

3 September 2018

Australian Energy Regulator
By email to: AERInquiry@aer.gov.au



**SUBMISSION TO AER FOR
Australian Gas Networks - Future capital expenditure determination
*Mount Barker gas network extension***

To Whom It Concerns,

For 38 years, the [Alternative Technology Association](#) (ATA) has been the leading organisation providing practical, independent advice on sustainable living. Established in 1980, the ATA is a not-for-profit organisation whose 6,700 members are mostly residential energy consumers with an interest in sustainable energy and resource use.

With the support of Energy Consumers Australia, ATA is also a prominent advocate for all Australian energy consumers. As a member of the National Energy Consumer Roundtable, ATA works closely with other consumer advocacy organisations, providing expertise and experience in energy policy and markets. We also conduct independent research into sustainable technologies and practices.

ATA's reach extends to a wide audience, of consumers and other stakeholders, through our magazines [ReNew: technology for a sustainable future](#) and [Sanctuary: modern green homes](#), as well as online resources, events, talks, reports and "good news" media articles.

Introduction

The economics of residential gas is changing. For more than three decades, gas provided a low-cost alternative to traditional electric technologies for household space heating, cooking, and hot water. However the evolution of heat pump and induction technologies in the Australian market, along with the exponential rise of solar photovoltaics (PV), now means this dynamic has changed.

Solar PV provides the least cost way for households Australia wide to generate and consume electricity. The levelised cost of electricity from solar PV in Adelaide is approximately \$0.07 per kilowatt hour¹ – some 20% of the retail cost in that State.

In addition, heat pump technology can now supply all hot water, space heating and cooling needs, at significantly higher efficiency than all other combustion-based technologies and integrates with on-site solar.

Given its climate with high solar yield and mild winter conditions, very few places in the country are as well suited to establishing all-electric homes run from solar and efficient appliances as South Australia.

The ATA explored the relationship between technology, residential fuel choice and energy bills in 2014 and again this year. Both times we found that there is no economic case for:

- establishing new homes as dual fuel (i.e. electricity and gas)
- converting existing all-electric homes to dual fuel

Our latest fuel choice research report, *Household Fuel Choice in the NEM*, is attached.

¹ ATA analysis

The findings of that study raise questions about some of the claims made by AGN in its business case. In particular, the ATA contests the claims that households will be \$900 per year better off by establishing new homes as dual fuel rather than all-electric; and that greenhouse emissions will be 52 per cent lower for dual fuel households than all-electric ones. Conversely, the ATA contends that by establishing new homes as all-electric:

- Typical households will be at least between \$30 and \$1,380 per year better off,² depending on whether or not they install solar PV; and
- Typical households will generate significantly fewer greenhouse emissions.

Household cost benefit

AGN claims: “Residential customers in the region would benefit ... through average savings of \$300 per year when substituting natural gas for LPG and \$900 per year when substituting natural gas for electricity for cooking, hot water, and space heating.”³

In the absence of known retail tariffs, it’s difficult to be precise. Nevertheless, our research into the economics of fuel choice has shown conclusively that:

- Natural gas and electricity are indeed both more cost-effective as household fuels than LPG; and
- Establishing a new home as all-electric has a *net positive value in every location we modelled*.

We compared the net present value (NPV) over 10 years of a new large home established as all-electric (using heat pumps for heating and hot water, and electric stoves with induction cooktops) with or without 5kW solar PV, with the same home established as dual fuel (with gas ducted heating, hot water, and stove). While Mount Barker was not included in our locations (due to having no reticulated natural gas), it is reasonable to assume that all-electric would there too be an economic advantage for residents over dual fuel, especially when you consider that it is true for Adelaide (warmer climate but similar electricity prices), Melbourne (similar demographics), Bendigo and Warrnambool (similar climate).

Figure 1 below shows the 10-year NPV of all-electric with 5 kW solar (blue) and without 5 kW solar (red) for new homes in all locations we modelled, compared with a business-as-usual case of dual fuel with no solar.

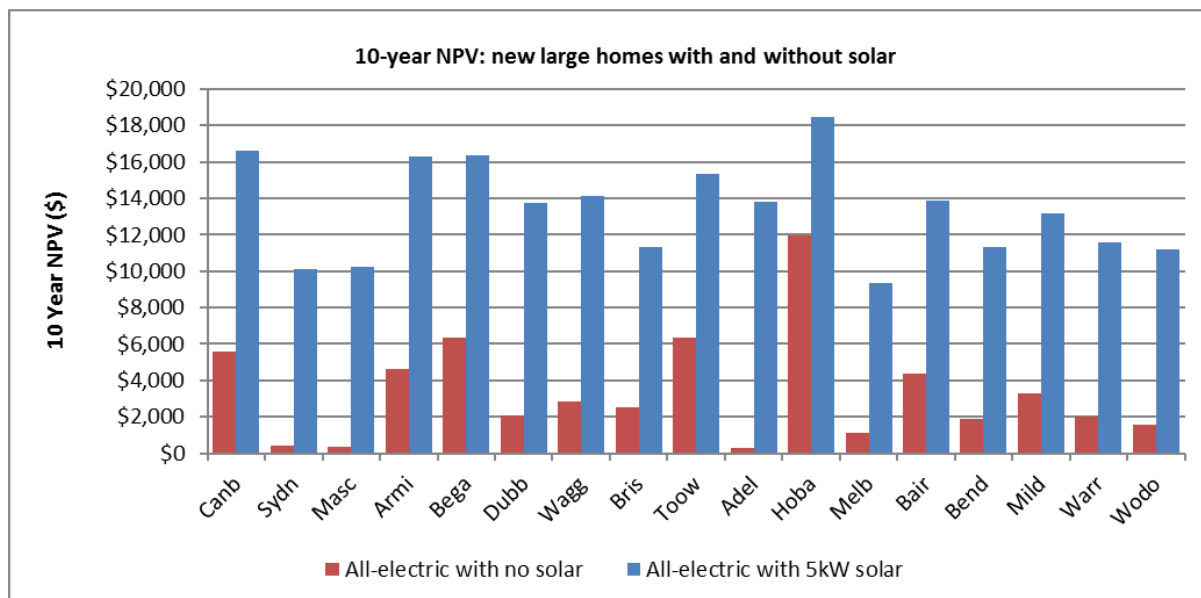


Figure 1: New homes choosing all-electric with and without 5 kW solar, over gas with no solar, 10-year NPV.

² Based on calculations for Adelaide – with greater heating loads and presumably higher gas prices than Adelaide in Mount Barker, the benefits of all-electric will be greater.

³ AGN Mount Barker Natural Gas Extension Business Case, June 2018: p. 9

Much of this value is from the solar PV. However, our analysis shows that even when compared to a dual fuel home with the same solar PV system, the 10-year NPV is still around \$1,700 in Adelaide and \$2,500 in Melbourne for all-electric over dual fuel (see Figure 2). Without solar PV, an all-electric home in Adelaide

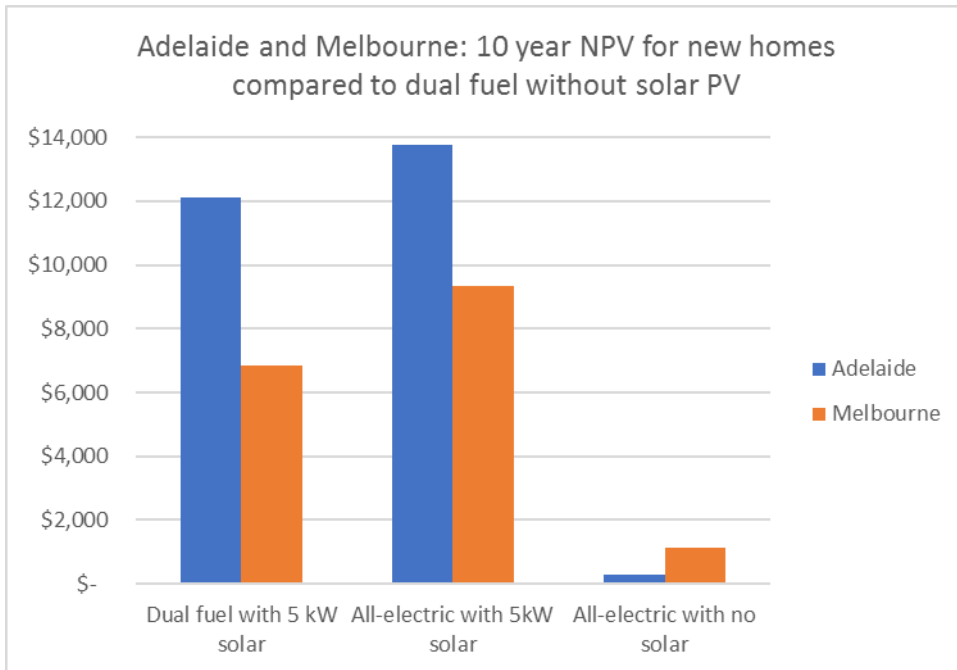


Figure 2: New homes choosing dual fuel or all-electric, with and without 5 kW solar, 10-year NPV.

The additional value of all-electric over dual fuel when both scenarios include 5 kW solar PV is not dramatic: but it still represents a typical average saving of around \$200 per year over 10 years, which is:

- a) A material benefit to households; and
- b) Significantly different to the \$900 per year saving claimed by AGN for dual fuel households.

It is not clear to us how AGN calculated that \$900 saving.

AGN particularly notes that heating is a major use case for natural gas in Mount Barker.⁴ We agree that gas is particularly favoured by residential consumers for heating. However, our research is unambiguous: heating with modern reverse cycle air conditioners (RCACs) is significantly more cost-effective than gas heating, and the more heating required, the greater the economic benefit. Figure 3 below shows the 10-year NPV of replacing an end-of-life gas heating system with multiple RCACs, even when retaining other gas appliances, in all the locations we modelled.

⁴ *ibid.* p. 11

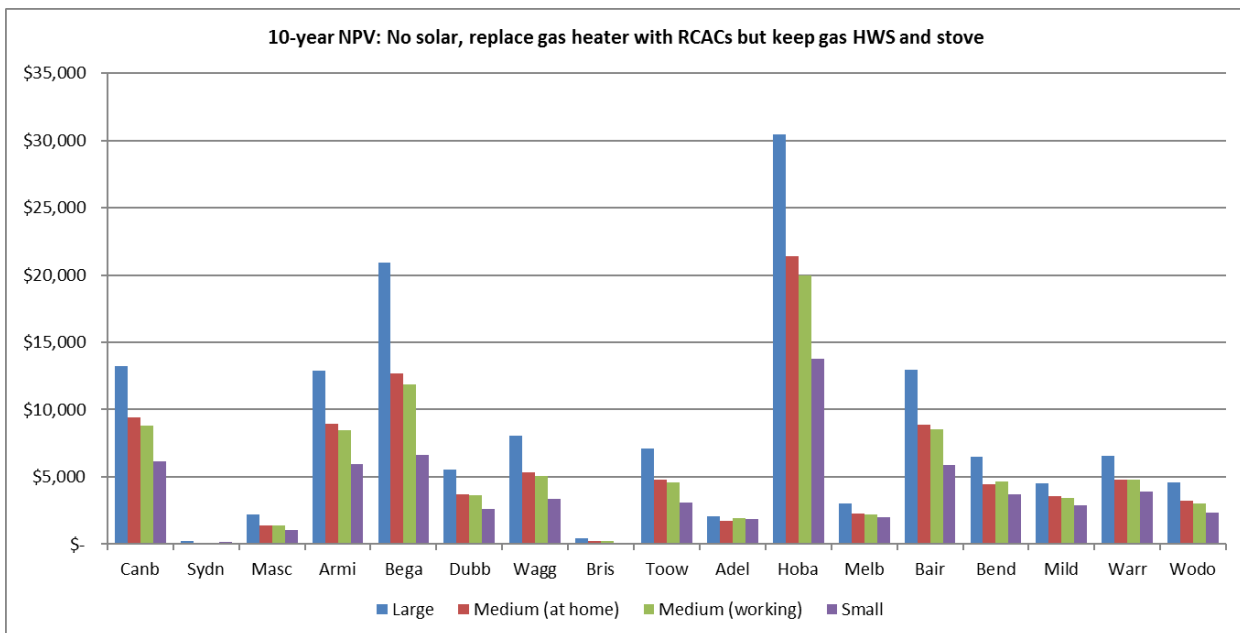


Figure 3: Existing homes replacing failed gas heating with RCACs but retaining gas HWS and stove, 10-year NPV.

Note that greater economic benefit, though affected by energy pricing in different jurisdictions, is most closely correlated with cooler climates.

In particular, because heating loads are greater and gas prices will presumably be higher in Mount Barker than in Adelaide, the economic benefits of electric appliances will undoubtedly be greater than our figures, based on Adelaide climate and prices, show.

Overall, the findings of our research suggest that AGN’s calculation of the average economic benefit to households establishing new homes with a natural gas connection rather than as all-electric is incorrect.

We also note that AGN intends to actively pursue connection of existing customers (currently using LPG or only electricity) to natural gas.⁵ Our research clearly shows that this is a poor economic choice for residential consumers.

Emissions savings

AGN also claims that there is an emissions reduction benefit by connecting households to gas. The ATA is currently conducting an emissions analysis of our fuel choice modelling. Critical to this is the recognition that while natural gas is a significantly lower source of greenhouse emissions than coal-fired electricity:

- The emissions intensity of each state’s electricity supply depends on the mix of generation – typically a combination of coal, gas, and renewables; and
- The relative energy usage of gas and electric heating, hot water, and cooking appliances – noting that heat pumps used in modern electric heating and hot water systems are typically five to six times more efficient than modern gas appliances.

Although this analysis is still ongoing, we are able to estimate the likely emissions outcome of choosing all-electric rather than gas for a large new house in Mount Barker by using the emissions intensity of the non-metro SA electricity and gas networks⁶ and gas and electric heating, cooking, and hot water consumption for Warrnambool (similar climate to Mount Barker) from our recent fuel choice report.⁷ This shows (Table 1 below) that the emissions reduction from RCACs used instead of ducted gas heating and heat pump hot water used instead of instantaneous gas vastly exceeds the modest additional emissions of electric cooking over gas. If rooftop solar is present, the heat pump hot water system further reduces emissions, assuming it is timed to operate during the day, which is the most cost-effective approach.

⁵ *ibid.*

⁶ From <http://www.environment.gov.au/system/files/resources/80f603e7-175b-4f97-8a9b-2d207f46594a/files/national-greenhouse-accounts-factors-july-2018.pdf>

⁷ ATA Household Fuel Choice in the NEM 2018 report.

MOUNT BARKER	Annual emissions saving (kgCO₂e)	Emissions savings with solar powering hot water (kgCO₂e)
RCACs instead of gas heating	1451	1451
Heat pump instead of instantaneous gas HWS	128	659
Induction/electric instead of gas stove	-24	-24
Total emissions saving from electric vs. gas	1555	2086

Table 1: emissions savings from electric appliances instead of gas in Mount Barker⁸

Conclusion

The ATA recognises that there is value for many commercial and industrial sites in having access to mains gas, and that many households value gas as a household fuel for non-economic reasons. However our research clearly shows that electricity is increasingly the most valuable fuel economically for Australian households, especially when the fixed cost of a second utility connection is avoided. All-electric homes also deliver fewer greenhouse emissions than dual fuel ones, especially in South Australia. We urge the AER to consider our findings when evaluating the business case for expansion to the gas network to Mount Barker.

Yours Sincerely



Dean Lombard
Senior Energy Analyst

⁸Based on emissions intensity of gas at 0.0726 kgCO₂e/MJ, and electricity at 0.61 kgCO₂e/kWh, using appliance energy consumption for Warrnambool as modelled in ATA *Household Fuel Choice in the NEM 2018* report.