

The control rods contain boron which will absorb neutrons, to slow down the reaction and reduce the amount of heat produced the rods are lowered further, if more energy is needed then the rods are raised

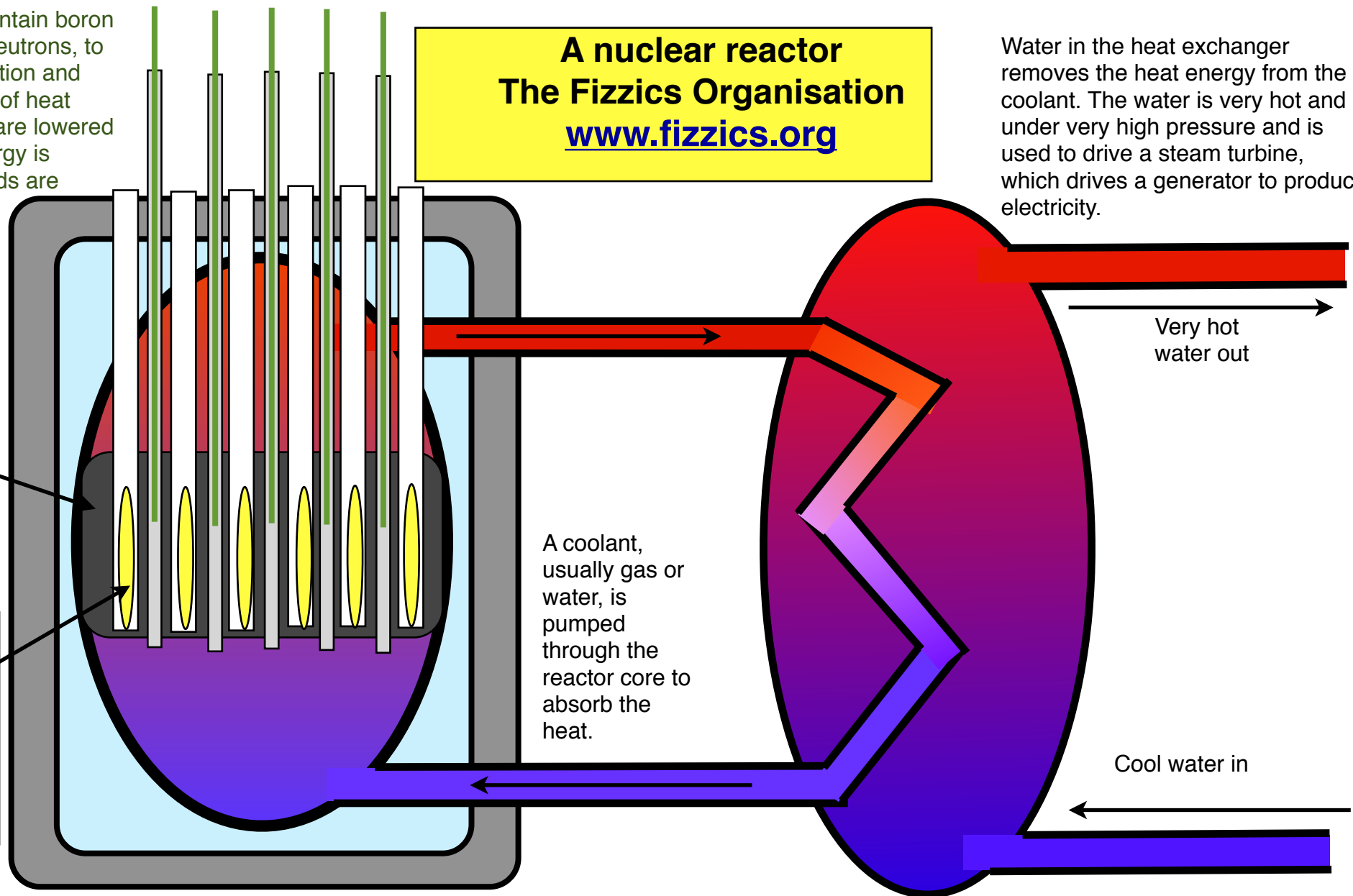
The graphite is a moderator. It slows the neutrons down so they react more effectively

The fuel is usually uranium 235 or plutonium 239. The neutrons split the atoms producing new elements and a large amount of energy.

A nuclear reactor

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Water in the heat exchanger removes the heat energy from the coolant. The water is very hot and under very high pressure and is used to drive a steam turbine, which drives a generator to produce electricity.

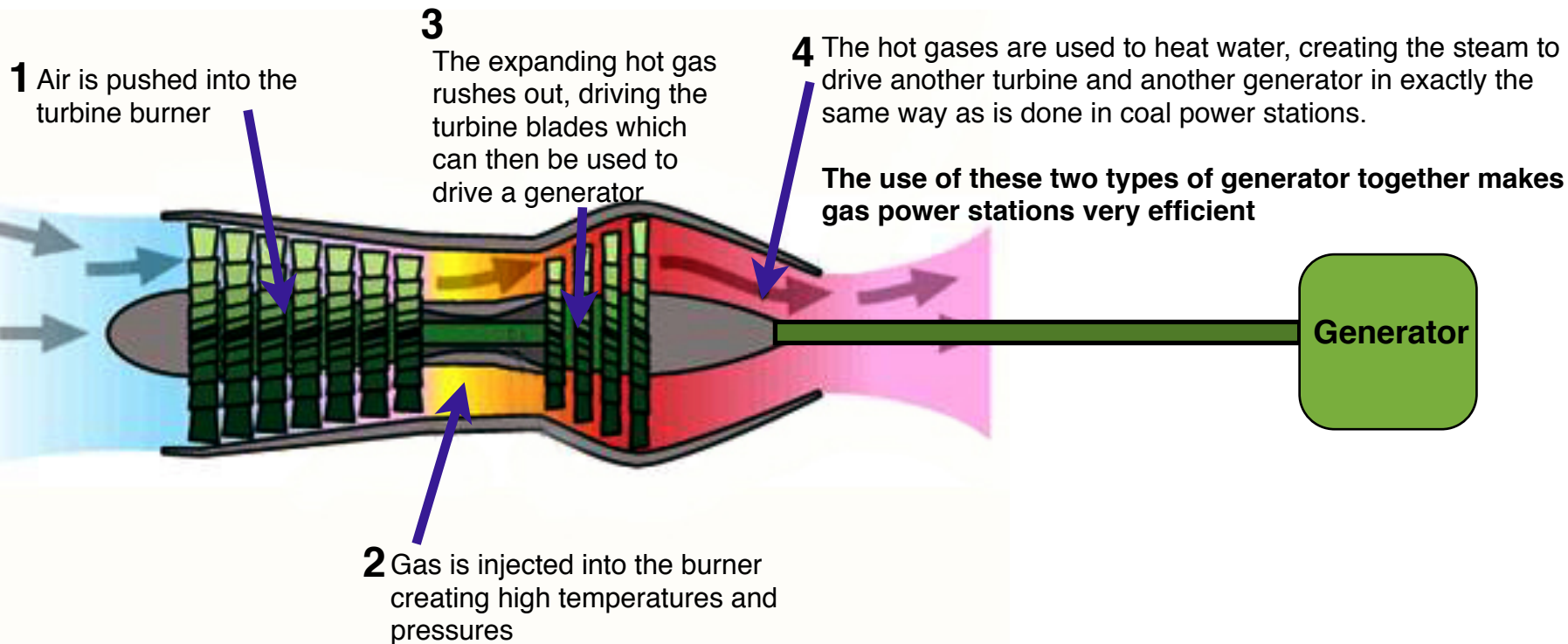


Nuclear power

- Causes no atmospheric emissions
- A flexible and reliable source of energy
- Fuel can be recycled to some extent
- Low cost power production once a power station is set up
- The fuel is easy to transport

BUT

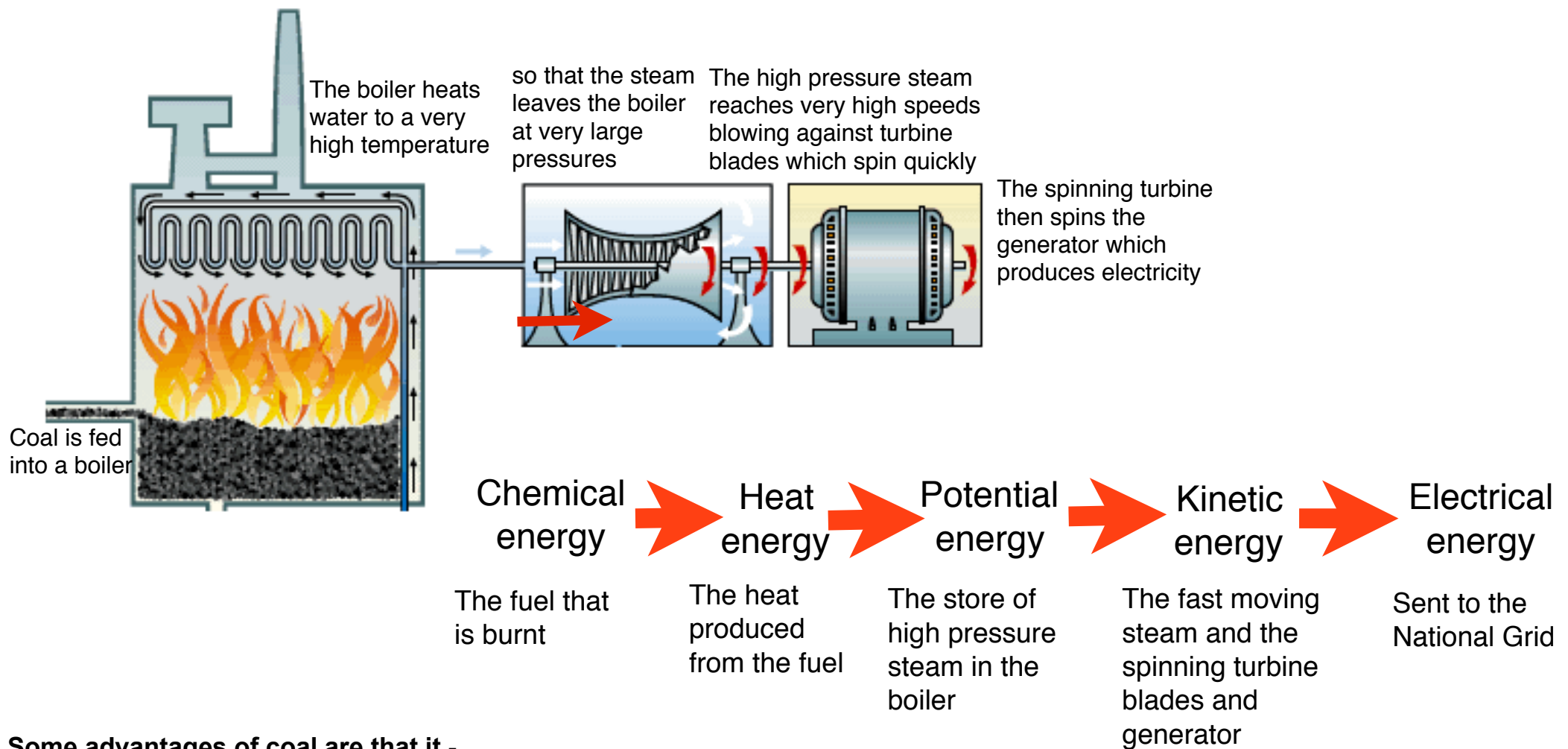
- There is a chance of high risk disaster due to accident, earthquake or tidal wave
- The waste produced is highly radioactive and will remain so for a long time
- Leaks can cause contamination of the environment
- The power station is expensive to build
- The lifetime of a nuclear power plant is limited and it is expensive to demolish at the end of its life.



Natural gas

- When gas burns relatively little carbon dioxide is produced and few other pollutants.
 - It is very easy to transport
 - Gas power station are relatively quickly and cheaply constructed.
 - It is a concentrated source of energy (burning a small amount of gas produces a large amount of heat).
 - Gas power stations are relatively efficient.
 - There is a good supply at present
- But
- It is not a renewable source and the world will run out eventually
 - It is not easy to store
 - It does contribute to global warming.
 - A lot of the worlds gas comes from politically unstable countries.
 - The world price varies beyond our control.

A gas fired power station
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Some advantages of coal are that it -

- Burns easily.
- Is widely available.
- Has large reserves and fairly cheap.
- Is fairly easy to transport and store.
- Needs power stations which are not complex to build and they can be turned up and down easily, depending on demand.

Some disadvantages of coal are:

- It is Non-renewable and will run out.
- Coal mining is a dangerous occupation.
- Burning coal releases a large amount of carbon dioxide, a greenhouse gas, contributing to global warming.
- Burning produces sulphur dioxide which causes acid rain.
- Mining of coal damages the surrounding environment.

**A coal fired power station
Basic diagram.**

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1 Coal delivered in bulk



3 The waste gas is cleaned to remove most of the dust and soot as well as the acidic gases. The waste gas is rich in carbon dioxide, a major greenhouse gas.

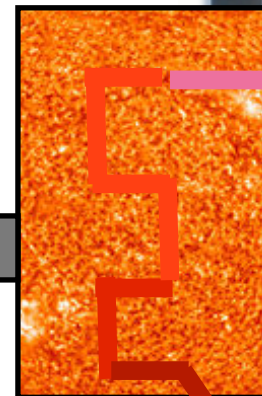


2

Coal is pulverised to a powder and then blown into the furnace

4

The furnace heats water to produce superheated steam at very high pressures. The steam is used to turn a turbine which in turn, turns a generator.



7

The condensed steam is re-used, pumped back into the boiler



8 The steam from the cooling tower is waste heat.



6

Having been used in the turbine the steam is cooler and at a low pressure. It is passed to the cooling tower to condense



5

The electricity from the generator is transmitted into a step up transformer. The voltage is increased to a very high value and transmitted around the country by the national grid.

