

3 What Can You Measure?

Purpose

To conduct a detailed survey of energy use in your school

Key question

How much energy do you use and waste?

Conduct a detailed audit of your energy use at home, at school and in getting from one place to another. You can use the results to guide you in looking for energy efficiencies. Log these on the national website www.measuringchange.co.nz

Consider

- How can you measure your electricity use?
- What influences the amount of electricity you use?
- Which things do you use for longest?
- Which things use the most electricity?
- How much electricity do you use at home?
- What other types of energy do you use at home?
- How much energy do you use getting around?

Evaluate/Reflect

- Were there any surprises about what uses the most energy at school?
- Was this different from at home?
- Which kinds of transport use the most energy?
- Which ones use the least?
- Is there anything you want to add to your Pool of Knowledge about energy?
- Have you any questions to add to your 'find out' sheet?

Activities

Energy Kit - "Powermate"

Background text - Data collection - what will I need?

Background text - What wattage?

- 3.1 Weather and energy usage
- 3.2 Reading an energy account
- 3.3 Energy use profile
- 3.4 Data collection sheets
- 3.5 Energy annual summary
- 3.6 Energy walk through audit
- 3.7 School energy audit - in depth
- 3.8 How much does it use?
- 3.9 Home and transport energy audit

Background Text

Data Collection - What Will I Need?

Knowing how much energy your school uses and how much it costs will help your school improve its energy efficiency and identify ways to become better stewards of limited energy resources.

What data will we collect?

For Energy! you will collect data on the cost of school energy use, the type and amount of energy your school uses and whether or not you generate energy on site. Most of this information you will be able to find on your school energy accounts so you will need to have access to these. If your school has alternative energy that is generated on site, you will need to have meters installed so that you can monitor how much electricity is being generated.

What will be in our Energy! Report?

Once you have completed a years worth of energy data on your Energy! Annual Summary and submitted it to www.measuringchange.co.nz, you will get a report summarising this data. It will have converted your data into efficiencies based on how much energy each person in your school uses or how much energy your buildings use. Over time as you submit more data you will get trend information showing how much progress you are making to be more energy efficient. You will also get comparisons between your school and other schools in your region and it will show how you're doing compared to schools in New Zealand.

You will need

- To talk to your administration staff and arrange a time to go through school energy accounts and energy information
- Copies of your school energy accounts for electricity and gas and information on the cost and amount of other energy sources used such as diesel, coal, firewood and biofuels. For gas, you will need gas accounts and information on the size and how many gas bottles you use
- To find about any onsite energy generation at your school such as photovoltaic or wind energy and gather information on how much electricity is generated on site. You may need to have monitoring devices installed so that you can record how much electricity is generated
- A tape measure and access to solar heating panels to measure their area

How much time will it take?

For Energy! you may decide to collect all of your data on one day of the year, or you may prefer to collect data once a term. You will need to set up a process to ensure you will have access to all the energy accounts when you need them and that you have any monitoring devices that you need installed. These devices may need monitoring on a more regular basis.

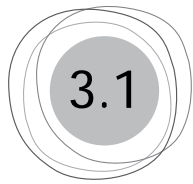
A small team should be enough to go through your energy records for the year and transfer the information onto the Energy! Annual Summary.

What Wattage?

Have a look at the label on the appliance which should tell you how many Watts it uses. Sometimes it is difficult to find the power rating written on an appliance. If you cannot find the rating on the appliance you are looking at, you can use this table of typical power ratings.

Typical power ratings

Appliance	Power (Watts)	Appliance	Power (Watts)
Dishwasher	2400	Microwave oven	650
Electric kettle	1500	Coffee percolator	600
Toaster	600	Refrigerator (2 door)	210
Vacuum cleaner	500	Washing machine	900
Clothes dryer	2400	Colour TV	200
Electric blanket (single)	70	Room air conditioner	2200
Electric fan	70	Sewing machine	75
Spa bath	5000	Exhaust fan	40
Fan heater	1500	Video recorder/DVD	100
Computer	150	Power saw	500
Hair dryer	1500	Iron	1000
Electric clock	2	Food blender	450
Electric radiator heater	1000	Radio	70
Incandescent light	40/60/100	Fluorescent light tube	13/20/40
Can opener	60	Coffee grinder	100
Electric shaver	10	Garbage disposal sink unit	650



3.1 Weather And Energy Use

Follow this sequence of actions to find out how much energy you use at school.

You will need

- Instructions: Reading the Electricity Meter
 - A thermometer
 - School Energy Audit Record Sheets
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- 1 Read and record the school's electricity meter and the weather on a daily basis for one week and record on the sheets provided. Inform the caretaker, and use the pictures provided to learn how to take readings. Make sure your meter readings are taken first thing each day. On the meter recording sheet, subtract yesterday's reading from today's reading to find the amount used in 24 hours. Make bar graphs of the week's electricity usage and weather conditions. Compare the amounts of electricity used in different weather conditions.
- 2 During the week, keep records of the times that heaters and other appliances in the classroom are used and record on the Classroom Energy Survey sheet. Allocate responsibility for recording the times that heaters and other appliances are used. Work out how many electricity units each appliance used that week:
$$\frac{\text{watts} \times \text{hours}}{1000} = \text{kilowatt hours}$$
- 3 Calculate the cost by multiplying the number of units by the cost of one unit. (Ask your power company or check a bill for the cost of one unit).
- 4 For at least one day, record the weather every half-hour inside and outside the classroom (in the same places) to give a more detailed picture. Graph the changes.

Evaluate/Reflect

- Do your graphs show a pattern?
- Are the patterns related to weather?
- Which days had the least/greatest use of electricity?
- What temperature in the classroom is too cold/ too hot/ just right?
- Which things do we use for longest?
- Which things use the most electricity?

Extension

- Record wind conditions using 5b.2 Wind Generation, Beaufort Scale Table
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This audit adapted from Bellingham, N. 1995 Energy Action Negawatt Resources Ltd, Wellington.

Reading the Electricity Meter

Read from left to right but ignore the numbers after the decimal point.

A unit is one kilowatt hour (KWh) or in other words, 1000 watts used over a period of one hour.



Record Sheet

Daily Meter Recording

	Friday	Monday	Tuesday	Wednesday	Thursday	Friday
Today's reading						
Yesterday's reading	✗					
Today's - yesterday's reading = Units used in 24 hours	✗					

Daily Weather Recording

	Monday	Tuesday	Wednesday	Thursday	Friday
Temperature inside					
Temperature outside					
Weather (fine/cloudy/rain)					
Wind (strong/moderate/light)					

Classroom Energy Survey

	Number of them in room	Total hours Mon	Total hours Tues	Total hours Wed	Total hours Thurs	Total hours Fri	Total hours for week	Power in Watts	Units used	Charge per unit	Weekly cost
Long Lights (Fluorescent)											
Round Lights (Bulbs)											
Electric Heaters											
Radiators											
Projectors											
videos											
Computers											
Other:											
Other:											
Other:											
Other:											

Temperatures Every Half Hour

Time	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	1:00	1:30	2:00	2:30	3:00	3:30
Temp. Inside															
Temp. Outside															

3.2 Reading An Energy Account

Most energy providers have samples of energy accounts for client education purposes. They can be viewed on the energy provider's website.

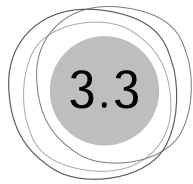
Learning to read an energy account will help you understand the cost of energy to your school.

You will need

- A previous electricity or gas bill for the school

- 1 How much electricity or gas has the school used in a month?
 - electricity is measured in kilowatt hours (kWh)
 - gas is measured in kilowatt hours (kWh) or cubic metres (m³)
- 2 What was the delivery cost per day?
 - each consumer pays a "fixed daily network charge", a "fixed daily transmission charge" and a "fixed daily charge"
- 3 What was the total cost of energy on the bill to the school for that month?
- 4 What time of day is energy cheapest to use, and how much did it cost in cents per kWh?
 - the price of any energy used depends on the time of day it is used
 - the time of day breakdown is in four hour groupings across 24 hours
 - the times of day prices are different for weekdays and weekends
- 5 What time of day is energy most expensive to use, and how much did it cost in cents per kWh?
- 6 Why do you think there is a difference in cost?
- 7 What are some of the ways energy is used in school? Brainstorm as many ways as you can.
- 8 Think about your school. How could you find out if there are some things that use energy in your school at a time when it costs a lot that could be done at a different time?

Question	Item	
1	kWh used	
2	Total delivery cost per day	
3	Total cost of energy	
4	Cheapest time of day and cost	
5	Most expensive time of day and cost	
6	Difference in cost?	
7	Energy use in school	
8	Things that could happen at a different time?	



3.3 Energy User Profile

Reading the electricity and gas meters gives information on how much energy is used and when. Using this data, energy use can be tracked and power saving actions decided on to improve energy efficiency.

- 1 Obtain the energy (electricity and gas) accounts from the school administration office.
- 2 Go through each account and transfer the information onto the electricity and gas data collection sheets.
- 3 You may like to first record all the information onto the Summary Sheets below.

Electricity Summary Sheet

Account period e.g. 12 Feb - 9 Mar 09	Number of days	Previous reading (kWh)	Current reading (kWh)	Electricity units used this month	Total electricity cost for month (\$)
Transfer to Data Collection Sheet			TOTAL per year		

Gas Summary Sheet

Account period e.g. 12 Feb - 9 Mar 09	Number of days	Previous reading (m ³)	Current reading (m ³)	Gas units used this month (kWh or m ³)	Total electricity cost for month (\$)
Transfer to Data Collection Sheet			TOTAL per year		

Evaluate/Reflect

- Compare the amount of electricity and gas used between months. Discuss the effect of seasons on energy use.

3.4 Data Collection Sheets

These sheets will help you record information on energy use in your school. Knowing how much energy your school uses and how much it costs will help your school to improve its energy efficiency and move towards sustainability. It is a crucial first step to understanding what changes can be made. Data collection sheets will work best where students and teachers work together to investigate where to find this information and how to record it over a school year.

Electricity

On this template record the total units of electricity used this month – see Activity 3.2 Reading an Energy Account for more information on how to read an electricity or gas bill from your energy provider.

Record the total electricity charges per month including all line charges, fixed and anytime costs. Your billing period may not be for an exact month.

Record the dates for your billing period on the template. When completed these billing periods will add up to an entire year.

Measurement period		Electricity bill	
Base period	Billing period	Units used kWh	Total electricity charges What you pay (\$)
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
TOTAL		kWh/yr	\$/yr

Transfer these TOTALS to the Energy Annual Summary

Gas

On this template record the total units of gas used this month – see Activity 3.2 Reading an Energy Account for more information on how to read an electricity or gas bill from your energy provider. You may have gas on reticulated supply and will be billed through an energy supplier.

Your gas bill may give your reading in kWh or m³. If kWh are given record as these, otherwise record as m³ (circling these units on the table). Make sure that you transfer this information to the correct box on the Summary Sheet.

Record all the total gas charges per month including all line charges, fixed and anytime costs. Your billing period may not be for an exact month.

Record the dates for your billing period on the template. When completed these billing periods will add up to an entire year.

If you purchase gas bottles, record the size of the bottle in the month refilled and how much this cost.

Measurement period		Gas bill		Gas bottle	
Base period	Billing period	Units used kWh or m ³	Total gas charges (\$)	Size of bottle (kg)	Cost of refill (\$0)
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
TOTAL		kWh/yr	\$/yr	kg/yr	\$/yr

Transfer these TOTALS to the Energy Annual Summary

Diesel and Coal

Your school may still use traditional forms of heating such as diesel or coal in boilers and generators.

Find where your school records are kept for Diesel or Coal purchases. Use the template to record how much of each of these fuel types you use and how much it costs. Your billing period may run across months so adjust the template to suit you.

Measurement period		Diesel used		Coal used	
Base period	Billing period	Litres (L)	Total cost (\$)	Kilograms (kgs)	Total cost (\$)
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
TOTAL		L/yr	\$/yr	kg/yr	\$/yr

Transfer these TOTALS to the Energy Annual Summary

Firewood and Biofuels

Your school may still use firewood for heating or may have upgraded boilers and heaters to a system using biofuels such as wood pellets, wood chips or even tallow or grease from the food industry.

Find where your school records are kept for firewood or biofuel purchases. Use the template to record how much of these fuel types you use and how much it costs. Your billing period may run across months so adjust the template to suit you.

Measurement period		Firewood used		Biofuel used (woodchips/pellets - if other please describe)	
Base period	Billing period	Cubic metres (m ³)	Total cost (\$)	Cubic metres (m ³)	Total cost (\$)
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
TOTAL		m ³ /yr	\$/yr	m ³ /yr	\$/yr

Transfer these TOTALS to the Energy Annual Summary

Biofuels	<ul style="list-style-type: none"> ▪ What type of biofuel does your school use? ▪ What system is used to convert it to energy? 	
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Transfer this information to the Energy Annual Summary

On site generation

Many schools are installing on site energy generation with photovoltaic panels, wind turbines and solar heating panels.

Photovoltaic and Wind Energy

Your photovoltaic panels and wind turbines will be generating electricity and you will probably have meters in place to record this information. Set up a system to monitor generation each month and transfer the data to this template.

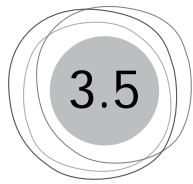
Measurement period		Photovoltaic energy	Wind energy
Base period	Billing period	Units generated (kWh/hr)	Cubic metres (m ³)
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
TOTAL		kWh/yr	kWh/yr

Transfer these TOTALS to the Energy Annual Summary

Solar Heating

Your school may have installed solar panels or tubes for heating hot water or other solar technologies for heating space. Measure the area of the solar panels and the area of other panels for heating space and record below.

Solar water heating	How many square metres of solar water heating panels are installed?		
	How many square metres are covered with black polyethylene piping (solid or in mat form) for heating the school swimming pool?		
Solar heating of space	How many square metres of solar panels for heating space are installed?		



3.5

3.5 Energy Annual Summary

SCHOOL NAME	
YEAR (data collecting period)	

Use the data collection sheets to help record this information

COST OF SCHOOL ENERGY USE	
Total annual cost of ELECTRICITY	\$/yr
Total annual cost of GAS (reticulated + bottle)	\$/yr
Total annual cost of DIESEL	\$/yr
Total annual cost of COAL	\$/yr
Total annual cost of FIREWOOD	\$/yr
Total annual cost of BIOFUELS	\$/yr

SCHOOL ENERGY USE Energy used	
Annual amount of ELECTRICITY used	kWh/yr
Annual amount of GAS used in either kWh or m ³ depending on your gas account reading	kWh/yr
	or m ³ /yr
Annual amount of GAS used – bottle refills	kg/yr
Annual litres of DIESEL used	L/yr
Annual weight of COAL used	kg/yr
Annual volume of FIREWOOD used	m ³ /yr
Annual volume of BIOFUELS (wood pellets etc) used. Please describe type of biofuel.	m ³ /yr
	type
On site generation	
Photovoltaic/solar – amount of electricity generated on site from panels	kWh/hr
Wind – amount of electricity generated from on site turbines	kWh/hr
Solar hot water heating – area of solar panels for hot water heating	m ² /yr
Solar hot water heating – area of solar black polyethylene piping (solid or in mat form) for heating swimming pool?	m ² /yr
Solar heating – area of solar panels for space heating	m ² /yr

3.6 Energy Walk Through Audit

Why should we use a walk through audit?

Looking at how efficiently we use energy is an essential part of creating more sustainable schools and communities. The audit results give data that can be used to help make informed decisions on actions that will lead to more sustainable practice.

It is not necessary to audit the whole school to become more energy conscious. Focus on a few aspects of school energy use and examine closely. Use the walk through audit as a guide.

The learning intention is to use the Energy Walk Through Audit as a guide to give us data to identify possible energy efficiency actions that could be used by the school.

You will need

- Energy Walk Through Audit form
- Clipboard
- Pencil
- Identify who to consult with on some aspects of the audit

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- 1 Divide school into manageable areas.
 - 2 Prior to the Energy Walk Through Audit clarify any questions on the audit for clarity around what is to be done.
 - 3 Conduct the Energy Walk Through Audit.
 - 4 Collate data from all groups. Write up the results.
 - 5 Using the results of the audit, brainstorm possible actions to reduce the amount of energy used by the school.
 - 6 Decide on actions that are achievable and produce a plan to share with interested stakeholders.

Evaluate/Reflect

- How will we measure the effectiveness of our recommendations?
- Often significant energy savings can be achieved easily through awareness education. What can be done to increase awareness of energy conservation in our school?

Energy Walk Through Audit

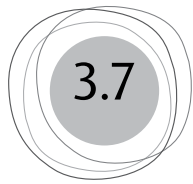
Energy use	How are most of the rooms in the school heated?	
Heating	Passive heating	
	Coal or wood fires	
	Oil or gas heaters	
	Central heating with hot water from a fuel burning boiler	
	Central heating with hot water from an electrical power boiler	
	Electric heater or air conditioners	
	Heat pumps	
Cooling	How are most rooms cooled in the summer?	
	Natural ventilation	
	Electric fans	
	Individual air conditioner units	
	Central air conditioning units	
	Heat pump	
Lighting	What kind of lighting is used in the large rooms of the school? Investigate the age and efficiency of the lighting.	
	Natural lighting	
	Incandescent	
	Halogen	
	Energy saving - fluorescent long tubes	
	Energy saving - compact fluorescent bulbs	
	What kind of lighting is used in outdoor areas of the school?	
	Sunlight only	
	Lights on at entrance and pathways (sensor)	
	Lights on at entrance and pathways at night	
	Lights on around most outdoor areas all night	

Data	How many data appliances in the school?		Are they switched off at the power point when not in use?
	Televisions		Yes/No
	Overhead projectors		Yes/No
	Video players		Yes/No
	Video cameras		Yes/No
	Stereos		Yes/No
	DVD's		Yes/No
	Video conferencing		Yes/No
	Data projectors		Yes/No
	Smartboards		Yes/No
	Intercom systems		Yes/No
	Computers		Yes/No
	Do the computers have Energy Star options?		Yes/No
	Are the computers switched off overnight?		Yes/No
Other	Do the photocopiers have energy saving mode?		Yes/No
	Do the printers have energy saving mode?		Yes/No
	Do the fax machines have energy saving mode?		Yes/No
	Is the school used at night? If so please explain.		
	Is the school used at the weekend? If so please explain.		
	Are all non necessary appliances switched off over the holidays?		Yes/No
Swimming Pool	Is the pool heated?		Yes/No
	What is the power supply on the pump?		
	What is the energy rating on the pump?		
	How many hours does the pump run in use?		
	How many hours does the pump run when not in use?		
	If heated is there a renewable heat supply? Please explain.		

Resources

If investigating lighting an electrician would be able to explain the efficiency of fluorescent and how to identify the age of the bulb/tube.

For more information visit <http://home.howstuffworks.com/fluorescent-lamp.htm>



3.7 School Energy Audit in-depth

This is an in-depth survey of your school involving teachers, students, caretaker, principal and Board of Trustees. It may be more suited for older students.

You will need

- Copy of School Energy Audit in-depth sheet
- Clipboard
- Thermometer

School:

Date:

Energy team:

This energy check will help you find out about how energy is used in your school. You can check the energy use by looking around the school, talking to teachers, pupils and the caretaker. You can also take measurements. Talk to an adult team leader before you start checking the school's energy use. Always take care around electricity.

About your school

How many buildings does your school have?		
Are any of these building temporary buildings?	Yes	No
How many of the buildings are temporary?		
How old are the buildings?		
Are the buildings insulated?	Yes	No
Does the school use gas?	Yes	No
Does the school use coal?	Yes	No
Does the school use oil?	Yes	No
Does the school use wood?	Yes	No
Does the school use any other type of fuel?	Yes	No
What type of room heating is used?		
How is the hot water heated?		
Is there a computer room in the school?	Yes	No
Is there a swimming pool in the school?	Yes	No

Energy Team

Does your school have an energy team?	Yes	No
Does it include pupils, teachers, caretakers and trustees?	Yes	No
How often does the team meet?		
Who does the team report its findings to?		
Does someone take meter readings each month?	Yes	No
Does the school set targets for energy use each year?	Yes	No
Is there a school energy awareness campaign running?	Yes	No
Does everyone at school know how much energy is saved?	Yes	No
Has anyone compared last year's energy use with this year's?	Yes	No
Is your school reinvesting the savings to further reduce energy use?	Yes	No

Lighting 1 - Are the lights in these areas energy efficient?

Classroom	Yes	No	Not sure
Classroom	Yes	No	Not sure
Classroom	Yes	No	Not sure
Office & staffroom	Yes	No	Not sure
Main hall/sports hall	Yes	No	Not sure
Corridor, toilet & changing rooms	Yes	No	Not sure
Canteen and kitchen	Yes	No	Not sure
Computer room	Yes	No	Not sure
Boiler room	Yes	No	Not sure
Outdoor areas	Yes	No	Not sure
Swimming pool	Yes	No	Not sure

"Not sure?" Usually lighting in school is by fluorescent tubes. Some fluorescent tubes are more efficient than others. It depends on when the tubes were installed; if they were installed recently it is likely that they are energy efficient ones.

Lighting 2 - Are there any areas of the school where ordinary household bulbs (incandescent) are used?

Classroom	Yes	No	Not sure
Classroom	Yes	No	Not sure
Classroom	Yes	No	Not sure
Office & staffroom	Yes	No	Not sure
Main hall/sports hall	Yes	No	Not sure
Corridor, toilet & changing rooms	Yes	No	Not sure
Canteen and kitchen	Yes	No	Not sure
Computer room	Yes	No	Not sure
Boiler room	Yes	No	Not sure
Outdoor areas	Yes	No	Not sure
Swimming pool	Yes	No	Not sure

If there are incandescent bulbs they should be replaced with the compact fluorescent bulbs. Compact fluorescents use about 80% less energy than incandescent bulbs and give the same amount of light. Normal compact fluorescents should not be used with a dimmer switch.

Lighting 3 - Are the fluorescent tubes used 'fat tubes' (38mm diameter) or 'thin tubes' (26 mm diameter)?"

Classroom	Yes	No	Not sure
Classroom	Yes	No	Not sure
Classroom	Yes	No	Not sure
Office & staffroom	Yes	No	Not sure
Main hall/sports hall	Yes	No	Not sure
Corridor, toilet & changing rooms	Yes	No	Not sure
Canteen and kitchen	Yes	No	Not sure
Computer room	Yes	No	Not sure
Boiler room	Yes	No	Not sure

Where possible replace the 'fat' 38mm tubes with 'thin' 26mm tubes.

Lighting 4 - Are there controls on the lights?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Outdoor areas	Yes	No	Doesn't apply
Swimming pool	Yes	No	Doesn't apply

"Not sure?" There are 2 main types of lighting controls used in schools.

Movement detectors switch lights on when they detect movement within an area. Lights stay on for a short time then go off if no more movement is detected.

Photocell controls switch lights on and off according to how much daylight they detect.

Automatic detectors have to be reset from time to time so the lights are controlled in the most efficient way.

Lighting 5 - Do people have the habit of always switching the light on when they enter this area/ room whether they need to or not?

Classroom	Yes	No
Classroom	Yes	No
Classroom	Yes	No
Office & staffroom	Yes	No
Main hall/sports hall	Yes	No
Corridor, toilet & changing rooms	Yes	No
Canteen and kitchen	Yes	No
Computer room	Yes	No
Boiler room	Yes	No
Outdoor areas	Yes	No
Swimming pool	Yes	No

Lighting 6 - Do people always switch lights off when they leave this room?

Classroom	Yes	No
Classroom	Yes	No
Classroom	Yes	No
Office & staffroom	Yes	No
Main hall/sports hall	Yes	No
Corridor, toilet & changing rooms	Yes	No
Canteen and kitchen	Yes	No
Computer room	Yes	No
Boiler room	Yes	No
Outdoor areas	Yes	No
Swimming pool	Yes	No

Lights should always be switched off if not needed.

Lighting 7 - Are lights always turned off as soon as there is enough daylight?

Classroom	Yes	No
Classroom	Yes	No
Classroom	Yes	No
Office & staffroom	Yes	No
Main hall/sports hall	Yes	No
Corridor, toilet & changing rooms	Yes	No
Canteen and kitchen	Yes	No
Computer room	Yes	No
Boiler room	Yes	No
Outdoor areas	Yes	No
Swimming pool	Yes	No

It may be dark early in the morning in winter but as the sun rises there may be no need for extra lighting.

Lighting 8 - Are banks of lights closest to the windows turned off as soon as there is enough daylight coming through the windows?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

If rows of lights have individual switches, the row next to the window can be turned off whilst the row of lights furthest from the window is still switched on.

Lighting 9 - Do you have an energy monitor who is responsible for checking lights are switched off in this area?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

Lighting 10 - Are there posters and stickers in this area to remind people to switch off lights when not required?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Outdoor areas	Yes	No	Doesn't apply

The use of stickers and posters remind people to switch off lights when they are not needed. Posters and stickers need to be changed regularly to ensure they catch people's attention.

Lighting 11 - Are the posters and stickers changed regularly?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Outdoor areas		No	Doesn't apply

Heating 1 - In which of these areas is the heating on?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply

Heating 2 - What is the temperature in each area? Use a thermometer to measure the temperature in various places in the room. Work out the average temperature for the room.

Classroom	°C
Classroom	°C
Classroom	°C
Office & staffroom	°C
Main hall/sports hall	°C
Corridor, toilet & changing rooms	°C
Canteen and kitchen	°C
Computer room	°C

Recommended temperatures are:

Classroom: 18°C

Admin. Areas: 20°C

Gym/changing rooms: 12-14°C

Heating 3 - Are the temperatures in these areas at this recommended level?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

Heating 4 - How is the temperature controlled in each area?

	Thermostatic heater control	Room temperature sensors with control valve	Manual control	No control	Windows open
Classroom					
Classroom					
Classroom					
Office & staffroom					
Main hall/sports hall					
Canteen and kitchen					
Computer room					

Heating 5 - Is there space around the heaters for good circulation of heat?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

Cupboards or equipment in front of the heaters will reduce the efficiency of the heater.

Heating 6 - Are there any draughts round the windows?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

A lot of energy is wasted through cold draughts coming in through poorly fitting windows. Putting draught proofing round the windows may help this.

Heating 7 - Are there curtains or blinds fitted at the windows?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

Heating 8 - Are doors to other areas kept shut to keep the heat in this area?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply

Heating 9 - If blinds or curtains are fitted, are they closed at night?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply

Closing curtains as the afternoon cools off, can help to keep the heat in and help the area heat up more quickly when the heating is switched on.

Heating 10 - Is there any cooling in this area?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply

Heating 11 - Is the cooling only on when the heating is off?

Classroom	Yes	No
Classroom	Yes	No
Classroom	Yes	No
Office & staffroom	Yes	No
Main hall/sports hall	Yes	No
Corridor, toilet & changing rooms	Yes	No
Canteen and kitchen	Yes	No
Computer room	Yes	No
Boiler room	Yes	No

Boiler Room

Is your school's heating and hot water set for the hours that the school is used, including any weekend and holiday activities?	Yes	No	Doesn't apply
Is there a schedule of the heating and lighting controllers, their optimum settings and changes needed for the school holidays?	Yes	No	Doesn't apply

The school can manage energy more efficiently if there is a schedule like this drawn up.

Water 1 - Are there water taps in this area?

Classroom	Yes	No
Classroom	Yes	No
Classroom	Yes	No
Office & staffroom	Yes	No
Main hall/sports hall	Yes	No
Corridor, toilet & changing rooms	Yes	No
Canteen and kitchen	Yes	No
Computer room	Yes	No
Boiler room	Yes	No
Outdoor areas	Yes	No
Swimming pool	Yes	No

Water 2 - What is the temperature of the hot water supply?

Classroom	°c	Doesn't apply
Classroom	°c	Doesn't apply
Classroom	°c	Doesn't apply
Office & staffroom	°c	Doesn't apply
Main hall/sports hall	°c	Doesn't apply
Corridor, toilet & changing rooms	°c	Doesn't apply
Canteen and kitchen	°c	Doesn't apply
Computer room	°c	Doesn't apply
Boiler room	°c	Doesn't apply
Outdoor areas	°c	Doesn't apply
Swimming pool	°c	Doesn't apply

Water 3 - Is this temperature over your school's recommended temperature?

Classroom	Yes	No
Classroom	Yes	No
Classroom	Yes	No
Office & staffroom	Yes	No
Main hall/sports hall	Yes	No
Corridor, toilet & changing rooms	Yes	No
Canteen and kitchen	Yes	No
Computer room	Yes	No
Boiler room	Yes	No
Outdoor areas	Yes	No
Swimming pool	Yes	No

If the temperature is over the recommended temperature, discuss how it could be reduced.

Water 4 - Do the taps drip?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Outdoor areas	Yes	No	Doesn't apply
Swimming pool	Yes	No	Doesn't apply

A dripping tap wastes water, a dripping hot tap wastes water and energy.

Water 5 - Are the hot water pipes properly insulated?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Outdoor areas	Yes	No	Doesn't apply
Swimming pool	Yes	No	Doesn't apply

If the pipes are not properly insulated, heat is lost and energy is wasted.

Water 6 - How is the water heated? _____**Water 7** - Is the hot water controlled by a timer?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Outdoor areas	Yes	No	Doesn't apply
Swimming pool	Yes	No	Doesn't apply

Water 8 - Are the time controls set correctly?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Outdoor areas	Yes	No	Doesn't apply
Swimming pool	Yes	No	Doesn't apply

Water 9 - Are the holiday periods set so the water heaters are switched off when not needed, or are the timers programmed appropriately?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply
Swimming pool	Yes	No	Doesn't apply

Swimming pool (if your school has one)

SP 1 - How does the water temperature compare to your school's recommended level?

At _____ Above _____ Below _____

SP 2 - If there is a pool cover, is it used when the pool is not in use?

Yes _____ No _____ No cover _____

Other equipment

OE 1 - Are the computer monitors switched off when the computer is not in use?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

OE 2 - Are the computers switched off at the wall when not in use for longer periods?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

OE 3 - Are the televisions, video machines or DVDs switched off at the wall when not in use?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Staffroom	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

OE 4 - Is other equipment e.g. the photocopier, switched off over night or when not in use?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office	Yes	No	Doesn't apply
Staffroom	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply

Outdoor Lighting

Lights controlled manually

OL 1 - Are these lights switched off when they are not needed?

Yes_____ No_____ Doesn't apply_____

OL 2 - Do these lights use energy efficient bulbs?

Yes_____ No_____

Lights controlled by photocell - Photocell controls switch lights on and off according to how much daylight they detect.

OL 3 - Are these lights left on when it is dark?

Yes_____ No_____ Doesn't apply_____

If security isn't an issue, you might consider using a timer to turn them off after hours.

OL 4 - Could these lights be switched off after hours?

Yes_____ No_____ Doesn't apply_____

OL 5 - Do these lights use energy efficient bulbs?

Yes_____ No_____ Doesn't apply_____

Lights controlled by movement detector - Movement detectors switch lights on when they sense someone moving. Lights stay on for a set period of time, then switch off unless there is more movement.

OL 6 - Do these lights use energy efficient bulbs?

Yes_____ No_____ Doesn't apply_____

Lights controlled by a time switch - Time switches turn lights on and off at set times.

OL 7 - Is the timer set to only turn on the lights at dusk when the school is being used?

Yes_____ No_____ Doesn't apply_____

OL 8 - Do these lights stay on at night?

Yes_____ No_____ Doesn't apply_____

OL 9 - Could any of these lights be switched off after hours?

Yes_____ No_____ Doesn't apply_____

OL 10 - Do these lights use energy efficient bulbs?

Yes_____ No_____ Doesn't apply_____

Doors

D2 - Do the doors in this area close automatically?

Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Classroom	Yes	No	Doesn't apply
Office & staffroom	Yes	No	Doesn't apply
Main hall/sports hall	Yes	No	Doesn't apply
Corridor, toilet & changing rooms	Yes	No	Doesn't apply
Canteen and kitchen	Yes	No	Doesn't apply
Computer room	Yes	No	Doesn't apply
Boiler room	Yes	No	Doesn't apply

Observations

Can you suggest other ways of making these areas energy efficient?

Classroom	Computer room
Classroom	Boiler room
Classroom	Outdoor areas
Office	Swimming pool
Main hall/sports hall	Canteen and kitchen
Corridor, toilet and changing rooms	Other

Evaluate/Reflect

- Did any of the results surprise you?
- Did you notice any patterns?
- Are there any low cost, easily achievable, efficiency actions?
- What changes do you hope to find when you do this survey again next year?

3.8 How Much Does It Use?

You will need

- Energy kit – Powermate
- Sample sheet
- Clipboard
- Pen/pencil



- 1 Look at the appliances or pieces of equipment in your classroom that are using electricity.
- 2 Choose one which can be plugged into a socket.
- 3 With the help of an adult, use the "Powermate" from the energy toolbox to measure how much electricity the appliance is using
- 4 To do this:
 - Make sure the appliance is unplugged from the wall socket
 - Remember – plugs should be pulled out by holding the plug firmly not by pulling them out by the flex!
 - Plug the Powermate into the wall socket
 - Plug the appliance into the Powermate
 - Turn on the Power
 - Read the amount of energy the appliance is using and record it on the Energy Use sheet
 - Use the powermate to find out how much it would cost to run that appliance and how much greenhouse gas is being produced to provide the electricity to run it
 - Record your findings on the table overleaf
 - Draw up your own sheet for other pieces of electrical equipment you can test in your classroom
 - Are there any items left on 'standby' that could be turned off when not being used?
 - What uses electricity in your classroom that cannot be measured using the powermate?
 - Is there any other way of finding out how much electricity the school uses each day? Who could you ask about this?
 - Draw up a sheet, or an excel spreadsheet, on the computer to record the energy used around the school each month
 - Draw graphs or bar charts to show how much electricity is being used each month
 - Is there any difference between the amounts of electricity used in each season? Why do you think this is?
 - Do your records over time show that energy is being saved?

Note: Remember to look at the kWh readings that tell you how much electricity has been used. Note that the cost of electricity per kilowatt can change. Refer to 3. What can you measure – Background text – What wattage? for typical appliance usage

Energy Use - School Appliances (sample sheet)							
Appliance	Power (Watts)	Cost per year	Cost per quarter	Energy (kWh)	Greenhouse gas (kg)	Volts	Current (amps)
Staffroom fridge							
Office fan							
On high							
On medium							
On low							
Computer - laptop							
Power off at the wall							
Power on at the wall - monitor off							
Power on at the wall - monitor on							
Computer – desk top							
Power off at wall							
Power on at wall - monitor off							
Power on at wall - monitor on							

3.9 Home And Transport Energy Audit

These are two simple activities to help you identify where your energy use is highest at home and on the road.

You will need

- Home Energy Use Survey sheet

- 1 Record how much energy is used at home by monitoring appliances over one weekend and recording on the Home Energy Use Survey sheet. Make a note of the other types of energy used at home.
- 2 Work out the percentages of electricity used for different purposes and make a pie chart for your household.
- 3 Record each trip you do – walking, biking, by car, bus or train. If in the car, how many people are in it? How many things do you do while you are out in the car? Was there any other way you could have done this trip?

Make a class list of transport forms (such as car, carpool, bus, bike, on foot, skateboarding, skating and scooters) and put a mark for each time that form was used by someone in the class during the course of a week. Display the class transport record.

Sample table:

	MON (<i>date</i>)	TUES	WED	THURS	FRI
Car	III				
Car pool	II				
Bus	### III				
Train					
Cycle	III				
Walk	### I				

Evaluate/Reflect

- What activities use the most electricity at home?
- What other forms of energy are used in the home?
- How often do you use motorised transport and how often do you use your own energy?
- Do you think you can cut down on the number of times you go by car?

	Number of	Total hours - Sat	Total hours - Sun	Total hours for weekend	Power in Watts	Units used	Charge per unit	Cost
Long Lights								
(Fluorescent)								
Round Lights								
(Bulbs)								
Fan heaters								
Oil heaters								
Bar heaters								
Video/DVD								
Computer								
Dishwasher								
Television								
Washing Machine								
Other								
Other								
Other								
Other								
Other								

What other types of energy do you use at home apart from electricity?