

HOME ENERGY EFFICIENCY TOOLKIT

Instruction Guide





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HOME ENERGY EFFICIENCY TOOLKIT
INSTRUCTION GUIDE at
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HOME ENERGY EFFICIENCY TOOLKIT INSTRUCTION GUIDE

This toolkit is designed to help you identify issues that are affecting the energy and water efficiency of your home. Each tool is designed to give information about some important aspects of your home's efficiency, which can help you to work out what steps you can take to reduce how much energy and water you use saving you money, and reducing your greenhouse gas emissions at the same time. Many thanks to Mitchell Shire Council for their assistance in development of this guide.

Energy efficiency and climate change

According to EPA Victoria, Australian households generate about one fifth of Australia's greenhouse gas emissions, which are the emissions causing rapid climate change. Making our homes more efficient, and making the shift to renewable forms of energy, are important actions we can take to reduce our carbon emissions and tackle climate change. Greater Shepparton City Council acknowledges that we are facing a climate emergency and is committed to supporting residents to tackle the climate emergency in their homes, workplaces and communities. Offering these toolkits to residents through our libraries is part of this commitment.



WHAT'S IN THE TOOLKIT?

This kit contains the following tools:

1. Energy Saving thermometer
2. Power Mate Lite Energy Meter
3. Lux Meter/light Level Meter
4. Water flow measuring cup
5. Thermal Camera
6. Instruction guide

This toolkit guide has been developed to help you understand how to use these tools.

ENERGY SAVING THERMOMETER

This is a standard thermometer with the addition of marked temperature range references for several different parts of your home. There are recommended temperature zones for your hot water, room temperatures, fridge and freezer. Using it is very easy!

Hot Water

Pick a tap that has the shortest pipe running to the hot water system (the one that gets hot water to the tap fastest, it may not physically be the closest in an old house). Run the hot water until it's at its hottest, then hold the bottom end of the thermometer under the running water for about 30 seconds. Check the reading on the thermometer (should be no more than 50 degrees Celsius).

Water that is too hot wastes energy and causes additional strain on your hot water system, reducing its life. Water that isn't hot enough (less than 60 degrees Celsius in your hot water tank) has the potential to grow pathogens like legionella. Note that there may be a drop of a few degrees over a long pipe run however.



Steps you can take: If the hot water temperature at the tap is outside the ideal zone indicated on the thermometer, then you can usually adjust the thermostat on your hot water system up or down as required. If you have a storage system it can take quite a while for the tank temperature to change so you may need to wait a few hours or even until the next day to check again. If you have an instantaneous system it should change quickly.

If your hot water system was installed in the last 10 years or so it may have a tempering valve fitted which mixes cold water with the hot water to prevent scalding, in which case the water temperature at the tap is unlikely to be more than 55 degrees.

Room Temperatures

The thermometer marks ideal temperature ranges for summer cooling and winter heating. Most people will be comfortable in these temperature ranges assuming there aren't other issues like draughts or radiant heat causing them to feel uncomfortable. Measure the temperature in your living spaces and adjust your heating and cooling if necessary. If you're not comfortable in these temperature ranges you'll need to do more research into why (It may be as simple as dressing appropriately for the season).

Fridge and Freezer

Leave the thermometer in your (closed) fridge or freezer for a few minutes and then read the temperature. If it's warmer than the indicated range then your food is in danger of spoiling earlier than it should. If it's cooler, then you're using more energy than you need to.

Steps you can take: Adjust the thermostat in your fridge and freezer up or down until it's in the recommended zone. It may take a few hours to stabilise to the new temperature. If it won't go high or low enough then it's due for a visit from a service person to investigate why.

<h1 style="margin: 0;">IDEAL TEMPERATURE ZONES</h1>	Running Hot water	50 degrees Celsius
	Hot Water in Tank	Not less than 60 degrees Celsius
	Room	18 to 25 degrees Celsius
	Fridge	2 to 5 degrees Celsius
	Freezer	-12 to -18 degrees Celsius

POWER-MATE LITE

The Power-Mate Lite is an energy meter that measures how much electrical power is being used by a device that is plugged into it. It is very handy for educating yourself about how much energy different appliances are using and possibly identifying the culprit behind high energy bills.

It can't measure the energy use of hard-wired devices like lighting, electric hot water systems, central air conditioners, oven and stove units etc, but it can measure appliances such as your wall heater, stereo system, fridge, television, microwave, kettle, washing machine, laptop or clothes dryer. By educating yourself about energy use of these kinds of appliances you are better placed to be able to understand how much these devices are using by estimation.

Depending on the type of appliance, you may test for a short period or a longer time, usually 24 hours. The Power-Mate has a timer function to help you test accurately.

Disclaimer: By borrowing this item and following the instructions, the borrower acknowledges that the items borrowed have been tested for safety and are in proper working condition at the time of loan. The power meter is tested and tagged for electrical safety every 3 years as per standards. As such, the lender shall not be held responsible for any damage caused to the borrower's appliances or property as a result of using the borrowed items. The borrower agrees to use the items responsibly and to take necessary precautions to prevent any damage.

How to use it

1. Choose the electrical appliance you wish to test. The Power-Mate Lite can be used indoors in dry locations for appliances up to 10A / 2400W. Most plug-in appliances are under 10A, but if unsure, check the label or appliance nameplate, which should show an amp (A) rating.
2. Unplug the appliance from the power socket, plug the Power-Mate Lite into the socket and plug the appliance into the Power-Mate socket like a double adaptor.
3. Turn on the appliance.
4. Clear any old meter data by pressing and holding 'run' and select 'clear all data' before you begin.
5. Press the 'run' button (quick press) to start measuring.
6. Pressing 'menu' scrolls the display, showing:
 - Energy (kWh)
 - Cost (\$/kWh) – pre-set to Victorian single-tariff default 39c/kWh
 - Greenhouse gas emissions (CO₂-e) – pre-set to 0.85kg/kWh

Each display shows four records:

- True value since the measurement started (cumulative)
- An estimated hourly amount
- An estimated quarterly amount
- An estimated annual amount

How to understand the Power-Mate reading

- Watts (W) are a measure of power, or how quickly electricity is being used. Power is probably the most important aspect to understand in energy efficiency.
- The total amount of energy actually used is the power multiplied by the length of time it is used.



Did you know?

Electrical energy is usually measured in kWh, or kilo-watt-hours (kWh) and this is usually what appears on your electricity bill. One kWh is simply 1,000 watts being used for one hour. The maths is not hard to work out, you just need to convert power to kW and time to hours.



10 Watts = 0.01kW

100 Watts = 0.1kW

1000 Watts = 1kW

Multiply the kW by how many hours it is used for e.g. a 100 Watt computer used 8 hours a day, so $0.1\text{kW} \times 8 \text{ hrs} = 0.8\text{kWh}$

A small item running 24 hours a day (e.g. internet router) can consume quite a lot of energy, while a very high powered item only run for a few minutes (e.g. kettle) won't use much energy.

For example, an internet router that consumes 10 Watts (0.01kW) and is switched on 24 hours a day will use $0.01\text{kW} \times 24\text{hrs} = 0.24\text{kWh}$ per day.

A kettle that uses 2400W (2.4kW) and is on for 6 minutes (6 mins in an hour = 0.1hr) will use $2.4\text{kW} \times 0.1\text{hrs} = 0.24\text{kWh}$, the same as the modem being on all day. Multiply this by lots of large and small appliances around your house and you have your power bill.

How to estimate your appliances' energy use

For simple devices that have fairly consistent energy use you can simply measure the watts and estimate how many hours a day it is used to work out total energy consumption.

Some appliances such as a fridge or plug-in heater will switch on and off (to ensure they stay at the set temperature). To get an accurate idea of their energy use you need to monitor them over several hours or days. The Power-Mate is capable of logging energy use over time (refer to the instruction manual). Make sure you measure as many appliances as you can. Sometimes the biggest energy user is a fridge or freezer kept in the garage. It's often an older model that's been moved out there when you've upgraded in the kitchen and can be subject to extremes of heat in summer.

The more appliances you measure the more of a feel you have for what each one uses and where your household energy is being used. (e.g. don't stress about the kids leaving lights on if it's a 5W LED, do stress about it if it's 6 x 50W halogen downlights!)

For more detailed instruction guide, please see the operator manual available in the toolkit. If not available in the toolkit, these instructions are also found online, just search for Power-Mate Lite manual.

Many appliances these days come with an energy star rating which should have estimates of typical energy use. If the label has been removed from yours you may be able to find it on the official database here: www.energyrating.gov.au.

Steps you can take: When you need to purchase a new appliance, remember: the more stars it has, the less energy it should use, and the more money it should save you over time. Also, the more water efficient it is (e.g. for a washing machine) the less energy it will need to heat the water when you are doing a warm wash. Remember however, that the best way to save energy when washing clothes is to wash in cold water (and no danger of shrinking your clothes either!).

LUX METER/LIGHT LEVEL METER

The most efficient lighting may be no lighting at all. In many cases, areas of your home may be over lit, making it not only uncomfortable on your eyes, but also a waste of energy.

The Lux Meter allows you to measure lighting intensity from 0 to 50,000 Lux. This light meter accurately displays light levels in terms of Lux (lx) and Foot Candles (fc). These are both measures of lighting intensity.



Lux = number of lumens per square metre

Foot Candles (fc) = number of lumens per square foot

LED light bulbs and fittings have a specified total lumen output, but this is not something you can directly measure. Instead, you can use this light meter to measure lux at a specific location or distance from that light source.

How to use it

1. Turn the power/function/range switch to select the range desired. It is recommended to begin with the dial on 200 as this will be the appropriate setting to measure moderate lighting.
2. Remove the cover from the attached wand (photo detector) and hold horizontally in the centre of the room you wish to measure with the light(s) on.
3. Read the number from the LCD display and note against the table below that provides a recommended lux range.



Please note, if the instrument displays only a “1” then the input signal is too strong, and a higher range should be selected (turn dial back further to the left).

RECOMMENDED LUMINANCE (LUX)



Activity	Recommended luminance (lux)
Corridors and passageways	40
Toilet/Bathroom	80-100
Home Office/Study	160-320
Kitchen	250
Living Room	150
Bedrooms	215

Steps you can take: Where Lux levels far exceed the recommended luminance, consider removing excess lighting. The above table has been adapted from Australian standards to suit a residential context and should serve as a guide only. There may be instances where a higher lux level is required, such as for a drawing or reading room or for personal comfort.

If the outside of your house has motion sensor security lighting, check the duration and sensitivity, and reduce if lights stay on for too long. If you have standard lighting or have old style halogen flood lights and need to leave on for safety or security, consider upgrading to save costs in the long run.

WATER FLOW MEASURING CUP

The water flow measuring cup is a very simple device for measuring how much water your taps, shower etc are using in litres per minute.

Fitting a flow restrictor to a tap or a low-flow shower head can save lots of water and especially energy if it's hot water. It can also save you from running out of hot water by using less water for the same length of shower.



How to use the Water Flow Measuring Cup

It's very simple to use for measuring tap flow rates.

1. Just turn the tap onto full, hold the cup under it with the handles pushed together and slowly pull the handles apart. There will be a point where the water level stops going up and overflowing and stays fairly level. If the water level is dropping then push the handles back together a little.
2. Once the cup is full to the top, and staying level, turn off the tap and look at the number on the side of the cup where the handle is pointing. This number will give you the litres per minute of flow.
3. An efficient tap should have a flow rate of less than 9 litres per minute (L/m) and it can be as low as 2 L/m with a very efficient tap. Kitchen and laundry sinks may require flows at the higher end of the scale, while bathroom basins etc. should be towards the lower end. See the following table for a guide.

RECOMMENDED FLOW RATES



Type	Recommended flow rate (litres per minute)
Hand basins	4
Kitchen sinks	6-8
Laundry sinks	8
Outdoors	6
Shower heads*	6-9

*Measuring the flow rate of a shower can be a bit trickier because of the wider water flow.

You might be able to improvise by making a wide funnel with a sheet of plastic (get someone to help hold everything!) to channel the water into the cup.

Otherwise you can use a big measuring jug or mark a bucket in litres and turn the tap on for 30 seconds and then double the amount of water measured to get the result in L/m (maybe get someone else to use the stopwatch on their phone while you hold everything).

For water-using appliances such as washing machines, dishwashers etc, they should have a star-rating label indicating how much water is used per load. If the label has been removed you can look up the model on the official database here: www.waterrating.gov.au

Steps you can take: You can retrofit most newer taps with flow restrictors or aerators. Not much can be done about older taps apart from being aware they are using a lot of water and changing your behaviour. When renovating or building make sure you compare flow rates on products. When you need to purchase a new appliance, remember: the more stars it has, the less water and energy it will use, and the more money it will save you over time.

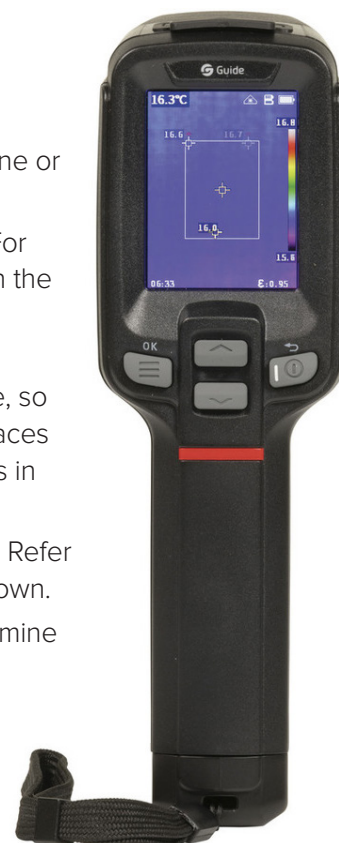
THERMAL IMAGING CAMERA

Use the thermal imaging camera to detect weaknesses in your home's thermal shell.

In winter, use the camera to find hard-to-see draughts and unseen areas of missing insulation. In summer, use the camera to see where cool air is escaping from or warm air is entering.

How to use the Thermal Imaging Camera (TIC)

1. Press the power button to switch the camera on and check if the battery is charged.
2. If needed, use the USB cable to charge the camera via your computer, phone or tablet charger.
3. Run your heating or cooling as you typically would for the current season. For best results, there should be at least a 10C temperature difference between the indoor and outdoor temperature.
4. Aim the camera at surfaces within your home to see the object's surface temperature. The colour shown is relative to other surfaces within the frame, so keep people and pets out of the frame. The camera represents cooler surfaces in black to dark purple, through to mid temperatures in red and hot surfaces in yellow.
5. The screen also displays an approximate temperature of the target surface. Refer to the temperature given in degrees C to provide context to the colours shown.
6. Methodically scan across your roof and walls, covering all surfaces to determine any weaknesses.
7. Take a photo of any images you wish to keep for future reference.
8. Plug the camera into your computer using the USB cable and save the photos to your computer.
9. Please delete all images from the camera before returning the kit.
10. Charge the camera before returning, and hold the power button to turn it off.



Top Tips- How to detect the issues

Remember that the camera displays the surface temperature of the material it scans – it cannot see through walls or ceiling. The surface temperature, however, may give you an idea of what is happening behind a wall or ceiling.

- Note, the camera will also detect reflected body heat from very smooth, glossy and reflective surfaces such as windows, mirrors, tiles and metallic surfaces.

Some common problems you may be able to detect include:

- Missing insulation in walls and ceilings often seen as a large square or rectangle of cooler or warmer surface
- Animal nests in a ceiling or wall, such as possums, are typically shown as warm patches or blobs where no other reason can be identified
- Draughts around windows or doors shown as a strong cooler or warmer line
- Plumbing leaks or damp shown as non-linear dark spots (cool) during warm testing

Some cooler or warmer areas that may not be an issue:

- Hot water pipes within your walls, although insulated, may be seen as a linear hot spot
- It is common for corner joins along walls and ceilings to appear slightly cooler or warmer. A thin line is normal. A wider band of cooler or warmer surface may indicate missing insulation.

EXTRA RESOURCES

This toolkit guide has been developed to help you understand how to use the tools provided but there's vast resources available online if you would like to learn more.

For more information, here are some resources that are worth referring to:

Sustainability Victoria's Household Energy Action Guide.
sustainability.vic.gov.au/You-and-your-home/Save-energy

The Australian Governments '**Your Home**' website provides an independent guide to designing, building or renovating homes to ensure they are energy efficient, comfortable, affordable and adaptable for the future. It is primarily aimed at new homes or renovations, but the majority of the information can also be applied to an existing house. It is available for free online or you can purchase a printed book. Visit yourhome.gov.au

Renew has a wealth of information on all aspects of sustainable living found on their website, forums and magazines at renew.org.au

They have recently launched their Getting Off Gas Toolkit at gettingoffgastoolkit.com and a series of webinars on getting off gas at youtube.com/@RenewAustralia/videos

Throughout the toolkit you will have access to external resources, all efficient homes featured and case studies from people transitioning to all-electric efficient homes.

To get a rough estimate of how much making the switch from gas to electric will cost you, go to **Make the Switch** website at maketheswitch.org.au

My Efficient Electric Home is a popular group on Facebook dedicated to helping people get off gas and make their homes more efficient. At the time of writing they have more than 118,000 members and there is a vast archive of questions and answers in the group. If you can't find the answer already there, then you can ask and you'll likely get a range of expert opinions.

To stay informed about energy efficiency and more resources, scan the QR code or visit shepp.city/envnews and sign up for our newsletter. Visit the energy efficiency section on our website at greaterShepparton.com.au/animals-environment-and-waste/environment





WHERE TO BORROW THE KITS

Goulburn Valley Libraries

Shepparton 41-43 Marungi Street, Shepparton

Mooroopna 9-11 Morrell Street, Mooroopna

Tatura 12-16 Casey Street, Tatura

Thank you for borrowing our Home Energy Efficiency Toolkit. We hope that this kit was beneficial to you and provided a sustainable outcome for you and your home.

If you'd like to share your experience or have a query regarding the toolkit, please reach out to us on Sustainability@shepparton.vic.gov.au

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