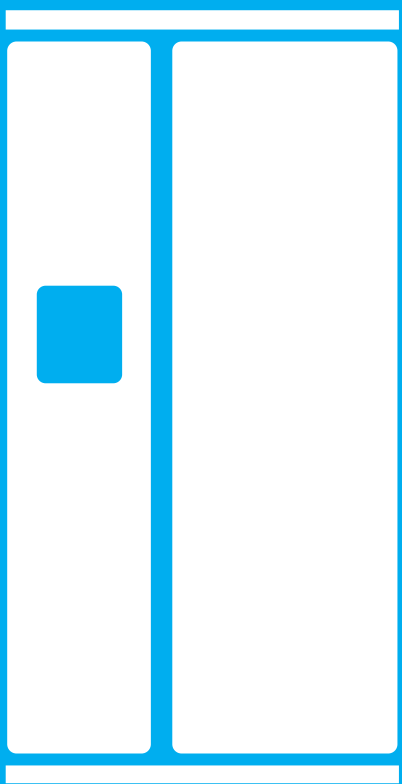
Refrigerators and Freezers

1

This information sheet provides advice on how to check the energy use of your fridge(s) and freezer(s), some ways of improving their efficiency and things to look for if buying a new fridge or freezer.



Refrigerators and Freezers

1

USING THE HEAT TO CHECK YOUR FRIDGE AND FREEZER

1. Place the thermometer in your refrigerator and leave it for at least 15 minutes (longer is fine) with the door closed. Remove the thermometer and read the temperature immediately. It should be in the range 3°C to 5°C. If it is warmer than this it is not preserving your food as well as it should. If it is colder than this it is using more energy for cooling than is necessary. If it is outside the ideal range, adjust the fridge temperature controller; leave it for an hour and then check with the thermometer again. Repeat if necessary.

2. Carry out the same exercise with your freezer except for a freezer the temperature should be in the range -15°C to -18°C for optimum food storage and efficiency.

3. To measure the electricity used by your fridge or freezer you need to plug the appliance into the Power-Mate. The compressors in fridges and freezers automatically turn on and off in order to keep the temperatures in the right range. This means that sometimes the Power-Mate will show a high power reading (when the motor is running) and sometimes a very low reading (when the motor is not running). This makes checking your fridge/freezer electricity use a little more complicated.

   a. When the Power-Mate is first plugged in push the "Mode" button a few times until "CLEAr" is on the screen, then press "Enter" and the screen will show "done" (and then SEtUP?). Then press "Mode" twice more until "POWEr" is on the screen. The screen will then show you the instantaneous power. The reason for doing this is that it resets the internal clock in the Power-Mate to zero so it will start recording the fridge or freezer electricity use and store the result.

   b. If the fridge/freezer motor is not running you should have a very low power reading, e.g. less than 1 (1 Watt). Try opening the door, the fridge light will come on and the Power-Mate will show 40 to 50 (depending on the Wattage of the light). When the motor is running the Power-Mate will show 100 to 400 (in some larger appliances it might be a bit higher than this). This is the power (in Watts) used by the motor.

   c. Leave the Power-Mate plugged into the fridge/freezer for at least 24 hours. The Power-Mate will keep track of all the energy used by the fridge/freezer over this period. Before you unplug it push the "Mode" button until "EnErgY" appears, then press the "+" sign, the energy used by the fridge/freezer for one year will appear briefly (if you have not had time to write it down press "+" again). The number shown is in kWh per year - you can compare this with the Star Rating label see (e).

   d. Make a note of how much energy that fridge/freezer uses for a year. Repeat this for other fridges and freezers in your home.

   e. If the fridge/freezer still has its Star Rating label attached you can compare the annual electricity use shown on the label with your own measurements. If your measurements are much higher it means your fridge/freezer is not operating efficiently (see below for actions you can take). If your measurements are less than that shown on the Star Rating label it means you are using your fridge/freezer well. You can look up Star Ratings on http://www.energyrating.gov.au/.

4. The Infrared thermometer can be used to check for leaks around doors. If there is a large leak it will show up as a cool spot. It can also be used for checking for adequate ventilation behind the fridge/freezer. If the thermometer shows the wall behind the fridge is one degree or more warmer than the same wall but away from the fridge/freezer it indicates inadequate ventilation.

HOW TO IMPROVE THE EFFICIENCY OF YOUR FRIDGE/FREEZER

Some of the suggestions below will only apply to some households, but the more you can do the more electricity (and money) you will save.

1. When putting cooked food into a fridge or freezer always let it cool to room temperature first. But do not leave it sitting at room temperature for long periods because bacteria may develop in the food.

2. Try not to open the door/lid too often. Door opening does not add much to your electricity use, but if done excessively, or if the door is left open for long periods, it will add to your bill.

3. Make sure there is some space between the back of the fridge/freezer and the wall (3 to 5cm) and both sides (2 to 3cm). This is important because it allows free movement of air to extract the heat given off by the outside of the fridge. Poor air circulation may double the electricity use of a fridge or freezer.

4. If you have a fridge that is just used for cooling drinks, turn it off during periods you are not regularly using it. Most fridges will cool drinks within 3 hours of being turned on again. If you can fit all your food into just one fridge or freezer, do so and turn the other one off until you need it again.

5. One of the biggest influences on a fridge or freezer electricity use is how warm the surrounding room is. Increasing room temperature by 5°C adds 30% to fridge energy use. So try to position fridges and freezers in cooler parts of the house (e.g. keep the freezer in an unheated laundry). Do not keep the kitchen heated overnight. Wherever possible do not have the fridge or freezer next to an oven or cook-top. Try to position the fridge/freezer so that it is out of direct sunlight.

6. The seal around the door or lid should be in good condition and clean. The seal at the bottom of the door is especially important because the cool air will drain out here. Bits of food or sticky liquids can collect at this bottom seal leaving little gaps for cold air to escape. If the rubber seal is cracked or torn it should be replaced.

7. If the fridge does not have auto defrost it should be defrosted as soon as ice starts to build up (ice is an insulator and prevents the fridge operating efficiently).

8. When buying a new fridge/freezer firstly decide how big it needs to be. Large fridges/freezers use more energy than smaller ones. When you decide on the size, look for the Star Labels and pick one with the maximum number of stars. A fridge using 300kWh per year will save you $60 in electricity costs each year compared to one using 600kWh per year (at present electricity prices).

Kitchen Appliances

Most modern kitchens have many electrical appliances intended to make cooking a little less labour intensive. Each of these can be monitored with the Power-Mate to see how much electrical energy it uses for a particular task (e.g. to toast a slice of bread). However the oven, cook top and grill are usually hard-wired into the house electrical circuit which means you cannot check their electricity use with the Power-Mate. The information sheet discusses some options for reducing electricity use.

Kitchen Appliances

2

Cooking food has strong personal and cultural influences. This makes the task of reducing energy use when cooking more difficult. But some modest savings can be made. For example, if you prefer to fry certain foods rather than cooking them in a microwave, consider a bench-top electric frying pan which is more efficient than a frying pan on a stove.

Households typically use 500 to 1200kWh for cooking per year (the electricity will cost $100 to $240 per year).

ELECTRIC COOK-TOP

There are several types of electric cook-tops (or hot plates). Electric hot plates are roughly 50% efficient (about half the heat is transferred to the cooking pot) . It is important to use cooking pots with clean, flat bases so they make good contact with the heating element. Even a tiny air gap 1mm wide will significantly lower the efficiency when using coil heating elements. The old-style solid cooking hot plates and the new halogen glass-top hot plates are slightly less efficient than the other types (metal coil and ceramic). Electric induction hot plates are the most efficient, but you can only use steel pots on them.

GAS COOK-TOP

Gas burners are less efficient than electric, but response is quick and reticulated gas is cheaper than electricity. If using gas burners it is very important to have, and use whenever cooking, a good exhaust hood to minimise indoor air pollution.

ELECTRIC OVEN

Electric ovens are rather inefficient cooking appliances because a lot of energy is needed to heat the oven itself and they are usually not very well insulated.

ELECTRIC GRILL

Electric grills built into ovens or under cook-tops are inefficient cooking appliances. Only a small fraction of the heat is actually transferred to the food being cooked.

BENCH-TOP OVEN/GRILL AND ELECTRIC FRYING PANS

Small bench-top ovens and grills are more efficient than their larger built-in cousins because their small size means less electricity is required to warm up the oven itself.

Electric frying pans are one of the more efficient cooking options because the electricity directly heats the cooking surface.

MICROWAVE

Microwave ovens are popular because they are very quick. The microwave energy directly heats the food itself (i.e. energy is not wasted heating the container). However, the electricity must first be converted to microwave energy and this step is only about 70% efficient. Other electrical losses in the system make a microwave oven about 65% efficient.

It is difficult to make direct comparisons with other types of cooking, but most commentators suggest microwave cooking is more efficient than using a conventional oven or cook-top. But small bench top ovens and grillers can have roughly the same efficiency as a microwave oven.

ELECTRIC JUG

An electric jug is a very efficient appliance; more than 90% of the electricity used goes directly into heating the water in the jug. It is more efficient than using a kettle on a gas or electric cook top and more efficient than heating water in the microwave.

Note: It is dangerous to heat water in a microwave.

The one factor that can significantly reduce the efficiency of an electric jug is heating more water than you are going to use for your tea, coffee or cooking. Some people have got in the habit of filling the jug every time they want just one cup of tea. This reduces the efficiency from 90% down to as little as 10% because much of the electricity has gone into heating a litre or more of water that will just be left to cool down before the jug is used again.

Electric jugs require enough water in them to cover the heating element; otherwise they will quickly burn out. So when buying a new electric jug, always choose one that is designed to heat as little as a single cup of water.

TOASTER

An electric toaster is an efficient cooking appliance. It uses less energy than cooking toast under the grill.

Toasters do not use any electricity when they are not toasting (i.e. no stand-by power) so they do not need to be switched off at the power point (but check yours with the Power-Mate to make sure). They generally use less than 1000W when toasting and take 1 to 2 minutes to toast a slice of bread. A two-slice toaster will provide two slices of toast using less than 0.03 kWh of electricity which costs less than ½ cent.

FOOD PROCESSOR, JUICER, BLENDER

Food processors, juicers, blenders and other handy kitchen gadgets used for chopping up or mixing food are only used for short periods, so, even though some of them have quite high power use, the total electrical energy (and cost) is very low over a full year.

PRESSURE COOKER, CROCK POT/SLOW COOKER

Slow-cookers, crock pots and pressure cookers can be very efficient cooking appliances. The electricity does not have to heat a large oven, just the food and the food container.

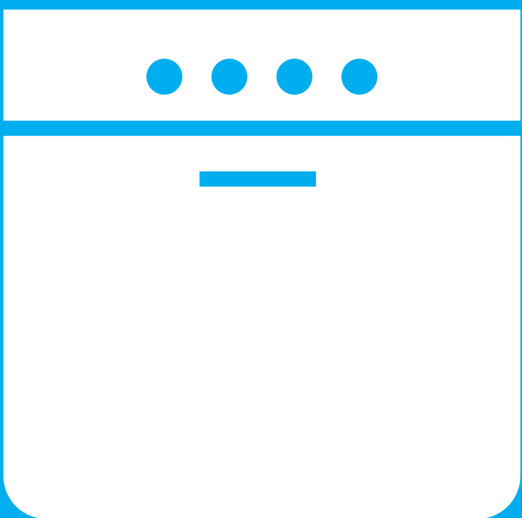
EXHAUST FANS - see sheet 11 Miscellaneous.

When measuring energy, remember that the Power-Mate must be 'cleared' before your start measuring. The total energy used and cost per year for each appliance will depend mainly on how often you use it.

Washing Dishes

3

This information sheet provides advice on how to check the energy use of your dishwasher and how its energy use compares with washing dishes in the sink.



Washing Dishes

To measure the electricity used by your dishwasher you need to plug it into the Power-Mate. The various washing, rinsing and drying cycles use different amounts of power. This means that sometimes the Power-Mate will show a high power reading (when the pump or heater are running) and sometimes a very low reading (when draining). This means you need to measure the energy used over a full washing cycle to get a true picture of how much electricity this appliance uses.

If the dish washer still has its star rating label attached you can compare the annual electricity use shown on the label with your own measurements. You can look up Star Ratings on www.energyrating.gov.au/.

USING THE HEAT TO CHECK YOUR DISHWASHER

a. When the Power-Mate is first plugged in push the "Mode" button a few times until "CLEAr" is on the screen, then press "Enter" and the screen will show "done"(and then SEtUP?). Then press "Mode" twice more until "POWEr" is on the screen. The screen will then show you the instantaneous power. The reason for doing this is that it resets the internal clock in the Power-Mate to zero so it will record one full wash cycle.

b. When the dishwasher is on at the power point but not running you should have a very low power reading, e.g. less than 1 (1 Watt). Dishwashers with electronic screen displays can use more power than this when not operating, if so you should consider switching it off at the power point when not in use.

c. Wash a load of dishes using your normal wash setting. As the dishwasher cycles through each stage of the wash cycle you will see that the power changes considerably. Some typical figures are: cold rinse 150W; drain 20W; hot wash 2000W (this includes water heating); dry 1900W. The important number is the electrical energy used for one complete wash, a typical figure might be about 1.8kWh. The cost is about 40 cents per wash or almost $150 per year if you use the dishwasher daily.

d. Next time you use the dishwasher try the economy wash setting (if your model has this option). Compare the electrical energy use and cost. This gives an indication of what you might save. Similarly the heavy duty wash cycle can be compared with the normal cycle.

e. If the dish washer still has its star rating label attached you can compare the annual electricity use shown on the label with your own measurements. You can look up Star Ratings on http://www.energyrating.gov.au.

WASHING DISHES IN THE SINK

Washing dishes by hand can save electricity provided the amount of hot water used is not excessive. It is possible to wash and rinse a family's dishes from a meal using 5 to 10 litres of hot water if washing is done in a small sink or bowl. This requires 0.25 to 0.5 kWh of electricity (for heating the water), far less than the energy used by a dishwasher in the example (c) above. Assuming 10 L per wash, the annual savings, if dishes are washed in the sink instead of the dishwasher most nights (say 6 nights each week), will be more than $80. But if you use lots of hot water (e.g. by leaving the hot tap running to rinses dishes of after washing) you might be better off using a dishwasher.

Many dishwashers have built-in heating elements that heat water for washing rather than drawing hot water from the household supply. There are two disadvantages to this design feature. One is that the dishwasher operates on the normal household electricity tariff so heating water is more expensive than using household supply which is heated using the cheaper hot water tariff or HydroHeat tariff. Secondly, if you have a solar hot water system this does not cut the costs of using. the dishwasher.

Note: A simple solution is to ensure your water is piped in via HW pipe.

HOW TO IMPROVE THE EFFICIENCY OF YOUR DISHWASHER

Some of the suggestions below will only apply to some households, but the more you can do the more electricity (and money) you will save.

1. Wait until the dishwasher is full before using it. It is far more efficient to wash one full load than two half loads.

2. If your dishwasher has an economy cycle this will give a satisfactory wash for every day dishwashing (ie if you do not have pots and bowls that food has been cooked in).

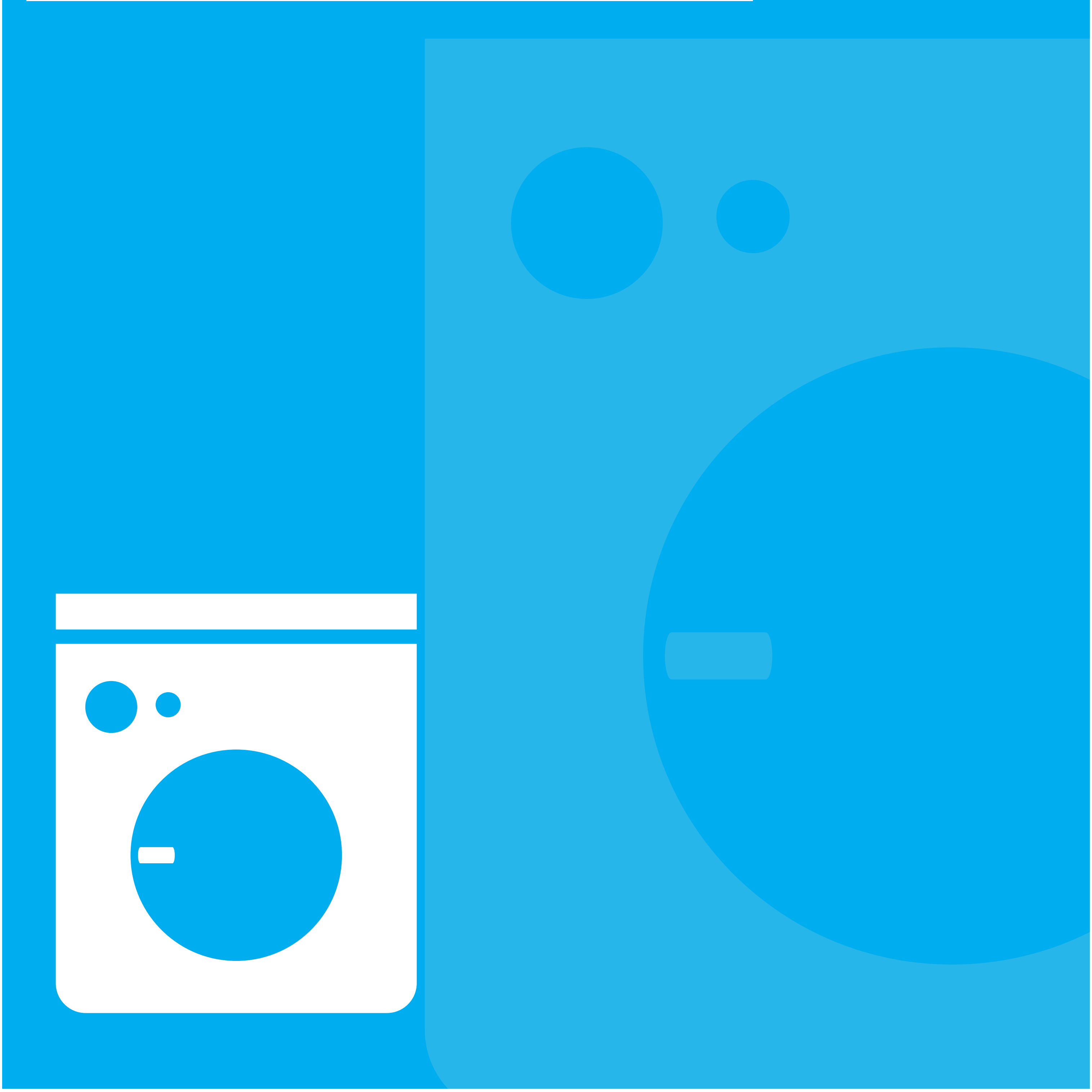
3. If you skip the drying part of the wash cycle by turning the dishwasher off at that point and allow the dishes to air-dry you will reduce electricity use considerably.

4. When buying a new dishwasher look for the Star Labels and pick one with the maximum number of stars.

Washing and Drying Clothes

4

This information sheet provides advice on how to check the energy use of your washing machine and clothes dryer, some suggestions for reducing their electricity use, and things to look for if buying a new washing machine or dryer.



Washing and Drying Clothes

4

USING THE HEAT TO CHECK YOUR WASHING MACHINE

To measure the electricity used by your washing machine you need to plug the appliance into the Power-Mate. An automatic washing machine runs through a series of cycles as it washes, each of these uses different amounts of electricity: the important things to discover are how much electricity it uses for a full wash cycle and how much electricity it uses when not washing but still switched on at the power point.

a. When the Power-Mate is first plugged in push the "Mode" button a few times until "CLEAr" is on the screen, then press "Enter" and the screen will show "done" (and then SEtUP?). Then press "Mode" twice more until "POWEr" is on the screen. The screen will then show you the instantaneous power. The reason for doing this is that it resets the internal clock in the Power-Mate to zero so it will record one full wash cycle.

b. Before you start the washing cycle, but with the power point switched on, note the power being used. It should be small, less than 0.1 (Watts), but some machines can use electricity to run electronic displays or internal transformers. If the Power-Mate shows 1 or more with the machine not operating it is worth always switching it off at the power point because each 1 Watt of stand by power costs almost $2 per year.

c. Now carry on with your normal washing practices. The Power-Mate readings will vary quite a bit depending on motor use, water control valves and water heating.

d. When the full wash cycle, including spin drying, is complete, push the "Mode" button on the Power-Mate until EnErgY appears on the screen. This will show you the energy (kWh) used by the washing machine for a full wash cycle. Write this on your record sheet. You can multiply this number by the number of times you use the washing machine in a year to get the total electricity used for washing clothes. Then multiply by the cost of electricity (20 cents per kWh in 2010) and this will give your annual electricity cost for running the washing machine (but this does not include the cost of any hot water used by the machine, see Information Sheet 5 for more on hot water).

e. For example, if the Power-Mate shows your full wash cycle used 0.823 kWh of electrical energy, and you usually do two loads of washing per week you multiply 0.823 by 2 and then by 52 (weeks per year) to get 85.592 kWh. Each kWh costs 20 cents (in 2010) so the use of the washing machine costs you 1711.84 cents or about $17 per year.

f. Repeat steps a to e for your clothes dryer (if you use one). Clothes dryers generally use more energy than washing machines (unless your washing machine heats its own water). If your dryer is using 3kWh per dry cycle and you use it twice a week this will cost over $60 per year in electricity.

HOW TO REDUCE ELECTRICITY USE WHEN WASHING AND DRYING CLOTHES

Some of the suggestions below will only apply to some households, but the more you can do the more electricity (and money) you will save.

DRYING CLOTHES

1. Whenever possible, dry your clothes on the clothes line. Each time you use your dryer it costs around 60 cents in electricity.

2. If you need to use the dryer because you want to wear some of the washed clothes straight away, put the clothes that are not so urgent on the clothes line.

3. If you need to use the dryer, make sure the clothes have been spun dry in the washing machine first. If your washing machine has different spin speeds, use the maximum speed.

4. Make sure the air filters on your dryer are cleaned regularly.

5. Switch the dryer off at the power point after use.

WASHING CLOTHES

6. Use a cold wash cycle wherever possible. Heating water uses a lot of energy, so if you are happy with the cold wash, use it all the time. A warm wash uses less energy than a hot wash.

7. It is more efficient to wash a full-load of clothes than two half-loads (but don't over-load the washing machine). If you only have a small load, make sure the washing machine is put on the small-load setting (if the machine has one).

8. Where practical, use the economy wash cycle (if your machine has one).

9. Switch the machine off at the power point after use.

BUYING A NEW WASHER OR DRYER

10. Front-loading washing machines are generally more energy efficient than top loading models. They also use less water.

11. Always look at the Star Rating labels, more stars means less energy and lower running costs.

12. Do not buy larger washing machines or dryers than you need. Generally, larger appliances use more energy than smaller models.

If the Power-Mate shows 1 or more with the machine not operating it is worth always switching it off at the power point because each 1 Watt of stand by power costs almost $2 per year.

Hot water, shower and bath

5

This information sheet provides advice on how to check your hot water supply and some things you can do to reduce hot water use.

Most Tasmanian homes have electric hot water systems consisting of a mains pressure storage cylinder (sometimes this is outside the house and sometimes inside in a cupboard or the roof space). Less common are low-pressure electric hot water systems, heat-pump water cylinders, gas heated storage systems, instant gas water heaters and solar hot water systems (with electric or gas boost). The most energy efficient systems are solar, heat pump and instant gas. These can also benefit from reduced hot water use and improved insulation.

Hot water, shower and bath

5

USING THE HEAT

1. Water temperature
   Run the hot water tap into a mug or cup. Use the tap closest to your hot water cylinder and do this measurement when the water is very hot (not just after someone has had a shower or bath). When the water runs hot put the thermometer in the mug/cup and leave the water running for 30 seconds (to allow the mug and thermometer to heat up to the water temperature). The thermometer should read in the range 50 to 60°C. If it is hotter than this you are probably wasting energy from the tank (unless it is a sunny day and you are using solar water heating). If you are using an electric or gas hot water system try turning the thermostat on the tank down to 60°C. If the water is less than 50°C, make sure it is not because you have just used a lot of hot water and the tank has not had time to heat up. If the hottest the water ever gets is less than 50°C then your tank is running too cool and there is a possibility that bacteria could grow in the tank. Adjust the thermostat on the tank up to 60°C.

2. Hot water tank insulation
   Use the infrared radiometer (the equipment that looks like a speed camera) to measure the surface temperature of your hot water tank. All hot water tanks are insulated, but in most cases the insulation could be improved. If the infrared radiometer shows the surface of the tank (measure temperature in the top half of the tank) is 1 to 2 degrees (or more) warmer than the adjacent wall or the air temperature measured with the thermometer then the tank is losing heat because of inadequate insulation. See suggestions 2 and 3 for ways of improving the insulation of your hot water tank.

3. Shower flow rate
   You will need a bucket or large saucepan and the stop watch from the kit for this test. Run the shower as you normally would. Then hold the bucket near the shower head (catching all the water) for exactly 20 seconds (time this with the stop watch or a clock with a second hand). If the bucket overflows, start again with an empty bucket but catch the water for just 10 seconds. Carefully measure the water in the bucket using a kitchen measuring jug. Multiply the number of litres collected by three (or by six if you only collected for 10 seconds). For example, if you collected 3.16 litres (or 3160 millilitres, mL) in 20 seconds your shower flow rate was 3.16 x 3 = 9.48 litres per minute. Less than 9 L/min is good, 9 to 12 is okay, 12 to 15 is not so good and more than 15 L/min is wasting a lot of water and energy. If you are using more than 9 L/min consider a low flow shower head.

The Power-Mate cannot be used to measure electricity consumed by your hot water system because your tank is hard-wired into the meter box. But you usually can use your Aurora meter to work out daily electricity consumed by your hot water tank. If you are using the hot water tariff (tariff 41) you simply need to take meter readings at about the same time each day for several days and average them. If you are using the HydroHeat tariff (tariff 42) or one of the off-peak tariffs (tariff 61 or 62) you can get hot water electricity use on days when you do not use any large heating appliances (heat pumps, fixed electric heaters, off-peak electric heaters) so this is best done in summer.

If you heat water with gas you can take daily gas meter readings but this will include gas used for cooking and space heating (if you use gas for these purposes). If you are keen, you can avoid using the gas stove and gas heater for one full day (use your barbeque). Your gas meter readings will then allow you to calculate the quantity of gas used for hot water.

The electricity required to heat one litre of water up to 60°C is 0.05 kWh (household hot water is typically about 60°C). This costs about 1 cent, i.e. every litre of hot water you use adds about 1 cent to your electricity bill.

REDUCING HOT WATER ENERGY USE

1. Fit a low-flow shower head (see point 3 Shower - flow rate). Have shorter showers. If your shower has a flow rate of 12 L/min, about two thirds of this will be hot water. The electricity to heat the water will cost around 5 cents per minute. If you use natural gas it will be around 4 cents per minute.

2. If you have an electric hot water cylinder located outside you will save up to one third of your hot water electricity use by constructing a water-proof enclosure and adding extra insulation (you can save over $200 per year). The pipes from the tank should be insulated with pipe insulation (from your hardware store). If you do add insulation, make sure the pressure relief valve is not covered or obstructed in any way.

3. If you have an electric hot water cylinder inside you will also make substantial cost savings by wrapping additional insulation around the cylinder (taking care not to obstruct the pressure relief valve). Hot water cylinder insulation wraps are available.

4. If you have a gas hot water cylinder outside you will need to contact your gas dealer to see what insulation could be added. The cylinder must have adequate air supply and allow exhaust gases to escape safely. But insulating the hot water pipes is still a good idea.

5. When you go on holidays, turn the hot water switch off in your meter box (there will be a switch marked hot water). Remember to turn it back on as soon as you get back from holiday, it will take a couple of hours to warm up again.

6. A typical bath holds about 100L of water. Water heating with electricity will cost around 60 cents (consuming about 5 to 6 kWh of electricity) or with gas 50 cents per bath. Some larger baths will use more hot water and cost more. A bath uses more hot water than a short/medium shower.

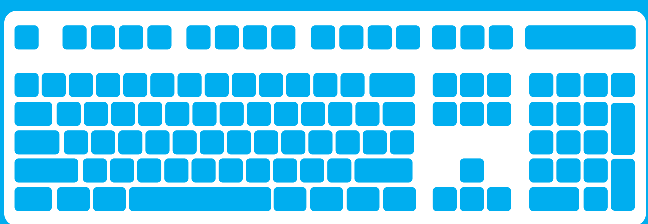
7. A spa bath typically holds 350 L, but it also uses electricity to power the water jets. Some spa baths have heating elements to keep the water hot.

8. Check your hot water pressure relief value - place a bucket underneath to capture drips - more than a few cups a day is a problem and valve is faulty. Sometimes just releasing the valve helps stop the problem. If problem persists seek plumber advice.

Computers and Home Office Equipment

6

Many households have a home office, or at least various electrical appliances used in offices such as computers, printers and scanners, routers and modems, telephone answering machines, paper shredders and fax machines. Each of these can be monitored with the Power-Mate to see how much power it consumes and how much electrical energy it uses for a particular task. Many of these appliances use standby power. The Power-Mate should be used to confirm where this occurs; these appliances should be switched off at the power point when not in use.



Computers and Home Office Equipment

6

COMPUTERS

Desk top computers and screens use far more electricity than laptop computers.

A desk-top computer and screen may use between 100 and 200W when on. This is costing 2 to 4 cents per hour. If you have the computer programmed to use your photos as the screen saver there is no reduction in electricity use while the photos are showing. If you are away from the computer for long, it is preferable to have the computer automatically move into 'sleep' mode. Better still, shut the computer down and turn it off at the power point.

If a desk top computer is left on continuously without the sleep mode engaged it will use around 900 to 1800 kWh/y costing $180 to $360 per year.

Laptop and notebook computers use considerably less electricity but can still be a significant cost if left on all the time. Typical power use is 20 to 50W, costing around 0.5 to 1 cents per hour ($45 to $90 per year if on continuously).

To minimise electricity use and costs always turn off computers and screens if they will not be used for several hours or more. To reduce electricity use when computers are not used for shorter periods activate the sleep mode rather than the screen saver mode.

PRINTERS AND SCANNERS

Printers and scanners consume quite small amounts of electricity when actually printing or scanning (typically only 30 to 50 W) but they continue to use a small standby power load even when switched off on the printer or scanner. To save electricity they should be switched off at the power point when not in regular use.

ROUTER AND MODEM

Most households have a modem to link the computer to the internet and many also have a router to allow wireless connection to one or more computers. A modem and router will use 10 to 20W continuously. This uses 0.25 to 0.5 kWh per day costing 5 to 10 cents/day (around $20 to $40 per year).

If the computers in the house are not in use the modem and router can be switched off at the power point resulting in modest savings over a full year.

TELEPHONES AND MOBILE PHONES

Conventional telephones do not use any household electricity (they draw the very small amount of electricity they need to operate from the telephone lines). But many homes have cordless phones, sometimes with multiple phones. The cordless phones sit on recharging units which each draw 2 to 3W. This is low power use, but it must be on all the time. With two cordless phones in a house, the electricity use per year will be around 44 kWh/y and cost around $10 per year.

There is not much that can be done to reduce this electricity use other than not having more telephones in the house than you really need.

Mobile phones require periodic recharging of the batteries. A typical power use when recharging is around 5W which costs just 0.1 cents per hour. So even if the phone is recharged for 4 hours twice a week for a whole year it costs less than 50 cents. But the phone charger itself draws a very small amount of electricity if left switched on at the power point when not used for charging (you can check this with the Power-Mate). It is worth switching it off at the power point when not in use even though it adds less than $1 per year to your electricity bill.

ANSWERING MACHINE

Answering machines are another one of the low energy - but continuous use - type appliances. Some cordless telephone systems have answering machines built in. In other cases the answering machine is a separate piece of office equipment. Stand alone answering machines typically use 3 to 5W, or about 25 to 45kWh/y ($5 to $9 per year). Check the power use of your answering machine using the Power-Mate.

FAX MACHINE

There is a great variety of fax machines, some are incorporated in computer printers or photocopiers and others are stand alone devices. It is not possible to suggest typical electricity use for a fax machine because there is so much choice. Use the Power-Mate to measure the electricity use of your fax machine if you have one. The stand-by electricity use is likely to be the most important measurement because the fax machine is left on continuously.

Some models of fax machine print on heat-sensitive paper. They may have higher stand-by power requirements (e.g. 10W or 90kWh/year costing around $20 per year).

PAPER SHREDDER

Many homes and offices use paper shredders to improve security these days. When shredding, a small home paper shredder uses 150W to 400W. Use is intermittent, often only a few minutes a day. However, many shredders do use standby power so it is sensible to turn off at the power point when not in use (this is also recommended for safety reasons because serious injuries to small children who put their hands into the shredders are not uncommon).

If a desk top computer is left on continuously without the sleep mode engaged it will use around 900 to 1800 kWh/y costing $180 to $360 per year.

Entertainment Equipment

7

Modern electronics has revolutionised home entertainment: everything from full home theatres to iPods and MP3 players. Many of the smaller gadgets use batteries, but often these are rechargeable and so also add a little bit to your electricity bills. The issues to think about most seriously regarding electricity use associated with home entertainment are stand-by power use and large television screens.

Entertainment Equipment

STAND-BY POWER

Stand-by power refers to the small amount of electricity used by many appliances that can be operated by remote controls. The television or stereo system must keep a small infrared receiver operating all the time so that it picks up the signal from the remote control. Many other electrical appliances have transformers in them to convert the mains voltage (nominally 240 volts) down to the 6 to 12 volts needed to run most electronics. When the appliance is switched off this transformer keeps using a small amount of electricity unless it is switched off at the power point.

Walk around your home and count the number of appliances plugged into power points that are never switched off. It is common to have at least 20, sometimes many more. If each of these uses 5W continuously (in practice some will probably use less than this and some more) the cost each year amounts to almost $200. So it is certainly worth checking with the Power-Mate and seeing which of these can conveniently be turned off at the power point when not in use.

If you have several appliances plugged into one power point through a power-board (e.g. a TV, a video, a DVD player, a digital set-top box, etc.) you can use the Power-Mate to measure the combined stand-by power of all at one time.

If you have things like a digital set-top box for your TV, a DVD player and a TV plugged in together it would not be unusual to find stand-by power use of 20 to 30W.

If your power point is difficult to access, it is worth purchasing an extension cord/power-board with switches so you can easily switch things on and off.

TV

Large screen televisions can be quite high power users, especially plasma screens. A medium sized plasma flat screen will use 300W when on. This costs about 6 cents an hour to operate. It adds up if the TV is on for 5 hours every day (over $100 per year). It is important to turn televisions off when no one is watching, don't use them just for background noise.

When purchasing a new television consider a LCD screen (Liquid Crystal Display) rather than a plasma screen because power use is lower (LCD screens use about half the power of plasma screens of the same size when switched on).

Larger flat screen TVs use more power than smaller ones.

MUSIC

Stereos and portable music systems are small electricity users and are unlikely to contribute much to your electricity bills. However, it is good practice to turn them (or their chargers) off at the power point when not in use.

RECHARGERS

Battery rechargers are everywhere these days. They are used for mobile phones, portable music devices, torches, toys, some workshop equipment, some kitchen appliances and many other every-day gadgets. Most of these appliances are very efficient, using only very small amounts of electricity. This makes them a good choice. But the recharger will use a small amount of electricity even when it is not charging anything unless it is turned off at the power point. Lots of rechargers all using a tiny bit of electricity add up to an unnecessary cost, so get in the habit of always switching them off at the power point when they are not being used to charge a battery.

RADIO

Radios are generally very low power users, but get in the habit of turning them off at the power point when not in use to avoid the stand-by power use.

CLOCK RADIO

Clock radios are generally quite low power users (you can easily check with the Power-Mate). But if you don't need them for checking the time (e.g. in a guest room that is only used occasionally) turn them off at the power point.

When purchasing a new television consider an LCD screen rather than a plasma screen because power use is lower (LCD screens use about half the power of plasma screens of the same size when switched on).

Lighting

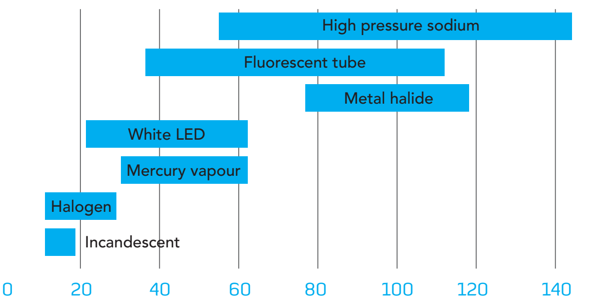
Lighting should not be neglected in any home energy audit, but it is usually not a large part of overall electricity use. Reduced electricity use for lighting can be achieved by using low-energy light globes and by turning off lights that are not needed. These are fairly obvious solutions that most people are aware of. A 100W globe costs about 2 cents per hour to run, this does not sound like much, but it soon adds up if several lights are left on for many hours (a 100W light left on continuously for a year will use $175 worth of electricity).

Lighting

These notes suggest a few ways the HEAT can be used to demonstrate electricity savings and the dollars saved if you use low-energy globes and switch off unnecessary lights. They also mention a few other ways of reducing electricity used for lighting that are not discussed as often

Efficient lighting maximises the light intensity (lumens) for each Watt of electricity. In the chart below you can see that modern compact fluorescent globes emit 4 to 5 times as much light per Watt as do the older style incandescent globes.

Lighting



Lumens per Watt

Based on information from: http://www.mge.com/home/appliances/lighting/comparison.htm

LOW-ENERGY GLOBES

If you have a plug-in desk lamp, standard lamp or bedside lamp you can see for yourself how much electricity and money the low-energy light globes save.

Using a conventional incandescent globe in the lamp (say 60W) plug the lamp into the Power-Mate, clear the memory on the Power-Mate and then turn on the lamp. Check the power reading (it should be close to the wattage shown on the globe, e.g. about 60). Replace the bulb **(warning, let it cool down before touching it)** with a low energy compact fluorescent bulb with equivalent light output (a 12W compact fluorescent is equivalent to a 60W incandescent globe). Using the Power-Mate confirm the lower power use. The Power-Mate can also give you the running cost for each type of globe.

You can estimate how much you would save if all your lights were compact fluorescent instead of incandescent. You need to estimate how many hours a day each light is on for, then add all the hours. If your average incandescent light globe is 75W and you estimate the total light-hours at around 30 (e.g. 4 lights for 5 hours each and 10 lights for 1 hour each); then with only incandescent globes you would use 30 x 75 = 2250 Wh or 2.25 kWh per day costing 45 cents. If they were all compact fluorescents they would use just 0.45 kWh and cost about 9 cents. So you would save 36 cents per day or about $130 per year.

TURNING LIGHTS OFF

Whether you have incandescent lights or compact fluorescents, you should always turn lights off when they are not required or if you are leaving the room for more than 5 minutes.

DOWN-LIGHTS

Down lights, that is lights that are recessed into the ceiling, are often very inefficient. The common halogen 12 volt lights that are fitted in many kitchens and living rooms are serious energy wasters in a cool climate like Tasmania. The lights themselves are not very efficient (see chart on previous page) and the transformer linked to each light uses 10 to 15 W as well. The halogen lights give off a lot of heat so each recessed light must be ventilated into the air space above. This ventilation also draws warm air from the ceiling out of the room, bringing in cool air from outside. Because of the heat given off by each light it is unsafe to put ceiling insulation above the light fitting. So each down-light has a circle of uninsulated ceiling around it adding further to heat loss.

You can replace the halogen globes in down-lights with much more efficient LED (Light Emitting Diode) globes (check at a specialist lighting retailer store for suitable globes). The LED globes are much cooler and so, with a suitable cover over the light fitting and transformer, you can insulate the ceiling above the down lights (but check with your lighting specialist before covering the down-lights).

LAMP SHADES AND REFLECTORS

Keep lamp shades, diffusers and reflectors clean. You can lose up to 50% of the light when diffusers get covered in dust or insects. Choose lamp shades that do not block much light, that way you can use a lower wattage globe but still have adequate light levels.

OUTDOOR LIGHTING AND SECURITY LIGHTS

Make sure your outdoor security lights do not come on every time the wind blows (this means the motion detector is too sensitive, they can be adjusted). Also, make sure security and other outdoor lights do not stay on during the day.

If you require outdoor lights that are on for long periods consider some of the more efficient light globes.

Heaters and Air Conditioners

Space heating and cooling are the largest energy users in Tasmanian homes. In many homes they also add most to annual electricity bills. It is difficult to do justice to the complex issue of cost-effective heating and cooling in a brief information sheet, so these notes focus on just a few of the most important aspects of home eating and cooling.

In Hobart, three quarters of the houses use electricity as their main heating energy source and one in seven use firewood. Gas is used by a small number of houses, but this is increasing as the reticulated gas network expands. For houses heated with electricity, roughly one-third use a reverse-cycle air conditioner (heat pump). This means about one-quarter of Hobart homes have potential for cooling if required .

Heaters and Air Conditioners

Heater types	Cost buy/run	Convenience	Comfort	Family health	Environment Local/Global
Portable electric	Low/ expensive	Good	OK	Good	Good/ Bad
Fixed electric	OK/OK	Good	Good	Good	Good/ Bad
Heat pump	High/ cheap	Good	Good	Good	Good/ Bad
Woodheater	High/ cheap	Poor	Good	OK	Bad/ Good
Nat gas flued	High/ cheap	Good	Good	Good	Good/ OK
LPG unflued	OK/ expensive	Good	OK	Poor	OK/ OK

Based on Australian Bureau of Statistics surveys in 2008: see ABS Report 4602.0.55.001

HEATER TYPES

The table above summarises various aspects of each common heater type. For example, portable electric heaters are low-cost to buy but expensive to run; they are convenient; they provide adequate comfort levels (usually for a small room or for one person); they have no adverse indoor health impacts (i.e. they are good for family health); and they are good for local neighbourhood environment but bad for the global environment because of greenhouse gas emissions from power stations.

Some points to note from the above table: woodheaters are only OK for family health because some spill smoke into the living room when refuelled (if there is no smoke spillage they are good for family health); they are bad for the local environment because of the smoke they emit, but they are good for the environment because most firewood supply in Tasmania is almost greenhouse gas neutral. Unflued gas heaters are poor when it comes to indoor air quality, they are not suited to living-room heating in Tasmania's climate.

HOURS OF USE

A good way to reduce energy costs is to turn heaters off if the house (or a heated room in the house) is unoccupied for an hour or more. If the house is empty during the working day some heater models can be switched on using automatic timers half an hour before the occupants get home, so the living area is warm when people arrive.

Households with woodheaters who buy their wood may find it cheaper to let the fire burn out in the evening rather than loading it up with firewood for an overnight burn and instead use a portable heater with a timer to come on in the kitchen or living area half an hour before getting up.

SHOULD HEAT PUMPS BE LEFT ON ALL THE TIME?

Some people believe heat pumps must be left on all the time to be effective. Some early models of heat pump suffered from icing on the outside heat exchange on cold days; this ice makes the heat pump much less efficient. Most modern units do not have this problem in Tasmania's climate. If ice does not form on the outside heat exchange then it saves energy by turning the heat pump off whenever the house is unoccupied and overnight. If the house is poorly insulated it might get uncomfortably cold overnight in mid-winter, so a case for setting the thermostat down to, say, 15°C and running overnight could be made.

Most heat pumps can be programmed to turn on automatically in the morning just before people get up and just before people get home from work or school.

WARM CLOTHES

In spring and autumn (and some summer days) the living area only cools down to uncomfortable levels late in the evening. It is much more energy efficient to put on a jumper or scarf for an hour or so rather than running the heater which has to warm up the whole living area to provide a little bit of extra comfort.

USE POWER-MATE ON THERMOSTAT CONTROLLED UNIT

The Power-Mate can be used to check the power and energy use of any portable electric heater. In some cases the heater simply runs at its set power for the whole time it is on; so if it is a 2.4kW fan heater and it runs for two hours it will use 2 x 2.4kWh = 4.8kWh. A 2.4kW heater costs about 50 cents an hour to operate.

But some heaters have built in thermostats that automatically turn the electric heating elements on and off at a set temperature; an oil-filled electric radiator is one example. In these cases you should use the Power-Mate to measure the energy used over an extended time (e.g. overnight if you heat a bedroom with one of these oil-filled radiators). The Power-Mate will show you how much energy the heater used overnight and how much that cost. You can try it over several nights to see what the optimum thermostat setting is for your comfort at minimum cost.

Heating (and cooling) costs depend on:

- The type and model of heater(s) used in the house;
- Whether fuel is purchased (most households) or self-collected (some firewood);
- How often the heater(s) are operated (and how well it is operated in the case of woodheaters);
- How well the house is insulated and draught-proofed.

Insulation and draught-proofing

10

Insulation is one of the most important features of any home when considering energy conservation. Heating accounts for at least half the energy used in a typical Tasmanian home. Reducing the rate at which heat escapes from a home during the colder months can save a lot of money and improve comfort levels.

Insulation and draught-proofing

An average Tasmanian household spends around $800 per year on heating. But there is much variation from this average figure.

Energy used for cooling homes on hot summer days is also becoming important. Insulation and draught-proofing helps keep homes cool and makes air conditioners more effective.

CEILING INSULATION

If you can access your attic space, the first thing to do is inspect the ceiling insulation. Use a strong torch.

- If there is no insulation in the ceiling you should contact local insulation suppliers and arrange for insulation to be installed under the Australian Government Energy Efficient Homes program. The program has grants available for installation of ceiling insulation where none exists previously. (see: http://www.environment.gov.au/energyefficiency/index.html). This grant will cover some of the cost of insulating your ceiling. The grants are not available to those who have received the solar hot water rebate.
- If there is insulation but it does not reach the top of the ceiling joists you will probably benefit from adding additional insulation, you might be able to do this yourself (see below) or you might prefer to have professionals come in and do the job.
- As a guide, if the insulation is less than 25 cm thick you should consider adding more. If there is insulation but there are gaps or it seems unevenly spread across the ceiling it needs to be repaired. Loose-fill insulation can be blown around by strong winds in some roofs so it all ends up at one end, or insulation might be moved during electrical work and not replaced.
- If there is no reflective foil under the roofing iron or tiles (or it has deteriorated badly) you are unnecessarily losing heat in winter and gaining heat in summer, you may also have problems of condensation dripping onto ceiling insulation (which makes it less effective) and staining ceilings. Seek professional advice on the best way to add new reflective foil.

Do-it-yourself

Safety is critical, older electrical wiring can be dangerous if you are crawling around in the attic space. On sunny days, high temperatures in the attic space can cause heat stroke.

If you are confident you can do the work safely yourself you can purchase insulation from hardware outlets or specialised insulation retailers. If access to your attic space is good, it is relatively straightforward to install insulation batts over existing insulation.

- Wear overalls and gloves, if working with loose-fill insulation wear a good face mask.
- Add R1.5 or R2 batts over existing insulation.
- It is important to get a complete coverage (i.e. do not leave any gaps between batts).
- Polyester insulation is the easiest (most pleasant) to handle.
- If you choose not to do the whole ceiling, start with the ceiling areas above the rooms you heat. Wool blends are also well worth considering.

IMPORTANT Do not cover down-lights (they can overheat and can catch on fire).

IMPORTANT If your electrical wiring is old or if it looks in poor condition, do not attempt the insulation installation yourself, seek professional advice.

Low-pitch roofs and cathedral ceilings

Some roof designs are difficult to insulate or to add extra insulation. Experienced insulation installers can check your insulation levels and add more if required.

WALL INSULATION

If you are building a new home, make sure you add bulk insulation to walls during construction. Adding wall insulation to existing homes is difficult. It can be done by removing internal plaster sheets on the walls but this is a difficult and dusty task. Weatherboard homes can have wall insulation installed by removing some weatherboards so that insulation can be slotted in above and below the noggins. If adding wall insulation to existing brick-veneer or double-brick homes you must be very careful not to create a pathway for moisture through the wall. Bricks are porus (they soak up water) and so the wall cavity is critical in preventing water problems on internal walls. It is therefore important that insulation does not touch the bricks.

WINDOW HEAT LOSS

Windows are very poor insulators. On cold evenings heat loss through windows is substantial. Double glazing will cut window heat loss by at least half, but even with double glazing windows lose a lot of heat. Good curtains with pelmets help reduce window heat loss dramatically. Retrofitting an existing home with double glazing can be a large investment, so it might be worthwhile to seek professional help from an energy auditor before choosing this option.

You can receive interest free loans for energy improvements such as double glazing but you must first have a free home energy audit under the Australian Government "Green Loans Scheme" (see: http://www.environment.gov.au/greenloans/)

FLOOR INSULATION

Wooden floors are not good insulators. Carpet and underfelt help insulate floors, but polished floorboards, tiles and vinyl floors can lose a lot of heat and make a house quite uncomfortable if they are not insulated. If you have good access under a house with wooden floors it is not difficult to add insulation. R1.5 or R2 batts can be placed under the floor and held in place with cement sheeting. Alternatively under-floor, expended polystyrene batts can be wedged in between the floor joists. Ensure there are no gaps for mice to enter. If the crawl space under the house is low it can be quite unpleasant installing your own floor insulation, so it is worth getting a quote from an experienced installer.

Concrete slab floors benefit from edge insulation (polystyrene) extending down below the ground by 50cm or more.

REDUCING DRAUGHTS

On a windy day check your home for draughts. Use an incense stick to see where draughts are coming in or just dampen your hand so you can feel the draughts. Check around doors, windows, skirting boards, power-points, and spots where pipes go through the wall. Sometimes wooden floors or wood-panel walls are also sources of draughts.

There are many draught-proofing products on the market suited to most types of draught. Check at local hardware stores.

USE THE RADIOMETER

The infrared radiometer in the kit can be used to check insulation in a home, but you need to do it at a time when inside temperatures are very different to outside. On a cold evening, with your house heated to comfortable temperatures, point the radiometer at the ceiling and slowly walk from one end of the house to the other. Within each room the radiometer should show the same ceiling temperature across the whole room. If part of the room has cooler ceiling temperatures it is a clue that the insulation above the cool section has been dislodged or is poorly installed

You can do the same thing with walls and floors. People are most comfortable when all their surroundings are at the same temperature (usually 18 to 21°C). Cool walls or ceiling, but warm air gives a sensation of stuffiness.

Miscellaneous equipment

11

It is easy to use the Power-Mate to check the electricity used by any appliance that plugs into a power point. The information sheet provides some indication of how much each appliance uses, but different makes and different usage patterns can make a big difference in overall electricity use. So spend a little time checking out the appliances in your home and think about ways of saving electricity and money while still enjoying the benefits of these appliances.

Miscellaneous equipment

11

TELEPHONE

See sheet 6 Home Office Equipment

FANS

Most homes have several fans: exhaust fans in bathrooms and kitchens, fans for cooling off (ceiling fans and standard or table-top fans), and fans in ducts for moving warm or cool air around the house. And, of course, fans are built into many of the appliances discussed elsewhere in these information sheets: in computers, ovens and heaters for example.

Fans around the home do not require a lot of electricity to operate. A typical bathroom or kitchen exhaust fan uses 25 to 40W (costing half to one cent per hour).

VACUUM CLEANER

Most vacuum cleaners use 750 to 1500W. This costs 15 to 30 cents per hour. If the vacuum is used for half an hour each week the annual electricity cost will be $4 to $8.

IRON

Modern irons are quite light weight, which means they heat up quickly. While heating they use 1000 to 1500W, but usually reach working temperature within a minute or so, they only need power to keep the iron hot and to produce steam. Half an hour's ironing might consume about 0.3 kWh; if this much ironing is done every week the annual cost is around $3 to $4.

HAIR DRYER

An electric hair dryer has a small electric motor and an electric heating element. The heating element uses most of the power, typically 500 to 1500W. If a hair dryer is used on high power (say 1500W) for 5 minutes every day it will consume about 50 kWh per year of electricity costing less than $10.

SEWING MACHINE

Home sewing machines and overlockers do not require very powerful motors, generally around 100W. The motor only operates for short periods so running costs are low. If someone used their sewing machine once per week and the motor ran for 15 minutes each time the machine was used, over one year it would consume less than 15kWh and cost less than $3 to run. Sewing machines often include a transformer which means some electricity savings result from turning the machine off at the power point when not in use.

ELECTRIC TOOTHBRUSH

Recharging an electric toothbrush only requires 1 to 2W, but this electricity is consumed even when the toothbrush is fully charged. It is only a small saving (but a saving none-the-less) if you turn the charger off at the power point once the toothbrush is fully charged. You will save about $2 per year.

SWIMMING POOL

Swimming pools are large energy users. Electricity is used to run the filtration pump, and electricity or gas might be used to heat the pool. If you have a pool you should look carefully at your energy use. A typical pool filter system requires a 750W pump and it runs for 6 hours a day throughout summer. This consumes 2,000 kWh and costs around $400. The cost of heating swimming pools depends on their size, the air temperature, the preferred water temperature, and heat losses due to evaporation and conduction. Warming the water in a small (10m long, 60,000L) back-yard pool by 5 degrees requires about 350 kWh of electricity (cost about $70). This much heating might be required every one or two days during the autumn/spring periods, so clearly energy use and total costs will be high.

To reduce energy costs of swimming pools use a pool blanket to minimise evaporation (evaporating water cools the pool). Select filter units that have large filters (this reduces the pumping energy needed to push the water through the filter). Have a look at the Australian government web page on reducing pool energy use: (https://www.energyaustralia.com.au/energy/ea.nsf/Content/Ways+Swimming+Pools+NEW)

ELECTRIC GARDEN TOOLS

Electric lawn mowers may be battery run (rechargeable) or plug-in. The mains power mowers are usually 1100 to 1500W and cost about 20 to 30 cents an hour to operate. Battery operated mowers have similar running costs.

There are many other electric garden tools, for example, electric hedge trimmers. Hedge trimmers for home use usually have small electric motors (400 to 600W) and cost 8 to 12 cents per hour to operate.

HOME WORKSHOP

Home workshops are full of electrical tools: drills, saws, planers, welders, etc. Some are cordless requiring recharging, some plug directly into mains power. Most home workshop tools are medium power users with electric motors of around 1000W. But some home workshops have larger professional tools and welding equipment which might require three-phase power because of their high electricity demand. The hours of use for each tool will determine electricity use and cost.

Small savings are possible by making sure devices are turned off once equipment is fully recharged.

OTHER ELECTRICAL GADGETS

Water features (small ponds and/or fountains) require small electric pumps (typically 20 to 25W). These are low power users but because they run all the time the costs can mount up. For example, a 25W pump used continuously for a year consumes about 220 kWh and costs around $45 to run. You can cut running costs by using a timer so the pump only runs when required (e.g. during the day in the case of a fountain).

Insect zappers were quite popular some years ago, but they are not very effective against mosquitos (who are not attracted to ultraviolet light) and have fallen out of favour. Units typically require about 50W of power and so cost about 1 cent per hour to run.

Xmas lights are low energy users in most households (one or two strands of mini-lights on the tree), but if you have a large outdoor display the energy use and cost can mount up. A strand of 50 mini-bulbs uses 25W (cost: half a cent an hour). If you choose LED lights you only use 10 to 20% of this electricity.