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WINTER HEATING GUIDE

Your guide to keeping warm, dry and healthy through winter.

Getting a fair deal

This year we've done something unusual. We've decided to make our Winter Heating Guide *free*, for everyone.

It's unusual because most of our content is for members. Because without them, we wouldn't exist. We're not government funded, we're independent and we don't accept advertising. But we believe everyone has a right to a warm and dry home. And one of our aims is a fair deal for all New Zealanders.

If you'd like to find more ways to make your life easier, consider becoming a Consumer NZ member. You'll have access to all our independent product tests and research, from heat pumps, vacuum cleaners, and other household appliances, to insurance, credit cards, and nutrition. Members can get help on anything from refunds to repairs, replacements and warranties by using our Advice Line.

We have special membership offers running until the end of June 2017. We'd love it if you joined us. To do that, just follow this link:

www.consumer.org.nz/purchase/special-offer

Stay warm this winter, enjoy your FREE Winter Heating Guide. And help get a fair deal for all New Zealanders.

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30% off
an online membership for the first three months – that's just $19.95 to get through winter.

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WINTER HEATING GUIDE

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Getting sorted

To make your home warmer, drier and healthier, it is important to think about how insulation, heating, ventilation and tackling dampness work together. By thinking of each element as one piece of a puzzle, it's easier to see how getting each part sorted contributes to a more comfortable and healthy living environment.

P6

ONE

INSULATION

Makes your home easier and cheaper to heat, and healthier and more comfortable to live in.

P12

TWO

DAMPNESS

By tackling dampness you reduce the growth of mould, mildew and dust mites, thereby reducing maintenance, while also making the air easier to heat.

P16

THREE

VENTILATION

Maintains air quality and removes day-to-day moisture and condensation.

P18

FOUR

HEATING

Keeps your home warm, dry and safe for your family.

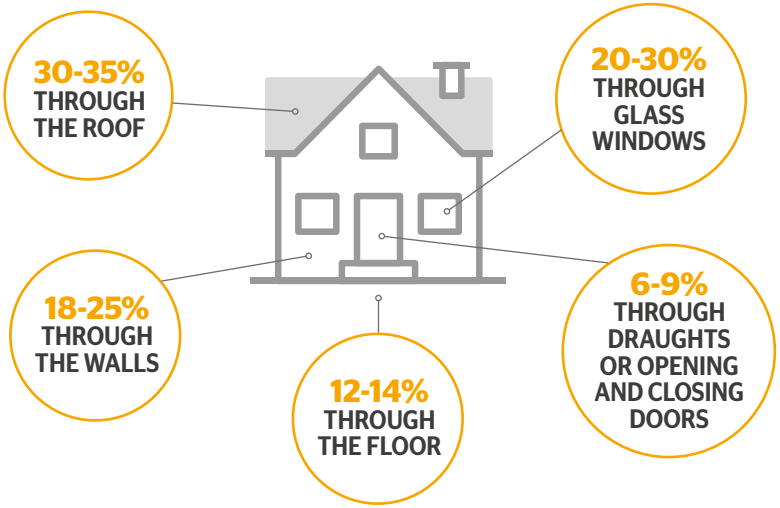
ONE

INSULATION

Insulation makes your home more comfortable, as well as easier and cheaper to heat. Warm indoor temperatures and adequate ventilation make for a drier and healthier home.

The first priority is insulating the ceiling/roof area, as this is where most heat is lost. Installing wall insulation is the next most effective step. However, this is difficult to check without removing wall lining or cladding, so take the opportunity to do so if you're renovating. You also lose heat through air moving through open doors, windows, unsealed downlights and extractor fan systems. Exposed glass makes retaining heat more difficult, so make sure your curtains and blinds form a good seal around your windows.

WHERE THE HEAT GOES



R-values

R-values measure the effectiveness of insulation. Along with the type of material, R-values are a key factor to consider when you're choosing insulation. The higher the R-value, the better the insulation will be at retaining warmth in winter and reducing heat gain in summer.

The R-value depends on the type of material, its density and thickness. So an aluminium single-glazed window has an R-value of 0.15 while a typical insulated wall's R-value is 1.99 – more than 10 times larger. Opposite are the minimum R-values for timber-frame homes.

Visit **building.govt.nz** for more information

REQUIRED INSULATION LEVELS FOR TIMBER-FRAME HOMES

	Ceiling	Walls	Underfloor	Glazing	Skylights
Zones 1 & 2 minimum – North Island excluding the Central Plateau	R2.9	R1.9	R1.3	R0.26	R0.26
Zone 3 minimum – South Island and the Central Plateau	R3.3	R2.0	R1.3	R0.26	R0.31

GUIDE TO THE TABLE Construction R-values show heat retention performance based on the combination of building components, including framing and the insulation itself. Table is based on Clause H1 – Energy Efficiency in the New Zealand Building Code: Acceptable Solutions for non-solid (timber-framed) construction.

New rules

2016 saw two significant changes to insulation rules:

Foil insulation banned:
The Building Act now prohibits the installation or repair of foil insulation. Since 2005, five people have died after being electrocuted when foil insulation they were installing came into contact with electrical wiring. Foil conducts electricity, so there's a risk of electrocution when fitting it in floor spaces near exposed electrical wiring. It's also less effective and reliable than bulk insulation underfloor, as its performance depends on the quality of its installation, which can be difficult for amateurs to get right.

Ceiling and underfloor insulation mandatory in rentals from 2019:
By July 2019, all rentals will be required to have underfloor and ceiling insulation, as long as it can be practically installed. From 2016, the changes also require:

- All new tenancy agreements to include a statement on the extent and safety of insulation.
- Any repair or installation of insulation in a rental to meet the required 2019 standard.
- All social houses where a tenant pays an Income Related Rent to have underfloor and ceiling insulation where it can be practically installed.

For more information on the new insulation and smoke alarm rules for rental properties, visit **consumer.org.nz/articles/news-insulation-and-smoke-alarms-regulations**

Insulation materials

GLASS FIBRE

Glass fibre (glass wool/batts) contains recycled glass and comes in a roll ready to run out in a roof space, or cut into segments for fitting between the framing timbers in your walls or ceiling.

Glass fibre came under the spotlight some years ago after it was classified as a possible cause of lung cancer by the International Agency for Research on Cancer, part of the World Health Organisation. The agency has removed this classification and now considers glass fibre not classifiable as carcinogenic to humans.

However, it can irritate the skin, eyes, nose and throat during installation. Always wear gloves, dust mask, goggles and overalls when handling glass fibre.

Glass fibre cuts easily with a craft knife and can also be pulled apart. When installing do not compress it and ensure joins are butted together firmly to avoid reducing the R-value.

POLYESTER AND WOOL

Polyester and wool come in rolls ready to run out in a roofspace, or cut into segments for fitting between the framing timbers in your walls or ceiling.

Polyester and wool cost more than glass fibre, but are nicer to handle and won't cause skin irritation. However, they are not as easy to cut.

EXPANDED POLYSTYRENE (EPS)

Expanded polystyrene comes in rigid foam sheets. It is used for exterior cladding systems (monolithic cladding), and for insulating under concrete floors. It can also insulate floors, walls and ceilings.

If there is sufficient working space under your house, it's easy and safe to fit polystyrene sheets between the floor joists: you can cut them to size and jam them between the joists without having to secure them further.

LOOSE FILL INSULATION

Loose fill insulation is machine-blown by specialist installers into ceiling spaces. Macerated paper (cellulose fibre), glass fibre and mineral wool (rock wool) are the most common.

New or recycled wool is also used. It's sometimes the only option if there's insufficient space in your roof to install bulk insulation.

Loose fill can settle or shift over time, and concerns over its performance meant it wasn't used in government-funded home insulation programmes. Its effectiveness also depends on the material used:

- **Macerated paper**, made from recycled newsprint, is the cheapest insulation available. A fire retardant is added during manufacture to prevent ignition. Macerated paper can be dusty, may retain moisture from roof leaks, and may settle or blow around over time. Rats like paper-based insulation!
- **Mineral wool** tends to be more expensive than macerated paper but will not blow around as easily, isn't dusty and won't burn. It settles over time.
- **Waste glass fibre** used as a loose insulation won't burn but can be dusty, settle and move about.
- **Wool** used as loose insulation is made from low-grade natural wool or waste clothing. It can also be dusty, and will burn in an established fire. If your roof leaks, wool and paper insulation won't dry as well as mineral fibre and may encourage mould.

To compare prices and R-values of more than 200 insulation systems, visit: **consumer.org.nz/products/insulation**

CURTAINS AND BLINDS

When warm air hits cold glass, two things happen and neither of them are good: the warm air escapes outside, and the newly cooled air forms condensation on the windowpane.

There are two ways to deal with this – keeping the warm air away from the window (with curtains and blinds) and insulating the windowpane (using double glazing or putting insulation film on existing windows).

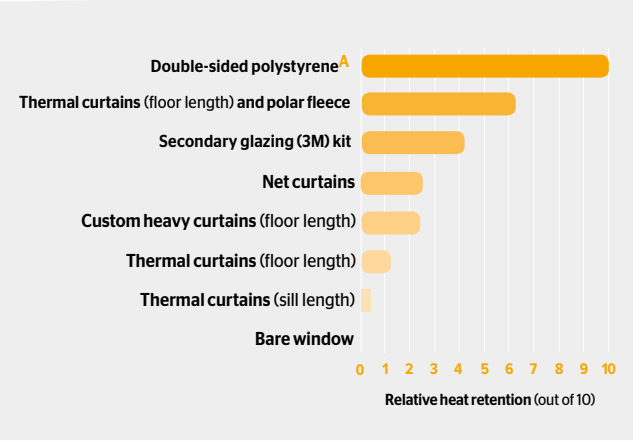
Curtains create a pocket of air between themselves and the window. **We've found how curtains are installed is more important than their material or thickness.** Ensure your curtains and blinds form a good seal against all sides of your window frame.

Old-fashioned net curtains are OK at keeping heat in, as they generally sit quite close to the window and disrupt the downward movement of cool air. Floor-length curtains are more effective than windowsill-length curtains, which aren't much better than no curtains at all.

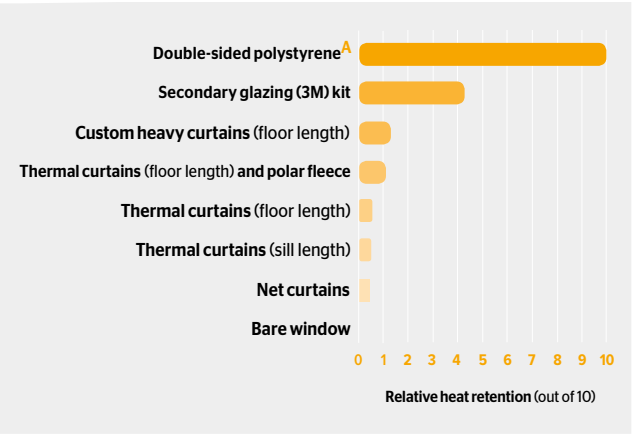
Double glazing traps a layer of air (or an inert gas like argon) between two glass windowpanes. Most new houses have double glazing. It's possible to retrofit older houses, but expensive.

DIY insulation film is a cheaper option for retrofitting older houses. You can easily install the film. It can help prevent condensation and reduce heat loss.

WOODEN-FRAME WINDOW



ALUMINIUM-FRAME WINDOW



[A]Polystyrene was used to obtain a relative maximum insulation value, not as a realistic option for inuslating windows.

WHAT ABOUT BLINDS?

As with curtains, how blinds fit is crucial for retaining heat. Make sure the blind sits snugly against both sides and the top and bottom of the window frame.

tips

- If you're renting, check with your landlord whether it's OK to install temporary double glazing.
- If temporary window insulation makes a difference, aim for permanent double glazing as your budget allows.

For information on curtains and how to keep in the heat, visit:
consumer.org.nz/articles/curtains

TWO

DAMPNESS

The next step to get your home warm and healthy for winter is tackling enemy number one — dampness.

Most of us could improve comfort by reducing dampness in our homes. A damp home is an unhealthy home. But it isn't just that — damp air takes more energy to heat than dry air, so it literally pays to remove moisture from your home. Moisture makes its way into your home in many ways. Start by tackling damp at the source.

WHERE IT COMES FROM

SHOWERS AND BATHS
1.5L/day
(per person)

CLOTHES DRYING
(unvented)
5.0L/load

COOKING
3.0L/day

GAS HEATER
(unflued)
Up to 1.0L/hour

DISHES
1.0L/day

CLOTHES WASHING
0.5L/day

SLEEPING
0.02L/hour
(per person)

BREATHING
0.2L/hour
(per person)

PERSPIRATION
0.03L/hour
(per person)

SYMPTOMS OF EXCESS MOISTURE AND DAMPNESS

- Musty smells in closed rooms.
- Damp or mouldy clothes in wardrobes.
- Mould or mildew behind paintings or mirrors.
- Stains or watermarks on ceilings or walls.
- Mouldy ceilings and walls in kitchens or bathrooms.
- Rotting wood in the structure of your home.
- Damp or mould under your house.

Removing the big hitters

DRYING CLOTHES

- Make use of fine winter days to dry clothes outside.
- Use the fastest spin speed on your washing machine.
- Use a condenser clothes dryer or one that vents outside.

COOKING

- Use pot lids when cooking to contain steam.
- Use a kitchen rangehood or a fan that vents outside.

SHOWERS AND BATHS

- Use an extractor fan when showering or taking a bath, or at least open a window.
- Fit a shower dome to contain moisture.

Don't use unflued gas heaters to heat your home. They are dangerous unless well vented and can add up to a litre of moisture to the air per hour.

DEHUMIDIFIERS

Once you've done your best to remove sources of dampness, a dehumidifier can have a big impact. They're great for renters because they can easily be moved from room to room, or house to house. But they're no substitute for addressing the sources of airborne moisture.

Most dehumidifiers work by cooling the air with a small refrigeration unit so it can condense out the moisture, then reheat the air and blow it back into the room.

Desiccant dehumidifiers use a water-absorbing (desiccant) material, such as silica gel, to remove moisture from the air. They are more effective at removing water than standard dehumidifiers, especially at lower temperatures, but cost more to run.

A great advantage of dehumidifiers is their ability to warm up a room. In fact, they are second only to heat pumps in terms of heating efficiency.

Condensation control

Before buying a dehumidifier, try to reduce any causes of dampness. Otherwise, mould could still be growing underfloor and the source of dampness could be damaging your home.

Don't believe the hype

Dehumidifier manufacturers base their water extraction claims on tests conducted at about 30°C and 80% relative humidity (RH). Unless you live in the Amazon, those conditions are nothing like the winter climate in your home.

We tested dehumidifiers in conditions ranging from 8°C and 90% RH to 16°C and 65% RH. Conditions much more typical of a New Zealand winter, and found actual performance is far lower than claimed. The upshot is the only way to get a realistic indication of performance is by using our test results for 16 commonly available dehumidifiers.

The best on test

TOP DESICCANT DEHUMIDIFIER

Goldair GD330 $393

The best-performing dehumidifier we've tested. Innovative "desiccant" technology makes it exceptionally good at removing moisture from the air at low temperatures. It also produces as much heat as a small fan heater, and is relatively quiet. The catch is the GD330 costs three times as much to run as conventional models that use refrigerant technology, though it will get the job done faster so you can run it for shorter periods. However, the water tank is on the small side.

TOP REFRIGERANT DEHUMIDIFIER

Delonghi DDS30 Combi $750

The Combi's been a solid performer for a few years. It's easy to use and has considerably better energy efficiency than the top-scoring dehumidifier, the Goldair GD330. It also comes with a separate heater option, making it a great option for quickly drying out a damp room. Its biggest downside is its price. It's also a little noisy.

HOW DO THEY HEAT A ROOM?

When water is turned from liquid to vapour, heat has to be added. This is called the "latent heat of evaporation". The reverse happens when water vapour is condensed to a liquid – that latent heat is released. When a dehumidifier condenses the water vapour in the air back to a liquid for draining off, the latent heat in the water vapour is released, helping to heat up your home.

tip

Keep rooms ventilated and warm during winter — at least 7°C warmer than outside temperatures, and leave windows closed on damp days.

We've tested 16 commonly available dehumidifiers. To find out what you need before buying, visit: **consumer.org.nz/products/dehumidifiers**

THREE

VENTILATION

Once the main sources of dampness have been removed or reduced, you can think about ventilation.

If you live in a Victorian villa, too little ventilation might not be a problem. But modern homes are much more airtight, so natural ventilation is minimal. Get in the habit of airing your home every day. Open windows to let a breeze through and vent stale, moisture-laden air. It seems counter-intuitive to open windows on a cold winter day, but removing moisture makes your home healthier and your heating more efficient.

AUTOMATIC VENTILATION SYSTEM

An automatic ventilation system can be effective and convenient for continuously airing your home. There are two main types:

- **Positive pressure:** Also called forced air systems, they work by blowing drier air into your house from the roofspace or from outside. This system will work in any house that has a suitably dry roofspace, and where sufficient air leaks past doors and windows. However, if your roof is heavily shaded or you live in a colder part of the country, a heater is essential for ensuring adequate airflow without cold draughts. You may also have to fit small vents to newer homes or leave windows slightly ajar on security stays to achieve sufficient air movement.
- **Balanced pressure:** Also known as heat-exchanger systems, they extract warm, damp air from living spaces and pass it through a heat-exchanger to heat up dry air brought in from outside. This is the best option, if you can afford it. While they'll work in almost any situation, provided they're properly matched to your home and correctly installed, they work best in modern, airtight homes with aluminium fittings.

Do they work?

Yes. In our 2017 survey, 89% of respondents with a ventilation system said it's effective at reducing condensation. However, the high upfront cost of these systems means it's a good idea to tackle moisture sources first, then see if you still need to make the investment.

TACKLE THE SOURCE

Close doors to contain steam or condensation in wet areas.

Open windows close to moisture sources: such as bathrooms and kitchens.

Fit window vents or security stays so the home can ventilate while you're out.

Never vent extractor fans into the roofspace or under the floor.

To compare the specifications of 94 ventilation systems, visit:
consumer.org.nz/products/ventilation-systems/overview

FOUR

HEATING

The fuel you use for keeping your home warm can have a big impact on your bank balance during the colder months.

A third of the energy supplied to your home this winter will be used for space heating, with another third going to your water heater. We found heat pumps were the cheapest space heaters to run. Unflued LPG heaters were the most expensive. They're also a health and safety hazard, as they fill the air with moisture and can produce toxic carbon monoxide if they develop a fault. We think they should never be used indoors. Natural gas is the cheapest fuel for central heating, with LPG the most expensive.

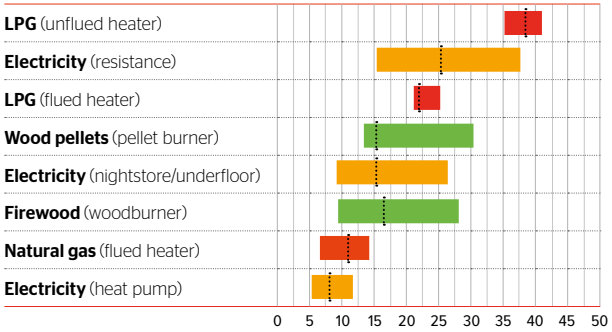
HEATING CHOICES

Cheap space and water heating isn't as simple as just choosing the fuel with the lowest cost per unit of energy – you also need to consider the fixed connection charges, as well as the purchase and installation costs of the heater.

Home heating costs 2017

(¢ per kWh)

RENEWABLE | SEMI-RENEWABLE | NON-RENEWABLE



GUIDE TO THE FIGURES COSTS are for providing one kilowatt of heat for one hour. Bars represent range between maximum and minimum costs, black dotted line represents the national median. Electricity and natural gas costs are from Powerswitch.org.nz based on April 2017 data. Other costs are from pricing data collected during April 2017. GST is included.

Fixed charges

In addition to the kWh cost, you also pay a fixed daily charge for electricity lines and gas mains, or an annual LPG rental fee. If you're considering gas when choosing a space or water heater, factor in the fixed daily charge (or rental fee for LPG cylinders). Unless you're going off-grid, you'll pay the fixed electricity charge, but you can always substitute gas for electricity when it comes to cooking and space/water heating.

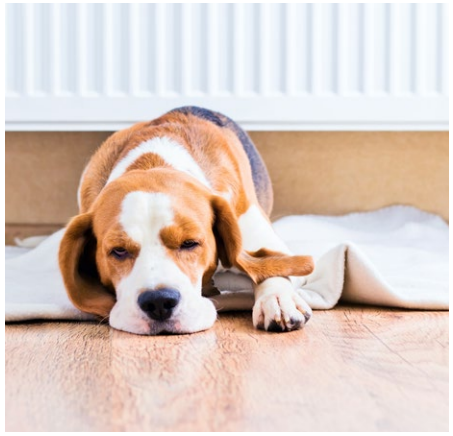
- **Electricity:** The average fixed charge for being connected to the grid was $1.73 at the time of our survey, a 2.4% increase on 2016, but this ranged from as low as 75¢ up to $2.74. If you use less than 8000kWh per year (or 9000kWh in the lower South Island) your retailer must offer you a low fixed charge tariff option of no more than 30¢ per day.
- **Natural gas:** The average fixed daily charge for piped natural gas was $1.45, the same as 2016. It ranged from 8¢ to $1.89.
- **LPG:** The annual rental fee for two 45kg LPG cylinders sets you back $118 (32¢ a day).

CENTRAL HEATING

Kiwi homes are often made up of small islands of heat in a sea of cold air.

In an open-plan home, the heat from a woodburner, electric heater or heat pump spreads throughout the open area, warming up the kitchen, living and dining rooms all at once. However, in homes with separate rooms the heat source often overheats the room where it's installed, while the rest of the home remains cold.

One solution is using a heat transfer kit with insulated ducting to help even out temperatures, but the home is unlikely to become uniformly warm.



WHOLE HOUSE (CENTRAL) HEATING

The principle behind central heating is separating the place where the heat is generated from where it's released. There are two common systems: ducted hot air and piped hot water (hydronic). Central heating systems have three major components:

- A **heat source** located in a convenient place away from where the heat's required.
- A **distribution** system to transfer the heat.
- A way to **release** the heat where it's needed.

They also have a **control system** to monitor the overall system.

Heating: The heat source is often referred to as a boiler and heats either air for ducted distribution or water for hydronic systems. Some models burn gas, diesel or wood, while others use a heat pump. We recommend you check with at least two heating companies to determine which boiler type is best for your area.

Distribution: The heated air or water needs to go to where the heat's required. This is done via insulated ducting for air systems or insulated pipes for hydronic. Usually the home is divided into different heating zones, which are heated to various temperatures.

Releasing: Ducted air systems have outlet grills that deliver heat directly into rooms. Hydronic systems release heat either through underfloor systems (where hot water is passed through pipes buried in a concrete floor slab) or radiators (where hot water is piped into wall-mounted radiators).

For more information on efficient central heating and tips on how to have a warm, comfortable and healthy home, visit: **consumer.org.nz/topics/home-heating**

tip

The most important thing when choosing a heat pump is getting one that's the right size for the room. See our calculator for an accurate guide on how many kW you need: **consumer.org.nz/articles/what-size-heat-pump**

HEAT PUMPS

Heat pumps are generally the cheapest to run. They use electricity to capture ambient heat from outdoors, converting each unit of power into three to four units of heat.

An experienced installer will give you advice on the right size and where to place the indoor and outdoor units.

Heat pumps are essentially large space heaters that can provide cooling in the summer. Since they use a fan to distribute warmed air, the heating spreads more evenly than with other space heaters, such as woodburners.

Smaller versions (up to 4kW) are designed for a single room, with larger units (up to 10kW) suitable for open plan areas. All heat pumps have an energy rating label to show their efficiency at heating and cooling. The most efficient models carry the blue Energy Star mark.

Heat pumps dehumidify when they are in cooling and dehumidifying ("dry") mode, but not in heating mode.

Is a heat pump for you?

PROS

- **Warm, dry and comfortable:** heat pumps can provide a level of all-round comfort not easily obtained by plug-in electric heaters. They can quickly bring a room up to temperature and then maintain it.
- **Cheap as chips:** they're also more than three times as efficient as plug-in electric heaters. For the cost of running a plug-in oil column heater, you can run a big heat pump with much more heating power.
- **Cooling:** a reverse-cycle heat pump is the only type of home heating system that can both heat and cool a room.
- **Air filtering:** most units incorporate a washable filter unit that removes dust and particles from the air. This could be an important feature for people with asthma and allergies, especially if you choose a unit with a high-performance HEPA filter.

CONS

- **Not so good in low temperatures:** extracting heat from outdoor air gets more difficult as the temperature drops. Sometimes, especially on frosty nights when the temperature is between 0°C and 5°C, exterior heat pump units freeze and stop working for several minutes while they defrost. Check our low temperature performance scores in our heat pump database to find a model less prone to frosting.
- **Noise:** whirring fans can be annoying. Fans run in both the interior and exterior units while they are switched on. Check our noise scores to find the quietest units.
- **Draughts:** circulating air can cause draughts – which means you need to think about where to place the unit. You don't want one on the wall just above your favourite armchair.

WHOLE HOME OR SINGLE ROOM?

Single-split air-to-air models are the most common type of heat pump in New Zealand. These consist of a single outdoor unit (the compressor) connected to an indoor unit via a system of pipes. They're designed to heat one room, not your whole home, and you may require multiple units if you have more than one living area.

There are several other heat pump technologies, including multi-split (where one outdoor unit serves several indoor units), ducted (where a large centralised compressor sends hot air via ducting throughout the home) and air-to-water systems (where a heat pump is used in lieu of an electric water cylinder). There are also ground-source heat pumps, which use heat from the earth rather than from the air. These systems remain a niche market, so our round-up only includes single-split air-to-air models.

RUNNING COSTS

If you install a heat pump and keep your home at the same temperature you do now, you could save plenty in heating costs. But many people choose to keep their homes warmer once they get a heat pump so their heating bills will not drop by much.

USE IT WISELY

Even if you've bought the perfect heat pump for your home, and your installer's done everything by the book, you need to use it properly to get the most out of it:

- Only leave your heat pump on all day if your home is well-sealed and has comprehensive insulation. In draughty villas, you're better off only switching it on when required.
- Don't set the controller to a higher temperature than required. Selecting 30°C in an effort to warm a room extra fast doesn't work – set the temperature you want (we recommend 21-23°C) and let the heat pump do the rest.
- If your heat pump spends 20 minutes defrosting on cold winter mornings, use the timer to turn it on half an hour before you get up, or leave it on overnight at a low level (if your home is well-sealed).
- Vacuum the filter on the indoor unit every three months. Regularly inspect the outdoor unit to ensure it hasn't become overgrown or clogged with debris, while looking out for rust. Beware of cold callers pressuring you into expensive heat pump servicing. They can charge hundreds of dollars for a service you can perform yourself in a few minutes.

For a guide to choosing the right heat pump for your home, and our assessment of 175 different models, visit: **consumer.org.nz/products/heat-pumps/overview**

TYPES OF FUEL

Some heating fuels generate less pollution and are more sustainable than others. We rate the most common options.

RENEWABLE

■ **Firewood** is one of the few sustainable carbon-neutral heating options. However, it needs to be burned hot and in a specially designed firebox to minimise pollution and generate maximum heat. You also need to make sure firewood is dry and the pieces aren't too big.

■ **Solar** is the cleanest fuel of all. The most common type of residential solar photovoltaic (PV) installation is grid-tied PV. This means the panels power your home when the sun shines and you can sell power back into the grid if you're producing a surplus during the day. However, most systems in New Zealand don't have batteries, as the large batteries required to store enough power for the evening remain expensive, so you can't use solar to run your heat pump on cold winter evenings.

If you're thinking of selling any "extra" solar power the panels generate, you may be disappointed. That's because "buyback rates" for your surplus solar energy are much lower than the retail price of power, meaning a system will only be economic if you can immediately use most of the power it generates.

We think grid-tied PV systems are a good option for those who use a decent amount of power during the day (for example, where one or two members of the household stay home most days).

Another option is a dedicated solar water heater. There are two main types: flat plates (which look like skylights) and evacuated types, made up of a series of glass tubes sloping down your roof. Flat plates are cheaper and less obtrusive but evacuated tubes can be more effective in cold/cloudy conditions.

In sunny parts of the country, solar water heaters can be a good bet. However, their high upfront cost and the fact you'll generally need an electric cylinder as a backup means they're only likely to be economic for households that use significant amounts of hot water (eg, large families).

SEMI-RENEWABLE

■ **Electricity:** In New Zealand, more than 75% of electricity comes from renewable sources such as hydropower and geothermal energy.

NON-RENEWABLE

■ **Natural gas** burns cleanly, but as a fossil fuel it's not renewable. Burning it releases a greenhouse gas (carbon dioxide) into the atmosphere.

■ **LPG** is another clean-burning fossil fuel, but it also adds carbon dioxide to the environment.

■ **Diesel** is now low sulphur and relatively free of pollutants, but it's still a non-sustainable fossil fuel that adds to greenhouse gas emissions.

To learn more about grid-tied PV systems, visit:
consumer.org.nz/articles/grid-tied-pv-systems

Powerswitch
In addition to electricity, powerswitch.org.nz can also calculate the cheapest piped natural gas plans for your home.

GAS HEATING

Your gas options depend on where you live. Piped natural gas is only available in some of the more populated areas of the North Island but LPG cylinders are available just about everywhere.

Gas heaters range from small wall-mounted units and fireplace inserts, to full central-heating systems.

The price of piped natural gas is relatively low per kilowatt hour, but becomes more expensive when you add in the daily connection charge. The economics of gas heaters become more attractive if you're already using gas for cooking and heating hot water. LPG is usually slightly pricier than natural gas, while unflued portable LPG heaters are the most expensive option.

Burning gas creates moisture and carbon dioxide. A flued heater removes these gases to the outside; an unflued heater releases them into the room being heated.

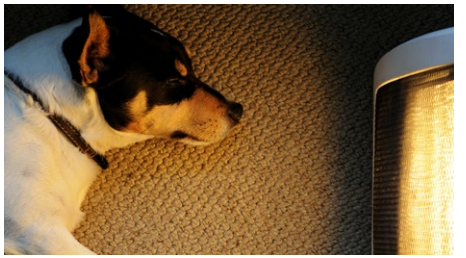
Emergencies only!

A portable unflued LPG heater is the most expensive form of heating. It's also a health and safety hazard as it produces carbon dioxide, and fills the air with moisture. If the heater develops a fault, it could release fatal levels of carbon monoxide. That's why we think an unflued heater should only be used in rooms with good ventilation and never in bedrooms. However, we do think it's a good idea to keep one for emergency use when other energy sources, such as electricity or natural gas, aren't available.

ELECTRIC HEATERS

Portable, plug-in electric heaters cost more to run than fixed forms of heating like heat pumps, woodburners or gas fires. They aren't powerful enough to keep larger living areas at a comfortable temperature. However, their low cost to buy and how easy they are to move makes them often the best bet for heating bedrooms, offices or infrequently occupied spaces. There is a wide array of electric heating options, each suited for different room types.

Which heater where?



OSCILLATING TOWER FAN HEATERS

Overview: Tall, pivoting heaters with a radiant element and usually a fan. Note: we test large fan heaters designed to warm an entire room. Small fan heaters that sit close to the floor can be a good option for personal heating (for example, if you're in the only one in the study and just want direct heat).
Pros: Fast, even heating thanks to fan, large element and oscillation. Usually have a good range of controls including multiple heat settings, timers and eco modes for low-level background heating. Top models include cooling fans.
Cons: Radiant element can be unsafe in bedrooms and around children (though most now use ceramic elements that are less of a fire risk than glowing radiant elements). Fans can be noisy, which makes them unsuitable for bedrooms.
Good for: Quickly heating an office or rumpus room.

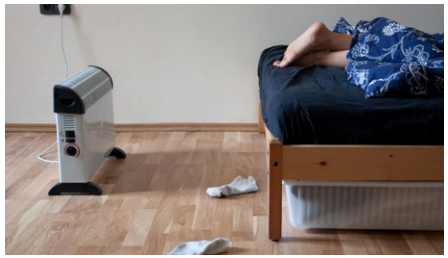
RECOMMENDED
Delonghi Ceramic TCH7092ER
$230 **75%**

MICATHERMIC

Overview: Similar shape to an oil column heater but thinner. Uses sheets of mica (a mineral similar to slate) encased in a metal housing, which heat up quickly.
Pros: Reasonably fast heating, though not quite as even as heaters with a fan. Similar effect to an oil-column heater, but with a toasty radiant heating effect in addition to the purely ambient background heat produced by an oil-column model. Heats up quicker than oil-column heaters. Generally silent operation. Lighter and portable than an oil-column.
Cons: Most models heat from all sides so can't be placed near walls or furniture. Exterior surfaces get very hot, so they can be hazardous around young children. Sometimes the mica creaks as the heater warms up.
Good for: Warming small living areas while watching TV.

RECOMMENDED
Kent Mica KPE216-071
$139 **78%**

Which heater where?



PANEL AND CONVECTION

Overview: These heaters draw cold air over an electric heating element. The warmed air then leaves the heater and rises towards the ceiling, while cooler air moves in to replace it. Often have a fan-assist option.
Pros: Can be wall-mounted, so they don't take up much space. When the fan is on, they can give reasonably quick and even heating for smaller living areas. Quiet operation and covered heating element make them good for bedrooms.
Cons: Can be expensive, particularly flat-panel models. Heating isn't as fast or even as an oscillating tower model.

RECOMMENDED
Delonghi HCX9124E
$450 **70%**

OIL COLUMN HEATERS

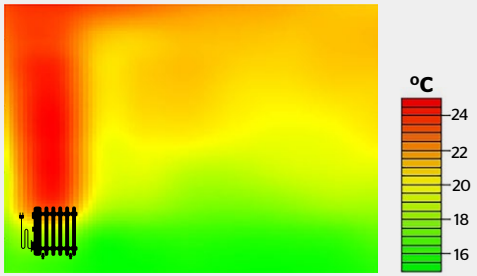
Overview: These models heat oil sealed inside their columns/fins. Heat from the oil is then transferred to the casing, and released into the air.
Pros: Provide ambient heating without their surfaces getting too hot, making them relatively safe to leave on unattended or in a bedroom while you're sleeping. Generally silent operation.
Cons: They're heavy, which makes them awkward to move. Rely on natural convection so give uneven heating (unless you use a fan to help the heat circulate).

WORTH CONSIDERING
Delonghi Radia S TRRS1224T
$220 **67%**

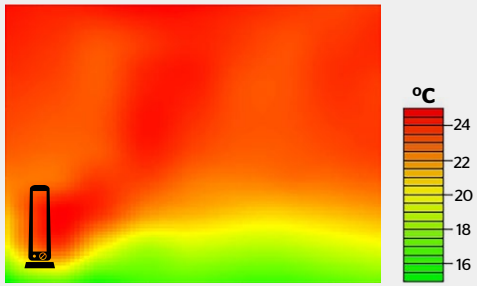
Fan power

The charts below from our electric heater test represent vertical cross sections of our lab. They show how much more evenly a heater with a fan warms a room compared to a fan-less heater. The oscillating tower fan heater gave a relatively constant spread of temperatures from the floor to the ceiling, but the fan-less oil column heater couldn't break up the layered temperatures, meaning cold feet and a hot head.

FAN-LESS HEATER



OSCILLATING TOWER HEATER

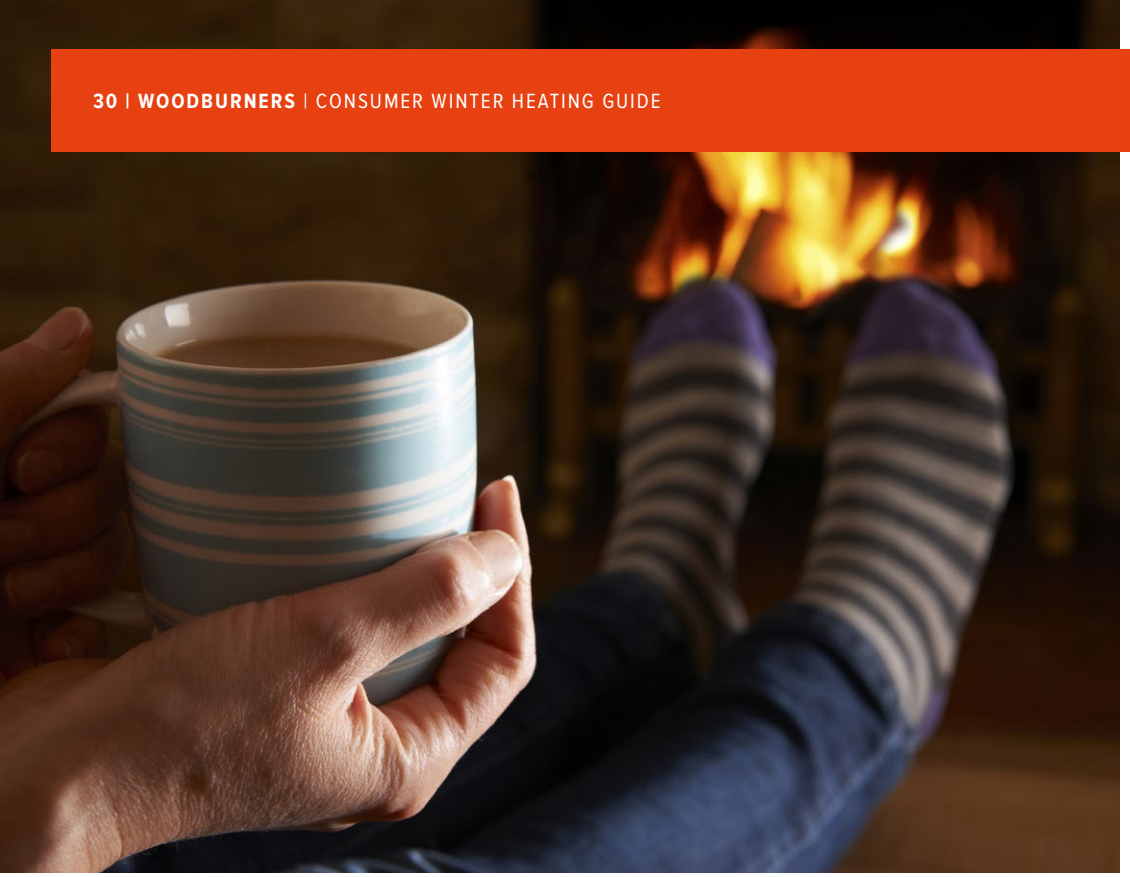


- **Thermostats** help maintain an even temperature and conserve power.
- **Fans** help a room warm up faster and distribute heat evenly.
- A **timer** allows you to turn a heater on and off automatically and is a great way to make sure you wake up to a warm home.
- **Tilt switches** turn off a heater if it falls over. Not all portable electric heaters have one, but we think they are essential.

Powerswitch

If you use heat pumps or plug-in electric heaters as your main source of warmth, it's essential you're on the best power deal. Visit **powerswitch.org.nz** to see how much you could save by switching electricity retailers.

For full reviews of more than 30 heaters, plus loads more buying advice, visit:
consumer.org.nz/products/electric-heaters/overview



WOODBURNERS

Nothing is nicer than toasting yourself in front of a cosy fire. Using a woodburner to heat your home means there's less risk of serious bill shocks this winter – and you'll stay warm if the power goes off.

Burning wood is sustainable and environmentally friendly, but only if it's burned cleanly. You get more heat from a clean-burning (non-smoky) fire, and cleaner burning means fewer smoke particles lodging in our lungs.

If you burn wood carelessly, or use wet logs, you can create a health hazard through ultra-fine smoke particles that lodge in people's lungs. Modern woodburners are designed to burn cleaner than older models, but you must still tend the fire carefully and use dry wood of the right size.

A ducted heat-transfer kit can be a good way to spread the heat though the home.

tips

- Keep the woodburner refuelled.
- Use dry firewood of the right size (less than 110mm in diameter).
- Keep your burn clean by adjusting the amount of wood burning rather than the air control.

House rules

If you live on a section smaller than two hectares, any woodburner you install must comply with National Environmental Standards (NES). The NES sets benchmarks for emissions and efficiency, and requires the number of grams of smoke particle for every kilogram of dry wood burnt to be less than 1.5g/kg. It also requires your woodburner's efficiency to be greater than 65%.

In Nelson and Canterbury, the rules are even tougher. Environment Canterbury Regional Council has sponsored the development of a new standard "CM1" requiring better emissions and efficiency standards. CM1, also known as "ultra-low emission burners (ULEB)", models are able to be installed in new builds in areas where new woodburner installations had previously been banned (for example, the Christchurch clean air zone).

For sections greater than two hectares, "rural" woodburners are allowed. While these often have significantly higher emissions than NES models, they generally deliver huge amounts of heat, making them great for large open-plan areas.

- **Authorised woodburners (Canterbury):** ecan.govt.nz/data/authorised-burners/
- **Authorised woodburners (Nelson):** nelson.govt.nz/environment/air-quality/approved-burners/approved-wood-burners-2/

Jayline Waltherm ULEB woodburner $5199

This woodburner meets the stringent emissions and efficiency standards required of an ULEB (CM1) model.
Output: 14.9kW
Emissions: 0.47g/kg
Heat area: 160-300m^2

What size woodburner?

In comparison to an electric heater or heat pump, putting an exact figure on woodburner heat output (kW) is difficult.

We use results from NES testing to measure heat output. The trouble is the NES test can understate what you can achieve in your home, especially for larger woodburners as they aren't run long enough to completely heat up.

An alternative figure, based on the New Zealand Home Heating Association (NZHHA) test method, is provided for many woodburners. In this test, the woodburner is refuelled every 20 minutes and reaches its absolute peak output. In use, your woodburner's typical peak output will fall somewhere between these numbers, only reaching the NZHHA figure after a few hours of regular stoking. We reference these figures in our database where available.

For a calculator showing the approximate heat output required for your home, along with buying tips and a comparison database of more than 100 woodburners, visit: **consumer.org.nz/products/woodburners-and-pellet-burners/overview**

APPLIANCE RUNNING COSTS

Why is your winter power bill so high? Think of it as a rule of thirds: one-third space heating, one-third water heating, one-third everything else. Everyone's familiar with the usual suspects for high energy bills, like electric heaters. But where does the rest go – what makes up "everything else"? Tackling power-hungry appliances helps soften the blow of winter power bills.

LIGHTING

Short days and dark evenings mean lights are on for longer over winter. If you are still using halogen downlights and standard incandescent bulbs you are wasting money. Replacing a standard 60W bulb with an LED would save about 1.5¢ for every hour it is switched on. Multiply that by the number of bulbs you have, and the number of hours they are on, and it adds up to a significant proportion of your power bill. A house filled with standard bulbs could contribute up to 8% of a power bill.

You can replace halogen downlight bulbs with LEDs and see similar savings. But replacing the entire fitting is a better option. It costs more upfront than buying bulbs, but you'll get a longer life and you can fit roof insulation over the top of LED downlight fittings to reduce heat lost into your roofspace.

LED lights may cost more, but it pays to replace the most frequently used bulbs and downlights with LEDs now, rather than wait for them to fail. Over just one winter period you are likely to save money overall.

FRIDGES AND FREEZERS

The appliance that is "always on" has a big impact on your power bill. Replacing a 10- to 15-year-old fridge-freezer with a new energy-efficient model could save more than 20¢ each day. And what about that old beer fridge in the garage? Unplugging that could save a further 20¢ each day. That's $12 saved every month.

COOKING

Winter means hot dinners: roasts, stews and casseroles. But running your oven and cooktop isn't cheap: bank on about 38¢ to cook a typical roast and 50¢ per hour to run each electric cooktop element. You might consider replacing some meals with a slow-cooked casserole – a typical slow cooker running for eight hours only costs 6¢. Or make use of your microwave: heating the equivalent of a plate of food costs just 2¢.

Energy-efficient recommended products

Miele TKB 350 WP ECO heat pump dryer $2299

Sunbeam Secret Chef Electronic sear and slow cooker $300

LG GB-450UPLX fridge-freezer $1899

Panasonic CS/CU-RZ9RKR heat pump $1899

Our tables show the typical running costs for a range of appliances.
Visit: **consumer.org.nz/articles/appliance-running-costs**

LIGHTING

Lighting is a great way to create a cosy atmosphere on long winter nights. Energy-efficient bulbs have advanced to where you can get any look you want while enjoying substantial savings.

ENERGY SAVERS

Incandescent bulbs are being phased out. Their replacements – compact florescent lamps (CFLs) and light emitting diodes (LEDs) – are more efficient and long-lasting. LEDs last two to three times longer than CFLs and don't contain any mercury.

INDOORS AND OUTDOORS

Different rooms require different lighting moods. Use bulbs with a warm colour temperature and diffuse light for living rooms and bedrooms. Spotlights with a cooler light are great for reading and work areas.

Look for PAR38 LEDs when replacing flood- and security lights. They're as bright as their halogen equivalents and more energy-efficient.

Finding the right bulb for you

Gone are the days of simply picking up a 50¢ incandescent of the right wattage when your bulb blows. When buying a CFL or LED you have to check lumens, beam angle, and colour temperature. So what does it all mean?

- **Lumens** measure brightness. When replacing an incandescent with a CFL or LED, check the equivalent incandescent wattage on the packaging – this shows how the brightness and wattage of the light bulbs measure up.
- **Beam angle** is how the light spreads out from the bulb. Narrow beam angles are good for spotlighting and downlights. For floodlights, you want a larger beam angle (greater than 60°).
- **Colour temperature** refers to the light's colour characteristic. It varies between warm, like the yellow hue of an incandescent bulb, or cool, like the bluish light of a fluorescent lamp.

REPLACEMENT BULB OR DEDICATED LED FITTING

A dedicated fitting houses the LED and its associated electronics – the bulb is fixed to the fitting and can't be changed like a regular light bulb.

A replacement bulb is an LED that can be retrofitted into an existing fitting to replace an incandescent, halogen or CFL.

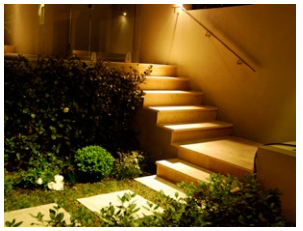
A dedicated fitting is designed to manage the heat that concentrates at its base; overheating can shorten an LED's lifespan. If you're installing lights as part of a renovation, or if you're building a home, we recommend dedicated LED fittings. Note, if the fitting fails you'll have to replace the whole unit.

If your home has recessed downlights with incandescent or halogen bulbs, it is better to replace the entire fitting with a dedicated LED downlight fitting, instead of just changing the bulb. This is because the LED is likely to overheat in the old fitting and its life will be shortened. In addition, most older downlight fittings require generous clearances to ceiling insulation and can allow draughts through the hole in the ceiling lining.

Outdoor lighting

Keeping your outdoor areas well lit is essential for preventing night-time falls and deterring burglars. There are several types to consider:

- **Solar garden lights** stake into the ground and use a built-in solar panel to charge their batteries during the day then activate (by a light sensor) when night falls. We found cheap solar lights (those costing less than $10) didn't provide enough light to keep you safe. However, more expensive models, like Duracell's LED solar spot and path lights, can be good options for avoiding the hassle of wiring in lights. For this to be an option, your outdoor areas need to get a decent amount of sun during the day.
- **Solar security lights** are mounted on a wall and designed to illuminate entranceways. They generally include a motion sensor, and a separate solar panel connected to the light via a long cable so the panel can be mounted where it will be exposed to the most sun (eg, on a garage roof). They aren't as bright as wired-in security sensor lights but can be a good option to avoid the cost of running electricity to areas remote from your home's mains supply.
- **12V garden lights** are powered from a transformer that plugs into a mains socket, and reduces the mains voltage from 230V to 12V. Using low voltages means the cables don't need to be buried, as they don't pose an electrocution risk if accidentally cut.
- **Mains sensor security lights** are the traditional motion-sensing outdoor lights, and often come as twin lamps allowing you to illuminate large outdoor areas. They're brighter than solar security lights, but need to be installed by an electrician and this can be expensive if you need to run wiring where you need the light.

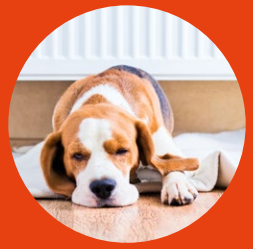


For our free test of outdoor lights, visit: **consumer.org.nz/products/outdoor-lighting**

TOP 10 HEATING TIPS

1. The key to reducing dampness is targeting the sources of **moisture** and ensuring your house has adequate heating, ventilation and insulation.

2. **Insulate first**, particularly the ceiling and underfloor.



3. Temporary double glazing is a cheap way to reduce **heat loss** through windows.

4. A **dehumidifier** reduces dampness, while also heating the room.

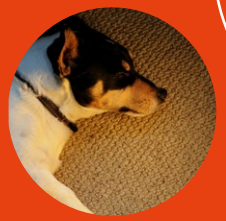
5. **Heat pumps** have the cheapest running costs. Woodburners and flued natural gas heaters are next best.

6. **Oil column** and other convection heaters can create a "pool" of hot air above the heater, while the rest of the room is heated less. Use a small desk fan to mix the air and even out the temperature.

7. Set heater and other thermostats at the **minimum temperature** you find comfortable. Every extra degree is costing you money.

8. A **ducted heat transfer kit** helps prevent a woodburner overheating the lounge while the rest of the house remains cold.

9. **Heat pumps** are great for large spaces, but for small or rarely used rooms, consider a cheap portable heater.



10. If your heat pump freezes on cold mornings, use a cheap **fan heater** to help the heat pump raise the room temperature. It'll only cost about 30¢ to use for half an hour.

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