

SUBMISSION

Submission to the Senate Economics References Committee

Inquiry into Residential Electrification

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The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

Residential electrification is an essential part of Australia's strategy to achieve net zero emissions by 2050 if not sooner. Electrification will not only reduce carbon emissions as the power grid moves to renewable energy but will also provide economic benefits as jobs are created in the re-fit houses and apartments. The technology to make this switch is readily available however a challenge lies in integrating renewable into the existing transmission grids and in supporting households to make this transition.

ATSE's [Position Statement on Australia's technology-led transition to net zero emissions](#) advocates for a more ambitious interim emissions target for 2030 (ATSE, 2021). The legislation of full electrification in new construction projects, offering incentives to landlords, and promoting energy-efficient standards, would assist in reaching this ambitious net zero by 2030 target and is a step that can be taken now. These measures would also contribute to a reduction in carbon emissions and alleviate residential power costs. By embracing renewable energy sources and electric alternatives, households can achieve long-term cost savings while fostering environmental sustainability. It is also worth noting that while electrification of new builds can be implemented now the goal of the Government should be full domestic electrification.

ATSE makes the following recommendations:

Recommendation 1: Expedite residential electrification efforts to reduce carbon emissions to achieve more affordable power for Australians.

Recommendation 2: Implement regulations and legislation that mandate full electrification, rooftop solar generation, battery storage, and high energy efficiency standards for new residential buildings across Australia.

Recommendation 3: Provide incentives for landlords to implement electrification and energy-efficient measures.

Recommendation 4: Expediate residential electrification while fast-tracking the switch to renewable energy generation.

Reducing carbon emissions from residential energy use

The consideration of residential electrification in Australia is primarily driven by the nation's commitment to achieving net zero carbon emissions by 2050, or preferably even sooner. This ambitious goal needs targeted investments in carbon emissions reduction across all sectors of the economy, given the country's finite capacity for such investments (0.14 per cent of Gross Domestic Product during the period of 2019 to 2030; The University of Melbourne, 2021). The aim is to achieve the maximum reduction in carbon emissions at the lowest possible cost (Wood et al., 2023). Consequently, residential electrification is one of the priority areas for such investments.

As coal-fired power generation is shut down, substantial investments are being directed towards renewable energy sources, particularly solar and wind, along with storage technologies. However, the locations for these renewable energy generation sites often lie far from the existing transmission grids, thereby needing significant investments in transmission infrastructure to connect these sites to the grid. External factors such as energy shortages and consequent price hikes resulting from the conflict in Ukraine further exacerbate this situation (Mercer, D, 2022). While the eventual low cost of renewable energy will counterbalance these price increases, the current scenario is a matter of great concern for Australians, burdening the population with higher living costs. A switch to renewable energy supported by electrification would be a key enabler for the Government's commitment to net zero emissions by 2050.

The ACT government has announced the delivery of a new Integrated Energy Plan for the Territory by 2024, aiming to electrify the city and transition away from fossil fuel gas by 2045 (ACT government, 2023). This ambitious plan not only sets a strong precedent for sustainable practices within the region but also has the potential to serve as a model for the nation. Replacing gas appliances with electric alternatives in scenarios with rooftop solar generation and battery storage presents significant opportunities for substantial energy bill savings. Currently, over 30 per cent of Australian households are already utilising electric heaters, cooktops, or water heaters. According to a study by Grattan, households in Melbourne that switch from gas to electric appliances can save an average of \$12,000 to \$14,000 over a 10-year period, depending on their energy consumption. Similarly, households in Sydney can save between \$2,000 and \$7,000 by making this transition (Wood et al., 2023). These savings are a result of reduced reliance on gas and increased utilisation of electricity generated

through rooftop solar panels, combined with battery storage. Sizable rooftop solar and battery setups significantly cut residential power expenses, so it's essential to assess the value of prioritising investment in residential electrification. This assessment should consider benefits like carbon emissions reduction and curbing power costs, thus easing inflationary pressures.

Recommendation 1: Expedite residential electrification efforts to reduce carbon emissions to achieve more affordable power for Australians.

Legislating the construction of new residences with full electrification

Ensuring full electrification and incorporating appropriately sized rooftop solar generation, batteries and energy-efficient standards are of relevance to Australia's high-priority investment agenda for new residential and commercial constructions. This should be established through codification and legislation nationwide, including for social housing and privately owned housing. Requiring new buildings to be electrified avoids the additional expense of retrofitting electric appliances and removing gas appliances later.

As recommended in [ATSE's submission](#) to the National Energy Performance Strategy, the Australian Government should also create stronger energy efficiency requirements for new housing stock (ATSE, 2023). Leveraging rooftop solar with batteries, along with smart meters and microgrids, presents a highly cost-effective means of meeting a substantial portion of Australia's renewable energy demand. Energy efficiency measures that should be required for new residential buildings include allowing electricity generated by rooftop solar to be split between units (Sykes, 2023), robust insulation and double glazing, as well as strategic orientation and architectural techniques to facilitate natural cooling and heating (Seo et al., 2018). While glass production is a carbon-intensive process, the thermal advantages offered by double-glazed units often outweigh the additional carbon investment required for the extra-glazing panes (Westbroek et al., 2021). To further increase the environmental benefits of double glazing, promoting the use of recycled material instead of virgin glass production significantly reduces energy consumption and emissions by up to 40 per cent during the melting process (Westbroek et al., 2021). Reusing glass products without any melting at all can result in nearly 100 per cent emissions savings.

Recommendation 2: Implement regulations and legislation that mandate full electrification, rooftop solar generation, battery storage, and high energy efficiency standards for new residential buildings across Australia.

Incentives for landlords to lower the cost of electrification

Australia's climate and low-density housing are favourable for solar generation. Australian rooftop solar adoption remains high, with a 58% decrease in residential energy costs from 2010-2020 (International Renewable Energy Agency (IRENA), 2022). This has made Australia one of the countries with the lowest solar costs in the world. The range of batteries for home use is increasing, and the costs of batteries are decreasing. The average cost per warranted hour (\$/kWh) has halved from AUD\$0.80 in 2016 to AUD\$0.39 in 2022 (Australian Energy Market Commission (AEMC), 2023) making solar and batteries an attractive investment.

There are still some impediments and challenges to an even greater uptake of residential rooftop solar and batteries. Solar generation from rooftop installations during peak solar radiation periods can overwhelm the grid. This can and must be managed by increased investment in home and suburban/town batteries for storage during these peak times, as well as smart meters and microgrids for ceding control of the distribution of that power to the power authority. Another way to reduce peak demand growth is to minimise winter heating loads to improve the thermal performance of houses. This means investing in ceiling insulation, draught-sealing and double-glazed windows.

ATSE has welcomed the 2023-24 federal budget announcement of the Household Energy Upgrades Fund, which will provide low-cost loans for improvements such as double glazing and solar panels, as well as a fund for energy upgrades to social housing (ATSE, 2023). While details of the Fund are yet to be announced, ATSE considers that the Australian Government must incentivise landlords to undertake energy upgrades including conversion from gas to electric appliances. Owners of rental properties do not have the incentive to invest in solar generation and batteries as the cost savings would be experienced by their tenants.

Recommendation 3: Provide incentives for landlords to implement electrification and energy-efficient measures.

Residential electrification with a switch to renewable energy

It is important for Australia to prioritise investments in residences that rely heavily on renewable energy sources for their electricity supply. If a residence primarily relies on non-renewable energy, it won't effectively reduce carbon emissions or lead to noticeable decreases in household power bills, especially if those residences have poor energy performance. Retrofitting such homes with renewable energy systems can be quite expensive (AUD\$42,000 - AUD\$63,000) (Seo et al., 2018) and disruptive to the building fabric, particularly in cases where integrated systems like gas-fired underfloor heating are involved. While some natural gas utilities are increasingly advocating for hydrogen as a substitute for natural gas (Baldwin et al., 2022), it is important to exercise caution when evaluating this proposition for residential and commercial buildings. This caution stems from the economic, logistical, and safety complexities associated with such suggestions.

Combining rooftop solar generation and battery storage with electric appliances allows for more significant integration of renewable energy into the residential sector. It reduces reliance on fossil fuels and contributes to greenhouse gas emissions reduction. By generating electricity through rooftop solar panels, households can become more self-sufficient and reduce reliance on the grid. This can lead to energy cost savings and greater energy independence. Since electric appliances can be more energy-efficient than their gas counterparts, their use can lead to reduced energy consumption and lower utility bills for consumers. Transitioning to electric appliances opens possibilities for synergies with other technologies, such as smart home systems, energy management, and electric vehicle integration. These integrated solutions can optimise energy usage and offer additional benefits. Shifting from gas to electric appliances without a renewable energy source could limit the environmental benefits and increase reliance on fossil fuels. It is therefore critical that household electrification efforts are combined with a switch to renewable energy sources.

Recommendation 4: Expediate residential electrification while fast-tracking the switch to renewable energy generation.

ATSE thanks the Senate Economics References Committee for the opportunity to respond to the Residential Electrification inquiry. For further information, please contact academypolicyteam@atse.org.au.

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