

ENERGY FLOWS

Modern society requires a lot of energy. We regularly change energy from one form into another to meet our needs. For example, a hairdryer turns electricity into heat or thermal energy. A battery converts chemical energy into electricity. A power station converts the chemical energy in fuels into electricity through a number of steps.

Energy conversions

Energy constantly changes from one form to another. Solar energy heats water in the sea. Heated water molecules move around more quickly, gaining kinetic energy. Some of the molecules move fast enough to form water vapour (a gas).

Water vapour rises into the air. As it rises, the water vapour cools and condenses to form clouds. Clouds contain liquid water and ice. A single cloud can weigh many tonnes. Clouds have potential energy. They release this energy when the water falls to the ground as rain.

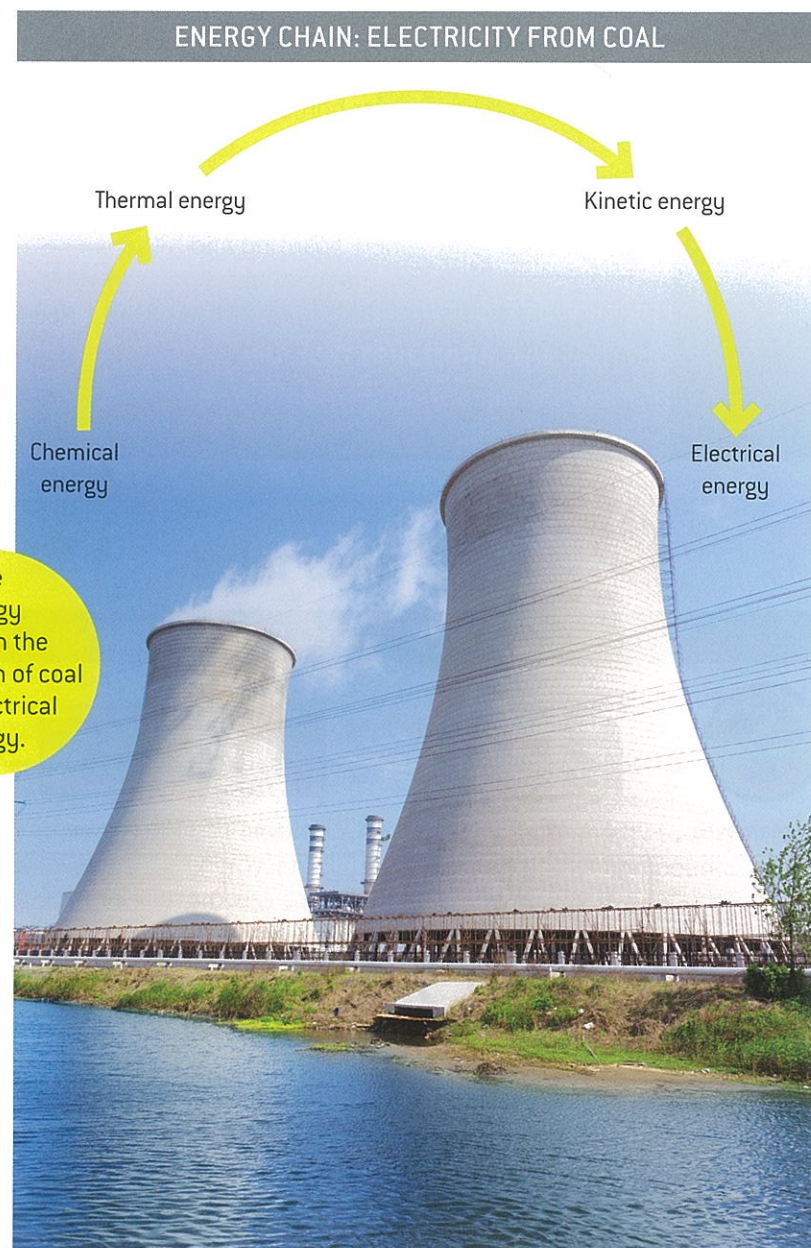
Flow diagrams can be used to represent energy conversions.

Turning chemical energy into electricity

A power station converts the chemical energy stored in coal into electrical energy.

Burning the coal releases the chemical energy as heat (thermal) energy. Water absorbs the heat, turning into steam. The steam moves at high speed, with great kinetic energy. The energy turns a turbine, which converts the kinetic energy into electrical energy.

This energy chain is shown in the flow diagram to the right.



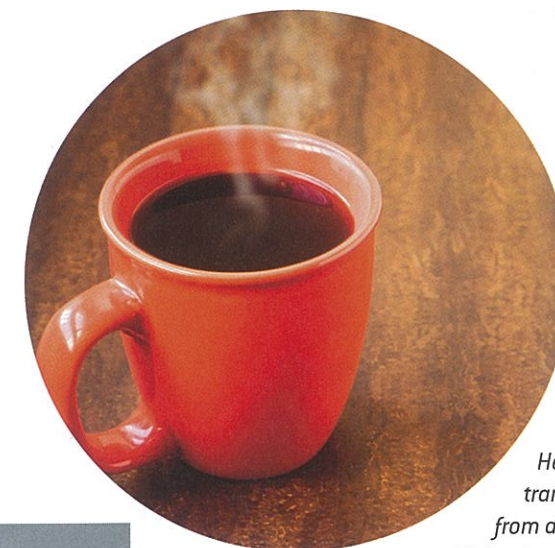
When a jet plane takes off, it is converting chemical energy in its fuel into the kinetic energy of motion.



Turning chemical energy into sound

When you listen to music on a smartphone, a number of energy conversions occur. The chemical energy stored in the smartphone battery is converted into electrical energy. The electrical energy flows through the wires to the headphones where it is turned into kinetic energy as the speakers in the headphones vibrate. The vibrations are sound energy, which we hear as music.

This energy chain is shown in the diagram below.



Heat is the transfer of energy from an object with a higher temperature to an object with a lower temperature. The heat energy from this hot coffee mug will transfer to the surrounding air and bench top.

Heat flow

What will happen to a mug of coffee with a temperature of 80°C if it is sitting on a bench in a room that has a temperature of 20°C ?

The answer, of course, is that the mug and coffee will cool. Eventually the coffee will reach room temperature. The mug of coffee is transferring heat to its surroundings. As the coffee cools, the average speed or kinetic energy of its particles decreases. You can think of heat as the transfer of energy from a hot object to a colder object.

What will happen to a glass of lemonade with a temperature of 10°C in the same room? The glass of lemonade will warm until it is the same temperature as the room. In this example, heat from the room is transferred to the lemonade.

CHECK IT OUT

- What information is provided by an energy chain flow diagram?
- Draw a flow diagram showing the energy changes when:
 - a cricket player hits the ball high into the air
 - a person bungee jumps from a bridge
 - a person uses a toaster powered by electricity from a nuclear power plant.
- Why will a hot object cool down to reach the temperature of its surroundings?
- Draw a flow diagram showing the energy changes for the following conversions:
 - speaking to a friend
 - boiling water in an electric kettle
 - generating electricity in a hydroelectric power station.
- Name a device that will convert:
 - electricity into chemical energy
 - kinetic energy into potential energy
 - electricity into sound.