OCTOBER 2024

How We Electrify

Easy cost-saving options to replace gas heating

renew.

environment victoria

Environment Victoria is located on Wurundjeri land and works across many Aboriginal nations. We pay our respects to Aboriginal elders past and present, recognise their continuing contribution to caring for country, and acknowledge that sovereignty was never ceded.

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Environment Victoria would like to acknowledge Bank Australia's support to develop this report. Bank Australia is committed to taking ambitious action on climate with a target to reach net zero operations and portfolio by 2035 and programs to support customers to go all-electric at home.

Bank Australia

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Summary

There's a cost-effective option to suit everyone when replacing gas appliances in Victoria's houses and switching to efficient electric space heating.

When you're faced with the choice of replacing a gas heater or going electric, our analysis shows that in every case electric heating is either cheaper up front or pays for itself in bill savings in less than a year. People who live in efficient electrified homes have lower bills, live more comfortably all year, and have a cleaner, healthier indoor environment.

Almost half of Victorian houses – 44 per cent of the total – use ducted gas heating but have no cooling. By switching to efficient reverse-cycle split-systems, households can keep cool in summer and warm in winter while reducing their annual bills by two-thirds.

It gets even better. A little more than a quarter of homes – 27 per cent – already have reverse-cycle split-systems but aren't using them to heat. If householders stop using gas to heat and use the split-systems instead, they can slash their annual energy bills by between half and two-thirds with no upfront investment.

Some 30 per cent of Victorian households have fully ducted heating and cooling. More than half of them – 18 per cent of all households – already use electric reverse-cycle systems. For the 12 per cent of homes with ducted gas heating and add-on cooling, an upgrade will slash heating and cooling bills by at least 60 per cent.

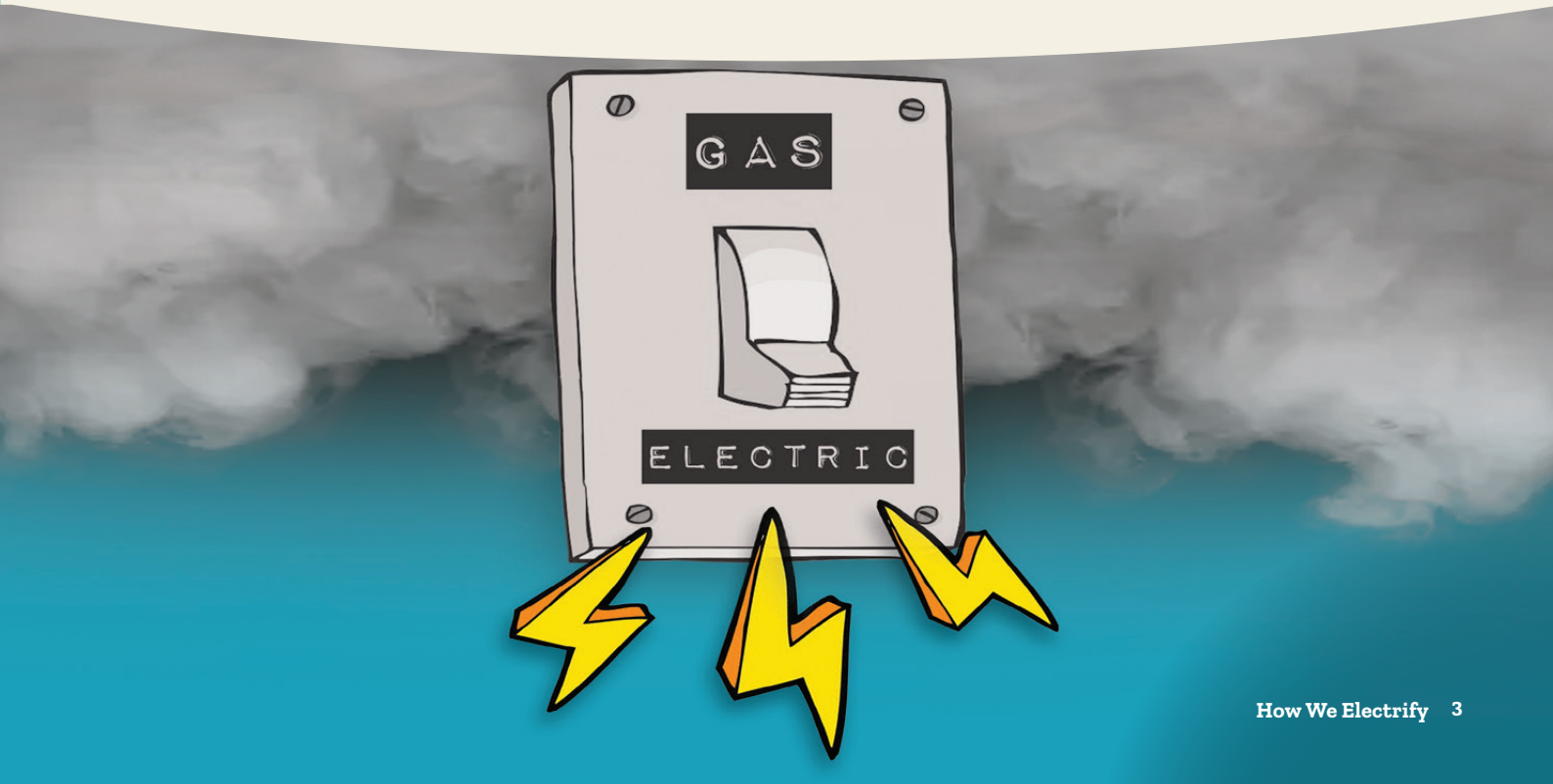
This higher-end option will pay for itself within a year if it replaces the gas system at the end of its life.

A small minority of Victorian homes – 7 per cent of the total – still have dangerous space heaters burning gas in their living rooms. Efficient split-systems can now be installed for half the price of the old gas heaters and cost between 27 and 56 per cent less to run, while allowing residents to keep cool in summer.

No matter what system is used, the most comfortable homes and the cheapest to run are those built or retrofitted to a higher thermal standard. Insulation remains one of the best things we can do for ourselves and the climate.

Our electricity systems are rapidly going renewable, and modern electric appliances are much more efficient than gas. Choosing efficient electric heating and cooling will cut lifetime emissions by at least half and in many cases by two-thirds. This will get better over time as our grid becomes cleaner. Gas, on the other hand, will only increase in emissions as domestic supplies wane.

The numbers are in. There is an efficient electric option for every house in Victoria that will slash bills, increase comfort and cut emissions.



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Background

Victoria is going electric

Around Victoria, people are going electric. From the thousands of Victorians reading and participating in the My Efficient Electric Home Facebook group to the Electrify community groups in Wangaratta, Ballarat, the Mornington Peninsula and all around Melbourne, households are discovering the benefits of getting off gas.

And it shows. In 2023, household and small business gas use in Victoria plummeted by 13 per cent, driven by electrification as well as cost of living pressures and weather.[1] East coast gas demand has been dropping since 2016; while we still have high-demand days, we're consuming less gas overall.[2]

Still, we consume far more than we need. Households account for half of Victoria's gas use, and 71 per cent of that is used for space heating.[3] This represents a colossal waste because gas just can't heat homes efficiently. Gas ducted heaters are old technology that long ago reached their best possible efficiency at about 95 per cent. Three-quarters of gas ducted heaters sold have an efficiency rating of 4 stars or less, making them at most about 75 per cent efficient.[4] Coupled with rising gas prices, gas space heating makes for a very expensive energy bill.

Electric heaters that use heat pumps are much more efficient. The average ducted reverse-cycle system in Victoria uses less than a quarter of the energy a gas heater uses to deliver the same amount of room heat, and non-ducted "split" systems tend to be even better.[5] This means much lower running costs, which get cheaper again when coupled with rooftop solar and when homes are disconnected from gas entirely.

Space heaters: still the biggest gas users in Victorian homes

Despite the benefits of efficient electric heating, it can be hard to know how to make the switch. When a heater breaks down, people seeking a replacement often turn to tradespeople. However, tradespeople have long been accustomed to replacing heaters like-for-like and don't necessarily understand the running costs. Their information may also be out of date. That's where the fresh data in this report can help.

Focusing specifically on space heating, we look at what people in Victoria are currently doing and examine how they can go electric when their gas heater needs replacing. Our analysis suits a range of budgets and homes, and considers multiple benefits include costs, comfort and greenhouse gas emissions.

In many cases, going electric brings additional benefits. Reverse-cycle systems cool and heat with a single appliance, whereas gas heaters just heat. As a result, most of our scenarios involve an improvement in comfort – not only warming in winter but cooling through the summer months as well.

Meeting our climate targets

Victoria has strong legislated climate action targets – compared to 2005 levels, on the way to net zero by 2045, our overall emissions must drop 28-33 per cent by 2025, 45-50 per cent by 2030, and 75-80 per cent by 2035. We're making good progress, but just closing coal power stations and building wind, solar and batteries isn't enough – we must also get off gas.

Our analysis in 2023 found that if gas consumption levels stay high, fossil gas will be responsible for up to 37 per cent of Victorian emissions by 2035, which is more than three times its current share.[6]

The Victorian government has responded with new initiatives to tackle gas wastage in homes in its Gas Substitution Roadmap. Its proposed new rental standards (yet to be implemented at the time of writing) will make a real difference to renters' cost of living and quality of life.[7] The government has also indicated upcoming action on standards for new appliances, which has the potential to shift all homes towards cheaper, efficient electric options.

Victoria's electricity system is quickly going renewable. Over the last five years, the amount of renewable energy in Victoria's grid has more than doubled; it supplied 37.8 per cent of our generation in 2023.[8] As a result, the emissions intensity of our electricity plummeted 46 per cent between 2014 and 2024 (from 1.34 to 0.75 kg of CO_2 equivalent per kWh). With the state's legislated renewable energy targets, emissions from electricity will have dropped to 0.01 kg per kWh by 2035 and our electricity supply will no longer be heating the planet.

On the other hand, the climate impacts of gas will only get worse. As Victoria's offshore gas fields are exhausted, we'll become increasingly dependent on imported LNG. Imported LNG is even more wasteful and bad for the climate than locally produced gas, because so much energy is consumed in liquefaction, regasification and shipping. (It's likely that the LNG will come all the way from Qatar, the world's main supplier.) Clearly, every Victorian home needs a plan to electrify.

A WORD OF CAUTION

The modelled scenarios represent typical Victorian homes, which means they aren't intended to provide individual advice. Every home is different, and everyone uses their home in their own ways. People investigating an electric upgrade and making purchasing decisions should seek tailored advice from trusted and knowledgeable sources such as:

- Renew **RENEW.ORG.AU**
- My Efficient Electric Home – Facebook group and Handbook **FACEBOOK.COM/GROUPS/MYEFFICIENTELECTRICHOME**
- SEC Victoria electric home planner **SECVICTORIA.COM.AU/POWERUP**
- Your local council

Scenarios

In this report we consider four major ways that Victorians heat (and in some cases cool) their homes:

- ducted gas heating but no ducted cooling
- reverse-cycle split-systems that aren't used for heating
- ducted gas heating with add-on cooling, and
- older-style gas room heaters.

We draw on recent market research about the mix of heating and cooling appliances currently installed in Victorian homes and how they are used.[9]

For each scenario, we compare the existing situation with an efficient electric alternative.

We also consider older and newer homes:

- About 1.48 million of Victoria's 2.93 million homes were built before 1991, when energy efficiency standards were first introduced. Of these 1.48 million homes, just 83,000 are known have been significantly renovated (although the actual number of renovations may be much higher and the impact on energy efficiency is unknown) leaving up to 1.4 million homes or 48 per cent of the total with an average rating of 1.6 stars under the Nationwide House Energy Rating Scheme (NatHERS), which assigns ratings between 0 and 10 stars.[10,11]
- About 1.05 million homes have been built in Victoria since 2005, when the five-star NatHERS standard was introduced – that's 36 per cent of Victorian homes.[10]

And we model for five Victorian climate zones:

- North-west Melbourne (Tullamarine)
- South-east Melbourne (Moorabbin)
- East Sale
- Bendigo
- Geelong

Each scenario involves a different retrofit in response to the current heating and cooling methods, to suit a range of household budgets and priorities. In most cases we've assumed that the existing gas heater has reached the end of its serviceable life and needs replacing with either the same thing or an efficient electric option. The exception is Scenario 2, where we assume that the householders start heating immediately with the reverse-cycle systems they already own.

More details about the assumptions used to model the scenarios can be found in the Methodology section later in this report.

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Scenario 1: Easy and cost-effective

The **44 per cent of homes** that have ducted gas heating but no ducted cooling can make simple changes that dramatically lower their energy bills and allow them to cruise through heatwaves through the addition of cooling.

We modelled an older home and a newer home with ducted gas heating that has reached the end of its serviceable life. The household upgrades to new electric split-systems in the living room and two sleeping areas and decommissions the old gas system.

Split-systems are good value for money because they're not too expensive to buy and install, they have good energy efficiency for both heating and cooling, and they only heat or cool the space where it's needed instead of running in empty rooms.

Split-systems aren't ducted, and there's a lot to be said for getting rid of ductwork. The "silver tube" flexible ducts typically used in homes are easily damaged or flattened and are often uninsulated, leading to heat and cool being lost to the roof or underfloor space. They also get filthy. As home comfort and energy adviser Tim Forcey observes in his *My Efficient Electric Home Handbook*, he's visited thousands of Australian homes, and more often than not the heating ducts have no filters. This allows dust and animal hair to accumulate and creates conditions for mould to grow.[12]

Scenario 1

REPLACE LIKE-FOR-LIKE:

install a new ducted gas heating system

OR

GO ELECTRIC:

install three new reverse-cycle split-systems and decommission the gas heater

ENERGY BILLS

Old homes with ducted gas are expensive to heat, as Figure 1 shows. To keep the house warm, energy costs more than $2800 per year in every Victorian climate. Before the upgrade, these homes had no cooling at all, so they're not only expensive to run but also uncomfortable in the summer months. Replacing ducted gas with three split-systems slashes the cost of keeping a home comfortable by between 46 and 67 per cent – including the cost of cooling.

In newer homes with more insulation and better overall thermal performance, gas ducted heating costs between $1400 (Moorabbin) and $2000 (Bendigo) each year. Replacing the old system with a split-system saves at least 66 per cent, making comfort far more affordable. As before, the upgraded homes are not just cheaper to run but comfortable all year with the addition of cooling (Figure 2).

PAYBACK PERIOD

Installing new heating and cooling systems is an expense. In this scenario, the ducted gas heater has reached the end of its life and needs replacing, so either way the households are facing some costs. In this section we discuss the difference in up-front costs and the time it takes for the energy bill savings to cover the difference.

To calculate the simple payback period, we divide the upfront cost difference by the annual energy savings difference (Table 1). This is a conservative analysis as it doesn't consider increases in gas and electricity costs over time.

The electric option costs a little more than replacing ducted gas heating because it includes the cost of decommissioning and removing the old gas heater and ductwork and blocking the registers. Newer homes have a lower up-front cost for split-systems because they attract a higher VEU incentive.

For older homes, the payback period is between 10 and 15 weeks for all locations – so in just one year, the electric split-systems will have paid for themselves many times over. In newer homes there is less need for heating and cooling, so the savings are lower. As a result, the payback period is 21 weeks. After the payback period, the householder has recouped the up-front cost and pockets all the savings.

LIFETIME COST

In this section we calculate the lifetime cost of owning each heating and cooling system option, for each location and for older and newer homes. We consider the up-front costs of purchase, installation, removal of old gas systems and energy costs, assuming a life of 15 years and a 5 per cent discount rate (a typical cash interest rate in 2024).

For older homes, the lifetime savings of going electric range from 33 per cent or $6726 in Bendigo to 47 per cent or $8639 in Geelong, where there is greater reliance on heating. In each case, the household saves thousands of dollars while gaining the ability to cool the home (Table 2).

Figure 1: Annual heating and cooling bill for an older home with ducted gas heating compared with split-systems in living room and two bedrooms.

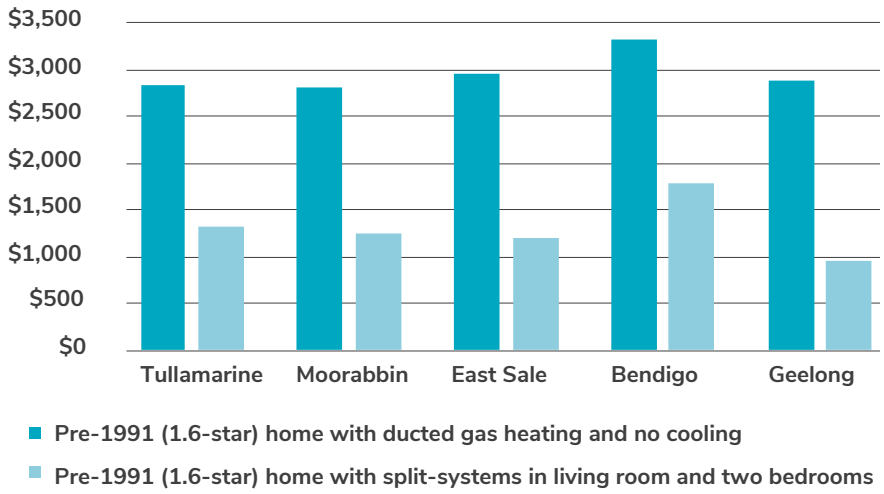


Figure 2: Annual heating and cooling bill for a newer home with ducted gas heating compared with split-systems in living room and two bedrooms.

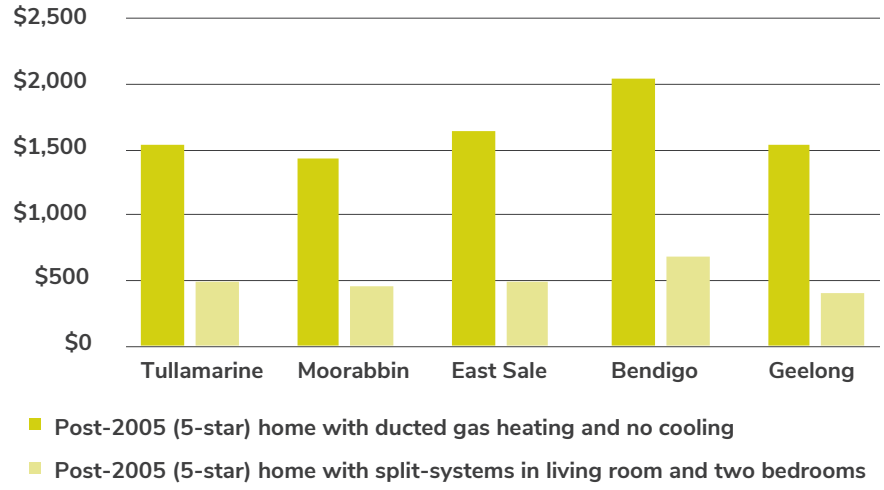


Table 1: Simple payback period for upgrading from a ducted gas heater to three split-systems.

Upgrade scenario	Location	Up-front cost difference ($)	Annual energy saving ($)	Payback period (weeks)
Pre-1991 (1.6-star) home Replace ducted gas heating with three split-systems	Tullamarine	430	1522	15
	Moorabbin		1578	15
	East Sale		1747	10
	Bendigo		1521	15
	Geelong		1927	10
Post-2005 (5-star) home Replace ducted gas heating with three split-systems	Tullamarine	384	1039	21
	Moorabbin		969	21
	East Sale		1149	15
	Bendigo		1356	15
	Geelong		1128	15

Newer homes save a similar percentage, but the dollar savings are less because better-insulated houses are much more comfortable and cheaper to run. The lifetime cost savings at the lower end are 36 per cent or $4176 in the milder climate of Moorabbin, ranging up to 41 per cent or $5997 in Bendigo. It's worth noting that the lifetime cost of efficient electric heating and cooling in a 1.6-star home is still cheaper over 15 years than gas ducted heating in a 5-star home (Table 3).

GREENHOUSE GAS EMISSIONS

Using fossil gas from Victorian networks produces 55.23 kg of carbon dioxide equivalent per GJ today, a value that is steady over time. Electricity, on the other hand, is increasingly renewable. Carbon dioxide equivalent emissions per kWh from the grid are predicted to drop from 0.75 kg in 2024 to 0.01 kg in 2035 and remain low from then on.

Figure 3 shows the difference in emissions for an older home, comparing ducted gas heating with three split-system air conditioners over their 15-year lifetime. Emissions from the efficient electric option are between a quarter and a third of those from using gas – even with the addition of cooling. From 2035, as the electricity grid decarbonises, electric appliances will produce almost no emissions.

For newer homes, the total emissions are lower overall but the difference in emissions is greater (Figure 4). The electric option produces about a quarter of the emissions of a ducted gas heater in every location.

Table 2: Lifetime costs and savings for older homes with ducted gas heating compared with three split-systems. Present values at 5 per cent discount rate over a 15-year life.

Location	Lifetime cost – gas ducted heating ($)	Lifetime cost – three split-systems ($)	% saving from going electric
Tullamarine	18,265	11,534	37
Moorabbin	18,196	11,202	38
East Sale	18,813	11,020	41
Bendigo	20,498	13,772	33
Geelong	18,540	9901	47

Table 3: Lifetime costs and savings for newer homes with ducted gas heating compared with three split-systems. Present values at 5 per cent discount rate, 15-year life.

Location	Lifetime cost – gas ducted heating ($)	Lifetime cost – three split-systems ($)	% saving from going electric
Tullamarine	12,165	7657	37
Moorabbin	11,682	7506	36
East Sale	12,646	7621	40
Bendigo	14,587	8590	41
Geelong	12,202	7276	40

Figure 3: Lifetime emissions from heating and cooling for an older home with ducted gas heating compared with three split-systems (kgC02-e).

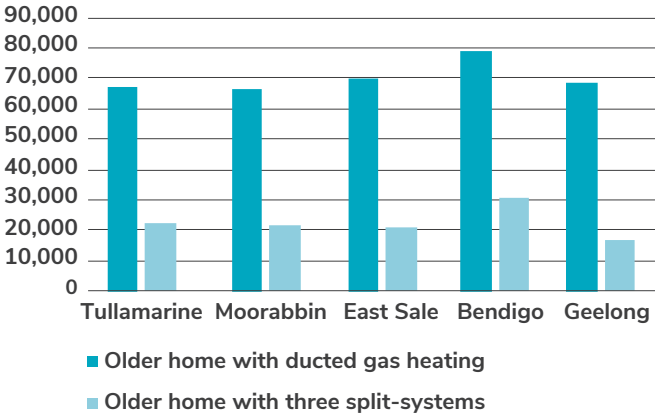


Figure 4: Lifetime emissions from heating and cooling for a newer home with ducted gas heating compared with three split-systems (kgC02-e).

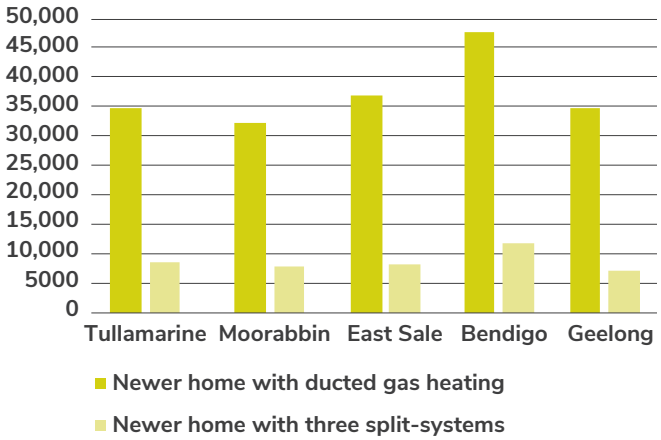


Image credit: NilsBV, iStock

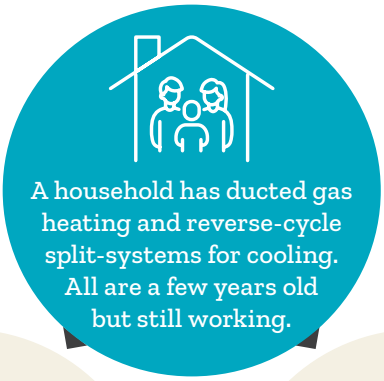
Scenario 2:
Use existing split-systems to heat

More than a quarter of Victorian homes – 27 per cent of the total – already have reverse-cycle split-systems but aren't using them for heating. These homes can start saving immediately and for free – all they need to do is start using the efficient heaters they already own and stop using gas.

We modelled an older and a newer home using ducted gas heating to warm the whole house against the cost of using split-systems to heat and cool a living room and two bedrooms. The modelling assumes that the householders decide to start using the three split-systems to heat. They don't need to install anything, but there is some cost in decommissioning the ducted gas.

We assume that the gas heater and split-systems are all a few years old and expected to last another eight years. The split-systems are assumed to be of moderate efficiency, again reflecting their age.

Scenario 2



DO NOTHING:

keep using the gas for heating

OR

GO ELECTRIC:

start using the split systems to heat and decommission the old gas heater

As before, there are savings from using a more efficient heating method and only heating the rooms that are being used. There are additional cost, health and hygiene benefits of decommissioning the ductwork, and the homes have one less device that needs maintenance and repairs.

ENERGY BILLS

For the older home using ducted gas for heating and split-systems for cooling, annual energy costs are high – over $3000 – because of the lack of home insulation, the inefficiency of gas heating and the inclusion of cooling (Figure 5). In reality, when heating and cooling are this expensive, many people simply can't afford a basic level of comfort.[13]

The good news is that ditching the gas heater and using the existing split-systems to heat instead slashes annual energy costs by between 53 per cent (Bendigo) and 66 per cent (Geelong).

Figure 6 shows the savings possible in better-insulated homes. Ditching gas and switching to the split-systems for heating reduces annual heating and cooling bills by at least two-thirds, bringing them down to $700 or less and making it affordable to maintain a comfortable home all year.

Image credit: Lazy_Bear, iStock

Figure 5: Annual heating and cooling costs for an older home, comparing ducted gas heating and split-system cooling with using existing split-systems to heat and cool.

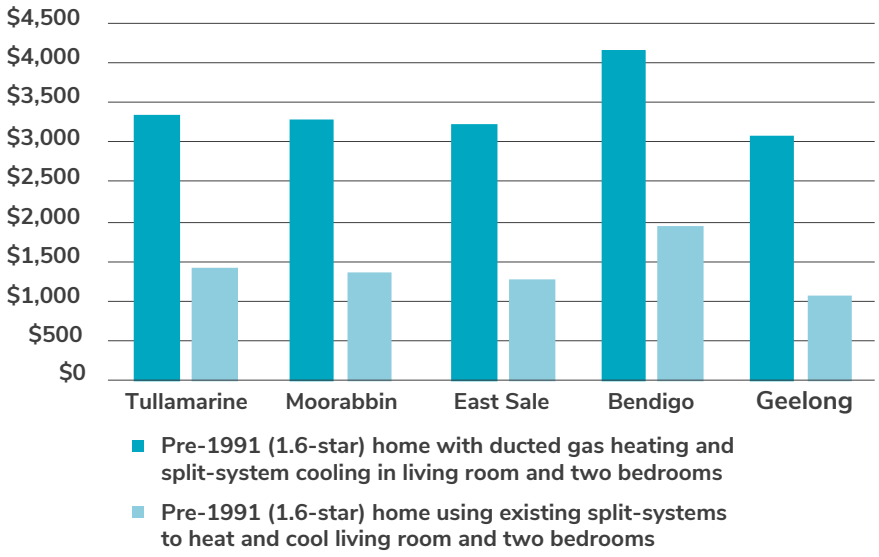
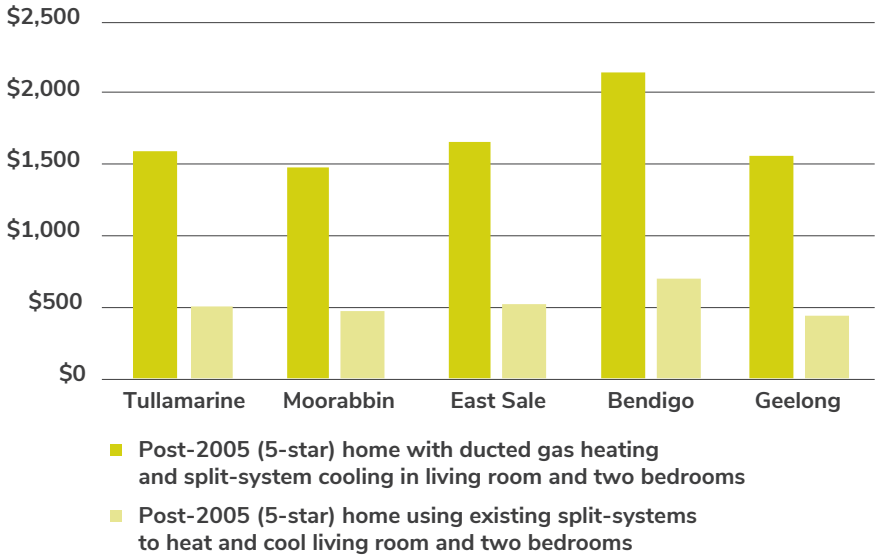


Figure 6: Annual heating and cooling costs for a newer home, comparing ducted gas heating and split-system cooling with using existing split-systems to heat and cool.



PAYBACK PERIOD

If a household simply stops using the gas heater and starts using reverse-cycle heating, the savings are immediate. In this section, however, we have modelled the payback period for decommissioning the gas heater – removing the furnace and ductwork and blocking the registers. Decommissioning reduces draughts and cold spots and removes dirty ducts.

The results are shown in Table 4. For the older house, the cost of decommissioning is recouped in less than five months in every climate zone. The newer house takes slightly longer because of its lower energy consumption, but in our scenario the cost is still covered in six months in Bendigo and about ten months in Moorabbin.

Table 4: Simple payback period for decommissioning the gas heater and using existing split-systems to heat and cool.

Upgrade scenario	Location	Up-front cost difference ($)	Annual energy saving ($)	Payback period (weeks)
Pre-1991 (1.6-star) home Decommissioning the gas heater and using split-systems to heat and cool	Tullamarine	799	1947	21
	Moorabbin		1939	21
	East Sale		1949	21
	Bendigo		2215	21
	Geelong		2027	21
Post-2005 (5-star) home Decommissioning the gas heater and using split-systems to heat and cool	Tullamarine	799	1087	36
	Moorabbin		999	42
	East Sale		1137	36
	Bendigo		1439	31
	Geelong		1108	36

LIFETIME COST

Next, we calculate the lifetime cost of owning each option, modelling for each location and both an older and newer home. We assume that the remaining lifetime for both the gas heater and the split-systems is eight years.

The savings are substantial. By using heating mode on the existing split-systems and decommissioning the gas heater, the people living in the older home save thousands over the remaining life of the device, ranging from $7815 or 53 per cent in Moorabbin to $9045 or 49 per cent in Bendigo (Table 5).

Table 5: Lifetime costs and savings for older homes with ducted gas heating and split-system cooling compared with using the existing three split-systems to cool and heat. Present values at 5 per cent discount rate, eight-year life.

Location	Lifetime cost – gas ducted heating with split-system cooling ($)	Lifetime cost – three split-systems to cool and heat ($)	% saving from going electric
Tullamarine	14,905	7050	53
Moorabbin	14,636	6820	53
East Sale	14,342	6478	55
Bendigo	18,422	9377	49
Geelong	13,703	5492	60

Similarly, householders in newer homes save between 55 and 60 per cent on their annual heating and cooling bills (Table 6). With a lifetime cost of about $3000 in all locations over eight years, these households are staying comfortable for a fraction of the cost of older homes on gas.

Table 6: Lifetime costs and savings for newer homes with ducted gas heating and split-system cooling compared with using the existing three split-systems to cool and heat. Present values at 5 per cent discount rate, eight-year life.

Location	Lifetime cost – gas ducted heating with split-system cooling ($)	Lifetime cost – three split-systems to cool and heat ($)	% saving from going electric
Tullamarine	7074	3040	57
Moorabbin	6568	2928	55
East Sale	7394	3141	58
Bendigo	9524	3939	59
Geelong	6925	2802	60

GREENHOUSE GAS EMISSIONS

Using the existing reverse-cycle appliances to heat rather than using ducted gas heating slashes emissions by about half for older homes (Figure 7) and even more for newer homes (Figure 8). The overall emissions are lower than other pathways because the predicted lifetime of the pre-existing system is shorter (eight years rather than 15).

Image credit: Liubomyr Vorona, iStock

Figure 7: Lifetime emissions from heating and cooling for an older home with ducted gas heating and split-system cooling compared with split-system heating and cooling (kgC02-e).

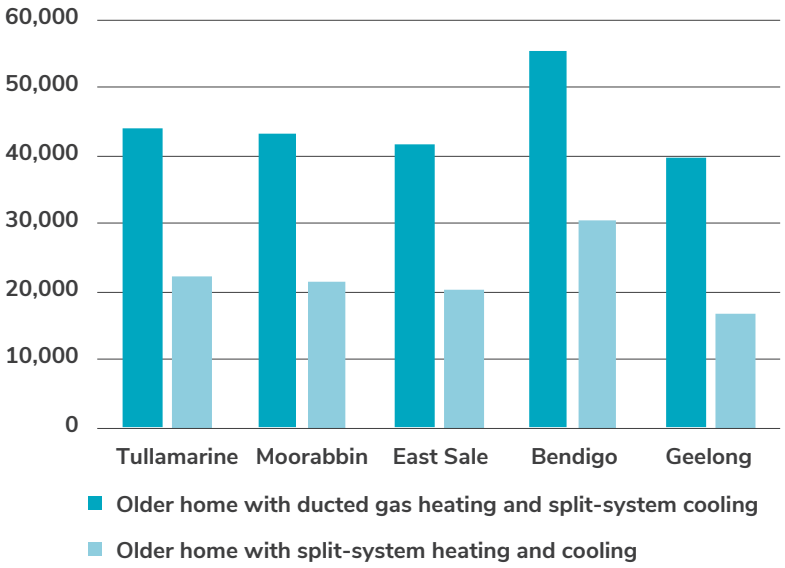


Figure 8: Lifetime emissions from heating and cooling for a newer home with ducted gas heating and split-system cooling compared with split-system heating and cooling (kgC02-e).

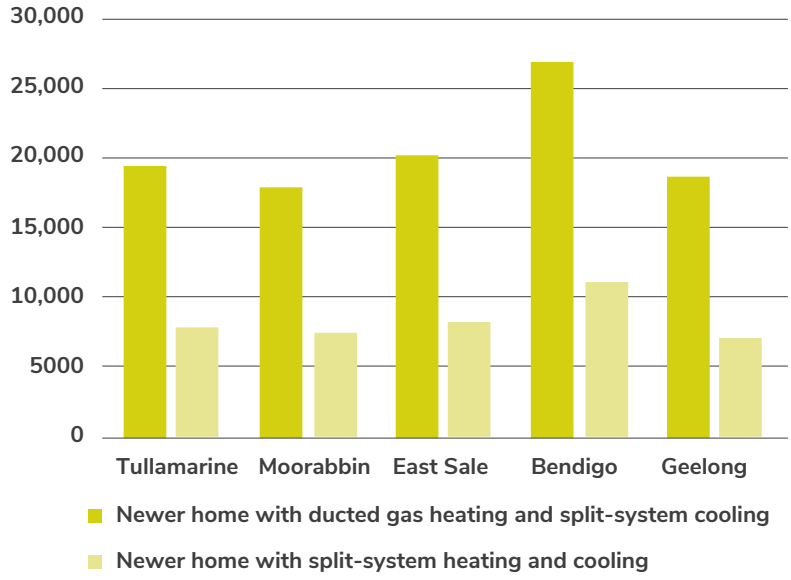


Image credit: Canva

Scenario 3: The premium option

This scenario represents the **12 per cent of homes** that regularly use whole-home ducted gas heating with add-on electric cooling. These households are higher energy users with high expectations for comfort, and we assume this typically corresponds with a newer house built to a 5-star standard.

We model an upgrade to efficient, ducted air conditioning with reverse-cycle heating, which is a type of system that 18 per cent of homes already have. The new system is zoned so that daytime and nighttime areas heat and cool independently. The existing system is decommissioned.

ENERGY BILLS

In all locations, the household's annual energy bills drop by more than 60 per cent because the reverse-cycle system is more efficient and better zoned, so it doesn't heat or cool empty rooms (Figure 9). The home also has just one unit to maintain instead of a separate gas heater and electric cooler.

Because the house is newer and better insulated, heating and cooling can be provided at a relatively low cost.

PAYBACK PERIOD

A ducted reverse-cycle system serving the entire home is the most expensive heating and cooling option we consider, costing $12,325. This includes Victorian Energy Upgrades incentives. However, a new ducted gas heater with add-on cooling, including ductwork and installation, is $11,474 – not much cheaper than the efficient electric alternative. On this basis, choosing the electric system is a decision that pays for itself in the first year (Table 7).

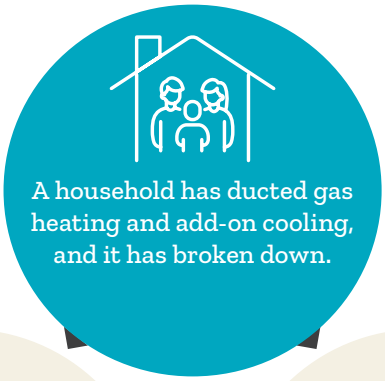
LIFETIME COST

For whole-home ducted heating and cooling options, the household saves up to $5000 over the lifetime of the system, but the high up-front cost means that there is a less dramatic difference in lifetime cost between the gas and electric options. Over the life of the system, the savings are between one-fifth and one-quarter (Table 8).

GREENHOUSE GAS EMISSIONS

The climate benefits of going electric are again obvious. Upgrading to a ducted reverse-cycle system slashes lifetime emissions by more than two-thirds in every location (Figure 10).

Scenario 3



REPLACE LIKE-FOR-LIKE:

install a new ducted gas heating system with add-on cooling

OR

GO ELECTRIC:

install a new ducted reverse-cycle heating and cooling system

Figure 9: Annual heating and cooling bills for a post-2005 home with ducted gas and add-on cooling compared with ducted reverse-cycle.

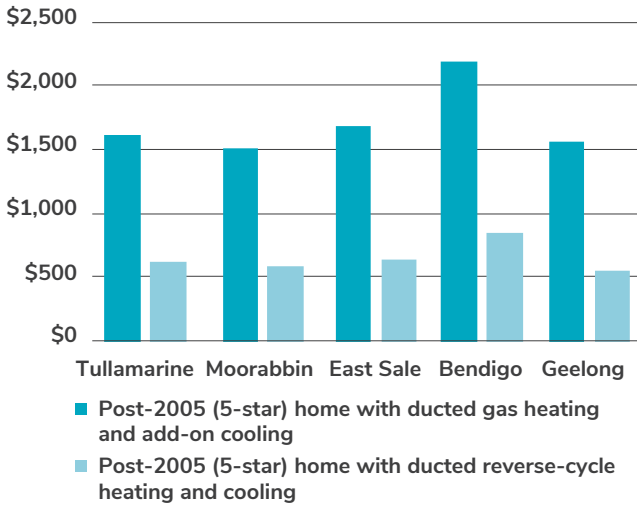


Figure 10: Lifetime emissions from heating and cooling for a newer home with ducted gas heating and add-on cooling compared with ducted reverse-cycle (kgC02-e).

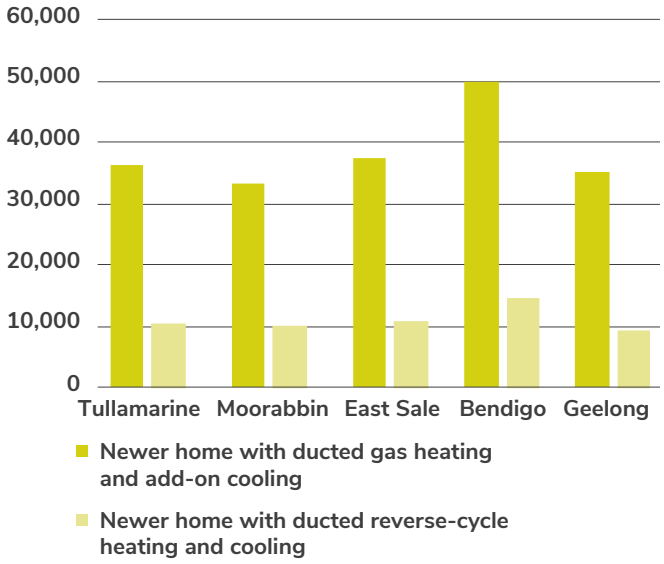


Table 7: Simple payback period for upgrading from a ducted gas heater with add-on cooling to a ducted reverse-cycle system.

Upgrade scenario	Location	Up-front cost difference ($)	Annual energy saving ($)	Payback period (weeks)
Post-2005 (5-star) home Replace ducted gas heating and add-on cooling with a ducted reverse-cycle system	Tullamarine	851	1008	42
	Moorabbin		917	47
	East Sale		1036	42
	Bendigo		1350	31
	Geelong		1010	42

Table 8: Lifetime costs and savings in a newer home with ducted gas heating and add-on cooling compared with ducted reverse-cycle heating and cooling. Present values at 5 per cent discount rate, 15-year life.

Location	Lifetime cost – gas ducted heating with add-on cooling ($)	Lifetime cost – ducted reverse-cycle ($)	% saving from going electric
Tullamarine	19,103	15,207	20
Moorabbin	18,536	15,070	19
East Sale	19,354	15,327	21
Bendigo	21,790	16,287	25
Geelong	18,826	14,924	21

Image credit: Irik Bikmukhametov, iStock

Scenario 4: Getting rid of gas space heaters

The final scenario represents the **7 per cent of homes** that still have dangerous space heaters burning gas in their living rooms. More than half of these households – accounting for 4 per cent of all homes – still use them regularly. In this case, we assume that the householders will have difficulty covering extra costs.

Open-flued gas space heaters burn gas inside the house and rely on passive ventilation to expel the carbon monoxide they produce. This isn't reliably safe; these appliances have been responsible for the deaths of three Victorians since 2010.[14]

Since then, the government has tightened regulations, including setting new maintenance requirements, but it has failed to outlaw space heaters completely. Unfortunately, if householders are struggling to afford a new safe and efficient heater, the costs of safely maintaining an old gas heater may also be unaffordable.

In this scenario we assume that an older home is undergoing a low-cost replacement of the gas space heater in the living room with a reverse-cycle split-system, getting the dangerous gas heater out and adding the ability to cool, improving summer comfort. We assume a very tight budget, so there are no changes made to bedrooms.

ENERGY BILLS

Switching out the dangerous gas space heater for a split-system brings energy savings of between 27 per cent (Bendigo) and 56 per cent (Geelong) even while gaining the ability to cool in the warmer months (Figure 11). As we have learnt from the preceding sections, the annual cost to heat and cool could be slashed again by improving the thermal performance of the home above 1.6 stars.

PAYBACK PERIOD

An efficient split-system is about half the price of a gas space heater thanks to VEU incentives, so there is no payback period. Therefore, the gas option is not only dangerous, but also more expensive to purchase and more expensive to run. We shouldn't wait for these heaters to break down before replacing them – they should be removed now, with government support for those who can't afford any up-front costs.

Scenario 4

A household has an open-flued gas heater in the living room.

REPLACE LIKE-FOR-LIKE:

install a new open-flued gas heater

OR

GO ELECTRIC:

install one new reverse-cycle split-system and decommission the old gas heater

LIFETIME COST

As with the other three scenarios, efficient electric cooling and heating is much more cost-effective than gas over the life of the device. The lifetime cost for the living room split-system compared with the gas space heater is 33 per cent lower in Bendigo and up to 53 per cent in Geelong (tABLE 9). The efficient electric option also adds the ability to cool in summer and eliminates the health dangers of heaters that burn gas inside the home.

GREENHOUSE GAS EMISSIONS

Replacing a gas space heater with a split-system is not only good for health, cost of living and comfort – it is also better for the climate. The split-system saves more than 10 tonnes of carbon dioxide equivalent over its 15-year life (see Figure 12).

Figure 11: Annual heating and cooling bills for a living room gas space heater compared with a split-system.

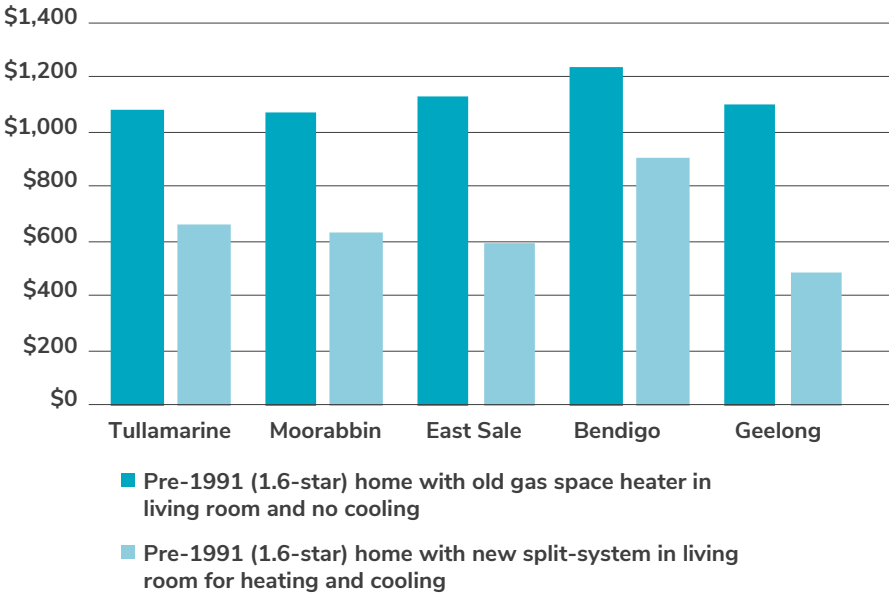
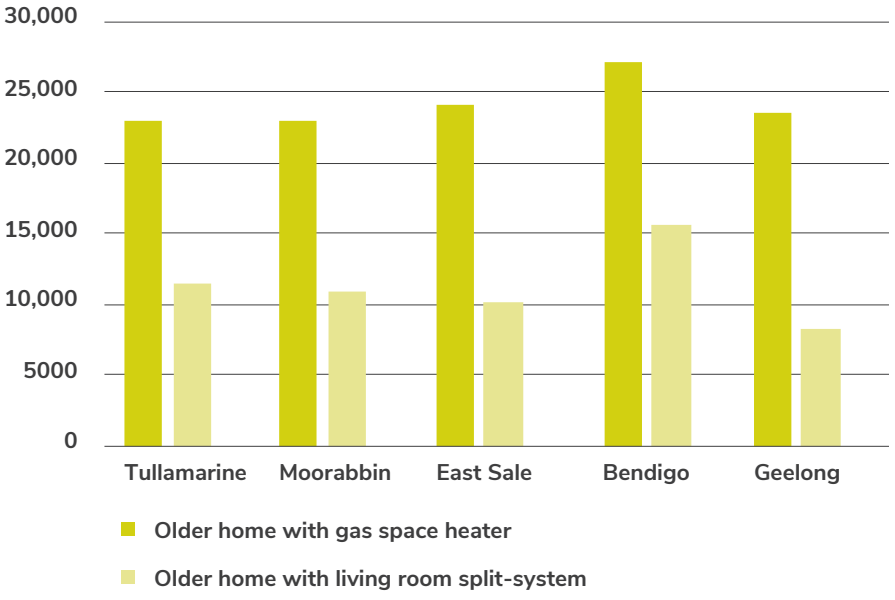


Table 9: Lifetime costs and savings in an older home with gas space heating compared with a living room split-system. Present values at 5 per cent discount rate, 15 year life.

Location	Lifetime cost – gas space heating ($)	Lifetime cost – split-system ($)	% saving from going electric
Tullamarine	7767	4539	42
Moorabbin	7741	4388	43
East Sale	7991	4198	47
Bendigo	8533	5684	33
Geelong	7880.50	3693.65	53

Figure 12: Lifetime emissions from heating and cooling for an older home with a gas space heater compared with a split-system (kgC02-e).



Methodology

SUNULATOR

The modelling for this report was carried out by Renew using their energy modelling platform Sunulator to simulate the gas and electricity used by a home for heating and cooling.

Sunulator simulates the operation of heating and cooling appliances, creating half-hourly consumption data. Detailed climate data was used to calculate heating across the range of locations. Variations in expected temperatures over time in different locations can result in different patterns of energy consumption and resultant energy costs and emissions.

Renew modelled two different houses: a typical pre-1991 home with a NatHERS thermal efficiency rating of 1.6 stars[15] and a typical post-2005 home with a 5-star rating. The 5-star minimum standard was introduced in 2005 and increased thereafter.

It was assumed that the older home was 160 square metres and the newer home 200 square metres, which are typical of homes being built at those times.

The results only consider the energy and costs of heating and cooling – they do not include energy used by other appliances in the home or the costs to run them. Results therefore do not include savings from removing all gas appliances and avoiding the daily gas connection charge.

HEATING AND COOLING APPLIANCES AND SETTINGS

Heating and cooling settings were different for living (daytime) and sleeping (nighttime) areas of the houses.

During daytime, Renew assumed an ideal indoor temperature of 21 degrees, with heating turning on when the thermostat falls below 18 degrees, and cooling turned on when the thermostat rises above 25 degrees. The World Health Organisation (WHO) recommends a minimum comfort temperature of 18 degrees.[16] The WHO does not recommend a maximum comfort temperature.

For homes with zoned heating and cooling or multiple split-system units, living room heating and cooling was turned off at night. In bedrooms, nighttime settings incorporate a higher tolerance for cold, assuming heaters turn on when the temperature drops below 16 degrees and cooling turns on when it is above 25 degrees.

The modelling assumes that living spaces and homes with no zoning are heated and cooled between the hours of 6 a.m. and 10 p.m. For homes with zoned systems, heating and cooling in bedrooms was in use between the hours of 6 p.m. and 8 a.m. All systems modelled included thermostats.

It was assumed that new reverse-cycle ducted air conditioning operates in separate zones, because this is typical of new systems today.[17] The gas ducted heaters we assume are not zoned. This is based on typical practice in 2011, which was to install low-cost 2 to 4-star gas heaters, even in new homes, and because gas appliance industry groups confirm that the majority of replacement gas heaters are “like for like”.[18] The modelling does not consider electricity use by ducted gas heaters, which means that energy costs from these appliances are understated.

TARIFFS

Gas tariffs were calculated by applying the average of three standing offers from major retailers in Melbourne in July 2024, as shown in Table 10.

Electricity tariffs were set at the rate of the Victorian Default Offer (VDO) for Citipower residential customers: 25.75c per kWh, and a $1.1673 daily connection charge. It is important to note that this rate is an effective price ceiling. Many offers are significantly cheaper – for example, some variable retail offers from major retailers are about 10 per cent cheaper than the VDO rate. As such, the cost savings from electrification presented in this report are conservative.

EMISSIONS

Emissions were calculated by applying emissions intensity factors to the electricity and gas use of each scenario. Historical emissions intensity data for electricity was from the National Greenhouse Accounts Factors and projected data from Australia’s emissions projections.[19,20] Gas emissions intensity was conservatively assumed to be constant in line with 2023 figures from the National Greenhouse Accounts factors. Renew notes that it is likely that the emissions attributed to gas do not account for all fugitive emissions and therefore understate the emissions from gas use.

Gas emissions factor:
55.2 kg CO_2-e per GJ

Table 10: Gas tarrifs used in analysis

Retailer	Usage (c/MJ): 0-27 MJ	Usage (c/MJ): 28-48 MJ	Usage (c/MJ): 49+MJ	Daily connection fee (c)
Alinta	4.801	4.19	3.256	86.418
EnergyAus	5.1634	3.9072	3.2087	116.71
Engie	4.68	3.93	3.29	96.89
Average	**4.88**	**4.01**	**3.25**	**100.01**

Table 11: Electricity emissions factors (in tonnes CO_2-e per MWh)

2014	1.34
2018	1.07
2022	0.92
2023	0.79
2024	0.75
2025	0.70
2026	0.68
2027	0.63
2028	0.56
2029	0.46
2030	0.37
2031	0.35
2032	0.30
2033	0.22
2034	0.12
2035	0.01

Table 12: Upfront costs

Scenario	Gas option	Electric option
1: Easy and cost-effective	$4953	$5327-$5373
	New ducted gas heating system	Three new reverse-cycle split-systems and decommission old gas heater
2: Use existing split-systems to heat	$0	$799
	Do nothing	Decommission gas heater
3: The premium option	$11,474	$12,325
	New ducted gas heating system with cooling	New ducted reverse cycle system
4: Getting rid of gas space heaters	$2705	$1425
	New open-flued gas heater	New reverse-cycle split-system and decommission old gas heater

UPFRONT COSTS

Quotes were sought from Melbourne providers for the upgrades considered in the analysis. These quotes included the cost for appliances, installation of new appliances and the disconnection of replaced gas appliances.

In total, four providers gave quotes. One provider offered a broad range of prices, while others suggested a single price, but all noted that prices can vary substantially depending on different installation requirements (such as the location in the house, ease of access, and whether switchboards need upgrades).

The prices applied in the analysis were an average of the prices quoted, including both the bottom and top price quoted by the provider that offered a range.

Prices applied in the analysis (and quoted by most providers) include Victorian Energy Upgrades (VEU) subsidies. A further calculation was undertaken to assess the upfront costs in the absence of VEU. The online VEU calculator was used to calculate the number of VEU certificates in each scenario. These were:

- Replacing ducted gas heating with whole-of-home RCAC (ducted/ multi-split): 43
- Replacing ducted gas heating and refrigerative cooling with whole-of-home RCAC (ducted / multi-split): 45
- Replacing gas ducted heating with single split-system RCAC: 22
- Replacing ducted gas heating and refrigerative cooling with single split-system RCAC: 24
- Replacing gas wall furnace heating with single split-system RCAC: 13

As of 10 August 2024, VEU certificates were valued at a spot price of $108.50.

PAYBACK PERIOD AND LIFETIME COST

A simple payback method is used in which the up-front cost difference is divided by the annual energy saving. This does not consider inflation or discounting.

The lifetime cost calculation sums the present values of the up-front cost and the annual energy costs. Present values place greater importance on costs and savings incurred earlier as defined by the discount rate. A discount rate of 5 per cent is used, which is a typical cash rate in 2024.

Glossary

Add-on cooling: A refrigerative air-conditioning (cooling) system that is added to a gas ducted heating system and sends cool air through the heater's ducts and outlets. It includes an outdoor unit usually containing the compressor and condenser where the refrigerant is cooled, and an indoor unit usually containing the evaporator where cold refrigerant cools the air.

Gas ducted heater: A heater that uses a gas furnace to heat air and a fan that sends the heated air through flexible ductwork into different rooms in the home. The furnace is usually installed outdoors or inside a roof space.

Gas space heater: A heater, typically designed to fit in a fireplace, that burns gas to create radiant heat and often also uses a fan to blow warm air into a space. Some space heaters are flueless, which means that combustion products are emitted into the room, which needs to be well ventilated. Others are open-flued, so that air is drawn from the room to feed the fire and combustion products are piped outside through a flue. Others again are room-sealed, which means that both the air drawn in for combustion and the combustion products are transmitted along flues that are completely separated from the space. Flueless and open-flued gas heaters have serious safety risks.

Nationwide House Energy Rating Scheme (NatHERS): A regulatory scheme used to ensure the thermal efficiency of Australian homes. Software is used to simulate the thermal performance of a home and assign it a rating between 1 and 10 stars.

Reverse-cycle: An electric system that can heat or cool air. It includes an outdoor unit usually containing the compressor and condenser and an indoor unit usually containing the evaporator. When heating, it uses the heat pump cycle to heat the refrigerant outdoors, which is then used to heat air at the indoor unit. When cooling, it runs in the other direction, cooling the refrigerant outdoors then using it to cool the air indoors.

Split-system: A common reverse-cycle system for heating and cooling rooms consisting of an outdoor unit and an indoor unit that is typically mounted on a wall inside. Air is blown into the space directly from the indoor unit, which is not ducted.

Victorian Energy Upgrades (VEU): A scheme which provides discounts for certain energy efficiency upgrades in Victorian homes and businesses.

Image credit: Totajla, iStock

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