

Natural gas heating versus split system heating and the current and future viability of the Natural gas network

Discussion Paper: Energy Consumer Reference Council meeting 7.

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1. Purpose of this paper

This Discussion Paper has been prepared to support the Energy Consumer Reference Council discussion of gas heating versus split system heating and the current and future viability of the gas network.

2. Introduction

Natural gas heating which comprises a significant proportion of the gas load in Canberra has to date enjoyed a large customer following in the Canberra community as a preferred home heating energy source. This has been due to many factors including cost of gas and appliances, performance, reliability, personal preference and at times seen as a greener alternative to coal fired electricity.

Some of these factors are now being challenged as a result of changes in the market including external influences such as off shore gas pricing, government policy changes, aggressive promotion by other energy market participants, competing appliance improvement, renewables and technology changes and the increase in demand for all-year round temperature control.

This is causing consumers to evaluate their use of energy sources for their particular preferences in this now more complex market. Natural gas home heating is no different and for individual consumers to be able to make an informed decision sufficient credible information needs to be available that matches their particular preferences.

No longer is cost the only or major criteria used in making the decision on the type of home heating installed.

Discussion with consumers indicates that the following criteria are just some of the considerations that a customer or potential customer takes into account when selecting home heating solutions:

- cost
- energy efficiency
- greenhouse gas or climate change impact
- reliability
- usable life
- meets specific heating requirements (e.g. zoning)
- noise
- maintenance requirements
- suitability for local climate/ performance
- aesthetics/ comfort factor/ambiance of gas flame/radiant heat

3. Canberra climate and requirements

For the Canberra consumer having relevant information available is sometimes more difficult as manufacturers and some of the efficiency labeling and testing results are frequently based on the major cities such as Melbourne, Sydney and environs and there is little understanding how this information might be translated.

Our climate is conducive to requiring both heating and cooling solutions depending on the type of dwelling the consumer resides in.

This leads many developers and consumers to consider reverse cycle air-conditioning as a package solution.

However, looking at some of the consumers criteria in more detail is this really the best solution overall?

4. Cost

Tariffs as per ActewAGL Retail as at 1 July 2015

Description	Gas	Electricity
A. 1 GJ of energy	1000 MJ	277.78 kWh
B. Retail cost of energy (inc GST) from ActewAGL	\$0.0308844 & \$0.028633 Per day rate \$0.02906/ MJ	\$0.17210/kWh
C. Maximum Efficiency of heater (stated by manufacturer)	95% (6 star gas heater)	420% (Daikin FTXM50PVMA)
D. Efficiency of heater at 0 deg (estimated)	95%	~ 250% and can be lower at lower temperatures
Total cost to heat home by 1GJ (A x B / D)	\$30.59	\$19.12

Reverse Cycle air-conditioning for heating in the ACT is approx. one third cheaper on a simplistic comparison.

Majority of this difference is directly related to the equivalent cost of energy. This comparison would not be the same for those customers in NSW as NSW electricity tariffs are considerably higher than in the ACT.

5. Climate impact (greenhouse gas emissions)

Description	Gas	Electricity
A. Efficiency of heater at 0 deg (estimated)	95%	~ 250% - Can be even lower in minus temperatures
B. Greenhouse gas emissions from different technology	184 gCO ₂ eq/kWh	820 gCO ₂ eq/kWh (assuming electricity is generated by burning coal)
Total GHG emissions to heat home by 1 GJ (277.78 x B / A)	54 kg CO ₂ eq	91 kg CO ₂ eq

<http://www.environment.gov.au/system/files/resources/b24f8db4-e55a-4deb-a0b3-32cf763a5dab/files/national-greenhouse-accounts-factors-dec-2014.pdf>

This shows that gas emissions are 50% less or half those from electricity generated by burning coal.

This is consistent with the view of natural gas as a transition fuel in a greenhouse gas constrained economy.

Wood – 16.2 MJ per kilogram and the efficiency of a slow combustion heater will be around 60% (a bit better for some of the newer ones but far worse for old "pot belly stoves" etc).

6. Energy efficiency

The gas industry has been working on making their systems and processes energy efficient and reduce greenhouse gas emissions the same as any socially responsible industry.

One area immediately evident to the customer is the increased efficiency of appliances with many early ducted heaters being 1 star up to 1990 and in 2015 5 to 6 star is the norm. This evolution has reduced the average annual gas consumption and has kept gas energy bills down for those that have installed the more efficient units.

A customer making a comparison of their energy bill with a one star unit and comparing that to a six star gas ducted unit or a reverse cycle air conditioner is going to see a significant reduction in their bill.

Although gas appliance manufacturers are reaching a maximum efficiency in the gas units, there are always innovations that increase efficiency over time and I see these continuing for some time yet. Some examples are zoning, remote switching, more precise and smart controllers, insulated ducting.

7. Reliability

Reliability of the appliance to perform in the conditions that prevail is important to consumers. Most want to be able to set and forget (unless you are an engineer) and they expect the performance and reliability to deliver what is promised?

Reliability is reliant on the gas network performance and on the appliance. Gas heaters have few moving parts and have a good long life as is evident by the number of 1 star units still functioning effectively in Canberra after 20 to 25 years of operation.

8. Usable life

The performance of gas heaters does not deteriorate significantly over time. Air conditioning units do not appear to have the life or maintain levels of performance without maintenance that may include re gassing the system.

Note: loss of refrigerant gas that requires regassing adds significantly to the greenhouse gas emissions of an air conditioning unit.

9. Meets specific heating requirements (e.g. zoning)

To be able to manage energy use effectively particularly for large houses, being able to restrict heating to areas that are being used is a good way of limiting energy use. New gas installations have this capability. They are also able to heat rooms to different temperatures to suit consumer preferences.

10. Noise

Noise is a factor for some consumers as being in small units with the split system main unit close by or even being a neighbor where a unit is close by can be annoying.

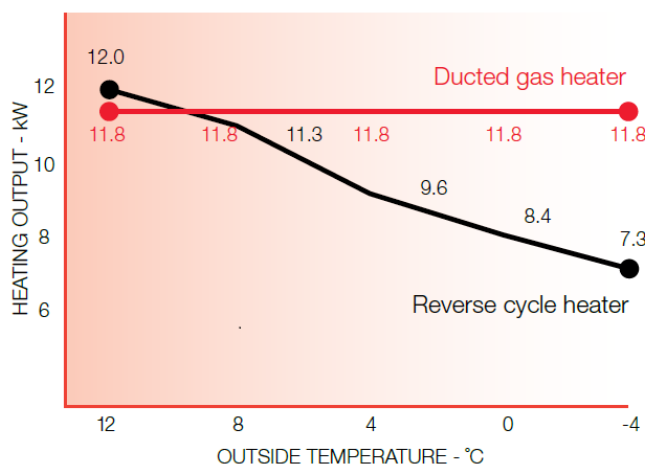
11. Maintenance requirements

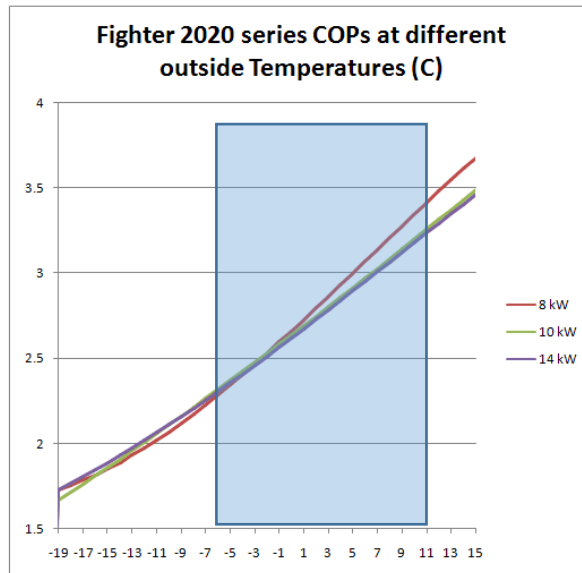
As mentioned in reliability, maintenance requirements may be a consideration for consumers.

12. Suitability for local climate/ Performance

Gas ducted heating performs to the full specification from the time you or the controller turns it on. Attaining the setpoint is usually rapid depending on the starting point temperature. Reverse cycle air-conditioning takes a reasonable length of time to come up to temperature again depending on the starting temperature and does not perform at full efficiency till they reach temperature. A gas heater's higher temperature output also adds to comfort levels as there is less likelihood of cold draughts when heating units are operating.

Performance of reverse cycle air-conditioning in the Canberra climate is also less efficient at low temperatures generally below 7 Degrees outside temperature. Humidity at low temperatures can also degrade performance. Gas heating is not subject to this lowering of performance. See Diagrams below.





13. Aesthetics/comfort factor

Many consumers that have gas heating prefer the type of heat natural gas heating provides and describe it as cosy. I will leave this to the individual to consider.

14. Seasonal use winter and summer

One important issue that should be considered in this comparison is the cooling side. If people are buying a reverse cycle air conditioner then it is most likely they will use it for cooling in the Canberra climate. We should then compare the total energy load over the heating and cooling days to get a fair comparison of the most efficient total energy usage and cost.

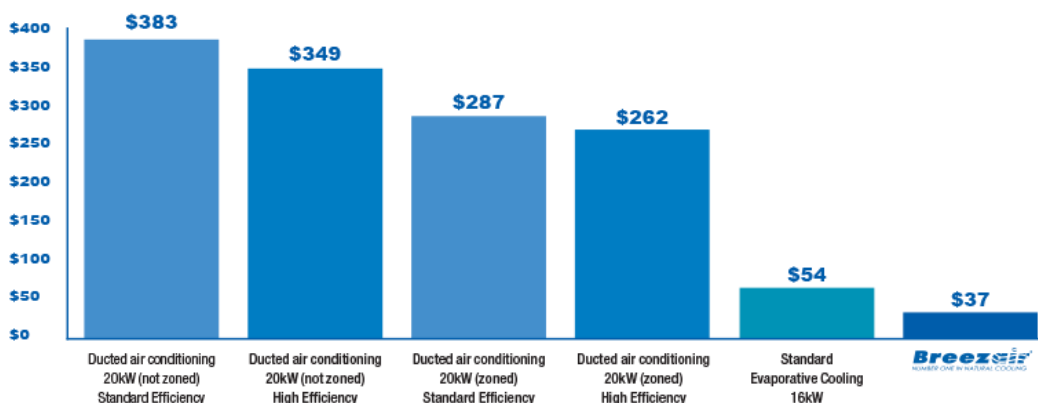
To do this comparison I have used ducted gas heating (as above) and evaporative cooling compared against the reverse cycle heating (as above) and cooling.

15. Cost comparison

Using a simple comparison made for the Victorian market we get an idea for the difference in magnitude of the running costs of the evaporative against the reverse cycle air conditioner in various configurations as in the table below. This cost saving can be directly off set against the heating costs in winter for gas.

Canberra's dry summer climate is ideally suited to evaporative cooling and the effectiveness and efficiency of the latest units is very high.

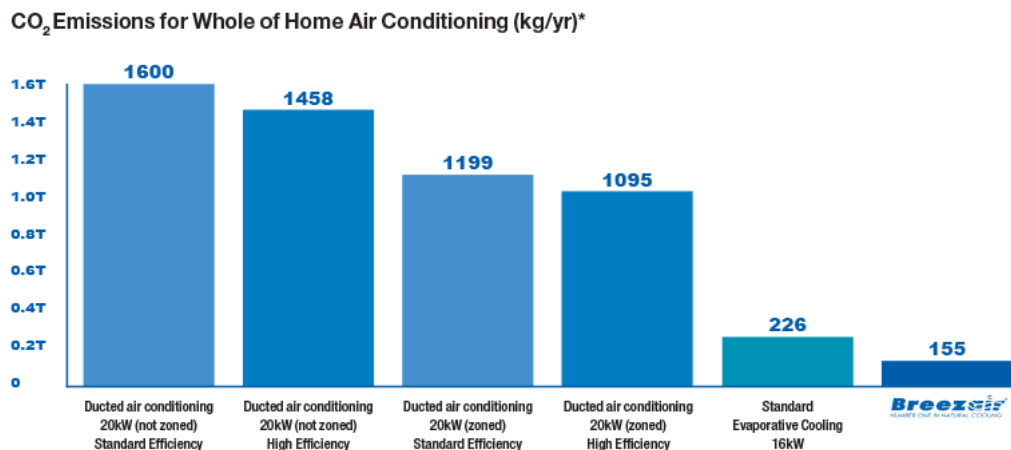
Annual Running Costs for Whole of Home Air Conditioning



16. Climate impact

By using small amounts of electricity to run the unit the greenhouse gas emissions are minimal and can be eliminated if solar power is used to drive the fan and pump.

Table below provides an indication of the greenhouse gas emissions.



17. Summary of comparison

Evaporative Cooling	Reverse Cycle Cooling
- Economical to operate	- Higher-cost to operate
- Energy efficient	- Higher energy usage
- Best used in hot, dry climates	- Effective in any climate
- Fresh, clean air	- Recirculated air
- Inexpensive installation	- More up front installation costs
- Minimal maintenance required	- Regular cleaning needed
- Very low CO ₂ emissions	- Higher emissions comparatively
- Adds moisture to the air	- Removes moisture from the air
- Allows for open windows and doors	- Effective in enclosed space
- Quiet operation	- Some are noisy when running

18. Other ActewAGL Distribution considerations

ActewAGL Distribution is looking into other areas that may provide a sustainable future for the network in Canberra.

The viability and availability of biomethane is being considered as a renewable gas energy source.

Other efficient methods of heating that are more aligned to the new building designs such as hydronic heating are also being investigated.

Current forecasts for the electricity network are based on natural gas remaining a viable alternative to electricity since moving the load from gas to electricity would require significant infrastructure spending to manage this extra load on the electricity network.

It will also be more difficult for the ACT to achieve its 90% renewable energy target as this is based on current load and growth for the electricity network.

19. Conclusion

The selection of appropriate heating in Canberra that is both cost effective and meets the wants and needs of particular consumers is a complex and very individual choice.

Unfortunately there is a lot of information in the public domain that is centered around promoting a particular choice (for whatever reason) rather than providing suitable information that allows the consumer to make an informed decision.

Many consumers are satisfied with the experience they have to date with their heating installation and elect just to upgrade to a more efficient model with possibly more functionality and do not evaluate all possibilities available against each other. It is important that gas continues to provide a realistic and competitive alternative to electricity else there will be a reduced choice for the consumers and reduced competition which keeps prices down.

Given the infrastructure we have in place and the downside of moving from gas to electricity in the short to medium term it is important to keep gas as a viable alternative. This is the challenge that confronts ActewAGL Distribution. I look forward to further discussion on this important matter to us all.