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Inquiry into Residential Electrification
Senate Economics Committee
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Ai Group submission
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Ai Group appreciates the opportunity to make a submission to the Senate Economics Committee on the topic of residential electrification.

About Ai Group

The Australian Industry Group (Ai Group®) is a peak national employer organisation representing traditional, innovative and emerging industry sectors. We have been acting on behalf of businesses across Australia for 150 years.

Ai Group and partner organisations represent the interests of more than 60,000 businesses employing more than 1 million staff. Our membership includes businesses of all sizes, from large international companies operating in Australia and iconic Australian brands to family-run SMEs. Our members operate across a wide cross-section of the Australian economy and are linked to the broader economy through national and international supply chains. That includes major global corporations that manufacture and supply electrical product that have a presence in the Australian market; suppliers of electricity and network services; suppliers of gas appliances and network services; and, overwhelmingly, business energy users with a broad interest in an affordable, reliable and clean energy system.

Overview

The electrical grid in the future will look remarkably different from now. Over the next decade we expect to see:

- Increasing rooftop and grid PV supply
- Increasing off grid/micro grid systems
- Increasing overall electricity demand
- Wide rollout of battery storage systems across utility and consumer/prosumer installation level
- Demand management across utility and consumer installation level
- EV uptake

Electrification will be relevant in different ways and to different extents across different contexts. Low-temperature heating needs in households, commercial use and many industries are very different to high-temperature heat requirements in other industries. The challenges in heating high-density multi-

unit dwellings are different to those in single-family detached housing. Light urban passenger transport is very different to inter-regional trucking. We should be cautious about blanket judgments, and there will be important roles in the Australian economy for bioenergy and clean hydrogen.

Nevertheless, electrification is set to be one of the biggest trends in global and Australian energy systems over the next few decades, for three broad reasons. In many, but not all, residential and transport contexts, and some commercial and industrial contexts, electrification can deliver cost savings and performance improvements over combustion of fuels. Electrification combined with clean electricity generation is a major tool for slashing greenhouse gas emissions. And high-quality electrification can support the more efficient and reliable operation of highly renewable electricity systems.

These reasons will be compelling for a very significant amount of electrification, with some important caveats:

- The quality of electrification must be high to maximise its benefits and minimise its costs. We have to think about systems as well as individuals;
- Achieving electrification at the pace implied by emissions goals will be challenging given the existing rate of turnover in the housing stock and vehicle fleet, and barriers to household adoption;
- The progressive reduction in reliance on existing fuel-based systems will involve costs that need to be fairly allocated and physical and logistical challenges to manage safely; and
- Additional decarbonisation tools will be needed, and both oil and natural gas will retain important uses for a long time (albeit at levels much lower than today).

For home electrification to be successful, extensive changes to the National Electricity Market status quo will be needed. Affordable, reliable electricity will become even more critical as the sole energy source for many homes.

In recent years national bushfires and the severe Victorian storms in June and October 2021 had devastating impacts on the communities that were left without electricity for prolonged periods. Following the June storms, 68,000 electricity customers remained off supply after 72 hours and 9,000 customers were still without power seven days after the event. Following the October storms, 23,983 customers remained off supply 72 hours later and just over 2,500 customers were still without power seven days after the event. The key problem was the loss of all phone and internet communications due to these systems having limited redundancy to prolonged power outages. Many were unable to contact services or family and friends to check on welfare, request assistance or receive updates from distribution businesses.

As the system goes through a tremendous transition to absorb much higher levels of variable renewable energy, every State and Territory is playing an increasing role in shaping their region of the electricity grid. While this is entirely understandable, the result is a complex patchwork of divergent systems with different distribution requirements and rules concerning the implementation and deployment of electricity to domestic and other dwellings. Regulators are doing their best, but their performance has not been without critics. Former Victorian Essential Services Commission head Ron Ben-David recently wrote:

> *"… the energy transition is tearing apart the regulatory frameworks operating in the energy sector. At times, the regulators firmly adhere to the traditional beliefs that have guided their regulatory thinking since the 1990s even though everything is changing around them. At other times, regulatory actions seem to wander without clear explanation into areas where*

economic regulators would have never gone in the past. When viewed in their totality, these actions increasingly appear to lack coherence."[1]

Grid infrastructure will require significant investment to be able to manage demand and more complicated electrical distribution. This will require more energy storage and more capability to move electricity around the network. The amount of investment needed could be much larger or much smaller depending on our success in coordinating the transition. National coherence and cooperation will be essential.

The electrical grid will also need to have a consistent approach to microgrids, be it home based or community. Prosumer, micro domestic grids is a community-based power generation and distribution system that interconnects smart homes with renewable energy sources. Microgrid efficiently and economically generates power for electricity consumers and operates in both islanded and grid-connected modes. These systems can be made up of solar, wind, and battery storage. This new style of domestic or other dwellings could employ part or all of the list energy generation systems, and regulation around the implementation of these systems and products restricts adoption within the Australian market.

The current environment for an installation depicted above could be completed today with products that are currently on the market to control energy consumed and produced by the residents. Currently, installations like this can be completed with guidance from Australian Standards, but multiple layers of government and network suppliers restrict the ability of residences to deploy this system with all the requirements of State Regulators and Distribution companies all with different requirements.

Further to the national grid issues across state borders, there is also currently variations across various electrical installation features for the home.

- Electrical installation rules
- Rooftop solar limits
- Battery system limits
- Street connection type and rating (single phase/3 phase/size)

These can vary due to age of installation, state, local electrical utility or local council. These inconsistencies need to be addressed so that the economy of scale can be realised and provide consistent affordable solutions to Australian consumers.

Systems thinking and the quality of electrification

Heating and cooking are important parts of everyday life and it is common to think about electrification of them in highly personalised terms: what are the costs, barriers and benefits a household faces if they electrify? These factors matter. But individual energy users are part of a larger set of systems and the interactions between them as electrification scales up need equal consideration.

For instance, an individual household can make substantial savings on their combined energy bills through self-generation with rooftop solar, electrified appliances and an electric car. But part of those individual savings come from the fact that electricity network costs are currently largely recovered through charges on the volume of energy consumed, rather than other metrics like maximum instantaneous demand. The network is still needed to share energy, meet peak demand and provide backup, and if more households electrify network costs will need to be recovered in different ways. Costs need to be considered systemically, lest they be underestimated.

[1] Ron Ben-David, *Rethinking markets, regulation and governance for the energy transition* (2023)

Similarly, an individual household's self-generation, energy storage and appliance use can create wider benefits for other energy users, helping address minimum demand; shave peaks; and avoid network investment. These systemic benefits also need to be considered.

Natural gas currently serves as an imperfect redundancy for electricity to heat homes and keep them warm, prepare food, shower and wash clothes. In colder regions, natural gas delivers a similar amount of energy to the home as electricity. That is a significant amount of energy to replace, though it can be done better or worse.

There is a wide gulf in systemic impacts between low-quality and high-quality electrification.

Consider a hypothetical electrification of NSW households and light commercial gas users.

Current annual gas usage from these customers is around 35 petajoules (PJ). If customers electrify with appliances that are no more efficient than typical gas heaters, replacing that annual energy with electricity would require around 10 terawatt hours (TWh) of generation – about 14% of currently projected statewide electricity demand in 2030. By contrast, if customers largely electrify with heat pumps that achieve an average coefficient of performance (COP) of 3, only about 3 TWh of additional generation will be needed, or 4% on top of other annual energy needs.

Peak demand differences are even starker. Current maximum demand for gas from these customers is around 214 terajoules per day, mostly for space and water heating. Efficient electric appliances (COP 3) operating primarily in daytime to maximise renewables usage might require generation capacity of 1.66 gigawatts (GW), or 12% of current maximum electricity demand. Super-efficient (COP 6) appliances running constantly at low levels might only need 0.41GW, adding 2.8% to peak demand. At an absurd but illustrative extreme, inefficient COP1 appliances all running for the same single hour a day would need peak generation and network capacity of 60 GW, or 426% of the current peak.

The point is that the more efficient electric appliances are, and the better their operation is coordinated with the state of the wider energy system, the higher their systemic benefits and the lower their systemic costs. Quality matters.

Achieving high quality in electrification is a major challenge with many facets.

Any incentives for electrification need to encourage quality, whether through minimum requirements for the efficiency of supporting appliances, minimum out-of-pocket contributions from beneficiaries to ensure they have more stake in good product selection, or conditions around participation in demand response and smart tariff arrangements.

Network tariff reforms are needed to increase the prevalence of more dynamic prices that encourage load-shifting. Governments need to be less cautious about the potential for short-term winners and losers from these tariffs, and more focussed on the immense gains to all from avoiding some additional network investment. However tariffs are mediated by retailers, and small customers need help to navigate an efficient response.

Product standards have an important role in lifting minimum performance over time and establishing the default products available to uninquisitive or emergency customers – such as when an old water heater fails suddenly and restoration of hot showers is urgently needed. As discussed further below, there are complex issues around the process for, harmonisation of and timing of changes to product standards.

Education about the stakes of electrification and how to do it well will be vital, both for the tradespeople who will do installations and upgrades and for the households who operate the appliances.

It is urgent to get electrification on a higher quality footing. Electricity and gas networks and the Australian Energy Regulator are in the midst of ongoing cycles of planning and approval for the capital investment they best judge is needed to maintain reliable supply. Those processes need the best steer possible about the pace, extent and quality of electrification. If they don't get it, we risk locking in the wrong investments – too much in some cases, too little in others – and reaping serious consequences.

The macro-barriers to increasing the uptake of home electrification.

Changing retail landscape

Consumers are also going to be controlling a lot more electricity on their premises as result of moving from gas to induction cooktops and/or from the replacement of internal combustion engine vehicles to electric vehicles in both the charging and discharging of that of that energy. This will provide consumers the option to generate, store and use their own energy locally wherever possible. This means that the householder will move from a OpEx model of energy usage to more of a CapEx model of energy usage where they invest in the electrical installation. Their return is the reduction of energy that flows through the meter, either import or export.

This will substantially change the role of electricity retailers. Rather than a remote financial manager and billing administrator with an interest in maximising consumption, retailers will need to remake themselves as providers of energy services with a close relationship to customers. They may be able to provide simple and low pricing only if they can play a role in managing key appliances to minimise the wholesale and network costs they mediate. They will need to compete with the services that households can provide for themselves, or buy from third party energy businesses.

Whoever provides services, the risk of low-information consumers being harmed – or failing to reap benefits – will require strong and evolving consumer protections.

Changing manufacturer landscape

Suppliers of home appliances have seen sharp swings in government policy over the years. In 2007, the Australian Government announced a proposed ban on electric storage waters from 2010 in favour of gas. Now we are turning in the other direction, though some states are still restricting the installation of electric water heaters. Appliances that are installed in new homes today will likely be replaced like for like in the future.

Hundreds of thousands of new homes have been built with gas appliances over the last 2 decades. The Grattan Institute notes that until recently, "it was mandatory for new homes in the ACT and Victoria to have a gas connection installed. This provided a strong nudge for home builders to install gas appliances, and locked large numbers of home owners into using gas." (Grattan, 2023)

In July 2008, South Australia became the first Australian state to enforce the phasing out of electric water heaters. Under South Australian regulations, many replacement water heater installations in existing homes in metropolitan and near surrounding areas needed to be either high efficiency gas, solar or electric heat pump systems.

Over 95% of the subsequent installations for the last 15 years were for continuous flow gas water heaters. In October 2020, Lloyd Harrington noted in a report commissioned for the Department of Energy and Mining that, “electric water heaters have become less prevalent in South Australia since around 2000. The rate of decline has been fairly steady over that 20-year period and this trend is also obvious in NSW, ACT, Western Australia and Victoria” (Harrington, 2020).

All this is to say that appliance suppliers would prefer a clear and sustained long-term plan to work to, rather than a series of radical shifts with minimal reaction time. That is not an argument against change – in fact it suggests deeper change but flagged much earlier. Investment in and coordination of supply chains is essential and takes time.

The impacts and opportunities of household electrification for domestic energy security, household energy independence and for balance of international trade.

Eastern Australia currently faces serious energy security risks as this decade goes on. Committed and anticipated gas supply is declining much faster than estimated gas demand. If this goes on, we would see winter shortfalls every year from 2027.

That situation is thoroughly avoidable. There is potential for additional supply from within Eastern Australia, though the combination of higher wellhead production costs and longer pipeline transport distances is sobering. There is also the potential for imports of liquefied natural gas from Western Australia or overseas, which would not be cheap per unit of energy but could be very flexible with little capital required.

Both supply-side solutions have their critics. The more gas demand can be transitioned to solutions appropriate for each user – whether electrification, efficiency, bioenergy or clean hydrogen – the less that these supply options will be needed – though the plausible pace of building upgrades and appliance replacement is such that both the supply and demand sides will have parts to play.

The effectiveness of existing Australian Federal, state and local government initiatives to promote and provide market incentives for household electrification.

Firstly, we acknowledge that incentives will have a role in starting the process of household decarbonisation. There is significant inertia to overcome, some of the products involved are unfamiliar, and there are significant barriers of resources or interest alignment concerning low-income households and rental properties. Different forms of incentive are likely to be needed for different contexts; individual rebates might work for single-family owner-occupied dwellings, but be ineffective for rentals and inefficient for multiple residences where a more concerted upgrade will minimise costs.

However incentives cannot last forever or deliver the whole transition. Key appliances are likely to decline in cost with greater global deployment and local experience, reducing the upfront cost gap with higher emissions options. There will also need to be a gradual process to move from handouts to phaseouts, with well-flagged product or rental standards progressively tightening with plenty of notice and time for preparation. Visibility of such a long-term strategy would both limit the long-term cost of incentives and encourage their earlier uptake.

Secondly, a clear lesson for electrical suppliers through the rollout of large home solar rebate scheme around 2010 was that an incredible number of solar installers appeared “overnight”.

The incentives initially created an environment where operators could set up and disappear quickly, leaving substandard and risky installations in their wake, while subjecting workers to substandard conditions. This was analogous to the housing insulation scheme around the same time.

Subsequently we have seen the emergence of a much high-quality rooftop PV sector thanks to a combination of government scrutiny and self-regulation (and accreditation), and Australia delivers some of the cheapest and best rooftop solar services in the world.

Government incentives for electrification would need to be carefully considered to ensure a high-quality industry culture.

Standards

Australia faces delicate choices around standards. Local standards requirements directly lead to local solutions, limiting access to global product and potentially raising costs, but potentially ensuring greater local opportunity as well as tailoring for local conditions.

The obvious example of this is for extreme heat conditions which are unique to certain parts of Australia. A cautious approach to new energy storage products for the home would deem them to be high risk until shown otherwise; that would increase costs but add consumer safety. Local standards for electrical products and installations make sense in some cases.

Multiple changes in standards will be required as changes occur, and risks are better characterised; regular standards processes enable a full weighing of technical issues but can lead to time delays. We need a mechanism to reliably, and easily roll out standards changes with grace periods to clear supply chains and reduce overstocking risk to suppliers. Setting out a long-term schedule of tightening requirements for product performance would be much better for suppliers and customers than either stasis or sudden changes without warning.

While local standards or variations to standards often require local solutions the Australian market is incredibly small – as such, local solutions are practically always more expensive to the consumer than global solutions though economies of scale. Also, due to the smaller resources of Australian standards committees compared to global standards committees, Australian standards will always be lagging behind the global standards, meaning lower outcomes for consumers. Adopting International standards should in all situations be the preferred solution

For questions related to this submission, please contact our Director – Climate Change and Energy, Tennant Reed Em: tennant.reed@aigroup.com.au Mb: 0418 337 930

Yours sincerely

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