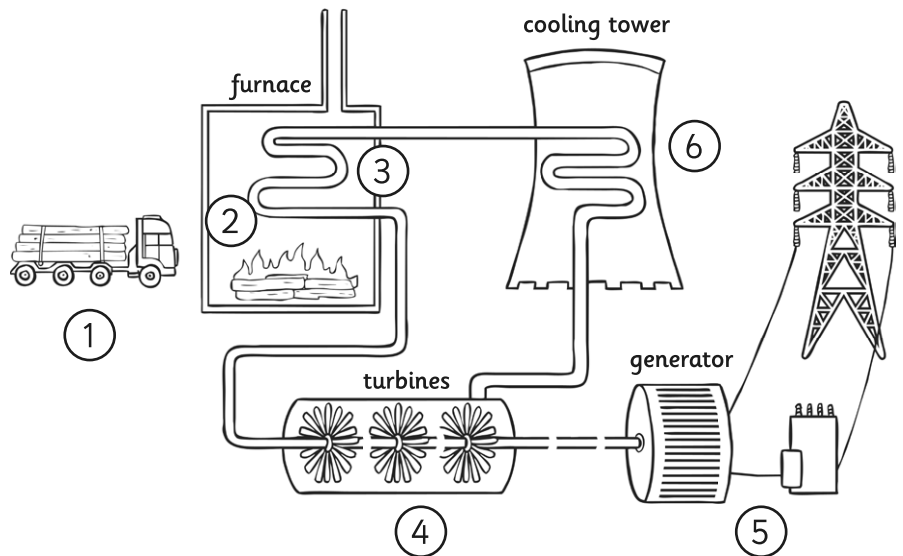


Biomass Power Stations

How It Works

1. Biomass is brought to the power station.
2. The biomass is burned in a furnace.
3. The heat is used to heat water to create steam.
4. The steam turns the blades of the turbines.
5. The turbines connect to a generator which creates electricity.
6. The steam is cooled into water in cooling towers and used again.



Advantages

It is renewable – new plants and trees can be grown to replace those used for fuel.

It supports farmers and foresters by providing markets for their crops.

It is a carbon neutral source of energy. This means that the amount of carbon dioxide released when the fuel is burnt is the same as the amount of carbon dioxide absorbed by the plants when they were growing.

Disadvantages

It is an expensive method of generating electricity.

Biomass power plants need to be built near a plentiful supply of biomass fuel.

Non-renewable.

Many coal-fired power stations can also burn biomass.

Biomass can also be turned into a fuel like gasoline called ethanol.

Did you Know?

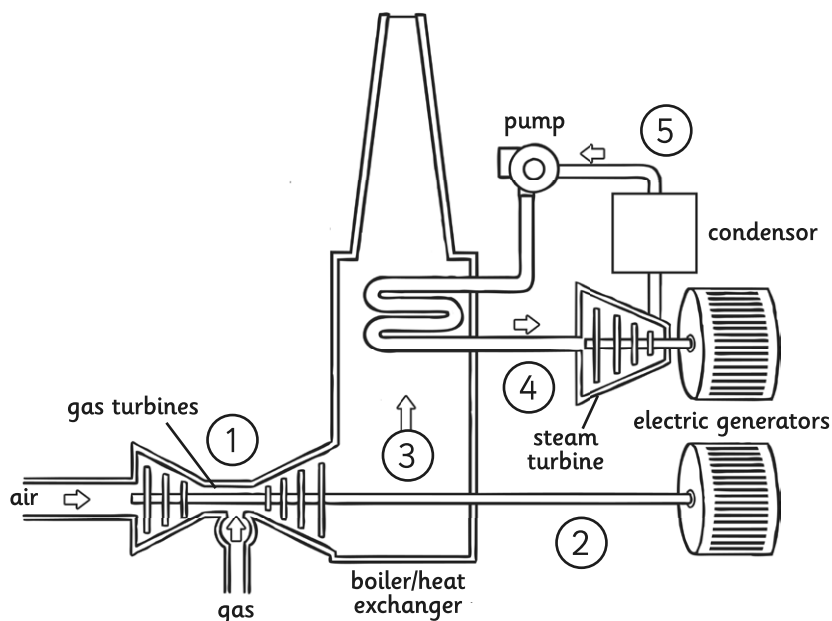
Biomass is any plant or animal matter, including plant and animal waste and even human sewage!

Energy crops are plants grown specifically for fuel.

Combined Cycle Gas Turbine Power Stations

How It Works

1. Gas is burned in a turbine to heat the air supply. The force of the expanding air pushes the turbine blades around.
2. The turbines connect to a generator which creates electricity.
3. The hot gases are used to heat water to create steam.
4. The steam turns the blades of a steam turbine connected to another generator.
5. The steam is cooled back into water in condenser and used again.



Advantages

- Gas is easy to transport by pipeline.
- Lots of electricity can be generated quickly.
- Gas-fired power stations can be built anywhere with a good supply of water and a gas pipeline network.

Disadvantages

- Burning gas produces CO₂.
- Gas is not renewable. There are limited supplies worldwide.
- The UK currently imports most of its gas. This means we are reliant on other countries for our supply.

Non-renewable.

36 power stations
in the UK.

Should remain viable
for 80-100 years.

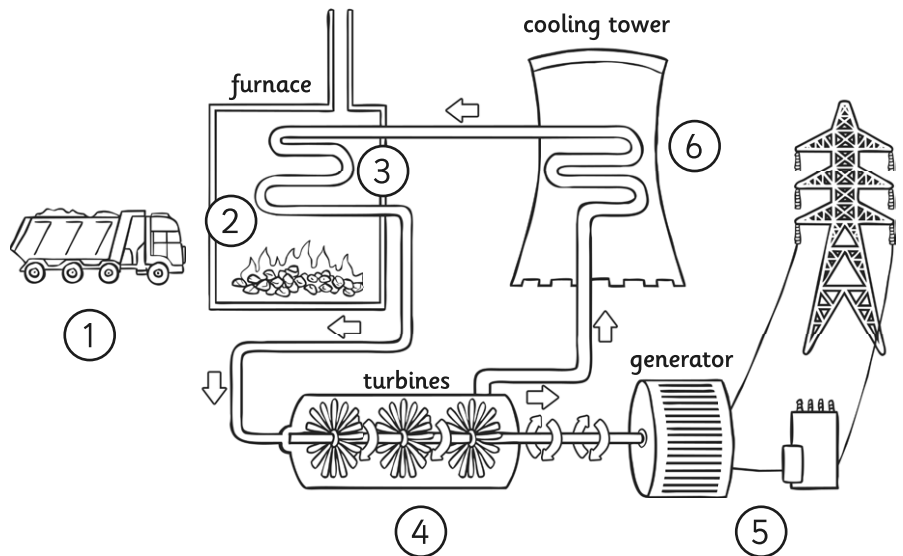
Did you Know?

Oil was formed million years ago. Dead organic material (animals and plants) built up on the ocean floor and in rivers. It mixed with sand and mud. Lots of layers built up over time. Heat and pressure changed the layers into kerogen. If this mixture is gaseous, it will turn into natural gas.

Coal Fired Power Stations

How It Works

1. Coal is brought to the power station and crushed into a powder.
2. The coal is burned in a furnace.
3. The heat is used to heat water to create steam.
4. The steam turns the blades of the turbines.
5. The turbines connect to a generator which creates electricity.
6. The steam is cooled into water in cooling towers.



Advantages

Burning coal is a cheap way to generate electricity.

Coal power stations can be built anywhere with a good supply of water and good transport links.

Many areas of the world have coal reserves.

Disadvantages

Burning coal produces CO₂.

Burning coal produces sulphur dioxide, a gas found in acid rain.

Coal is not renewable. There are limited supplies worldwide.

Coal-fired power stations need lots of coal to keep them running.

Non-renewable.

17 power stations
in the UK.

Should be viable for
around 180 years.

Many coal-fired
power stations in the
UK are old and need
emissions equipment
updating.

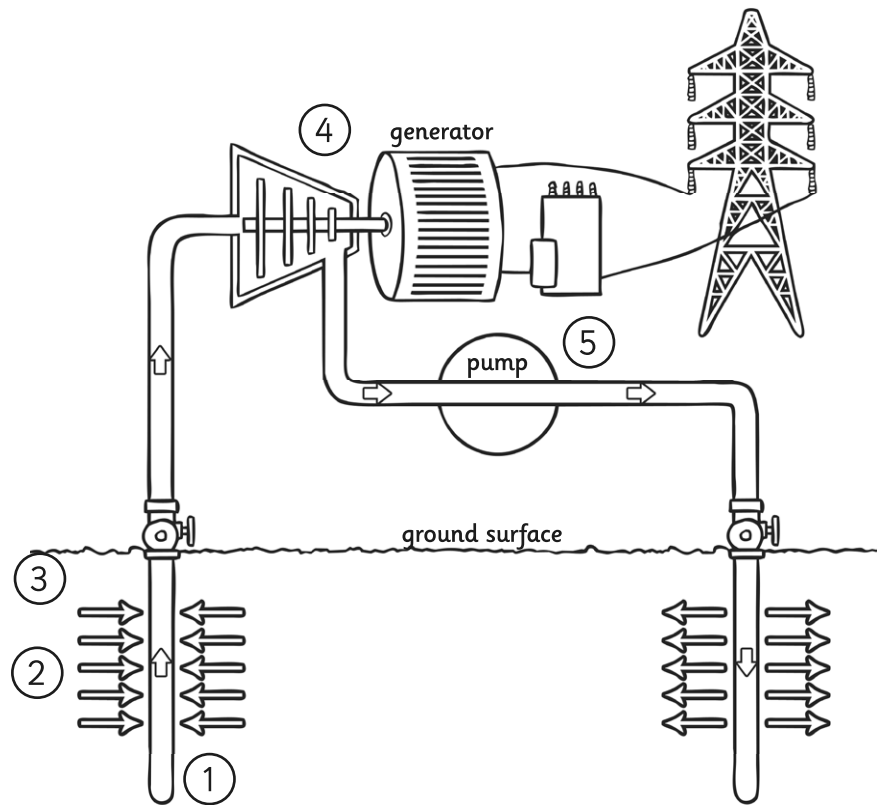
Did you Know?

Coal was formed over 300 million years ago. It formed from the remains of plants that died in swampy areas. As there were no bacteria present, the plants did not rot down. Chemical changes over time changed the plants into coal over millions of years.

Geothermal Power Stations

How It Works

1. Molten rock from the Earth's mantle rises, bringing heat nearer to the Earth's surface.
2. In some places, water deep beneath the Earth's surface is heated up.
3. Pipelines are drilled to allow the water to rise to the surface.
4. The heated water can be pumped up and used to power steam turbines to generate electricity.
5. The water is then pumped back underground to heat up again.



Advantages

Geothermal energy does not produce any pollution.
Running costs for a geothermal power station are very low.

Disadvantages

It is difficult to find suitable sites to put a geothermal power station.
If it is not carefully managed, a borehole can 'run out of steam' and may not be useable for several decades.
Dangerous gases and minerals can come out of a borehole, which may be difficult to dispose of.

Non-renewable.

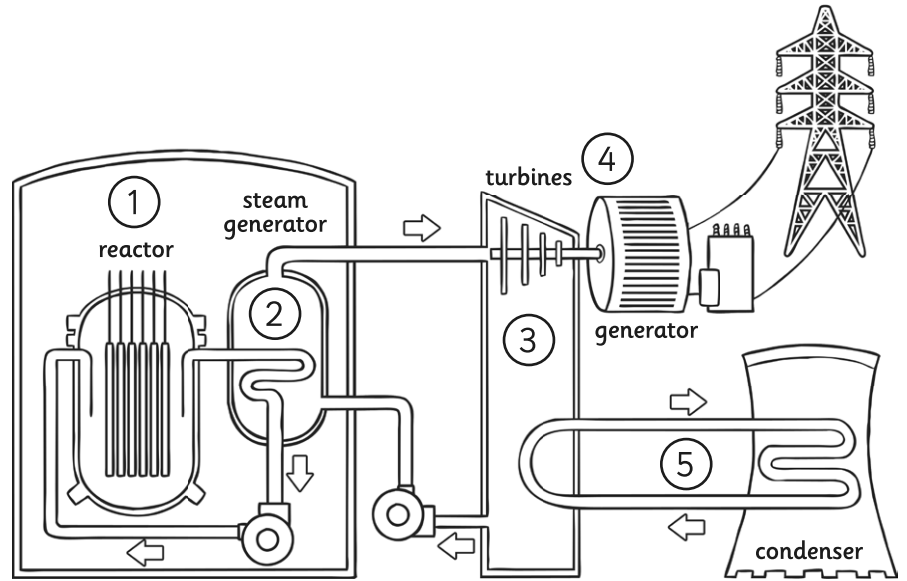
Limited use in the UK. One plant in Southampton produces geothermal heat.

Ground source heating (using heat from the Earth's surface to heat water for domestic heating) is possible in the UK.

Nuclear Power Stations

How It Works

1. Uranium atoms are split into lighter elements in the reactor. This is called nuclear fission. Nuclear fission produces lots of heat energy.
2. The heat is used to heat water to create steam.
3. The steam turns the blades of the turbines.
4. The turbines connect to a generator which creates electricity.
5. The steam is cooled into water by a condenser and used again.



Advantages

Uranium is readily and cheaply available.

Nuclear fuel is easily stored.

A small amount of nuclear fuel produces a lot of electricity.

Nuclear power stations do not produce any carbon dioxide from nuclear fission.

Disadvantages

Nuclear power stations may be unpopular with people who are concerned about how safe they are.

Nuclear energy is not renewable. When uranium runs out it cannot be replaced.

Nuclear energy produces radioactive waste which must be buried in sealed containers for a long time.

Nuclear power stations cannot be switched on and off easily.

Non-renewable.

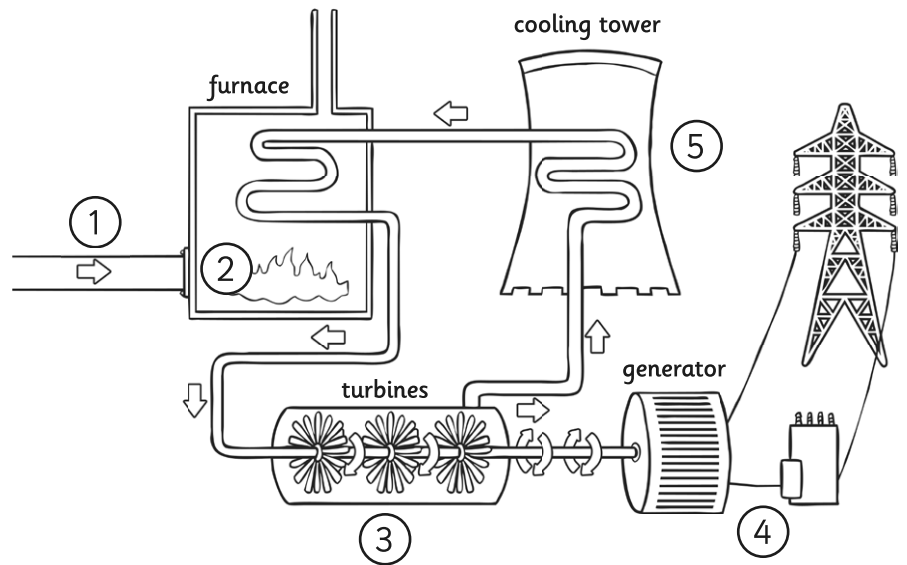
11 power stations
in the UK.

Many of the
existing power
stations in the UK
will need to shut
down in the next
10 years.

Oil Fired Power Stations

How It Works

1. Oil is pumped from a refinery to the power station.
2. The oil is burned in a furnace. The heat is used to heat water to create steam.
3. The steam turns the blades of the turbines.
4. The turbines connect to a generator which creates electricity.
5. The steam is cooled into water in cooling towers and used again.



Advantages

- Oil is easy to transport by pipe or ship.
- Oil power stations can be built anywhere with a good supply of water and good transport links.
- Lots of electricity can be generated quickly.

Disadvantages

- Burning oil produces CO₂.
- Burning oil produces sulphur dioxide, a gas found in acid rain.
- Oil is not renewable. There are limited supplies worldwide.
- Oil is very expensive compared to coal or gas.

Non-renewable.

2 power stations
in the UK.

Should be viable for
around 30-50 years.

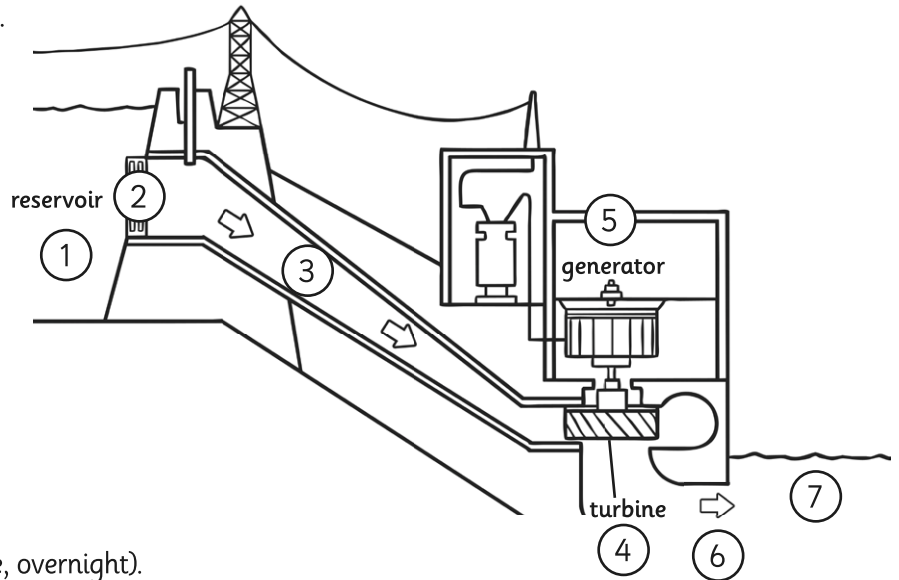
Did you Know?

Oil was formed million years ago. Dead organic material (animals and plants) built up on the ocean floor and in rivers. It mixed with sand and mud. Lots of layers built up over time. Heat and pressure changed the layers into kerogen. If this mixture is liquid, crude oil is formed.

Pumped Storage Power Stations

How It Works

1. Water is stored in a reservoir behind a dam.
2. When the electricity is needed, a pipe called a penstock is opened.
3. Water flows under great pressure down to a turbine.
4. The water turns the blades of the turbines.
5. The turbine connects to a generator which creates electricity.
6. The water is returned to the river.
7. The water is stored in a lower reservoir. It is pumped back up to the top reservoir at times of low electrical demand (for example, overnight).



Advantages

Once the plant is built, operating costs are very low, so the energy produced is virtually free

It does not produce any CO₂.

It is sustainable – the water supply that fills the reservoir never runs out.

Dams store water so we can control when electricity is made.

Power output can be increased very quickly to meet sudden demand.

Electricity can be generated constantly as long as there is enough water.

Disadvantages

Dams are very expensive to build.

Valuable land is flooded when a reservoir is made. Homes and wildlife habitats can be lost

A good site for a hydroelectric power plant, such as a mountainous region, is not always near towns where energy is needed.

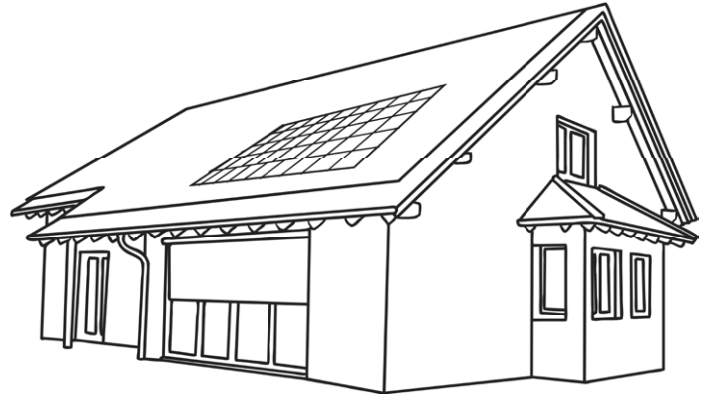
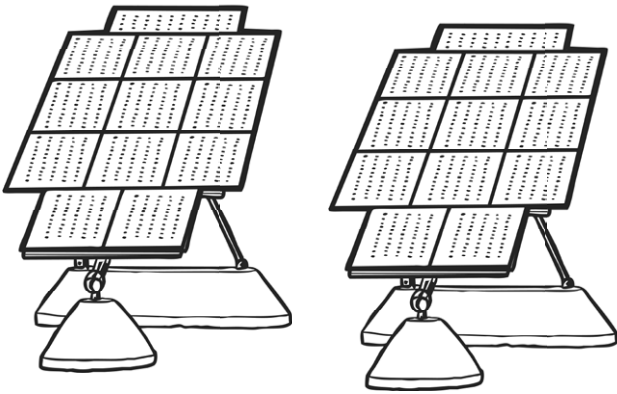
There are not many suitable sites in the UK for new hydroelectric schemes.

Renewable.

7 power stations
in the UK.

Smaller sites are still
being developed.

Solar Power



How It Works

1. The Sun shines on solar panels, usually located on the roof of a building or in a field.
2. Photovoltaic cells (PV cells) inside the panels convert the Sun's energy into electrical energy.
3. The electricity can either be used or carried along power lines to the National Grid.
1. Some solar panels are used to provide heating.
2. The Sun shines on solar panels, usually located on the roof of a building.
3. Water inside the panels is heated.
4. The water is pumped around the heating system in the building.

Advantages

Solar energy is renewable and the Sun's heat and light are free.

Solar energy can be used to generate electricity in remote places where other electricity supplies are hard to come by.

It does not produce any CO₂.

Energy is usually generated at or near to the location it will be used, reducing transmission costs.

Disadvantages

PV cells do not work so well when it is cloudy and do not work at night.

The UK is not a very sunny country! Solar power works better in hot places, so its use is therefore limited.

Renewable.

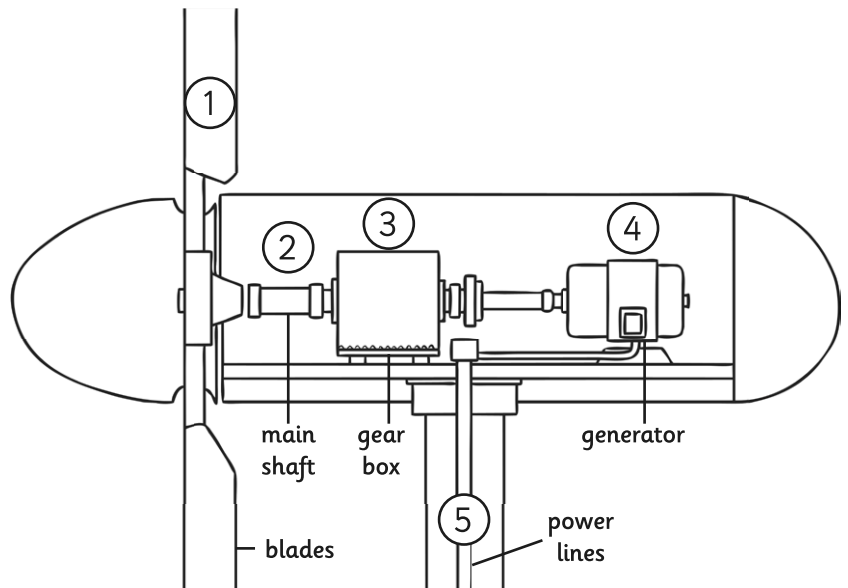
There are increasing numbers of solar farms in the UK.

Many buildings are now fitted with solar PV cells.

Wind Power

How It Works

1. When the wind blows, the blades turn.
2. The blades turn the main shaft which connects to the gear box.
3. The gear box increases the speed of rotation to around 1500 rpm (revolutions per minute).
4. The shaft turns a generator which generates electricity.
5. The electricity is carried along power lines in the tower.



Advantages

Once the wind turbine is built, running costs are very low.

It does not produce any CO₂.

The land occupied by a wind farm can still be used for farming.

Wind is a renewable source so it will not run out.

Wind farms are safe and easy to build.

Disadvantages

Wind turbines must be shut down in very strong or very weak winds.

They can only be built in certain areas.

Not everyone likes the appearance of wind farms.

Renewable.

There are many wind farms in the UK.

Wind farms vary from a single turbine to fields of over 200!

Did you Know?

Other parts of the mechanism allow the turbine to be turned to face into the wind. In high winds, the pitch of the blades can be changed to stop the turbine turning at all and prevent damage.