



Igniting the Future of Sustainability

Is Hydrogen the Solution for
Net-Zero Living in Australian Homes?

INTRODUCTION

Australia's Long-Term Emissions Reduction Plan sets out to deliver net-zero emissions by 2050. In order for Australia to meet this target, all industries must act now to lift their rate of Carbon reduction by developing new low-emissions technologies and deploying them at scale.

Decarbonising the residential sector is one challenge we must meet to achieve a clean energy future. In Australia, residential buildings account for more than 10% of all Carbon emissions and about 24% of all electricity consumption.¹ More than 18 tonnes of greenhouse gases are produced annually by each Australian household, in total accounting for at least one-fifth of the country's total emissions.²

As an alternative to fossil fuels, the role of Hydrogen gas is coming into focus as a key component of the clean energy transition. Due to its capacity to burn without emitting greenhouse gases into the atmosphere, Hydrogen gas is being investigated as a potential replacement for fossil fuels in a variety of applications, such as transportation and energy production, as well as for domestic use.

In particular, the use of Hydrogen gas in cooking appliances, such as Hydrogen cooktops, is one exciting new area that we need to turn our attention to.

With the right appliances, a Hydrogen-powered home may one day eliminate household emissions while enabling Australians to enjoy the convenience and reliability of gas. In this whitepaper, we examine why Hydrogen may be the future of net-zero energy living.



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CLIMATE IMPACT OF GAS AND ELECTRIC APPLIANCES

In order to understand the potential of Hydrogen at home, we must first understand the climate impact of gas and electric appliances. All electric appliances are powered by electricity, which is primarily produced by burning fossil fuels. In Australia, fossil fuels, such as gas, coal and oil, contributed 71% of the total electricity produced in 2021.³ The largest source of Australia's Carbon emissions is energy production; specifically, burning fossil fuels to produce electricity contributed 33.6% of total emissions.⁴

What about gas? Even though it has been marketed for years as a clean energy source for our homes, gas is still a polluting fossil fuel. In Australia, there are more than five million homes connected to a gas network, which accounts for 17% of total gas consumed and 2% of total

emissions.⁵ Much of these emissions can be attributed to leakage and incomplete combustion of natural gas by appliances, which releases methane, a powerful greenhouse gas that is significantly more warming than Carbon Dioxide (CO₂), into the atmosphere.

When comparing gas and electricity-powered appliances, we need to keep these factors in mind, as well as the growing share of renewable energy in the Australian market. Over three million households now benefit from rooftop solar in Australia as a result of the government's solar rebate programs.⁶ Renewable energy sources have the potential to reduce annual energy costs for households by hundreds to thousands of dollars annually by enabling them to produce their own energy.

IS HYDROGEN AN OPTION?

There is growing discussion about Hydrogen (H_2) and how it can take the place of gas for cooking and heating. Advocates for Hydrogen claim that it has the potential to cleanly and effectively power the next generation of gas appliances. This is because burning Hydrogen, unlike other fuels, produces a tremendous amount of energy without releasing greenhouse gas emissions. Rather, Hydrogen emits only water when it is consumed in a fuel cell or combusted.

In our environment, Hydrogen is abundant in water (H_2O), hydrocarbons (such as methane, CH_4), and other organic matter. It cannot, however, be taken straight from nature in its pure form; we must produce it from other compounds. Effective Hydrogen extraction from these compounds, and the resulting environmental impact of that extraction, is one of the challenges in using Hydrogen as a fuel.

Hydrogen is not a primary energy source but an energy carrier; it requires chemical processes, such as thermochemical or electrolytic processes,⁷ to produce it. Several domestic energy sources, including natural gas, nuclear energy, biomass, and electricity from the grid or renewable energy sources, can be used to produce Hydrogen.⁸

Whether or not Hydrogen is a clean, sustainable fuel depends on the process used to produce it. 'Green' Hydrogen is created using renewable energy sources like solar and wind, thus generating no or very little polluting emissions. This characteristic makes green Hydrogen an attractive option for replacing production methods that contribute to climate change and aiding in the reduction of Carbon emissions in energy use.

Today, the production of steel, ammonia, methanol and oil are the most prevalent examples of industry applications for Hydrogen, but its potential for diverse domestic applications is increasingly being recognised.⁹ According to the International Energy Agency, commercial and multi-residential buildings, particularly those in densely populated areas, have the greatest potential for incorporating Hydrogen into existing natural gas networks, with longer-term prospects including the direct use of Hydrogen in Hydrogen boilers or fuel cells.¹⁰ Combustion of pure Hydrogen or Hydrogen-rich blends with natural gas may be used for the production of electric power, space heating and cooking.¹¹

If low-Carbon Hydrogen production techniques can be developed and implemented at scale, there is the potential to significantly reduce Carbon emissions globally.¹²

“Hydrogen can one day become an additional source of clean energy to displace emissions while enabling Australians to enjoy the convenience and reliability of gas.”



THE NEW COOKING FUEL

Studies show that home cooking on the whole, which is still dominated by electric and gas appliances, is inefficient. For example, a survey into current cooking practices found that home cooking accounts for as much as 61% of total emissions associated with specific foods.

According to international research organisation Global Footprint Network, households in more affluent parts of the world use 8% of their residential energy for cooking and refrigeration. Reducing this value by one-third through more efficient cooking methods and technologies would have a significant impact on the total residential footprint and move Earth Overshoot Day by 0.9 days.

By any standard, decarbonising the residential sector is a huge global challenge. However, there is a potential solution on the horizon: Hydrogen gas. Not only are gas networks in Australia capable of transporting Hydrogen gas, but Hydrogen blending is already happening in Australia. Internationally, Hydrogen appliances have already been developed and certified, meaning it is only a matter of time before they are commercially available in Australia.

There is no reason why Hydrogen-powered appliances could not offer comparable performance, lifetime and reliability to current natural gas appliances if they are designed with Hydrogen in mind from the start. With this Hydrogen future in mind, we summarise the key benefits of Hydrogen appliances below:

- **Sustainable.** Using cooktops powered by Hydrogen gas reduces your impact on the environment. When burned, Hydrogen gas only produces heat and water vapour, emitting no greenhouse gases and pollution. In line with Sustainable Development Goal (SDG) 7 of the United Nations, using Hydrogen as a cooking fuel is cleaner and more secure than traditional biomass fuels thus making it one of the solutions that could enable affordable, reliable, sustainable and modern energy access in developing countries in the future.
- **Safe.** The blending of Hydrogen into natural gas networks is already happening in Australia and around the world. Much of the existing gas network is made of polyethylene (plastic pipes) and is already suitable for transporting Hydrogen safely to Australian homes, while proposals are being put forth to upgrade older pipes with modern alternatives. Existing gas appliances will work safely with blended renewable gas (up to 20% Hydrogen). The next generation of Hydrogen-ready appliances will be able to run on 100% Hydrogen safely and efficiently.
While it requires respect and proper care, the properties of Hydrogen make it safer to handle and use than current fuels. Hydrogen, for instance, is non-toxic. Additionally, since Hydrogen is much lighter than air, it dissipates quickly when it is released, enabling the fuel to disperse relatively quickly in the event of a leak. Though Hydrogen is odourless and colourless, an odour can be added to ensure it has a distinct and noticeable smell.
- **Efficient.** High-efficiency Hydrogen cooktops use less energy and cook food more quickly than conventional gas cooktops. Hydrogen burns at higher temperatures than natural gas. In addition, its high energy content translates into lower fuel consumption relative to heat production.
- **Versatile.** Hydrogen gas is a flexible and clean energy option because it can be produced from a variety of renewable sources. In this respect, Australia has the potential to become a green Hydrogen powerhouse. More than 100 Australian green Hydrogen projects, including the production of green ammonia and green methanol, were announced in 2022.

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INTRODUCING ELECTROLUX GROUP'S NEXT HYDROGEN-POWERED COOKTOP

With new technologies scaling rapidly and globally, Electrolux Group is at the forefront of driving innovation and sustainability across their product line. One of their most exciting innovations is their exploration into a possible future where we can harness the full power of Hydrogen gas to deliver unparalleled efficiency to Australian homes.

While existing home appliances will operate safely, dependably and effectively with Hydrogen blends of up to 10% and possibly higher, Hydrogen-ready appliances are expected to be available soon. As a great alternative to natural gas, Hydrogen can be used in cooking appliances like your oven, cooktop, and barbecue in the same ways that it is for heating and providing hot water.

Electrolux Group has pooled their global design knowledge and technical expertise into creating a 100% Hydrogen-powered cooktop with zero greenhouse gas emissions when burned from renewable Hydrogen gas. The concept UltimateTaste 900 Hydrogen Gas cooktop

looks to future energy living by delivering the reliability and heat of a gas cooktop without the environmental impact of traditional electricity or gas-powered appliances when connected to a renewable gas supply.

The UltimateTaste 900 Hydrogen Gas cooktop is a revolutionary cooking technology that offers sustainability without compromising the cooking experience. The cooktop is highly efficient, cooking food fast with swift, precise heat, and using less energy than traditional gas cooktops. It also features a sleek, modern design that can elevate the aesthetic of any kitchen.

Harnessing the power of Hydrogen gas, this cooktop is the epitome of premium and eco-conscious living, offering a refined and responsible cooking option for the discerning home chef. While the cooktop is still currently in prototype, it is testament to Electrolux Group's commitment to enabling better and more sustainable living in the future.

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All information provided correct as of October 2023