NAGA Discussion Paper - Gas as a transition fuel

May 2014

Introduction

This position paper has been developed by NAGA to better inform its members about changes in the Australian natural gas market. NAGA member councils have been actively investigating, and in some cases installing gas-powered cogeneration for buildings and aquatic centres.

This paper examines the issues surrounding gas as a transition fuel as society moves away from coal-fired generated electricity towards greater reliance on renewables. Specifically, it outlines likely changes to the supply and demand of both conventional and unconventional gas in eastern Australia, and the implications for the domestic price and environmental impact of gas.

The issues surrounding gas supply in Australia are changing rapidly and it is recommended that this position paper be re-visited within 12 months.

Background

Electricity generation in Victoria is dominated by brown coal fired power stations, resulting in high greenhouse gas emissions associated with electricity use. By contrast, electricity produced by gas fired power stations has a lower greenhouse coefficient than brown coal.

Gas can be extracted from both conventional and unconventional sources. Conventional sources take the form of large underground basins from which gas can be directly extracted with little obstacle. By contrast, unconventional sources are characterised by gas existing in multiple pockets which are not necessarily joined together. As the Grattan Institute explains:

> "Imagine trying to get all of the air out of a hollow chocolate Easter egg. Now, imagine trying to get the air out of a chocolate Aero bar, where it is trapped in small bubbles between the chocolate. The analogy illustrates the differences between extracting gas from conventional and from unconventional gas reservoirs."[1]

Unconventional gas development in Australia draws on resources of coal seam and shale gas; in this process, gas is extracted by hydraulic fracturing, or fracking, in which liquid is injected into the gas reservoir to break up surrounding rock, allowing the gas to flow more freely.

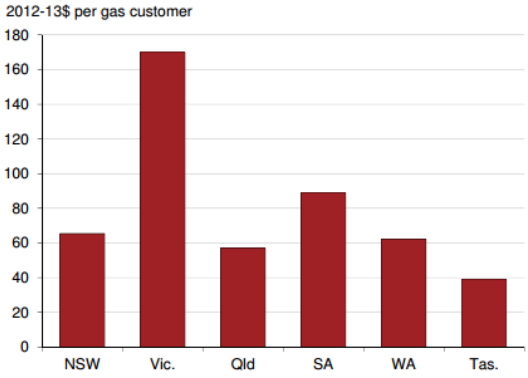
[1] Wood, T. & Carter, L. 2013 *Getting gas right: Australia's energy challenge*, Grattan Institute, Melbourne.

Gas Prices: Supply and Demand

Victoria currently sources conventional gas from the Bass Strait, Gippsland Basin and Otway Field, which is sufficient to meet the state's domestic and manufacturing needs as well as export some gas to New South Wales. There is currently a ban on the development of unconventional gas sources although the state government has signalled that this may be coming to an end.[2] Victoria has sufficient unconventional gas reserves from shale alone enough to meet the state's needs for 30 years.[3]

The major change is opening up the gas supplies of eastern Australia to the export market. Currently, the domestic and export markets are separate with wholesale gas prices much lower on the domestic market; current domestic prices range between $3 and $4 a gigajoule while international prices range from $8 up to $15 a gigajoule in Japan.

The issue for domestic users will not be a lack of overall supply; rather it will be likely that gas producers will seek higher prices through export sales. Higher wholesale gas prices are predicted to add an extra $170 a year to the gas bill of the average Victorian household, as set out at right.[4] Victorians are particularly exposed to sudden price hikes due to an extensive gas distribution network delivering to a higher number of homes than in other states, and higher heating needs than most states due to colder winters.



Note: Assumes volumes remain at 2009-10 levels in 2020.
Sources: ABS (2011b); ABS (2011a); ACIL Tasman (2010); AER (2012); BREE (2012a)

Rising gas prices will also affect electricity generation with gas becoming an expensive option for generators, even with a carbon price on fuels with higher greenhouse gas intensity.

Future production of unconventional gas is likely to face delays from local opposition, as has been the case in New South Wales, leading to further uncertainty. In all, the availability of higher export prices and uncertainty surrounding the exploitation of unconventional sources, is likely to lead to increasing domestic prices for those using gas as a fuel to generate electricity, such as through co-generation plants, as well as for consumers as end-users.

[2] The Age, 2013. *Victorian government to block exemptions for coal seam gas fracking* (http://www.theage.com.au/victoria/victorian-government-to-block-exemptions-for-coal-seam-gas-fracking-20131107-2x4hj.html). Accessed 2 May 2014.

[3] Cook, P. 2013. *Unconventional gas in Victoria: proceed with care*, The Conversation (http://theconversation.com/unconventional-gas-in-victoria-proceed-with-care-20082). Accessed 2 May 2014.

[4] Wood, op. cit.

Unconventional Gas: Emissions and Environment

Opposition to the development of unconventional gas sources has centred on a number of environmental concerns, including those specifically related to greenhouse gas emissions:

- *Fugitive emissions* – caused by leakage of coal seam or shale gas as part of the fracking process. These emissions may be much higher in greenhouse gas intensity; to date there has been no measurement or assessment of fugitive emissions associated with unconventional gas production and transport. The gas greenhouse coefficient is based on data for conventional gas production, and uses data from several years ago.

  There is an urgent need to independently re-evaluate fugitive emissions, and recalculate the greenhouse coefficient o reflect the new extraction make up to allow up-to-date analysis of the greenhouse impact of gas use. Given the variety of geological conditions that exist, and differing extraction techniques, it is likely that fugitive emissions will vary from site to site.

  At this stage, this uncertainty makes it difficult for gas consumers, such as local government, to fully appreciate the benefits and costs of investing in gas, particularly as doing so may leave them with invested infrastructure which produces higher emissions than was originally anticipated.

- *Biodiversity impacts* – a US study on the impact of fracking on local biodiversity in the Appalachian mountains found increases in synthetic chemicals, salt and radionuclides in the environment.[5] The study also noted disruption of the local landscape by wells, pipelines and roads, and increased truck traffic. Species with restricted geographic ranges were considered particularly vulnerable.

- *Groundwater contamination* – contamination of groundwater surrounding fracking operations takes the form of methane at levels higher than would normally be expected, and contamination by fluids used as part of the process to force gas into larger cavities. Methane has been found in groundwater close to wells at dangerously high levels in research conducted near fracking operations in Pennsylvania and New York[6]. In 2011, a US EPA study found contamination of groundwater supplies by fracking chemicals in Wyoming, near an extraction facility following complaints from residents[7]. The EPA noted that the well in this instance had been drilled much closer to groundwater supplies than was the norm.

As has also been argued, investment in gas as a transition fuel detracts governments from investing in renewables, which is what gas is supposedly transitioning towards[8]. In addition, gas remains a fossil fuel which, while possessing the potential for delivering lower greenhouse gas emissions than coal, will also need to be replaced at some point by renewables.

NAGA's position is that the transition to a renewables-based economy should be the priority of governments at all levels. In addition, the financial forecasts for increased gas prices as well as health and environmental concerns surrounding the production of gas from unconventional sources, suggests that investment in gas as a transition fuel is fraught with potential drawbacks.

[5] Kiviat, E. 2013. Risks to biodiversity from hydraulic fracturing for natural gas in the Marcellus and Utica shale's. *Annals of the New York Academy of Sciences*, 1286, pp. 1-14.

[6] Osborn, S., Vengosh, A., Warner, N. & Jackson, R. 2011. Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing, *Proceedings of the National Academy of Sciences USA*, 108, pp. 8172-8176.

[7] *Fracking may be causing groundwater pollution, says EPA report*, The Guardian 10 December 2011 (http://www.theguardian.com/world/2011/dec/09/epa-reports-fracking-groundwater-pollution?guni=Article:in%20body%20link). Accessed 2 March 2014.

[8] Engelder, T., Howarth, R. & Ingraffea, A. 2011. Should fracking stop? Extracting gas from shale increases the availability of this resourse, but the health and environmental effects may be too high. *Nature*, 477 (7364), pp. 271-275.

Summary

- Domestic gas prices set to rise dramatically from 2014 due to opening up of eastern Australian domestic gas market to export.
- Victoria has opportunity to expand gas production from unconventional sources but this may be slow due to local opposition, and is more likely to be priced at a level closer to export prices.
- There is uncertainty regarding the environmental impacts of unconventional gas extracted through fracking.
- Emissions from fracking extraction may be much higher than existing energy sources due to fugitive emissions; research is underway.
- Local government should be careful about investing in infrastructure which is likely to result in higher operating costs (due to gas price rises) and possibly higher emissions than expected (due to source of gas and extraction methods).
- In essence, gas remains a fossil fuel and investment in gas production as a transition fuel to a renewables-based economy, distracts governments from that transition.
- NAGA's position is that focus should be on the immediate transition to a renewables-based economy.