Submission to: The Legislative Council Environment and Planning Committee Inquiry into Unconventional Gas in Victoria - 10th July 2015

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Summary

This submission responds to the terms of the inquiry, to examine the potential benefits and risks of developing unconventional gas. It points out that the potential benefits, if any, will be short lived and that the potential risks are significant and long lasting.

The potential benefits, as perceived by supporters of unconventional gas, are predicated on three invalid assumptions relating to future demand and price of gas. These flawed assumptions are discussed. The potential risks relate firstly to water contamination and land use of prime agricultural land. The risks of substantial fugitive emissions are also explored and shown to be a cause of extreme concern to anyone who wishes to embark on a serious policy of emissions reduction in response to climate change.

On the perceived potential benefit: holding down the gas price

Many observers and economists have predicted continued increases in the price of gas to the retail market. It has been argued that the interests of Victorian consumers would best be served by increasing the supply of gas to the market, on the assumption that price increases in this market are driven primarily by the supply:demand ratio.

This argument ignores three major facts. In the first place, the forecast price increase of gas in Australia is due to the local gas market's linkage with the much larger international market. Thus the much higher international price of gas will determine the price on the domestic market. The second fact ignored is that the cost of unconventional gas production is, almost by definition, more costly. Such gas can only find a market when the retail price can absorb that additional cost. Thus, the development of unconventional gas is predicated on a higher market price than currently prevails in Victoria.

The third fact ignored in the argument supporting unconventional gas development is found in the assumption that gas will continue to outcompete electricity as the preferred energy source for heating. Until now, most Victorians have used gas, both for space heating and for heating of hot water. This is because gas has traditionally been significantly cheaper than electricity for heating.

This is no longer the case. Due mainly to the availability today of much more energy efficient reverse-cycle air conditioners (RCACs) for heating with a high coefficient of performance (COP), it is already significantly more cost effective for Victorians to use RCACs for heating than gas ducted gas heating systems. The cost comparison given in the APPENDIX shows the energy cost for space heating with electricity is approximately 30% of the cost for ducted gas heating. This translates to a savings of 70% on energy costs for space heating based on the conservative figures used in the sample calculation. Applicable tariffs may vary slightly; the writer has used currently available tariffs (See APPENDIX). The actual savings can be greater if top of the range air conditioners are installed. This large disparity in operating cost can only increase with increasing exposure to the international market.

Similarly, significant energy cost savings can be achieved today for water heating by installing an electric heat-pump hot water system in preference to a gas fired hot water system. The energy savings, taken conservatively, would be of the order of 65%.

Taken together, and using the figure of $2,800 as typical of the annual Victorian household energy spend, from a recent report by Sustainability Victoria (Ref. 1), the savings to be achieved by using the above electrical systems in preference to gas systems is about $907 or 32% of the current annual energy bill.

The general public are not currently aware that such a significant difference in efficiency and coefficient of performance translates to potentially large savings of energy costs. Vested interests are unwilling to recognize this new reality. That notwithstanding, many informed individuals are already moving away from gas. The writer has made the change and can testify to the savings and knows of several colleagues who have done likewise.

Those who have recently invested in gas hardware are unlikely to change over in the short term, but those building or renovating will increasingly turn to RCACs for space heating as well as solar or heat-pump systems for heating water. Gas appliances in general are destined to become a thing of the past, sooner than the fossil fuel industry would like to admit, simply because of the higher running costs that increasingly will be associated with using gas.

On the risks of contamination of water supplies and agricultural land

The infrastructure necessary for CSG exploitation is extensive. The functions cover handling and use of large quantities of hazardous chemicals, the hydraulic fracturing process including the release of contaminated water and unknown quantities of fugitive emissions, storage and treatment of contaminated water, construction of a network of access roads to wells and other facilities, construction of a pipe network, gas transport and gas processing at a central processing plant. When such functions take place in a farming environment, there are profound impacts on farming and risks of spillage, leakage and contamination to land and water supplies.

The Sydney Catchment Authority recognized the potential for such impacts in its 2012 review of coal seam gas impacts on water resources (Ref. 2). The report acknowledges that,

> 'The major impacts of CSG activities on surface and groundwater include depletion of groundwater resources, contamination of surrounding aquifers, and contamination of the surface water and alteration of surface hydrology of the impacted region.'

Yet the report goes on to minimise these risks and claim they are manageable.

The NSW Farmers Association takes these risks more seriously. In a submission to the NSW Parliament Inquiry into CSG of 2011 (Ref. 3), they stated,

> 'The physical infrastructure associated with coal seam gas exploration and extraction is incompatible with modern farming practices.'

The 39-page submission details their concerns and includes a list of 32 recommendations to the NSW government to guide policy development governing CSG exploration. The first of those recommendations is that the government should heed the advice of the National Water Commission and take a precautionary approach to CSG development, to safeguard surface and groundwater resources.

Given the increasing vulnerability of Australia's water resources due to climate change, the relevance of observing the precautionary principle is most pertinent.

It is revealing, that when Santos took over CSG test drilling sites in the NSW Piliga in 2011, it reported on a dozen incidents of pollution under the previous operator, only one of which had previously been reported to authorities, according to a Mining Australia report in 2013 (Ref. 4). The Sydney Morning Herald (SMH) is mentioned as putting the number of such incidents at 16.

Later, Santos itself was found guilty of a spillage incident in 2014. Environmental group, Lock The Gate published an EPA investigation (Ref 5) in which the extent of the damage from that spill was detailed, including the contamination of two separate aquifers. Lock the Gate added their own commentary also (Ref. 5).

The NSW Chief Scientist, Mary O'Kane is quoted in the SMH in 2014 (Ref. 6) as saying,

> 'The risk to human health and the environment posed by coal seam gas can be managed, but 'unintended consequences' due to accidents, human error and natural disasters are inevitable'.

The areas being considered for CSG exploration in Victoria are both more heavily populated and more intensively farmed than affected areas in Queensland and NSW. The inevitable 'unintended consequences' referred to by the NSW Chief Scientist will therefore effect a larger population and do much greater economic and environmental damage than in more sparsely populated and less intensively farmed areas. These concerns alone should be sufficient to warrant raising the red flag against CSG exploration in Victoria.

On the risks of high levels of fugitive methane emissions

In recent years, abundant evidence has come to light of far greater levels of fugitive emissions from CSG activity than was previously believed. Some of this evidence was collated, reviewed and summarised in a fact sheet issued by Beyond Zero Emissions (Ref. 7).

Previous estimates of fugitive emissions were based on those occurring at the point of combustion. The error in this simplification may have been only slight when talking of conventional gas production in large volumes at central industrial locations. However the CSG production process is spread over a large scattered network encompassing a range of activities from initial exploratory drillings at multiple sites, sinking of multiple production wells, transport of gas via an interconnected network of hundreds of kilometres of pipes and control devices and processing at a central processing plant. There is evidence of varying degrees of leakage taking place at all of these production stages.

As reported in Scientific American last year (Ref. 8), two recent studies have shown that, on a global scale, gas fields may be leaking enough methane to make the fuel as polluting as coal for the climate.

Methane, as a green house gas, is far more polluting than carbon dioxide, particularly when considered within the 20-year time frame within which the science says we must take effective action to cut emissions. Taken on a 20-year time scale, NASA has estimated it to have a global warming potential 105 times that of carbon dioxide (Ref. 9).

Until now, governments and industry have tended to regard natural gas as an ideal 'transition fuel', between coal and renewables. That the gas industry should continue to believe this

outdated concept is a matter of self-interest. Governments, however have a responsibility and a duty of care to all their citizens to take effective action to minimise climate change. In relation to energy policy, that responsibility and duty requires them to discriminate against fossil fuels in favour of renewables. Methane gas production is just as damaging, and conceivably more so than coal. Promotion of gas can only be at the expense of renewables.

Conclusions

1. Electricity has already eclipsed gas as the most cost-effective energy source for heating. It is inevitable that demand for gas will start to decline once this is generally recognised. It makes no economic sense today to invest in gas as a future fuel source.
2. CSG activity will have a detrimental effect on farming activity in its vicinity, due to inevitable contamination over time of land and water resources. It will similarly be to the detriment of environmental assets.
3. CSG activity results in fugitive emissions of sufficient magnitude to represent a significant contribution to Australia's real greenhouse gas accounts. No government serious about climate change can approve of such activity.

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APPENDIX

Ducted Gas Heating vs Reverse-cycle A/C Heating
Sample Cost Comparison

The following compares the unit energy cost of 100 energy units of heat output by a ducted gas system with the unit energy cost of the equivalent heat output by an electrically driven reverse cycle air-conditioner.

Tariffs used are those recently available to the writer at Powershop and Lumo. gas units expressed in mega-joules (Mj) are converted to kWh using the formula: 3.6 MJ = 1.0 kWh

1. Power cost for a residential ducted gas heating system

Assume unit gas cost = 2.0c per MJ = 2.0*3.6(kWh) = 7.2 c/kWh.
The above includes a service charge contribution.

Efficiency of a typical gas ducted heating system is roughly 33%[1]. For every 300 energy units of input, there are typically 100 units of flue losses and 100 units of duct losses, with delivered heat to the vent being the remaining 100 units.

Therefore, to provide one hundred energy units of useful heat output requires an energy input of 300 energy units.

Cost of 300 kWh (heat units) of gas @ 7.2c per unit = $21.60

2. Power cost for heating by a reverse cycle air-conditioning unit

Assume a unit grid electricity charge of 26c/kWh.
The above includes a service charge contribution.

Coefficient of performance (COP) of an average modern system is typically about 4.0[2].

Therefore, to provide one hundred energy units of useful heat output requires an energy input of 25 units.

Cost of 25 kWh (heat units) of grid electricity @ 26c = $6.50

3. Conclusion

The percentage cost of the electricity consumed relative to the cost of the gas consumed for the same heating benefit is: [650/2160] x 100 = 30% (A cost savings of 70%)

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[1] The efficiency of ducted gas heating is discussed in the Zero Carbon Australia Buildings Plan (2013) published by the Melbourne Energy Institute in collaboration with Beyond Zero Emissions.

[2] See: http://www.currentforce.com.au/coefficient-of-performance/ A COP of 4 means that the ratio of the heat energy produced relative to the electrical energy consumed is 4. That is achieved by harvesting 'free' ambient heat from the air passing through the system. The best systems on the market today have a COP better than 4 Give an commercial example here. Divide output energy by input energy to obtain COP in the table at: http://reg.energyrating.gov.au/comparator/product_types/64/search/