Australian Gas Networks

Attachment 11B

Additional Support for Economic Base Case

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1 Introduction

This Attachment provides additional support for the Economic Base Case.

1.1 Base and extension case energy mix assumptions

The base and extension case energy mix and consumption reflects current development, building and consumption trends in Mount Barker and South Australia.

1.1.1 Current development and building trends

While significant credits are available for small-scale solar thermal or heat pump hot water installations (around $1,000 per system[1]), installations recorded by the Clean Energy Regulator show they are not very popular across South Australia, and have declined in popularity in recent years. There were around 2,200 installations in 2017, compared to 3,500 in 2012 and 4,000 a year on average between 2001 and 2011.

Table 1 below shows, of an estimated 800 water heater installations for the Mount Barker area each year (comprising around 500 replacements at fail and almost 300 for new home builds),[2] solar and heat pumps average 35, or just over 4% of the total 800 hot water installations. The solar installations include both gas and electric boosted.

Table 1: Clean Energy Regulator small-scale hot water installations, postcode 5251

Type of installation / Year	2013	2014	2015	2016	2017	5-year Average
Solar*	27	18	15	16	9	17
Heat pump	22	15	22	19	12	18
Total	49	33	37	35	21	35

*can be gas or electric boosted

We consider the key reasons why solar thermal and heat pump systems are not taken up in Mount Barker are:

- They are significantly more expensive to purchase and maintain;
- They don't operate as well in cooler (particularly for heat pump systems) or cloudier (particularly for solar thermal electric systems) conditions, both of which are prevalent in Mount Barker;
- Significantly larger footprint than gas only equivalent, making integration into home design more difficult; and
- Noise associated with heat pump.

[1] Based on 25 small-scale technology certificates (STCs) at $40 per certificate. Suppliers, retailers and installers usually provide discounts directly to customers in exchange for the STCs created.
[2] Assuming one in twelve of the existing 6,000 homes in Mount Barker are replacing their hot water system each year, plus almost 300 new homes installing hot water systems.

Table 2 below provides an estimate of the average cost and energy requirements of different hot water systems.

Table 2: Cost and energy comparison of hot water systems

System	Upfront cost (unit cost minus rebates plus installation)*	Maintenance (incurred once at half life)*	Economic Life (years)	Estimated energy use*	Average customer equivalent energy use	Emissions*
Gas	$1,500	$100	12	20GJ	15.4GJ	560 NG 660 LPG
Solar (gas boosted)	$4,000	$600	12	10GJ	7.5GJ	290 NG 340 LPG
Solar (electric boosted)	$4,000	$600	12	2.6-3.0MWh	2.15MWh	580
Heat pump	$3,500	$500	12	2.4MWh	1.8MWh	600

*Estimated prices, rebates, installation and maintenance costs, energy use and emissions from Tradelink, Rheem, Apricus and SA government websites

For the reasons outlined above, the most reasonable assumption for the energy mix of the average residential customer under the base case is LPG for cooking and hot water, and electricity for space heating.

1.1.2 Current gas consumption trends

The average natural gas use per customer of 27.3 GJ p.a. under the extension case is based on the average gas use of new homes in Mount Gambier, which has the most similar climate in SA to Mount Barker. This consumption level is reflective of the current uptake of different appliances for new homes.

We then looked at the typical gas consumption by appliance, as well as the saturation of appliances, to make reasonable assumptions to split the average consumption by use.

Cooking – average 3 GJ p.a. reflects the fact that most customers will install gas cooktops, some will also install connections to an outdoor BBQ area.

Hot water – average 15.4 GJ p.a. reflects that most customers install natural gas instantaneous hot water, however a small number will opt for gas boosted solar and a small number will install solar electric boosted or electric heat pump systems.

Space Heating – average 8.9 GJ p.a. for heating reflects that some customers will install gas space heating, some customers will install ducted gas heating and some will install electric reverse cycle heating. Importantly 8.9 GJ does not reflect the average use of a gas heating appliance which is around 15 GJ pa for a space heater and up to 30 GJ pa for ducted gas heating.

The gas consumption of LPG and natural gas appliances is assumed to be the same.

The electricity consumption for space heating that will be displaced by natural gas is assumed to be 0.7 MWh p.a. This is the amount of electricity required by the most efficient reverse cycle systems on the market, working in a similar climate to Mount Barker, to produce the equivalent heating as 8.9 GJ p.a. of natural gas.

1.2 Economic benefits compared to an all-electric base case

As set out above, we consider the energy mix of LPG and electricity adopted in our business case is the most reasonable assumption. However we have also considered what an alternative all-electric base case might look like for comparison to our extension case.

Electric cooktops are of a comparable cost to gas cooktops and use around 0.5MWh p.a.

The cost and energy requirements of hot water systems vary depending on the model, size, climate and hot water use patterns of the household. Based on the assumptions in Table 3 below, the Mount Barker extension case compared to an all-electric base case is expected to produce economic benefits of $7-17m.[3]

Table 3: Mount Barker all electric base case assumptions

System	% uptake	Additional upfront cost (unit cost minus rebates plus installation)	Additional maintenance cost (once-off)	Average customer equivalent energy use	CO2e	Tariff (c/kW)	NPV
Solar (electric boosted)	50%	+$2,500	+$500	2.15MWh	+20	19.25*	+$7.0m
Heat pump	50%	+$2,000	+$400	1.8MWh	+40	37.99	

*Assumed solar electric hot water is eligible for controlled load tariff, and no boost is used during peak times

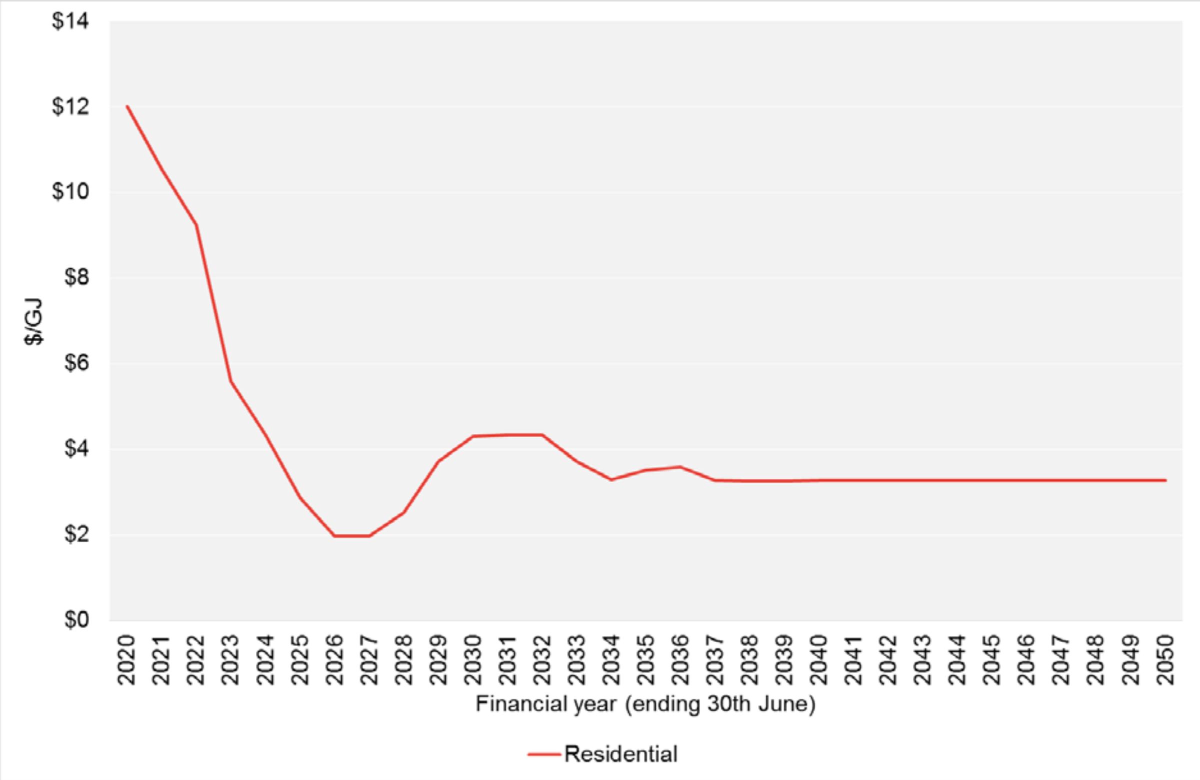
It is important to note two significant drivers of this result are:

- our weighted average cost of capital, which is used as the discount rate for all costs and benefits, including capital costs directly incurred by customers; and
- the forward outlook for significant real reductions in electricity prices.

The average price of electricity in the all-electric base case results in a willingness-to-pay per GJ that is higher than the cost of gas for all years out to 2050 as shown in Figure 1 below. The large decrease between 2020 and 2025 reflects the forward outlook for significant real reductions in electricity prices, compared to flat real gas prices over the same period.

[3] +$7m is based on solar electric hot water energy consumption at the controlled load tariff of 19.25c/kW with no boost at peak times, +$17m is based on solar electric hot water energy consumption at the average residential tariff of 37.99c/kW

Figure 1: Difference between willingness-to-pay for gas and cost of gas – switching cooking, hot water and space heating from electricity to natural gas at average prices ($2017/18)



Notes

1. *Figure 1 shows residential customers only as AGN does not expect any other customers to switch from electricity*
2. *The willingness-to-pay for gas is based on a controlled load tariff for solar hot water*

The above analysis demonstrates that under the economic benefits of the project are NPV positive by at least $7million when comparing the extension case (all gas appliances) against an alternative base case with all electric appliances.

We however reiterate that most appropriate energy mix assumed for the base case is LPG for cooking and hot water, and electricity for space heating. This energy mix reflects the current energy utilisation in Mount Barker, and the expected energy mix into the future if our proposed natural gas extension does not proceed.