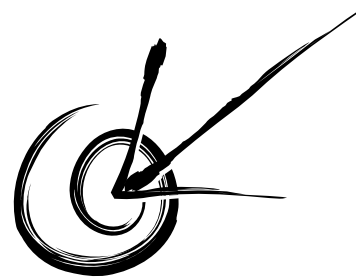




# Where is your energy going?

## Lesson aims

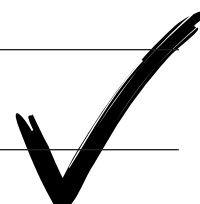
Students will learn about the different ways in which energy is generated, why it is important and how its use effects the environment. They will conduct an energy audit of their classroom and home, looking at the use of heating, cooling, insulation, lighting and hot water appliances and its impact on the environment. They will be able to list several ways of conserving energy in their school and homes based upon their audit analysis.



## Learning outcomes

As outlined in the National Profiles:

<b>Studies of Society and the Environment</b>	Place & Space	Features of places. People and places. Care of places.
	Resources	Use of resources. Management & enterprise.
	Natural & Social Systems	Natural systems. Economic systems.
<b>Science</b>	Life and Living	Living together. Structure and function. Biodiversity, change and continuity.
	Natural & Processed Materials	Materials and their uses. Structure and properties.
<b>Mathematics</b>	Chance & Data	Collecting data. Displaying and summarising data. Interpreting data.



## Where Is Your Energy Going?



### Background information

#### What is energy?

Energy is the ability to do work. When we move something by pushing or pulling, we are doing work. Energy is necessary for anything to move or change. Energy allows us to move: to walk, to talk, to play, and to learn. Our bodies require energy to function, and we find this energy in food and water. Food and water are the fuel that we need to move.

In the material world, we can use different types of fuel to make things move. Energy resources can be described as renewable or non-renewable.

#### Renewable and non-renewable energy

Renewable energy sources are those which are continually being replaced such as energy from the sun (solar) and wind. Less than 10% of the energy generated in Australia comes from renewable sources.

Non-renewable energy sources are used up faster than they can be replaced (for example, coal, oil, natural gas and uranium). Non-renewable energy sources will eventually run out. More than 90% of the non-renewable energy generated in Australia comes from coal-fired power stations.

Non-renewable sources of energy include electricity generated from burning fossil fuels. Fossil fuels are plant materials that have broken down and compressed over thousands of years. Fossil fuels like coal need to be mined from the ground. Mining harms the natural environment and requires a lot of water. Burning fossil fuels releases a greenhouse gas called carbon dioxide which is a source of global warming.

#### Energy use in human history

The rate at which humans are burning fossil fuels is unsustainable. It has not always been this way. There has been a vast increase in

use of fossil fuels to provide energy for new technologies since the Industrial Revolution. More information on the science of global warming can be found in the "Let's Explore Climate Change" lesson plans.

More recently, countries have become concerned about the role of fossil fuels in global warming. Australia is starting to develop systems called offsetting where, for example, trees are planted to absorb carbon dioxide emitted from the burning of fossil fuels for energy.

Countries from across the world met at the Copenhagen Climate Conference in December 2009 to try and find a solution to global warming. Unfortunately, the conference failed to reach consensus on the level or scope of actions needed.

#### Energy Conservation in the home

When we waste energy at home, we worsen the problem of global warming. There are many ways we can conserve energy: the most fundamental is to move to renewable sources, for example by installing solar panels or converting to a solar hot water system. Some activities are free such as using the sun to dry your washing rather than a dryer.

Conserving energy from non-renewable sources is something that everyone can do. Some suggestions are listed below:

- installing energy efficient light bulbs
- buying the most energy efficient appliances: look at the star rating on TVs, white goods and other appliances
- turning off lights when you leave the room
- turning off the heater/electric blanket at night before you go to bed
- using a microwave instead of the oven
- having short showers
- using cold water for washing clothes



## Where Is Your Energy Going?

### Energy Audits

In order to conserve energy, we need to understand our energy consumption, identify ways to reduce energy waste, make recommendations, implement those recommendations, compile an audit report and monitor change in energy use over time.

An audit is a tool that leads you systematically through these processes. The audit can serve as the first step in an integrated environmental management system.



### Sources & Further Information

**Sanyo Solar** – Provides information on what solar power is, and the solar technology that Sanyo has developed.

[www.us.sanyo.com/solar](http://www.us.sanyo.com/solar)

#### Department of Environment, Water

**Heritage and the Arts** – Provides information sheets on global warming, a greenhouse calculator and easy ways to reduce greenhouse gases.

[www.environment.gov.au/settlements/gwci/](http://www.environment.gov.au/settlements/gwci/)

**Kyocera Solar Energy** – Provides information on the different types of solar products they have developed.

[www.kyocerasolar.com.au](http://www.kyocerasolar.com.au)

**Clean Up Australia** – Energy Fact Sheet provides some useful tips for reducing the impacts of energy we use.

[www.cleanup.org.au](http://www.cleanup.org.au)

**Energy Smart** provides tips and information on making your home Energy Smart.

[www.energyrating.gov.au](http://www.energyrating.gov.au)



**Gould Group** designs innovative environmental education and training in sustainability.

[www.gould.edu.au](http://www.gould.edu.au)

**Energy Rating** – learn about how you can choose energy efficient appliances.

[www.energysmart.com.au](http://www.energysmart.com.au)

**Research Institute for Sustainable Energy (RISE)** – has information on a number of different renewable energy technologies.

[www.rise.org.au](http://www.rise.org.au)

**NSW Department of Energy, Utilities and Sustainability** – looks at renewable energy and energy saving tips.

[www.deus.nsw.gov.au/](http://www.deus.nsw.gov.au/)

**Dux** can provide a wide range of solar hot water heaters.

[www.dux.com.au](http://www.dux.com.au)



## Where Is Your Energy Going?

### Classroom activities



1. Introduce the class to the concept of energy. Describe to the class that energy can be produced from non-renewable or renewable sources and give examples of each.
2. Ask students to research how energy is made from the different types of sources. Divide the class into small groups and assign each group an energy source, such as coal, gas, oil, geothermal, hydro, landfill, nuclear, solar, wind and wave-tidal. Each group should look at the advantages and disadvantages of their energy source and present them to the class. The impact on the greenhouse effect should be discussed here. The websites above provide an excellent source of information for this activity.
3. As a class, have students brainstorm a list of as many items as they are able to think of in the classroom that use energy.
4. Write the list so that students are able to think of new examples. After they have had 5-10 minutes to come up with a list, help students think about how each item gets its energy and if the energy is coming from a renewable or non-renewable source.
5. Have students complete the *Worksheet: Just Turn It Off* which depicts a classroom with many appliances.
6. Students should be encouraged to explain their answers in a classroom discussion. Have students share their different items and reasons for choosing them.

### 7. Home Energy Quiz

The home energy quiz asks students to consider how much energy they use for activities such as heating and cooling, cooking, lighting and using appliances. The results will help students understand activities where they could reduce energy use.

Ask students to complete the *Worksheet: Home Energy Quiz* for homework. Students should be **warned in advance that they should not check settings or move appliances without adult supervision.**

In class, for each activity on the *Worksheet* add up the number of students who were:

- high energy users
- moderate energy users
- low energy users

Discuss if the energy sources required for the activities were renewable or non-renewable and identify ways to reduce consumption of non-renewable energy in the home.

### 8. Schools Energy Audit

This audit will help you find out the dollar cost and greenhouse cost of the school's energy consumption.

#### 1) Establish baseline data

Locate the school's past electricity bills. You will see that energy consumption is recorded in kilowatt hours (kWh).

1 kilowatt hour = 1000 watts x 1 hour

Cost = kWh x \$ value/kWh (your energy bill)

Your bill is likely to record energy consumption over a three month period (a quarter).

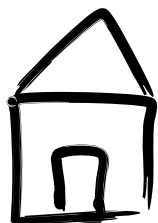
For each bill, note down the number of kilowatt hours and total costs.

Find out the total number of students and teachers in the school.

From this information, you can work out a daily rate of electricity consumption for the whole school and the daily cost to provide electricity. You can express this as a rate per person if you wish.

## Where Is Your Energy Going?

- 2) Locate the electricity meter. If you need help reading the meter, look for information on the bill or ring your energy provider.
- 3) Set a schedule for reading the meter: the same time each day. Aim to involve as many students as possible and to plan to take readings in each term to track changes in electricity consumption in the different seasons.
- 4) Record and graph electricity consumption.
- 5) Look on the back of your bill to see how many kilograms of carbon dioxide are emitted to generate 1kWh of electricity in your area. Multiply this by the number of kWhs used by your school to get the total kilograms of carbon dioxide emitted each quarter.
- 6) Brainstorm ways to reduce this total. Set achievable targets and realistic actions to meet targets. Continue auditing process and assess results.
- 7) Review and monitor progress annually.



### Extension / Home-Based Activities

Organise a school excursion so that students can learn more about energy. A number of centres provide interactive exhibitions that promote the benefits of renewable energy.

Hydro Tasmania Hands On Energy  
Discovery Centre (Hobart)

[www.hydro.com.au/handson/dro](http://www.hydro.com.au/handson/dro)

CSIRO Science Education Centres  
(capital cities in Australia plus Townsville)

[www.csiro.au/org/pps73.html](http://www.csiro.au/org/pps73.html)

World Energy Museum (Fremantle)  
Telephone: (08) 9430 5655



EnergyAustralia's Energy Efficiency Centre  
[www.energyaustralia.com.au/Common-Environment-and-Community/Energy-Efficiency-Centre.aspx](http://www.energyaustralia.com.au/Common-Environment-and-Community/Energy-Efficiency-Centre.aspx)

Teachers can also contact the Department of Education in their state or territory for a list of school excursions relating to environmental education.

#### Lower Primary

Develop energy information through the arts and present to an audience.

Create an educational display for your school on energy efficiency.

#### Middle Primary

Develop energy saving tips for the school newspaper, weekly bulletin or PA system.

Have students make signs and stickers to remind people to turn off the lights when they leave a room.

#### Upper Primary

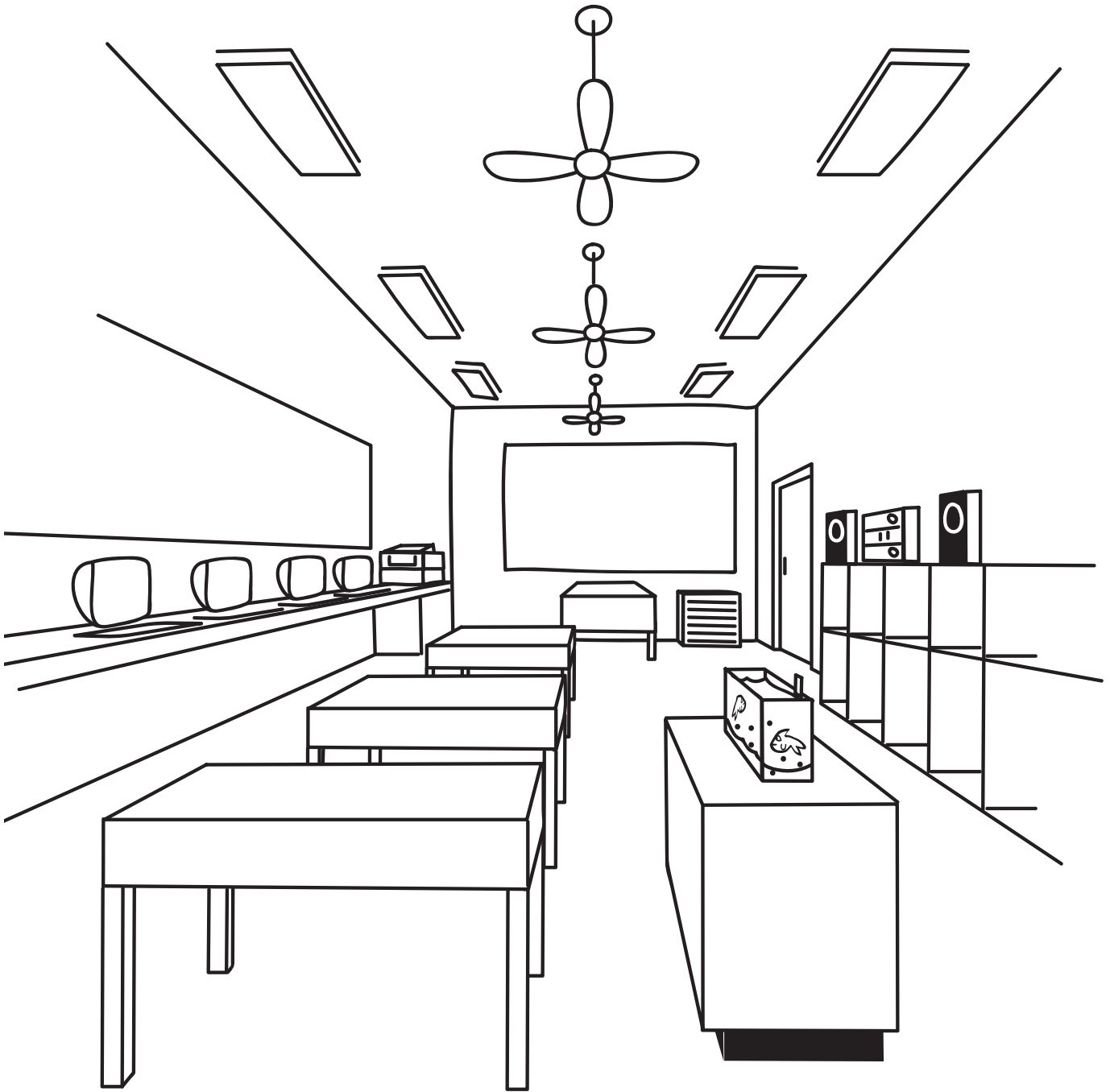
Track monthly energy savings or classroom behaviour changes. Post them in a common area at school.

Conduct 'The Great Energy Debate' on non-renewable versus renewable energy which could be held at a school assembly or open day.

## Where Is Your Energy Going?

### Worksheet: Just Turn It Off

- Colour all of the things in the picture that use energy.
  - Work out what is the source of the energy (e.g. gas, coal, solar) and write it down next to the energy user.
- Circle the things that you could turn off or could change from a non-renewable to renewable source of energy.



## Where Is Your Energy Going?

# Worksheet: Home Energy Quiz

**Instructions.** Go through each of the energy use questions and colour in the box to the right which best describes your home. You may need to ask an adult to assist you in answering some of the questions. Add up the number of coloured boxes at the end of each column.

Energy use question	A. High energy user	B. Moderate energy user	C. Low energy user
Do you turn off lights if you are not in the room?	Lights left on all the time	Lights turned off sometimes	Lights always turned off when no one in room
Do you heat your beds?	Electric blanket used all night	Electric blanket used just before bed	No heating
What are your main forms of cooking?	Electric stove and oven	Occasional microwave	Microwave and/or gas stove
Do you have a second fridge or freezer?	Always running	Only when needed	No second fridge or freezer
Where is your fridge located?	In a hot spot	A sometimes warm spot	In a cool spot
How do you turn off your appliances?	Turn on and off with the remote control	Turn off at the wall sometimes	Turn off at the wall all of the time
Do you have a computer and how do you turn it off?	Left on for long periods	Use energy star sleep features	Computer turned off (when not in use) / do not have a computer
What type of water heater do you have?	Electric storage	Gas	Solar, 5-star gas or heat pump
Do you shower or bathe?	Long showers and deep baths	Showers only or shallow bath	Short showers (3 minutes or less)
What water temperature do you use for clothes washing?	Always hot or warm	Sometimes warm	Always cold
How do you dry clothes?	Always use the dryer	Sometimes use the dryer	Always dry on the line or clothes airer
How much of your home do you heat and cool?	Whole house	All living spaces	Only rooms that people are in
What do you use for heating?	Whole of house heating	Single room heater	Warm clothes and occasional heater
What do you use for cooling?	Whole of house cooling	Single room air conditioner	Ceiling fans
Total number of coloured boxes			

### How did your household score?

The column with the highest number of coloured boxes best describes the way your household uses energy. Read the results below and find out what you can do to improve your home's energy efficiency.

**Column A: High Energy User.** Unfortunately you are using too much energy. Look for ways to improve areas where you were a high energy user. Remember by using less energy, you can save money on your energy bill, and help the environment too.

**Column B: Moderate Energy User.** Your home is getting closer however there are steps you can take to improve energy efficiency in your home. Review the quiz and see what changes you can make to become a low energy user.

**Column C: Low Energy User.** Congratulations. Your home is very energy efficient! Keep up the good work and educate your friends to follow your example.

