

# Support material #1: Information about energy

When anything happens on Earth, energy is used. Most of this energy ultimately comes from the sun. Look around at all the machines and appliances that are operating – lights, fans, air conditioners and televisions. Can you imagine life without them?

Energy is essential to life and its conservation has become increasingly important. Can you imagine the amount of energy that is being used to run all of the appliances at your school? In your home? Fortunately, people are becoming aware that they are consuming too much energy and efforts are being made to conserve this valuable resource.

## Origins of energy

Where does energy come from and how does it get into our homes?

Humans have always used energy in their daily lives. Energy has been used throughout time in food preparation. Fire has been used to transform wood into heat for thousands of years.

Today we tap into a wider range of energy sources by converting primary energy sources into forms of energy that can be more easily used, such as electricity.

The primary energy sources used in Australia include coal, natural gas, water, LP Gas, the wind, the sun and biomass. Other countries use additional primary sources, such as geothermal energy in New Zealand.

## Renewable or non-renewable?

Primary energy sources are classed as renewable or non-renewable.

Renewable energy sources are those that can be replenished quickly or that are never-ending. They include sunlight, wind, water, waves, tides and biomass.

Renewable energy has been used for thousands of years: heat from the sun to dry clothes and food, wind energy to turn the mills that grind corn and pump water.

Renewable energy is environmentally friendly and sustainable. Sustainable energy resources are not likely to run out like non-renewable resources. Some examples of sustainable energy sources are the sun, wind and water, which can be easily replaced, unlike coal and gas, which take thousands of years to create.

Non-renewable energy sources are those that are used faster than they can be replenished. They are finite. Examples include coal, natural gas and petroleum, all of which are fossil fuels.



Wind energy is clean and renewable.

## Secondary energy sources

Secondary energy is produced by the conversion or transformation of primary energy sources, such as coal, water and natural gas. Secondary energy sources can be renewable or non-renewable.

Electricity is the most widely used and rapidly growing form of secondary energy.

Electricity is mostly made in power plants that burn fossil fuels to create steam. This steam then drives machines that generate electricity. The most commonly used fuel in Australia is coal, which is abundant and, in this country, relatively cheap because large amounts of electricity can be produced in one place.

Electricity travels along wires to commercial premises and to our homes where we can switch on our lights, heat and cool our homes and use our appliances.

Sources of Australia's electricity	Per cent
Coal-fired power stations	Around 76
Gas	Around 14
Clean and renewable energy sources (such as hydro, wind or solar energy)	Around 10

## Transfer of energy

Energy can shift or transfer from one place to another. There are two main types of energy transfer: work process and heat flow.

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When one object pushes against another object, energy is transferred by the force of the movement. A work process results in the transfer of energy, and the type of energy involved is called kinetic (or movement) energy.

For energy to be transferred through a heat flow, there must be a difference in temperature between two objects. This type of energy flows from a higher temperature to a lower temperature. The speed of the energy flow depends on the difference in temperature – the larger the difference, the faster the flow of energy.

### Types of energy

#### Kinetic energy (movement)

The energy of motion, or the energy an object possesses when it is moving. Kinetic energy travels in waves, electrons, atoms, molecules, substances or objects.

Examples of kinetic energy	Electrical energy	Radiant energy	Thermal energy (heat)
Definition	Energy caused by the movements of electrical charges.	Electro-magnetic energy which travels in waves e.g. visible light, solar energy, x-rays or radio waves.	The internal energy of a substance, which comes from the moving particles of the substance.

#### Potential energy (stored or hidden)

Energy which is stored, with the potential to be used later.

Examples of potential energy	Chemical energy	Nuclear energy	Gravitational energy
Definition	Energy stored in chemicals or substances, which is released or absorbed during a chemical reaction e.g. petrol or natural gas.	Energy which is stored in the nucleus of an atom, which is released when the atom is split apart e.g. uranium.	Energy which is stored as a result of an object's position or place in the gravitational field.

### Transformation of energy

Energy can be converted or changed from one form of energy into another form of energy. Energy can be transformed through work or heat. Machines are often used in the process of energy transformation.

As energy is transferred or transformed, the total amount of energy never changes. Energy cannot be created or destroyed – it can only be converted into a different form. The amount of energy stays the same throughout this process.

Each time energy is transferred or transformed, it becomes less useful. The more it shifts or changes, the less useful it becomes. Eventually it becomes low-grade energy which is of little use to us, apart from warming the air around us slightly.

#### Some examples of energy transformations

- Bicycle (transforms potential energy into kinetic energy)**  
 The potential energy that is stored in a person's leg muscles is released through a work process, as the person exerts force on the pedals. This energy is transformed into kinetic energy which keeps the bicycle moving forward.
- Iron (transforms electrical energy into thermal energy)**  
 When you plug an iron into a power point and switch it on, currents of electrical energy flow through to the iron causing the transformation into thermal (heat) energy.
- Hot-air balloon (transforms thermal energy into kinetic energy)**  
 Heat from the burner is propelled upwards, filling the balloon with thermal (heat) energy. Warmer air rises in cooler air, so the balloon rises when it is full of hot air, transforming the energy into kinetic (movement) energy.

### Greenhouse gases

A major source of greenhouse gases is the burning of fossil fuels. Scientists tell us that increasing the concentrations of greenhouse gases will lead to global warming and changes in the Earth's climate and weather. Some say it already has.

Reducing energy use will reduce the need to burn fossil fuels and in turn reduce greenhouse gas emissions.

### Home energy conservation

Individuals and households can help reduce the negative effects of greenhouse gases by using less energy. Reduced energy use also means lower household energy bills.

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Electricity being generated at Queensland's Mount Stuart power station.

## Issues affecting your area

Discuss what issues you have noticed that are affecting the world, Australia, or your community in relation to energy and the environment. For example, consequences of energy being overused, especially during summer, weather changes and the effects of the drought on the environment.

For explanation of terms used, see *Support material #4: Glossary*.

### Sources

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