

Senate Standing Committees on Economics
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Residential Electrification Senate Inquiry

The Australian Energy Council ('AEC') welcomes the opportunity to make a submission to the Senate Standing Committees on Economics inquiry into *Residential Electrification*.

The AEC is the peak industry body for electricity and downstream natural gas businesses operating in the competitive wholesale and retail energy markets. AEC members generate and sell energy to over 10 million homes and businesses and are major investors in renewable energy generation. The AEC supports reaching net-zero by 2050 as well as a 55 per cent emissions reduction target by 2035 and is committed to delivering the energy transition for the benefit of consumers.

The AEC supports policy efforts to promote residential electrification which is needed for Australia to reach its climate targets. Last year, the AEC commissioned a [research paper](#) that provides some guidance to policymakers contemplating electrification policies. This research paper highlights that electrification technology is readily available to replace gas for residential use and addresses some misconceptions relating to electrification uptake.

Residential electrification has so far been mostly driven by sub-national jurisdictions, with Victoria and ACT leading the way through the creation of regulatory frameworks to phase out residential gas use. These two jurisdictions have the highest proportion of household gas use so early policy action is needed to meet their respective carbon goals.

In addition to environmental benefits, electrification will help households save money over time. However, policy support may be required to cushion the initial upfront costs of replacing gas appliances with electric appliances. The Federal Government's allocation of \$1.3 billion in its budget towards household energy upgrades is one such example, though subsidies should not be the only policy lever. Government certainty regarding timing of the decommissioning of gas networks may also be needed to protect customers that have not switched.

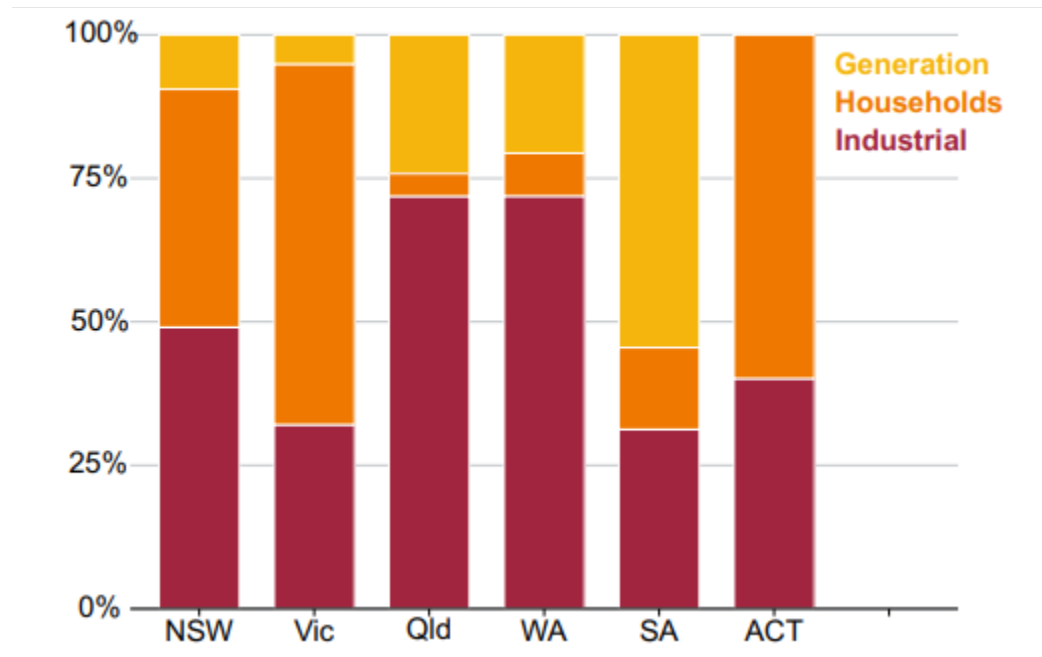
When should electrification replace gas?

Gas emissions represent about 22 per cent of Australia's total emissions and generally come from three sources:

- Electricity generation – burning gas to generate electricity.
- Industrial use – burning gas to create the high levels of heat needed for some industrial processes and using gas for feedstock.
- Residential (households and small businesses) – burning gas through low pressure distribution networks for space and water heating, and stovetop cooking.

The figure below, drawn from the Grattan Institute’s [Getting Off Gas](#) report, shows the breakdown of these sources across the states and territories.

Figure 1: Sources of gas use by state 2021



Source: Grattan Institute [Getting Off Gas](#) (p7)

The Senate Committee should be mindful of these different sources. Experience indicates that policy discussion about the merits of residential electrification often leads to misleading scope creep about the role of gas in electricity generation and industrial processes.

For electricity generation, gas-fired generation will remain important for peaking and firming services as Australia transitions. The Australian Energy Market Operator’s (AEMO) [Gas Statement of Opportunities 2023](#) confirms that:

Electricity from gas generation is expected to play an important, continued role in the National Electricity Market (NEM) ... gas generation can support the power system by responding to sudden changes in the supply demand balance, helping manage extended periods of low renewable generation, helping meet the NEM’s energy needs if coal generation and other dispatchable sources are unavailable, and providing critical power system services to maintain grid security and stability.

For industrial heating, it is not expected electrification technology can produce the level of heat required for high-intensity industrial processes (e.g. metals refining and alumina production). Decarbonisation of these processes may be more suited to replacement fuels like [biomethane](#) and hydrogen.

Residential electrification can reduce carbon emissions now

Victoria’s Gas Substitution Roadmap has sparked commentary about whether electrification will reduce carbon emissions. The counterargument made is that switching to electrification will only increase

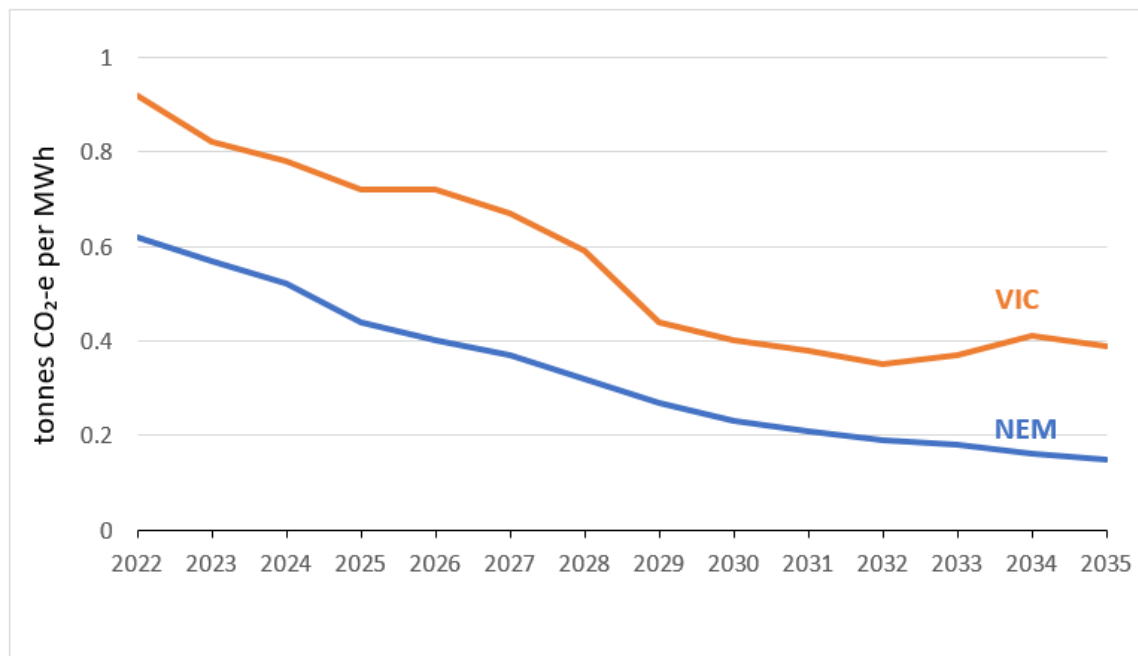
demand for coal-fired generation (which remains the main source of electricity in Australia) and by doing so, this will increase overall carbon emissions.

The Senate Committee should be aware that this argument ignores an important thermodynamic factor: electricity is far more efficient at producing heat than gas. The International Energy Agency [says](#) the energy output of modern heat pumps is about four times greater than the electricity energy used to run it (i.e. an efficiency ratio of 400 per cent), and [newer technologies](#) can reach as high as 600 per cent. Conversely, gas heaters range between 60 to 90 per cent efficiency.

These efficiencies are so stark that the International Energy Agency has concluded that “heat pumps still reduce greenhouse gas emissions by at least 20 per cent compared with a gas boiler, even when running on emissions-intensive electricity. This reduction can be as large as 80 per cent in countries with cleaner electricity”.

As the figure below illustrates, the National Electricity Market is well on track towards having much lower carbon intensity. Furthermore, this does not consider ‘behind the meter’ electricity like that supplied by rooftop solar and, to a lesser extent, home battery installations. It is reasonable to assume that many new homes will have rooftop solar installed and some a home battery (subject to the economics of home batteries improving), significantly reducing further any electricity heating emissions.

Figure 2: Projected CO₂ emissions factor of electricity in the NEM and Victoria to 2035



Source: AEC graph using Federal Government’s [Australia’s Emissions Projections 2022](#) (p81)

The AEC used the above data from the Federal Government’s Emissions Projections as well as the Australian National Greenhouse Accounts Factor to do an indicative calculation of the likely overall emissions output of gas versus electric heating. The calculations below suggest that electric heating should

be around 25 percent more efficient today, and over 50 percent more efficient by 2025 (compared to now).

Indicative calculation of emissions output of gas versus electric heating

To produce 1MWh of gas heating:

- CO₂ emissions factor of natural gas is 0.05153kg CO₂/MJ.
- 1MWh = 3600 MJ.
- 1MWh of gas burnt produces: 0.05153 x 3600 = 185.5kg/MWh of CO₂.
- Efficiency of modern gas heater assumed to be 75 per cent.

185.5kg/75% = **247.3 kg CO₂**.

To produce 1MWh of electric heat pump heating:

- CO₂ emissions factor of National Electricity Market grid electricity generation is 690kg/MWh of CO₂.
- Efficiency of modern electric heating assumed to be 400 per cent.

690kg/400% = **172 kg CO₂**.

And then by 2025:

To produce 1MWh of electric heat pump heating:

- CO₂ projected emissions factor of National Electricity Market grid electricity generation in 2025 is 440kg/MWh of CO
- Efficiency of modern electric heating assumed to be 400 per cent.

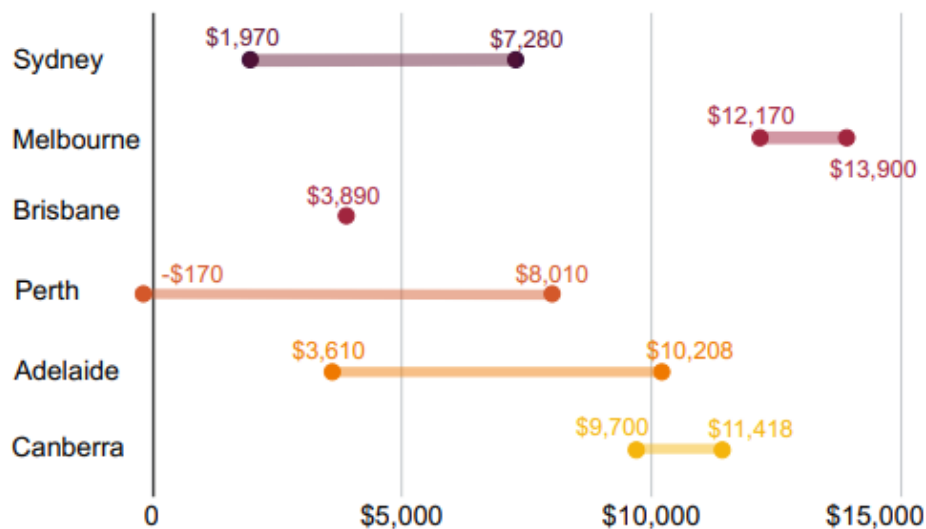
440kg/400% = **110 kg CO₂**.

A better explanation of these calculations can be found [here](#).

Residential electrification reduces costs for households over time

Independent modelling from the Grattan Institute has found households will save money over time by upgrading to electric appliances.

Figure 3: Most households will save money by upgrading to electric appliances (household savings over 10 years)



Source: Grattan Institute [Getting Off Gas](#) (p15)

These calculations include the upfront costs, which will be recovered over time due to the lower running costs of efficient electric appliances. Government modelling from the two jurisdictions with gas substitution policies, Victoria and the ACT, has also found annual savings for all-electric households.

The challenge is less about cost efficiency over time and more about how to support households with the initial upfront cost hurdle, especially for low-income earners. Government subsidies and rebates are one way to cushion these costs and such policies have successfully incentivised early uptake of electric appliances in overseas jurisdictions.¹

The other policy response this Senate Committee should consider is how to support households that remain on the gas network. One policy option is for governments to provide gas networks with timing certainty around decommissioning. This can allow these networks, and the Australian Energy Regulator (AER) who regulates their pricing, to begin the depreciation process – most importantly, through that process, the AER can ensure that customers who remain on the gas networks are protected.

Any questions about this submission should be addressed to Rhys Thomas, by email Rhys.Thomas@energycouncil.com.au or mobile on 0450 150 794.

Yours sincerely,

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¹ Grattan Institute, 'Getting Off Gas', June 2023, p22-23.