

Replacing household gas heaters avoids Victorian winter gas shortfalls



Image: household gas heater. Credit: Fogarty Avenue (Flickr)

KEY POINTS

- Victorian gas production is forecast to decrease in the years to come.
- The key challenge will be meeting peak consumption during winter, which is driven by residential space heating.
- AEMO forecasts shortfalls of 27 terajoules per day (TJ/d) for 1-in-2-year events and 153 TJ/d for rare 1-in-20-year events.
- The Victorian government has announced a program to replace 250,000 residential heaters over the next four years, amongst a range of other energy efficiency and electrification policies.
- Our calculations show this heater replacement program alone will reduce gas consumption by 33-34 TJ/d – enough to avoid shortfalls in 1-in-2-year events.
- Broader electrification of households could help avoid shortfalls in 1-in-20-year events.
- This Victorian government program and other energy efficiency and electrification policies demonstrate that gas usage is likely to fall significantly over the coming decade, calling into question the need for new supply projects such as AGL's proposed Crib Point gas import terminal in Westernport Bay.

Background

Victoria for a long time has had access to plentiful and affordable gas. Paired with support from successive Victorian governments, Victoria became the state with the highest rate of household gas connections (83%) and the highest average household gas consumption (around 60 GJ per year) in Australia.¹

Victoria's gas production is forecast to substantially decrease as some of the state's legacy gas fields in Bass Strait are expected to cease operations within the next 5 years.

The prevailing narrative – from many in the media as well as government agencies such as the ACCC – is that Victoria has a supply problem and that to increase energy security we need to increase gas supply in Victoria. However, this narrative (and the analysis and assumptions underlying it) routinely ignores the possibility of addressing falling supply through reducing demand.

Analysis by Northmore Gordon (commissioned by Environment Victoria) has previously shown that efficiency and electrification policies could reduce gas consumption by enough to avoid forecast annual shortfalls. This paper looks at the role of household electrification in avoiding forecast seasonal shortfalls – that is, in winter, when demand is highest.

Snapshot of Victoria's gas consumption

Victoria's gas consumption is divided between residential (39%), industrial (37%), commercial (14%) and gas powered generation (10%).² Despite how often commentators bring up the importance of increasing gas supply for electricity generation, the reality is that it is a small fraction of Victorian gas consumption.

The vast majority of residential gas consumption correspond to space heating (69.2%) followed by water heating (27.9%) and the remainder is used for cooking. Space heating and hot water can be cost-effectively replaced with heat pumps. For example, reverse-cycle air conditioners, which due to their high efficiency are cheaper to run than gas appliances.³

According to energy efficiency consultancy Northmore Gordon, there are more than 600,000 ducted gas systems in Victoria that are over 20 years old. Replacing them with efficient heat pump systems would deliver benefits to these households and to the environment.⁴

Peak gas demand and potential shortfalls

Gas demand is highly seasonal. During winter months cold temperatures increase the demand for space heating for residential and commercial use. Since the use of gas for space heating is commonplace in Victoria, winter peak day demand is around 3 times higher than peak summer demand.

The forecast reduction in gas supply is expected to raise energy security concerns only during winter months.

According to AEMO's estimates, Victorian production capacity will reduce from 1,214 terajoules per day (TJ/d) in 2020 to 631 TJ/d in 2024 (i.e. it would decrease by 586 TJ/d).

AEMO also forecasts that by 2024 Victoria would have a daily production shortfall of 27 TJ/d on a 1-in-2 peak day and a 153 TJ/d shortfall on a 1-in-20 peak day (see Figure 1 below). A 1-in-20 event is a rare occurrence in a particularly cold winter.

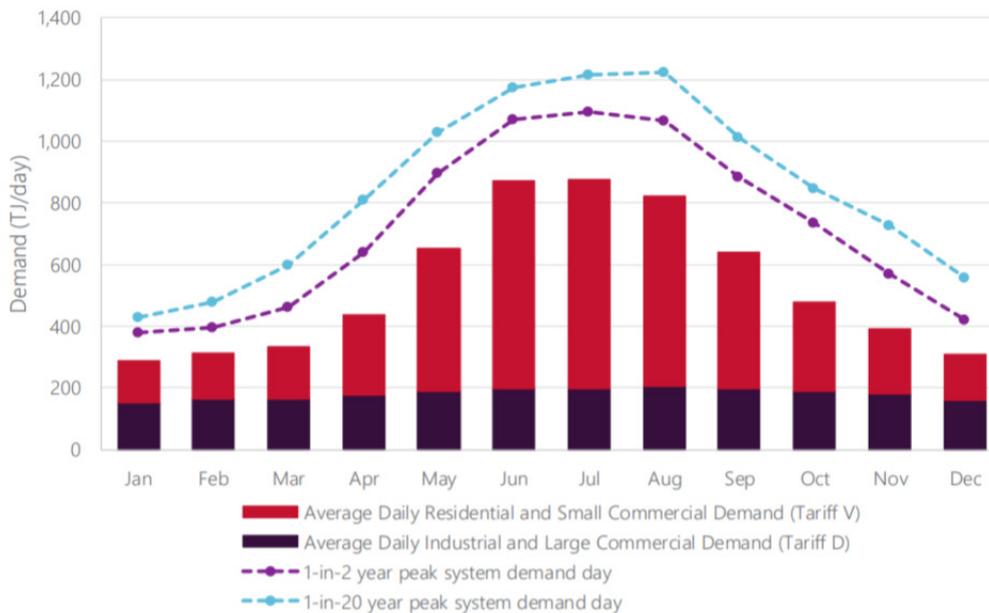


Figure 1: Average daily demand compared to peak day system demand forecasts

Source: 2020 Victorian Gas Planning Report – Update (2020)⁵

FOOTNOTES

- <https://www.energy.gov.au/publications/gas-price-trends-review-report-2017>
- https://www.energy.gov.au/sites/default/files/gas_price_trends_review_2017.pdf
- https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf
- <http://environmentvictoria.org.au/wp-content/uploads/2020/06/Vic-Gas-Market-Demand-Side-Study-Final-Report-1.pdf>
- <https://aemo.com.au/en/energy-systems/gas/gas-forecasting-and-planning/victorian-gas-planning-report>

New Victorian policies will significantly reduce gas consumption

The 2020-21 Victorian budget featured major announcements to improve energy efficiency and lower power bills. Of particular interest is a \$335m program to replace 250,000 old heaters, including gas fired heaters.

This program will provide a base rebate of \$1000 towards the cost of installing high efficiency electric heating (average cost

\$1700)⁶ and, according to Solar Victoria's website, households that replace gas heaters are expected to save around \$300 a year. The program is due to be completed within four years.

Using data from the Australian Energy Regulator on energy consumption benchmarks for gas,⁷ we calculate that the average daily winter consumption for residential space heating in Victoria for households of 2 and 3 people are 200 and 205.4 MJ respectively (the average Victorian household size⁸ is 2.55).

	2020	2021	2022	2023	2024
Total supply capacity (including Victorian LNG)	1,781	1,746	1,703	1,576	1,238
DTS available supply including pipeline constraints	1,508	1,457	1,442	1,431	1,093
1-in-2 peak DTS system demand	1,136	1,136	1,135	1,131	1,131
Surplus/shortfall quantity on 1-in-2 peak day	372	321	306	327	-27
1-in-20 peak DTS system demand	1,249	1,252	1,252	1,245	1,246
Surplus/shortfall quantity on 1-in-20 peak day	259	205	190	185	-153
Anticipated supply projects including constraints		73	82	82	87

Table 1: Forecasts DTS peak day supply adequacy excluding GPG, 2020-24(TJ/d)

Note: totals may not add up due to rounding. DTS peak day demand in this table is slightly lower than the 2020 GSOO Victorian peak day demand forecast, due to non-DTS Victorian gas demand.

Source: 2020 Victorian Gas Planning Report – Update (2020)⁹

Household size	Gas heater?	AVG daily consumption (total)	AVG daily winter consumption (for heating)
2	Yes	323.0 MJ	200.0 MJ
2	No	123.0 MJ	-
3	Yes	340.6 MJ	205.4 MJ
3	No	135.2 MJ	-

Table 2: Average daily Winter consumption in Victorian Households

Source: Energy consumption benchmarks electricity and gas for residential customers (2017)¹⁰

FOOTNOTES

6 <https://www.solar.vic.gov.au/heaters>

7 <https://www.aer.gov.au/system/files/ACIL%20Allen%20Energy%20benchmarks%20report%202017%20-%20updated%205%20June%202018.pdf>

8 9 Households with 2 and 3 inhabitants are used as a reference as according to the 2016 Census the average Victorian household size is 2.55. Further, there are more than 688,000 single-dwelling households and almost 345,000 2-person dwellings. We could not find publicly available information on whether there is a size difference between households connected to the gas network and those which are not.

9 <https://aemo.com.au/en/energy-systems/gas/gas-forecasting-and-planning/victorian-gas-planning-report>

10 <https://www.aer.gov.au/system/files/ACIL%20Allen%20Energy%20benchmarks%20report%202017%20-%20updated%205%20June%202018.pdf>

66.2% of Victorian households currently use gas as their main source of space heating. If 66% of the 250,000 rebates are taken up by homes with gas heaters, we could expect at least 165,000 households to switch from inefficient gas space heating to efficient electric heaters over the next four years.

As shown above, the amount of gas used by space heaters in the average Victorian home is 200-205 MJ per day in winter. Switching 165,000 gas heaters would translate into a decrease of 33-34 TJ per day on daily winter gas consumption – more than enough to avoid the forecast 1-in-2 year peak event shortfall of 27 TJ per day (see Table 3).

Replacing all of the estimated 600,000 gas heaters in Victoria that are over 20 years old would reduce peak winter day consumption by over 120 TJ per day – by itself nearly enough to prevent Victoria's potential shortfall in a 1-in-20 scenario.

These calculations are an underestimate of the likely fall in gas consumption over coming years, as it only takes account of one government program.

A range of other significant energy efficiency and electrification policies and programs exist in Victoria, such as the recently expanded Victorian Energy Upgrades Program,¹¹ energy efficiency upgrades to 35,000 social housing units,¹² and funding for upgrades in businesses, hospitals and other government buildings,¹³ meaning the state's diminishing need for gas will occur even faster than indicated here.¹⁴

Household electrification can avoid forecast peak-day gas shortfalls

Based on the average winter daily gas consumption in households with 2 and 3 inhabitants, our calculations show that electrifying 500,000 households would reduce average daily winter gas consumption by 160-170 TJ/d – enough to overcome the (low probability) forecast 1-in-20 peak day event shortfall of 153 TJ/d (see Table 4).

Household size	AVG daily consumption in MJ	Disconnecting 165,500 gas heaters (TJ)	Disconnecting 250,000 gas heaters (TJ)	Disconnecting 600,000 gas heaters (TJ)
2	200.0	33.1	50.0	120.0
3	205.4	34.0	51.4	123.2

Table 3: Impact of replacing gas heaters with efficient electric heaters on Victoria's daily average winter gas consumption

Household size	AVG winter daily consumption in MJ	Impact on daily average winter consumption of:				
		Disconnecting 100,000 gas households (TJ)	Disconnecting 200,000 households (TJ)	Disconnecting 300,000 households (TJ)	Disconnecting 400,000 households (TJ)	Disconnecting 500,000 households (TJ)
2	323.0	32.3	64.6	96.9	129.2	161.5
3	340.6	34.1	68.1	102.2	136.2	170.3

Table 4: Impact of disconnecting households from the gas network on Victoria's daily average winter gas consumption

FOOTNOTES

- 11 <https://www.energy.vic.gov.au/energy-efficiency/victorian-energy-upgrades/about-the-program>
- 12 <https://www.premier.vic.gov.au/helping-victorians-pay-their-power-bills>
- 13 <https://www.eec.org.au/news/eec-news/article/victorias-massive-energy-management-investment-to-drive-jobs-boom>
- 14 The reduction in peak consumption would also likely be even higher as the reduction was calculated using the average daily winter consumption rather than peak day winter consumption. This is because there is no publicly available information on average household consumption on a 1-in-2 or a 1-in-20 peak day.

Demand-side solutions reduce the need for supply

Based on the average winter daily gas consumption in households with 2 and 3 inhabitants, our calculations show that electrifying 500,000 households would reduce average daily winter gas consumption by 160-170 TJ/d – enough to overcome the (low probability) forecast 1-in-20 peak day event shortfall of 153 TJ/d.

Recent electrification and energy efficiency policies announced by the Victorian government are a major step in the right direction. The scale of just one government program will have a material impact on the gas market, decreasing winter gas consumption sufficiently to avoid the most common seasonal shortfall.

This clearly shows that demand-side measures are an important alternative to new sources of gas supply.

One proposed new source of gas supply is AGL's Crib Point gas import terminal project, which is in the final stages of its environmental assessment, with a decision from the Victorian Planning Minister due at the end of March 2021. The proposed site in Westernport Bay is within the boundaries of an internationally significant and Ramsar-listed wetland, and AGL's core justification for the project is to meet a projected gas shortfall in winter.

However, as this research demonstrates, recently announced Victorian government programs can significantly reduce gas demand, enough to comfortably avoid the most likely 1-in-2 year gas shortfall. This seriously weakens AGL's case for additional supply.

The trend towards improved energy efficiency and greater rates of electrification is only going to accelerate, bringing benefits to consumers and the environment.



Image: wind turbines