



THE FUTURE OF HOME HEATING

Choosing the Right Heating System
in the Changing Energy Landscape



ComfortHeat
Superior Floor Heating Systems

INTRODUCTION

We use energy in nearly all aspects of life, but the ways we are producing and consuming it are changing rapidly. Today, coal remains Australia's primary source of energy, yet it is the highest emitting and polluting fossil fuel. Replacing coal with natural gas presents an opportunity to transition to cleaner energy, but it may not be as 'clean' as initially thought and there are issues with supply and rising prices. Green energy options, such as wind and solar, are showing great potential, but without the appropriate infrastructure, access is limited.

Architects and designers need to meet current demands while building in flexibility for the future – which is at the moment unknown. Heating and cooling are among the highest energy users in the typical Australian home, so the choice in heating system can have a significant impact on the efficiency of the building, the comfort and health of its occupants, and how easily it can be adapted to meet changing needs in the future.

When it comes to specifying heating and cooling systems, different energy sources can be used, from electricity and gas to renewable energy drawn from solar panels. Parameters such as budget, noise and space come into play, but given the uncertainty of Australia's energy future, future flexibility is also a major concern. Ideally, a heating and cooling option that provides access to the energy sources available today needs to be able to utilise energy improvements into the future.

In this whitepaper, we explore the changing landscape of energy creation in Australia, and how these factors impact which home heating system is best suited to meet current and future needs.



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SHIFTING AWAY FROM FOSSIL FUELS

Fossil fuels are found in earth's crust and are drilled, mined then burned for energy. In recent history, the main energy sources used for generating electricity have been fossil fuels such as coal and gas. In Australia, coal accounts for around 75% of electricity generation, followed by gas at 16%.¹

Despite powering economies for over a century, many countries are moving away from fossil fuels, albeit at different rates of change. The primary reason for this transition is due to the devastating environmental impact of burning fossil fuels for energy. Burning fossil fuels like coal results in the release of billions of tonnes of carbon dioxide – the biggest driver of climate change.² Awareness of this fact has driven policy changes by governments across the world looking to curb the effects of climate change by transitioning to cleaner sources of energy.

Natural gas is seen as a transitional fuel due to its economic viability compared to emerging renewable technologies and less polluting effects compared to other fossil fuels.³ It is the cheapest source of heating energy – powering appliances such as fireplaces, space heaters and boilers – and is a practical solution for tight residential footprints.

While commonly perceived as the 'cleanest-burning' fossil fuel, it is now understood that gas is in fact a highly emissions-intensive energy source. Recent studies have found significant methane leaks during the extraction process, and from natural gas plants and pipelines.⁴ A primary component of natural gas, methane is a greenhouse gas 30 times more potent at trapping heat than carbon dioxide over 100 years.⁵ Science and policy institute Climate Analytics reported that between 2015 and 2020, the emissions growth from liquified natural gas was enough to wipe out the carbon pollution avoided through the 23% renewable energy target.⁶

Growing environmental awareness among consumers is driving further change away from fossil fuels, hastened by rising energy prices and issues with global supply chains. Due to the Russian invasion of Ukraine and floods in Australia, inflationary pressures are expected to cause a rise in wholesale energy prices.⁷ Natural gas, despite being a 'cheaper' source of heating energy, is not immune from rising energy prices. International disruptions in gas supply are expected to impact the daily price of gas, especially in eastern Australia.⁸ These factors are expected to drive up energy bills for households and small businesses, with lower income and vulnerable households hit the hardest.

THE UNCERTAIN FUTURE OF RENEWABLE ENERGY

The transition to a lower-carbon economy driven by premium solar and wind resources is underway, but not without its challenges. Thanks to the government's solar rebate programs, almost three million households now enjoy the benefits of rooftop solar across Australia. In 2020, there were 378,451 rooftop solar installations, which was the most installations in the industry's history at the time.⁹

As they minimise carbon emissions in energy generation, renewable energy sources such as wind and solar are the cleanest, most viable solutions to prevent environmental degradation, reduce waste, and halt the effects of climate change. By enabling consumers to generate their own energy, such as electricity from solar panels, renewables also have the potential to save households hundreds to thousands of dollars per year on energy bills.

While the future of electricity looks bright with growing renewable energy capacity around the world, the supporting infrastructure is not yet fully developed. Findings from the Grattan Institute suggest that moving to 100 per cent renewables at this point in time would involve 'costly' measures to keep power supply reliable, especially in states where electricity demand is high, solar supply is low, and where droughts in wind energy are possible.¹⁰ Sufficient grid infrastructure and connectivity remain the biggest challenges to be addressed before we can move to renewable resources to meet all our energy needs.¹¹

COMPARING HOME HEATING SOLUTIONS

Passive heating

When it comes to designing and specifying home heating systems, designers must balance meeting immediate user needs with providing enough flexibility to adapt to future changes to the energy landscape. This need for future flexibility must be considered alongside other factors such as budget, efficiency, space limitations and noise.

The first consideration in home heating design is improving the thermal performance of the building fabric using passive design principles. Passive design is design that works with the local climate to reduce or eliminates the need for additional heating or cooling. Passive design considerations include, the orientation of daytime living areas, choosing materials with high thermal mass for storing heat, insulation and airtightness, passive shading and glazing design.¹²

Passive heating refers to design elements that utilise the free heat of the sun to warm an interior space thus minimise the need for mechanical heating and cooling as much as possible. Such elements should be incorporated in every new build, but can be added through renovations. Effective passive heating can also reduce the heating load of a building, such that heating systems will not need to work as hard to maintain the indoor temperature within a comfortable range.

Electric heaters

Electricity provides energy for a wide range of heating solutions, including portable and fixed convective heaters, radiant panels, bathroom light heaters, oil-filled column heaters, heat pumps, and embedded floor heating cables. It is also commonly the energy source for reverse cycle air-conditioning and ducted air-conditioning.

Electric heating converts 100% of the energy used to heat. It results in no emissions in the home, has low initial costs, and is convenient and easy to use. While burning gas, coal and oil for electricity have negative environmental impacts, electric heating may be powered using a renewable source such as solar or wind for better sustainability outcomes.

However, with energy prices on the rise, electric heaters will become more costly to run, at least in the short term. Larger heating systems, in particular, can result in high energy consumption. In addition, conventional air-conditioning systems have spatial requirements that may impact building design. Compressors, which are located on the outside of the building, are also a feature of such systems and may cause noise issues for surrounding neighbours.

Gas heaters

Gas is used as the energy source for radiant and convective in-room heaters, ducted hot air systems, and for heating water for hot water heating systems. Gas power can provide high heat output relatively quickly and is cleaner than traditional sources of electricity. Furthermore, while gas prices continue to rise, gas heaters have lower running costs than other forms of heating.

However, the cost of installation of gas heating systems is higher than for electric heating. The byproducts of gas combustion must be vented outside, and there are strict regulations as to the specification, testing and performance of gas heating systems. Installing a gas connection if one did not already exist is enough to wipe out any savings gained from cheaper running costs.

If gas heating is specified, it is difficult to upgrade or change energy sources in the future. Changing from gas to electric heating requires removal of the existing gas heating system, which is often comprised of multiple components, including boilers, pipes and radiators. Given the uncertainty around domestic and international gas supply, homeowners who have chosen gas heating may need to consider the cost of switching energy sources in the near future.





Hydronic heating

Hydronic heating systems relies on pipes laid in the concrete slab or screed to carry heated water. Water is heated in a boiler then distributed around the house through piping within the floor or walls. The heat in the pipes radiates into the room through wall-mounted radiators, convectors, or underfloor heating systems.

Water in a hydronic heating system can be heated by various energy sources. A natural gas packaged boiler is the most popular option, but solar evacuated tubes, heat pumps and wood stoves can also be used to heat the water in the system. Importantly, a hydronic system does not lock in the way it heats water as all boilers and heat pumps are external to the building and can be replaced with more efficient heating systems in the future. This capability allows for the use of more environmentally-friendly energy sources as alternatives to straight electricity and is also ideal for off-grid heating solutions.

Hydronic underfloor heating is a particularly cost-effective and efficient form of in-home heating. If floor heating is installed in a slab, then the slab itself can be used as a

thermal store. If the floor heating is powered by green energy, such as solar, then the electricity generated can be converted to heat with an electric heated water source such as an electric boiler or electric heat pump for later use when no solar energy is available. While the electric boiler generates 1KW of heating for 1KW of electricity, the heat pumps can generate 4KW of heating with 1KW electricity.

In comparison, radiator panel heating is immediate, and has no thermal storage capacity other than the water in the system. Radiators are a good option for wood-fired boilers but to make use of solar energy an in-floor system with a thermal store is the more efficient option.

Hydronic systems deliver a more comfortable thermal environment than other forms of heating. Unlike heating systems that use fans or vents to blow warm air throughout an indoor space, the heat from a hydronic system is either underfoot or close to it. This approach delivers an even distribution of comfortable heat with lower ambient room temperatures than with space heating. With no hot air being blown around in the room, hydronic heating also results in less dust and better indoor air quality.

COMFORT HEAT

Electric and Hydronic Underfloor Heating Systems

Comfort Heat Australia is a leading supplier of hydronic and electric underfloor heating systems. Hydronic heating is ideal for large floor areas for both residential and commercial floors. The floor heating is not only energy efficient but also extremely comfortable, running costs are kept down, and environmentally-friendly energy sources can be used as alternatives.

Other sources of heat include:

- Electronic heat pumps
- Geothermal heat pumps
- Wood-fired stoves
- Solar PV

With pipes laid in the floor, heated water is circulated to warm the floor. The heat sources can be varied and need not always involve electricity. The heating is managed by a thermostat with a floor sensor and an air sensor. Comfort Heat systems are gentle and low temperature, with no air movement, dust, noise or dry air.

All Comfort Heat systems are designed by experienced technicians and engineers to ensure the best possible outcome for any individual project. Quality components for the system are distributed in Australia and imported from overseas. Comfort Heat can design and supply a complete hydronic system and ship to anywhere in Australia.

“Importantly, a hydronic system does not lock in the way it heats water as all boilers and heat pumps are external to the building and can be replaced with more efficient heating systems in the future.”

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