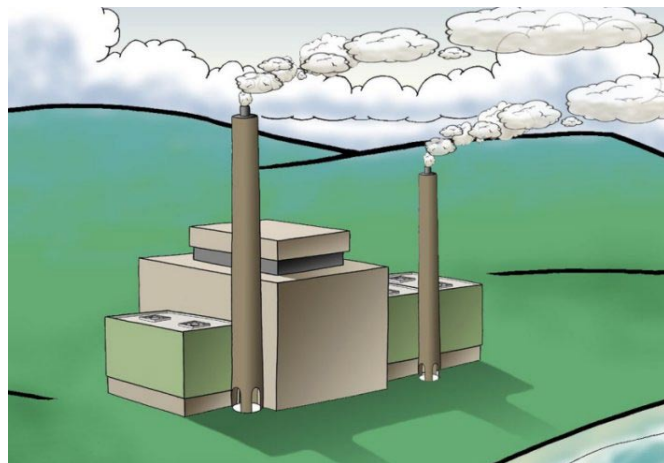
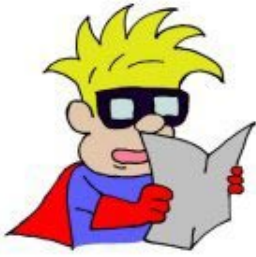


Mission 4:

Fossil Fuel Power Stations



What are Fossil Fuels?



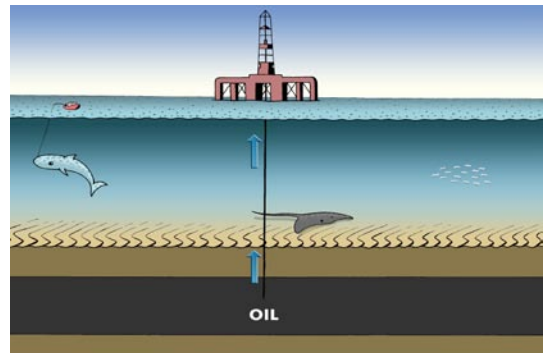
It says here that electricity is made in a big factory called a power station. It is made by burning fossil fuels. So what is a fossil fuel?

Coal, peat, oil and gas are called **fossil fuels** as they are formed over millions of years from the remains of dead plants and animals.



Coal is found under the ground. It is made from trees and plants which were alive millions of years ago. Coal is taken out of the ground from coal mines.

Peat is also made from trees and plants, but has not been in the ground for as long as coal. If left in the ground, peat would eventually turn into coal. Peat is cut from the ground in areas called peat bogs.



Oil and gas are formed beneath the sea. They are made from the remains of tiny sea creatures and plants which have sunk down to the bottom of the sea and begun to rot away. The rotting material turns into a dark liquid, which is the oil. Tiny bubbles float to the top of the liquid, forming a layer of gas on top of the oil. An oil rig drills down beneath the sea to extract the oil.

Fossil Fuels



Find out what coal, oil and gas look like.

In the box, draw a picture of some coal.
Write down three words below that could be used to describe coal.



What happens when you hold a piece of coal in your hand?

Write down three words that could be used to describe oil.

Write down three words that could be used to describe gas.

Match each type of fossil fuel to the correct word below.

coal

liquid

oil

gas

gas

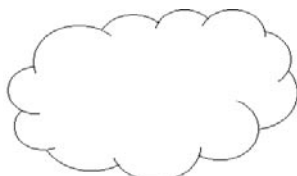
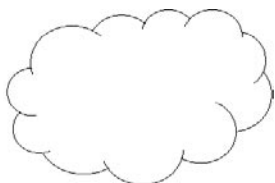
solid

When fossil fuels are burned they give off smoke. Match each smoke cloud to the fossil fuel you think it has come from. Think about the colour of each fossil fuel.

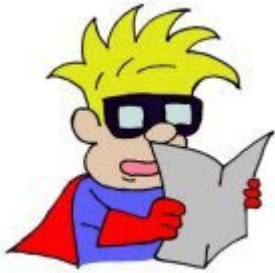
COAL

OIL

GAS

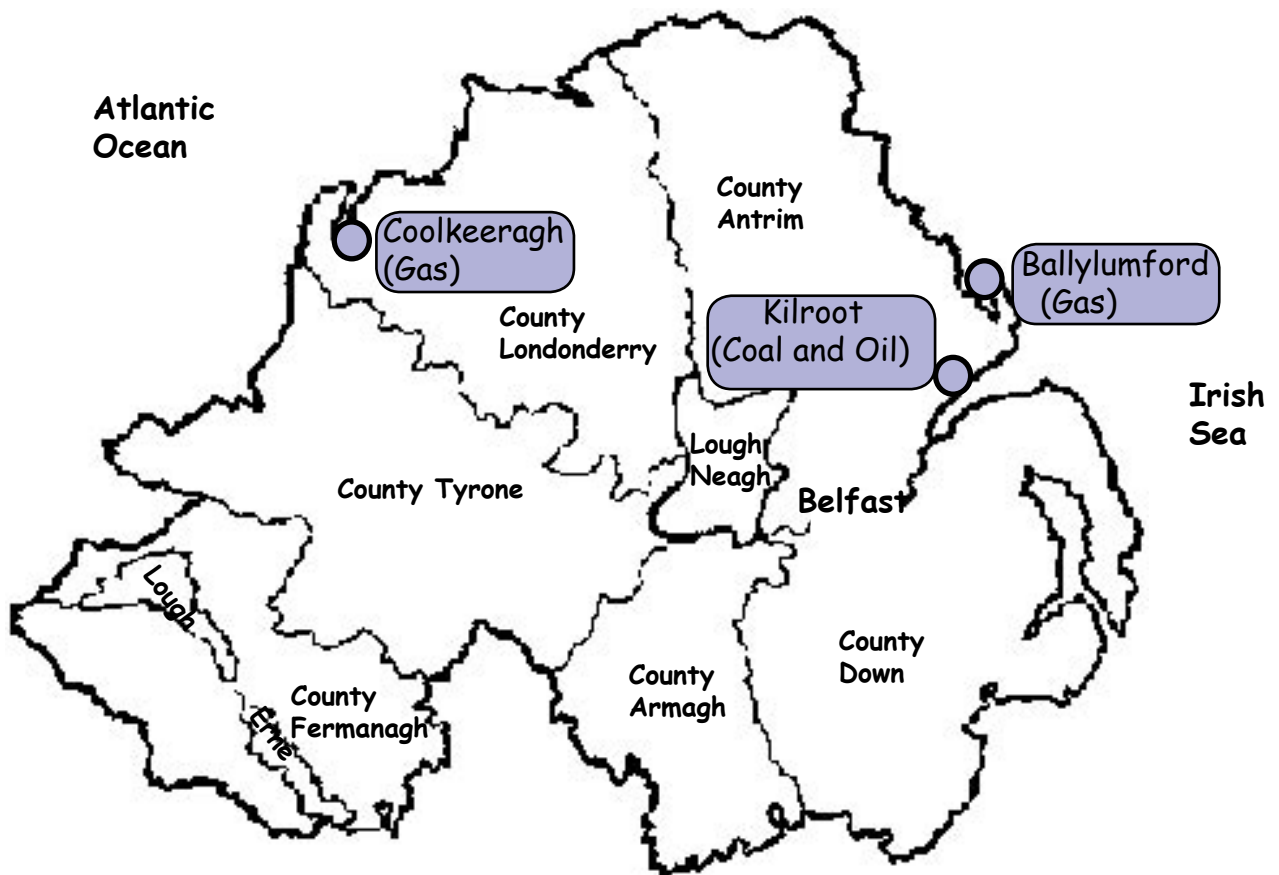


Fossil Fuel Power Stations



Sparky has located three fossil fuel power stations in Northern Ireland. A power station is a factory which makes electricity. Fossil fuel power stations change the chemical energy stored in coal, oil and gas into electrical energy.

Where are our power stations?



A public supply of electricity began in 1892, in Larne. Three years later, Belfast Corporation began to supply Belfast with electricity. The power stations in Northern Ireland are connected to every home in the province through hundreds of miles of wires. The power stations are also connected to the Republic of Ireland by two interconnectors, which allows electricity to cross back and forward over the border when necessary.

Fossil fuel power stations

1. Look at the map of Northern Ireland showing the location of our power stations. Circle the right answer for each of the following questions.

a. All the power stations are beside

- a. rivers
- b. mountains
- c. sea

b. The power station nearest to Belfast is

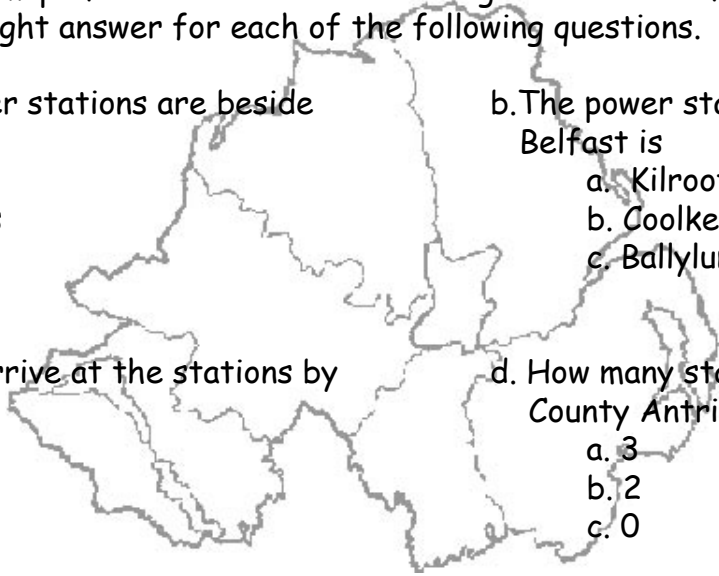
- a. Kilroot
- b. Coolkeeragh
- c. Ballylumford

c. Oil & Coal arrive at the stations by

- a. plane
- b. train
- c. ship

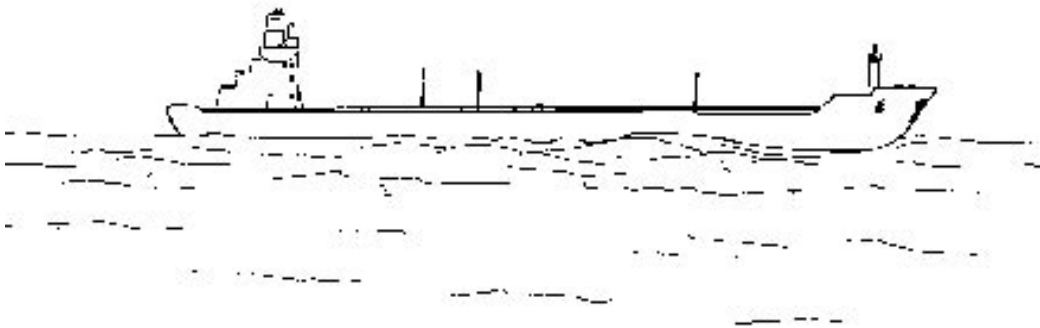
d. How many stations are in County Antrim?

- a. 3
- b. 2
- c. 0

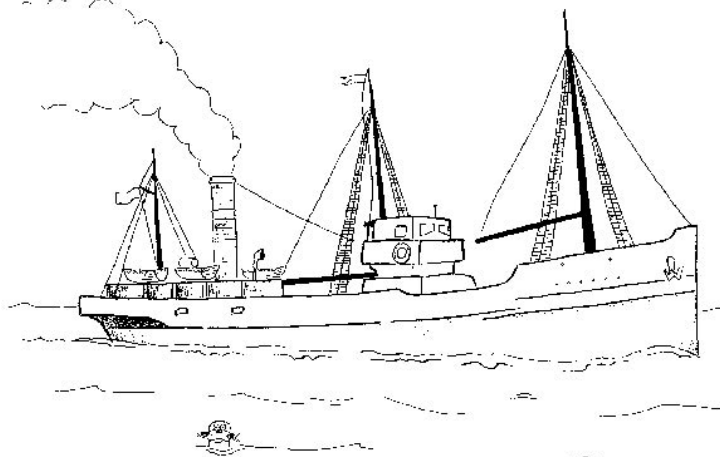


2. Look at the pictures below. One of the ships is an oil tanker the other is a coal collier. Which one is which?

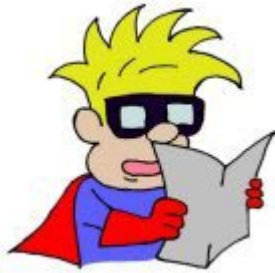
This ship is an _____



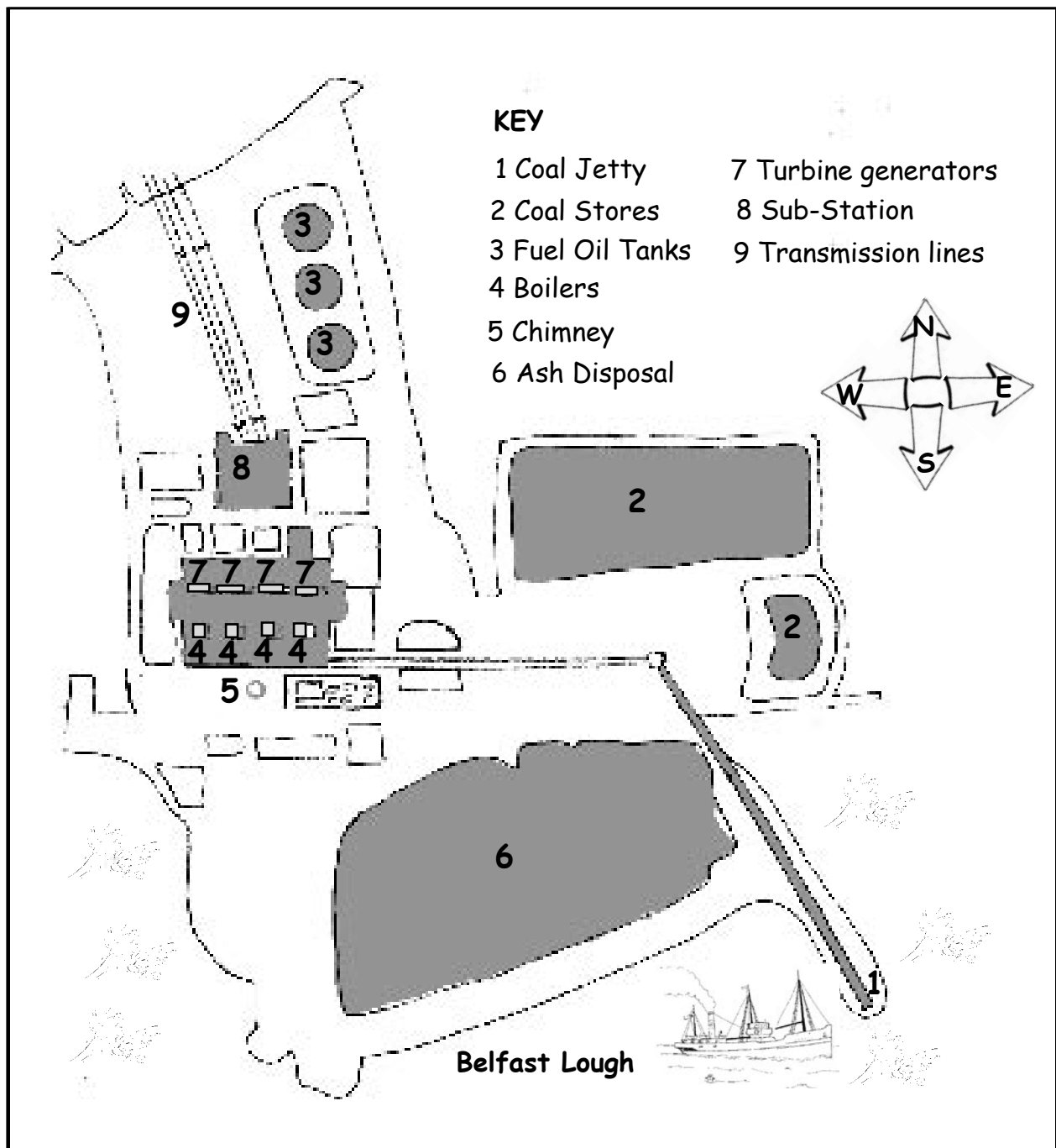
This ship is a _____



Power Station Main Site Plan

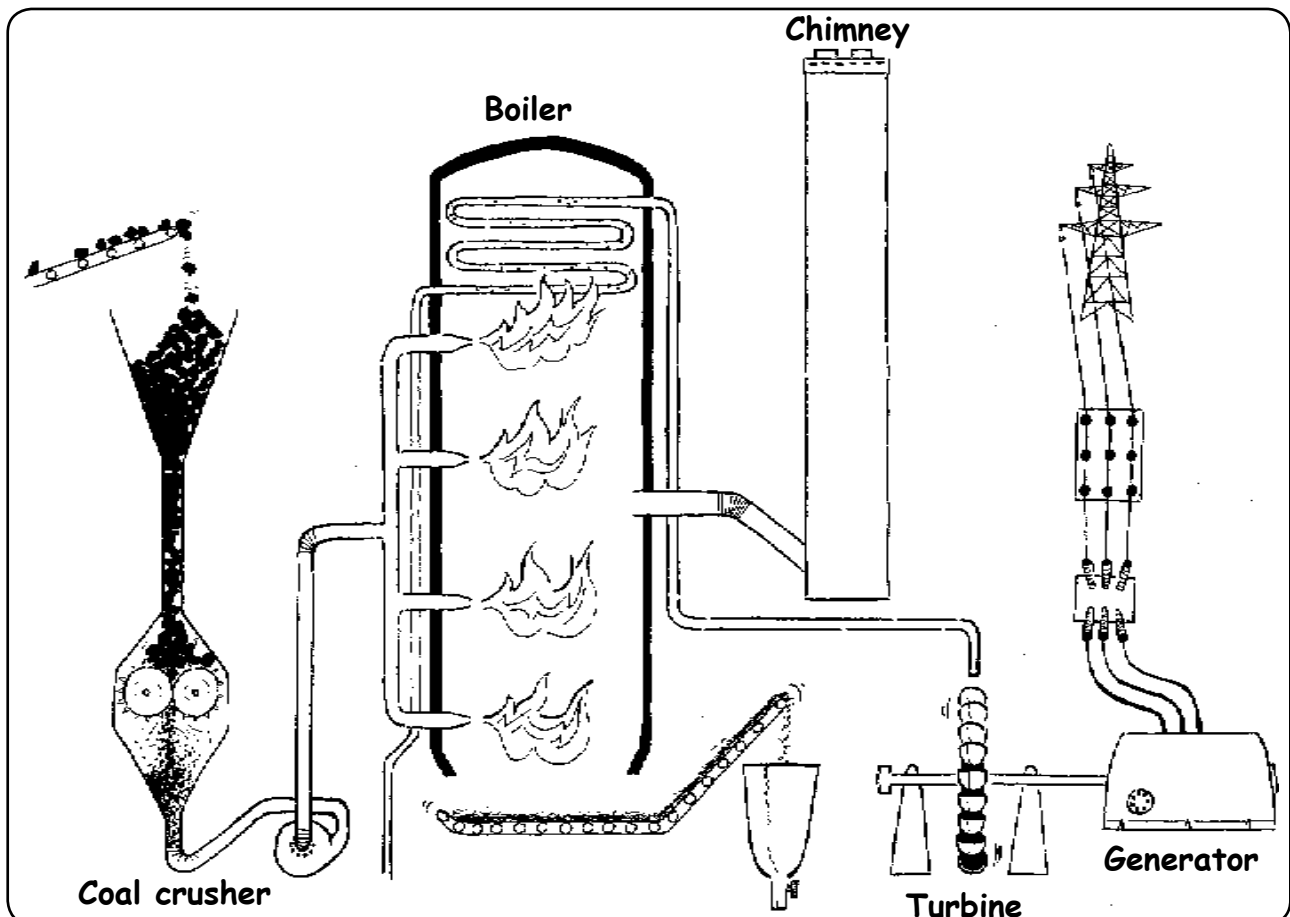


Below is a drawing and plan of AES Kilroot power station. Power stations have four main parts, the **fuel, boilers, turbines and generators.**

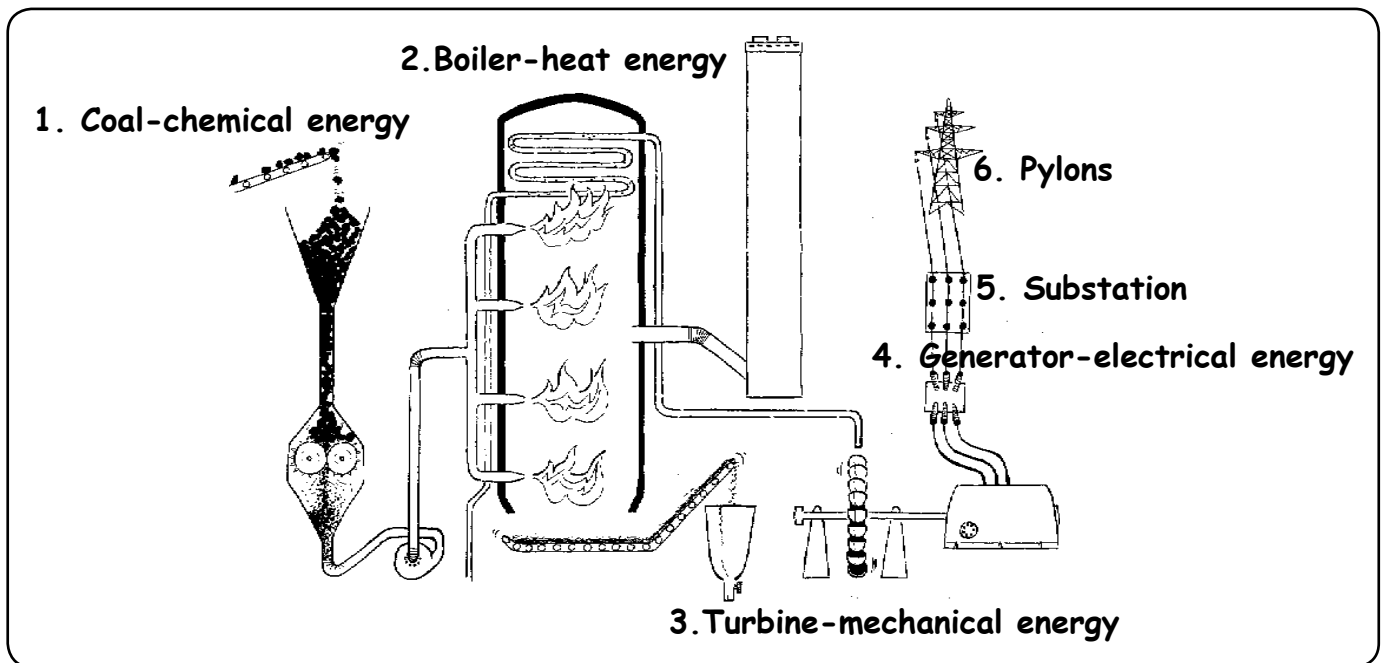


Power Station Parts

- Using the plan of Kilroot power station and a ruler find the power station parts.
 - Go to the end of the coal jetty, go North for 6cm, West for 9cm. You have found the first part of the power station, the _____.
 - Find the chimney at 5, go East for 1cm, then North for 2cm. You have found the second part of the power station, the _____.
 - Go to the end of the coal jetty, go West for 10cm, then North for 8cm. You have found the last part of the power station, the _____.
- The picture below shows how all the parts in the power station are joined together. Using the key below colour in the different parts.
 - colour the pipe from the **coal crusher** black.
 - colour the flames in the **boiler** red and the **pipes** blue.
 - colour the **chimney** grey.
 - colour the pipe from the top of the boiler and the **turbine** in yellow.
 - colour the **generator** in orange.



Making Electricity

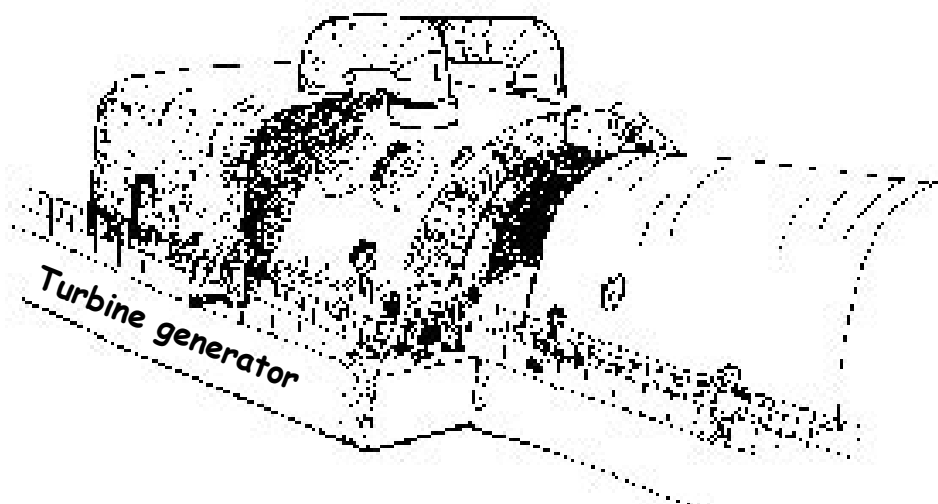


1. A fossil fuel power station starts off with the energy stored in coal, oil or gas and changes it into electrical energy. Fossil fuels store **chemical energy**. The power stations put the fuel into a **boiler** and set fire to it. The boiler also has water in it. The chemical energy in the fuel is changed into **heat energy** in the form of steam. A boiler is just like a huge kettle.

2. The steam is superheated to over 500°C and sent through pipes to the **turbine**. The steam is under pressure, just like air in a tyre. This means that the steam has lots of **mechanical energy**.

3. The steam goes through the turbine blades making them spin 3000 times in one minute. Once the steam has gone through the turbine it goes into a condenser which changes it back into water, which is then pumped back into the boilers.

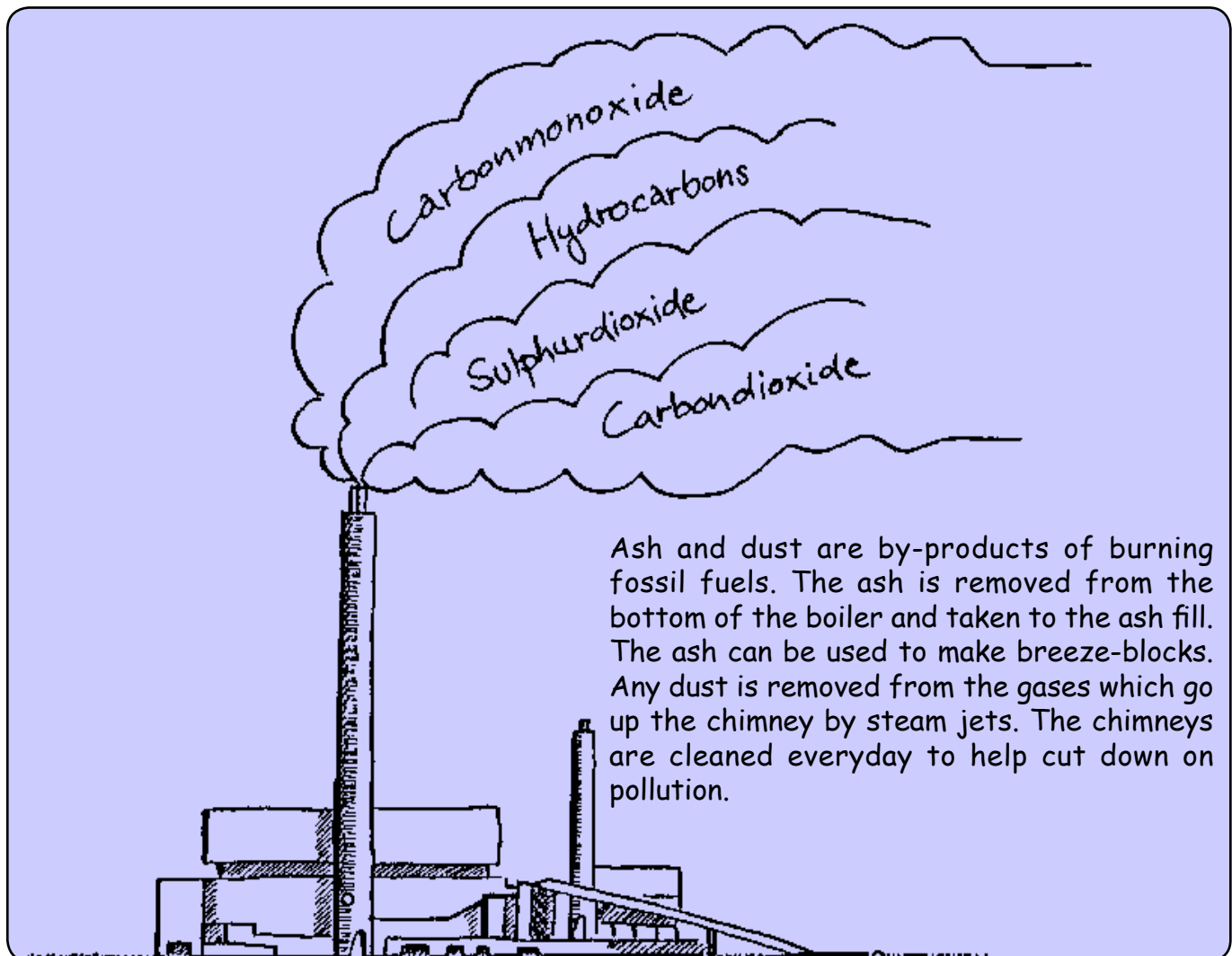
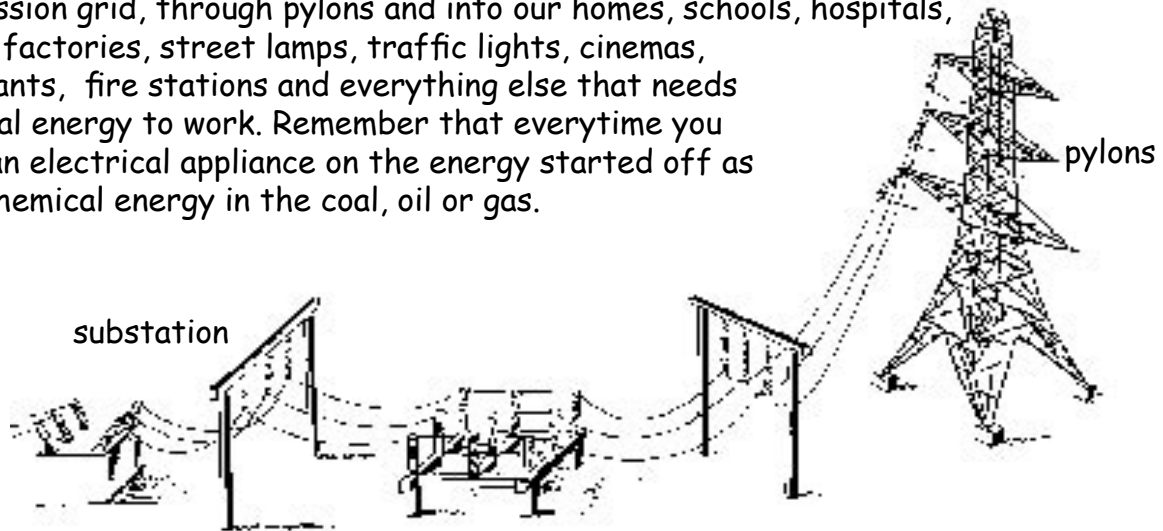
4. The turbine is connected to the **generator**, this is a large magnet and lots of wire. When the magnet spins 3000 times a minute the generator makes **electrical energy**.



Making Electricity

5. The electricity is fed through the power station to the **Substation**. The substation or transformers make the electricity stronger so that it can travel through the pylons.

6. The electrical energy travels through the Northern Ireland transmission grid, through pylons and into our homes, schools, hospitals, offices, factories, street lamps, traffic lights, cinemas, restaurants, fire stations and everything else that needs electrical energy to work. Remember that everytime you switch an electrical appliance on the energy started off as chemical energy in the coal, oil or gas.



Power Station Quiz

1. There are three ways to finish each of these sentences. Only one is the right way. Circle the correct answer.

- (a) In a power station coal is crushed into
pebbles
dust
rocks
- (b) Smoke leaves a power station through a
long pipeline
tall chimney
deep cave
- (c) Coal, oil or gas are burnt in the boiler to produce
water
heat
light
- (d) The heat in the boiler is used to turn water into
steam
electricity
air

2. Belfast West power station closed in March 2002 after over 40 years of electricity generation at Belfast docks. The coal-fired power station had 7 boilers, each boiler burning 100 bags of coal every hour. The coal was burned in the boilers 24 hours a day, 365 days a year.

(a) How many bags of coal did the 7 boilers burn every hour?

(b) How many bags of coal did the station burn in one day?

(c) How many bags of coal did the station burn in the month of May?

(d) How many bags of coal did the station burn in a year?



Power Station Quiz

3. Steam makes the turbine spin 3000 times a minute. In one second, how many times will the turbine spin?
4. a. Which part of the station uses heat energy to turn water into steam?
 b. The steam makes which part of the station spin 3000 times a minute?
 c. Which part of the station turns mechanical energy into electricity?
 d. What is the oil stored in?
 e. What goes up the chimney?

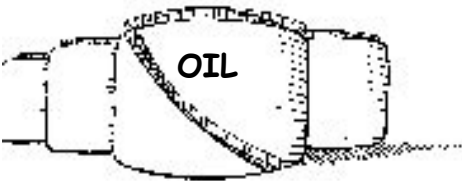
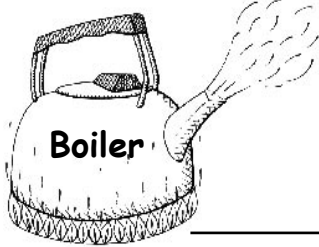

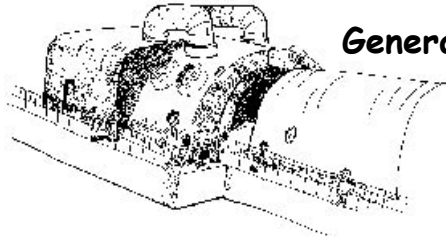
			a						
			b						
c									
		d							
			e						



When you have filled in all the answers the shaded boxes will show you what happens to coal and oil in a power station. _____

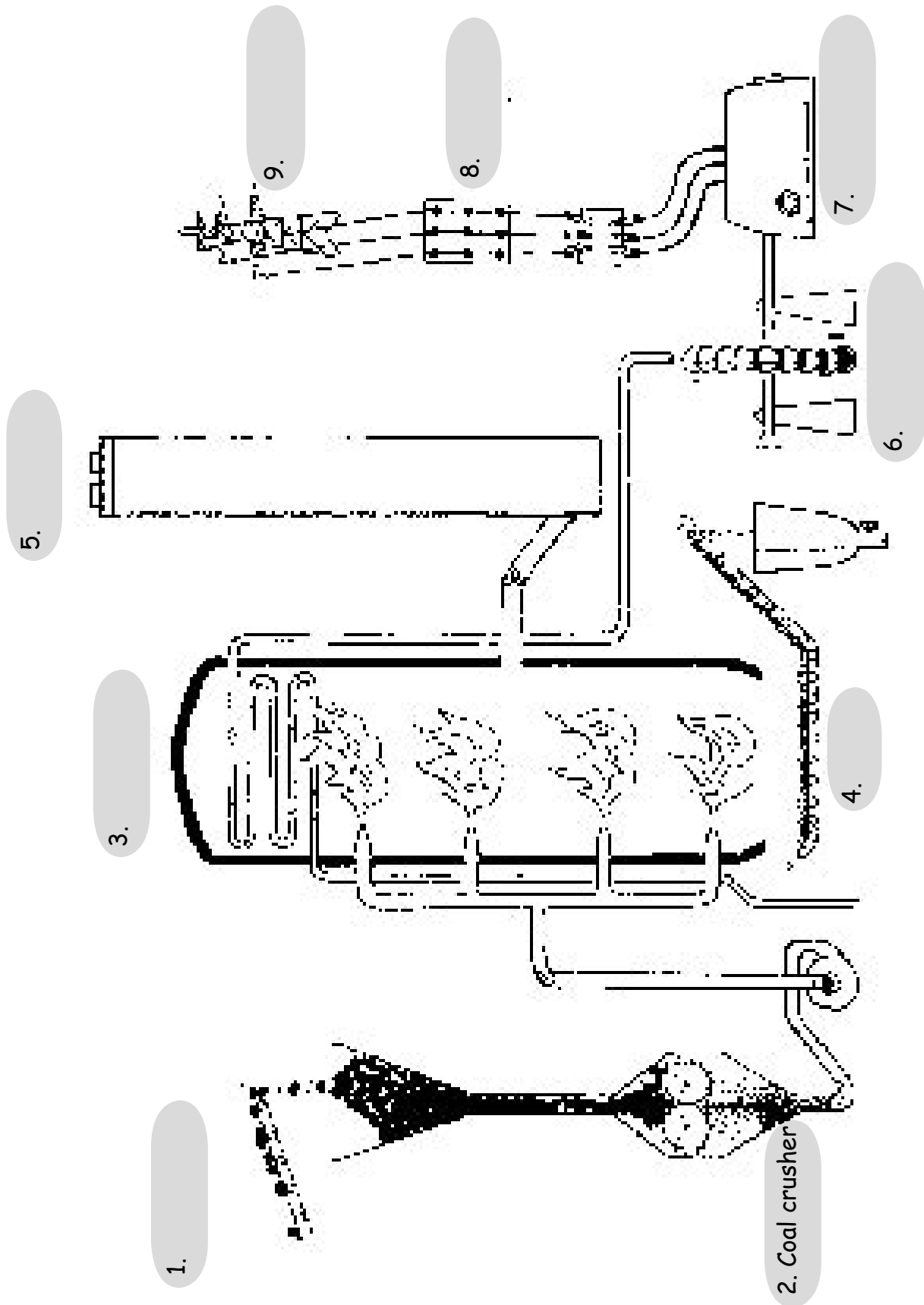
5. What kind of energy is being changed in the power station?

Chemical Electrical Heat Mechanical

 _____ energy	 _____ energy
 _____ energy	 _____ energy

Power Station Parts

1. Label the power station diagram.



Power Station Parts

2. Finish off these sentences using the words below.

turbine

steam

sub-station

generator

fossil

a. The electricity passes into the Northern Ireland Grid through a _____.

b. The _____ changes the turbines' mechanical energy into electrical energy.

c. _____ fuel power stations burn coal, oil or gas.

d. The steam drives the _____.

e. Water is heated until it turns into _____.

Now write them out again in the right order to explain how a power station works.

Keywords and definitions

Condenser	A chamber where steam is cooled and turned to water.
Electric current	A flow of electrons moving along a wire or conductor.
Electrical Energy	The ability of the electric current to do work. Measured in Kilowatt-hours.
Electromagnet	An iron core surrounded by a wire coil that produces magnetic effects when an electric current is flowing in the wire coil.
Electrons	The negatively charged particles that are part of an atom.
Fossil Fuels	Coal, oil or natural gas that result from the fossilisation of ancient plants or animals.
Generator	A machine that produces electricity.
Grid	A system of transmission lines which carry electricity between power stations and sub-stations.
Mechanical Energy	The energy of the moving parts of a machine or a human.
Megawatt	1,000 Kilowatts or 1,000,000 (1 million) watts.
Transformer	Increases or decreases the voltage in an electricity system.
Turbine	Rotors or blades that spin when driven by steam, gas, water or wind.
Turbo-generator	A turbine connected to a generator to produce electricity.
Watt	The unit of electrical power. A measure of the rate at which an appliance uses electrical energy.

