkers.

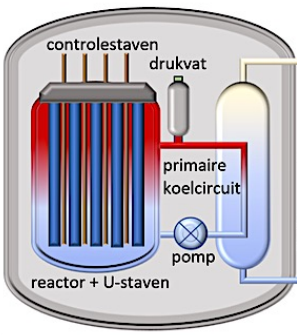
Practice

1. Nuclear power stations generate 10% of the world's power. Uranium 235 is used as a fuel. Name another substance that is used.



2. Why is nuclear energy defined as a low carbon resource?

3. Comparing energy produced from nuclear fission and wind, (a) which source is the more consistent, and why? (b) which source can respond to changes in demand day-to-day, and why?



4. Inside a nuclear power station, water is heated to make steam. Explain how electricity is generated by the power station.

Compare the resources

Research the various energy resources online. Make a table of advantages and disadvantages to help to inform a group discussion.

Resource	Advantages	Disadvantages
Nuclear		
Fossil Fuels		
Solar		
Wind		
Hydro		
Geothermal		
Biomass		