

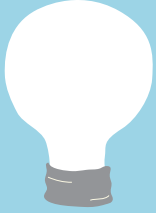
A seven part series exploring the fantastic world of science.

# ENERGY



# What is Energy?

Energy is the ability to do work.



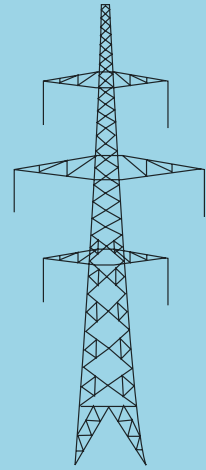
Light



Motion (kinetic)



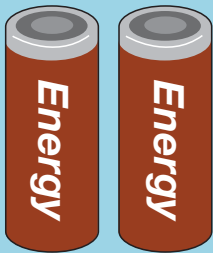
Heat



Electrical

Energy can be found in different forms.

Chemical



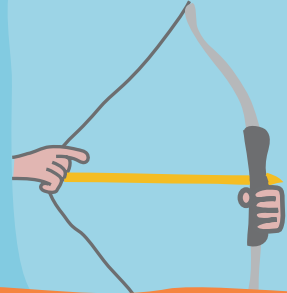
Sound



Nuclear



Stored (potential)



Energy cannot be created or destroyed. However, energy can be converted from one form to another. For example the chemical energy of batteries can be converted into the light energy of a torch.

## Food is our fuel.

Humans, like all animals, get their energy from the food that they eat. The amount of energy in food is measured in kilojoules (kJ). The kilojoules from the food you ate for breakfast gave you the energy to walk to school, play games at break and complete your school work.

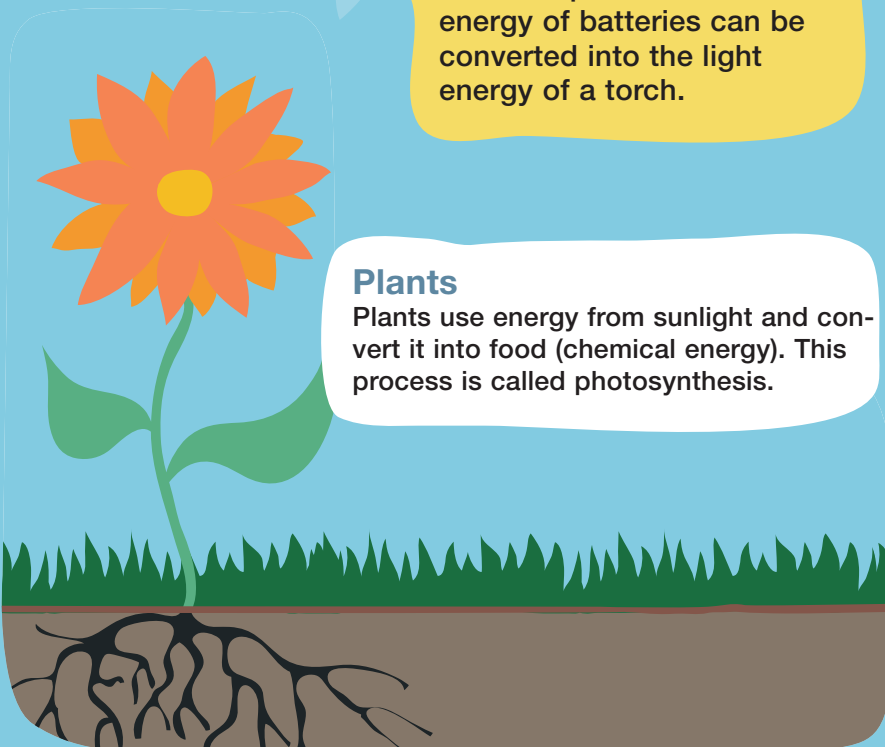
## Plants

Plants use energy from sunlight and convert it into food (chemical energy). This process is called photosynthesis.

## Did you know?

1 slice of buttered toast contains 315 kilojoules, which is enough energy to either:

Jog for 6 minutes  
Cycle for 10 minutes  
Walk for 15 minutes



# Different energy sources.

Our energy comes from natural resources, which are either renewable, sustainable or non-renewable.



## Renewable

Renewable energy sources include solar, wind and tidal energy.



## Non-Renewable Energy

Non-renewable energy sources are also known as fossil fuels. Fossil fuels include oil, gas and coal. These are currently our main source of energy.



## Sustainable Energy

Nuclear energy is called a sustainable source because although it will last for a very long time, it is not renewable. Nuclear energy can generate a huge amount of electricity from a small amount of radioactive material. Despite the large amounts of energy and small amounts of carbon dioxide produced, there are drawbacks. There are very high costs associated with equipment, buildings and waste disposal.

## Did you know?

Plutonium remains radioactive for 24,000 years!

## What do you use energy for at home?

Most of the energy you use is spent keeping your home and your family warm. About a quarter of the energy your family uses is on hot water for baths, showers and cleaning.

Cooking, lighting and other household appliances such as televisions, computers and fridges use the rest of your family's energy.

## Have a go!

Use the worksheet provided to carry out a survey in your house and work out how much energy is used to light your home for one year.





# Fossil Fuels.

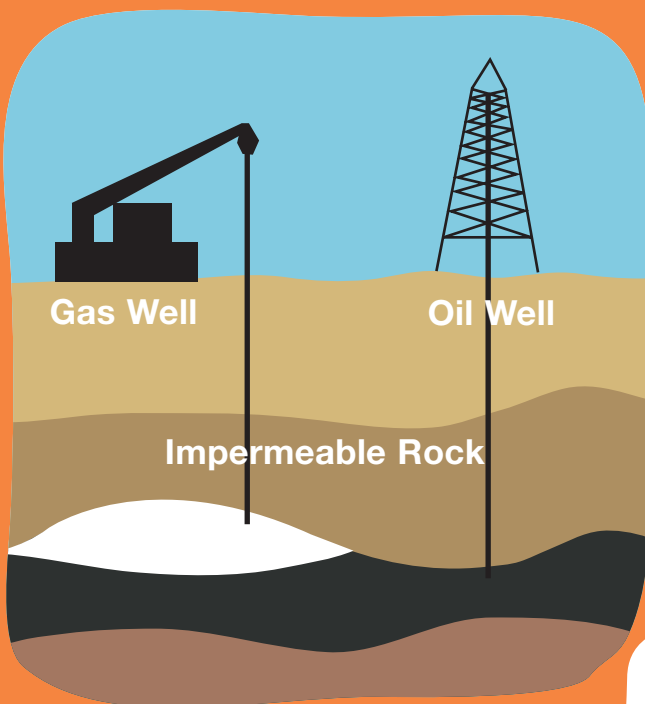
Discover more about fuels that are millions of years old.

## Fossil fuels

Fossil fuels are a limited resource. Fossil fuels were formed from decaying plant and animal material over millions of years and contain carbon. When fossil fuels are burned the carbon is released and forms carbon dioxide. Carbon dioxide is a greenhouse gas. Greenhouse gases are important because they trap some of the Sun's heat within the Earth's atmosphere. An increase in greenhouse gases is linked with climate change.

## Why use fossil fuels?

Non-renewable fossil fuels are an attractive energy source for several reasons. Fossil fuels are found in highly concentrated reserves, they are easy to store and because the technology is well developed it is cost effective and efficient. However, fossil fuels are only found in limited areas and there is a very limited supply. Burning fossil fuels contributes towards pollution of the environment.



## Oil and Gas

Oil and gas are fossil fuels. Oil was formed when plants and micro-organisms living in the sea died and fell to the sea bed. A layer of mud formed on top of the decomposing plant and animal matter. Very slowly, over millions of years this layer was turned to crude oil and gas by a combination of temperature and pressure.

## Coal

Coal is the dirtiest fossil fuel. Coal was formed over 200 million years ago when plants and trees that grew in swamps died and began to rot. As the plant material rotted it turned into peat. Over millions of years the heat and pressure caused the layer of peat to become coal.

## Coal Mining in Scotland

Coal mining in Scotland began in the 12th century but the demand for coal rose soon after the invention of the steam engine, by the Scot James Watt.



## Did you know?

Experts predict that there is only 40 years worth of oil left.



# Renewable Energy.

Learn about the different types of renewable energy sources.

Renewable energy sources offer a cleaner alternative to fossil fuels. Renewable energy sources are widely available, and will be for the foreseeable future. However, this energy supply can be unreliable and the quantities produced are relatively small and hard to store.

## Solar energy

The energy from the Sun can be trapped by photovoltaic (PV) cells within solar panels and converted into electricity. Solar panels can be built into houses and offices to deliver a clean and silent energy supply.

## Did you know?

You might not think you live in a sunny country, but the British Isles receives 60% of the solar energy that the equator does! This means that the UK can use solar energy to heat water and generate electricity.

## Wave energy

Waves in the seas and oceans are formed when the wind blows over the surface of the water. Waves can travel for thousands of kilometres without losing any of their energy. Due to the direction of the prevailing winds around the UK coast and the massive size of the Atlantic Ocean, the UK is well placed to exploit the energy stored in the waves and turn it into electricity.

Over 400 homes on the island of Islay are powered by wave energy.

## Hydro energy

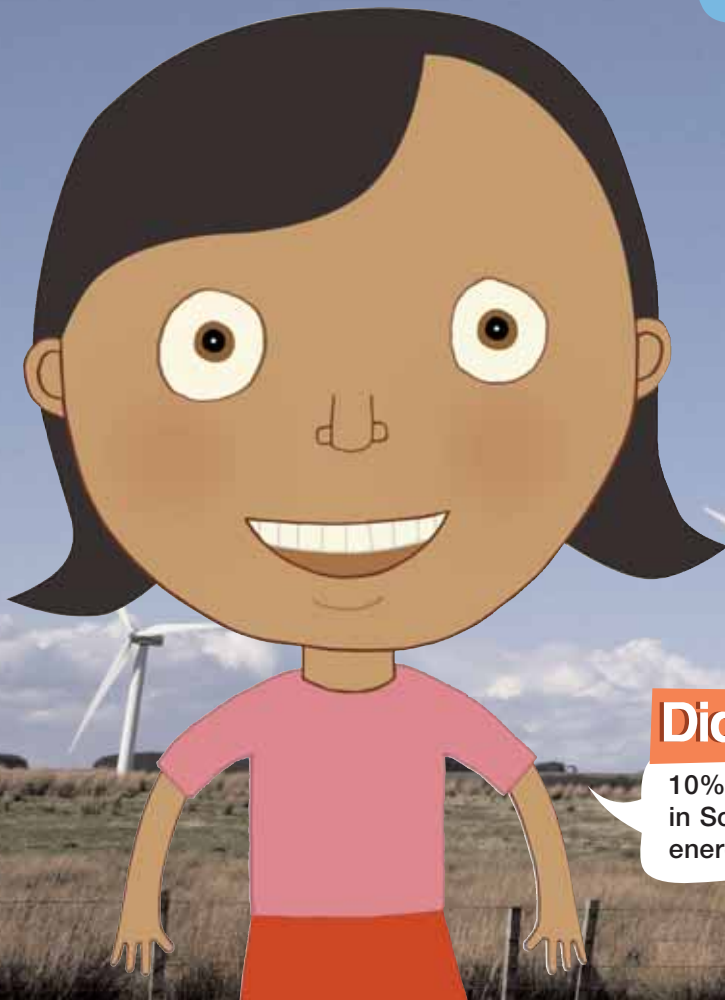
Hydro energy converts the kinetic energy of running water into electrical energy using large water wheels or turbines.

Hydro energy is the only renewable energy source that can be used to store large quantities of energy, by using a system of water reservoirs and pumps.

Hydro turbines are very efficient, converting over 90% of the water's kinetic energy into electrical energy.

## Did you know?

10% of the energy produced in Scotland comes from hydro energy sources.



## Wind energy

The kinetic energy of the blowing wind can be harnessed to turn large turbines. The turbines convert the kinetic energy into mechanical energy and finally into electrical energy.

Peebles has a wind farm where you can find 24 wind turbines each standing over 75 metres tall. There are several wind farms throughout Scotland.

## Geothermal energy

Geothermal energy uses the heat from the centre of the Earth to make steam. The steam is used to turn turbines and this kinetic energy is converted into electrical energy.

## Biomass energy

Biomass energy is the energy released from burning trees and plants. As plants grow they absorb carbon dioxide gas from the environment during a process called photosynthesis. So, although some carbon is released back into the environment when the plant is burned, this is equal to the amount of carbon dioxide the plant absorbed whilst growing. Fast growing trees, such as willow and poplar, are grown in managed and sustainable forests to provide biomass energy.

## Did you know?

In Iceland, geothermal energy sources provide enough energy to power the capital city, Reykjavik.

## Did you know?

That Britain is the windiest country in Europe.





## Lights! Action!

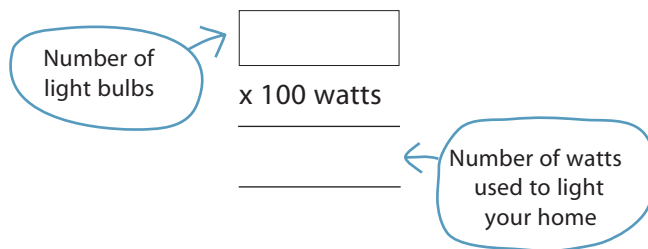
Carry out an energy survey and find out how much energy is needed to light your home.

Name: \_\_\_\_\_

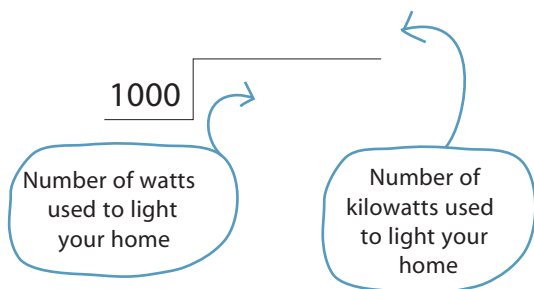
**1** Count and write down how many light bulbs are used in your house. The number of lights used in my house is:

\_\_\_\_\_

**2** Using this number you can calculate how many watts of power are used. Let's assume that each light bulb is a 100 watt light bulb.

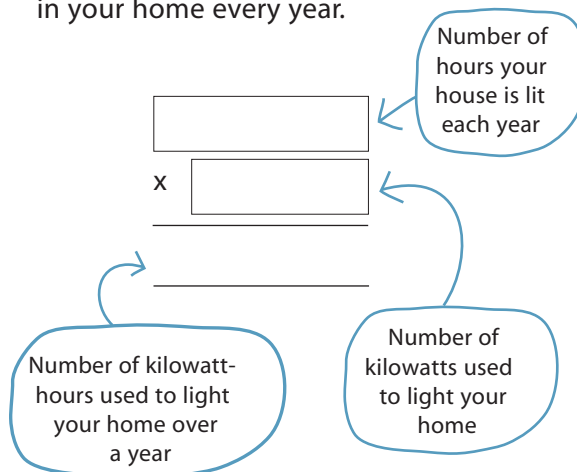


**3** Energy is measured in kilowatt-hours. There are 1000 watts in a kilowatt. Using this information, calculate how many kilowatts are used to light your home.



**4** Imagine the lights in your home are on from 8am to 10am and from 5pm to 11pm. The total number of hours your home is lit for each day is 8 hours, or 2920 hours every year.

Now calculate how many kilowatt-hours are used by the light bulbs in your home every year.



**5** An 18 watt energy saving light bulb gives out the same amount of light as a regular 100 watt light bulb. If you were to replace all the light bulbs with energy saving light bulbs, how much energy could you save?

\_\_\_\_\_

Have a go!

# Types of Energy.

Copy this sheet and complete the outer ring with examples of different types of energy.

Name: \_\_\_\_\_

