

CHEMICAL ECONOMICS - THE ENERGY SAGA

At the time of writing (May 2017) the eastern seaboard of Australia is suffering from an energy crisis of our own making. There are serious issues with the reliability and price of electricity. This became apparent to the public when a storm last year precipitated the shut-down of the electricity grid in South Australia. Also there is increasing uncertainty about the availability and price of gas. Both these are interlinked in that gas is required in large volumes and on an intermittent basis to run open-cycle gas turbines as back-up generation when renewable power fails to generate sufficient electricity for the demand.

This is clearly demonstrated in the attached Figure 1 which show a significant rise for the cost of electricity for the NSW and Victorian wholesale electricity markets and Figure 2 for the gas market in Victoria. For the current level of electricity and gas prices, as I have discussed in previous articles in *Chemistry in Australia*, no producer of aluminium, fertilizer, methanol or similar product would be profitable. With continuation of energy prices at this level this will ultimately result in the closure of most energy intensive manufacturing on the eastern seaboard.

For years now, many in the processing industries have been predicting a serious problem with energy supply (Andrew Liveris of Dow Chemicals in an Op-ed in *The Australian*, April 25th. 2012). In an article (*Chem. Aust.* October 2015, p. 36) I asked the question if the then emerging LNG export industry was worth more to the country than the chemical process industry. As witnessed by the political inaction to solve the current crisis, the answer it would seem is that the country's leaders, without exception, believe that indeed LNG exports are not only worth more than the chemicals industry but are worth more than the entire manufacturing sector.

What action there has been to-date, appears piecemeal and inadequate. The three main LNG export companies and their gas suppliers have been exhorted to make more gas available to the domestic market. Not all have agreed to this. But more importantly no mention is made on the price of gas and if not reduced dramatically (to below \$5/GJ) large numbers of energy intensive manufacturing facilities would be forced to close.

However, state governments continue to block the development of new gas supplies by bans on advanced production and well stimulation techniques, commonly called fracking, used across the world in the oil and gas industry including off-shore Australia. This encompasses most of the major prospective gas resources that could relatively quickly supply gas to the eastern seaboard. Victoria has gone further by effectively closing further development of its smaller gas fields in the west of the state which have been producing gas since the late 1960s.

Furthermore, the progressive closure of older coal fired generating stations is putting increasing pressure on the supply of electricity and increasing reliance on additional renewable sources which require additional back-up gas generating capacity somewhere in the system. And since renewable sources are inherently high cost generators (due to the capital return demanded by private corporations on the high capital costs which includes the cost of effective and secure connection to the grid). This high cost will be further exacerbated if expensive, and as yet unproven, battery technology is adopted as a partial back-up to renewable generators.

What are the alternatives for gas supply. I have summarised these as follows with my estimates for the likely costs and timing:

LNG import into southern states: Spot LNG is readily available and could be imported at one or several locations. The concept would require the construction of LNG re-gasification plant which could be ship based. The cost of gas would be made up of the LNG price (say A\$6/GJ), shipping from the north west shelf (shipping from Gladstone would be perverse) which would cost another (A\$1/GJ) and re-gasification (another \$1/GJ). The total gas cost would be at least A\$8/GJ. Taking into account permitting requirements and construction of a re-gasification facility, this could see gas delivered in 3 to 4 years.

Gas by pipeline from north west Australia: The pipeline would deliver gas from the large resources off-shore north-west Australia to Moomba which would deliver gas through existing pipelines to Brisbane, Sydney, Adelaide and then Melbourne. Pipelines of large transcontinental size as the ones proposed would cost A\$5 billion. This would include the provision of re-compressor stations every 100 to 200km. This solution is very sensitive to the quantum of gas moved. Supplying all of the east coast non-LNG demand would cost about A\$3/GJ for carriage costs to be added to the pre - LNG cost or about A\$6/GJ. However if the pipeline was only used for part of the demand (say 100PJ/y) then the cost of carriage alone would be \$8/GJ). Permitting has traditionally been easy in Australia but native title issues across inland Australia may now be a problem. This solution may take 8 to 10 years.

Gas by pipeline from northern Australia (Timor Sea): This is the proposed northern pipeline that would link gas fields off-shore the Northern Territory to the eastern grid at Mount Iza or Moomba. Should the NT government lift its ban on on-shore gas developments, these gas sources could be added. The cost is less than the transcontinental option at \$1.5billion but gas carried would be lower increasing transmission costs so final cost would be similar to a transcontinental pipeline (A\$8/GJ). This is unlikely to be a solution within 5 years.

Synthetic Natural Gas (SNG) made from coal: SNG facilities could be located on a suitable coal field and be coal of any type including low grade non exportable coal. SNG would also have the advantage of producing significant co-generated electricity which would reduce the SNG production cost. The cost of SNG would be in the region of A\$8 to 12/GJ depending on the scale and coal costs. Permitting and construction could take 4 to 5 years.

Complete lifting bans on exploration and production of gas in eastern Australia: This is the obvious solution but since bans have been in place several other hurdles have arisen. To be effective this would require reform of the fiscal regime of which a major one would require the states to give up part and preferably all of their royalty to land owners - farmers and native title custodians. This would encourage the exploration and development of new reserves. However, it is unlikely that a very large new onshore development will occur, rather a series of small operations is most likely. Many of these discoveries require the development of coal seam gas or shale which are inherently high cost (A\$5/GJ or more). Large scale discoveries would, on past history, be more likely to come from off-shore in deeper water off-Bass Strait, the Otway Basin and the Australian Bight. These are costly, high stakes operations requiring Commonwealth incentives not helped by current ideas to increase tax on off-shore oil and gas production. This solution would deliver large volumes of gas at low price (<A\$3/GJ) but starting from scratch would take at least 5 years.

None of these proposals would deliver gas in the short term, but more importantly all, except large scale off-shore, are high cost options. The prognosis for manufacturing and the chemical industry in eastern Australia is grim. This is not to say that all is lost. Gas costs in the west are competitive with international practice and there is plenty of gas to be developed to support local industries, so that energy intensive and strategic manufacturing may survive. But then again it would only take a few turns of the election cycle to destroy this as well.

D. Seddon, May 2017

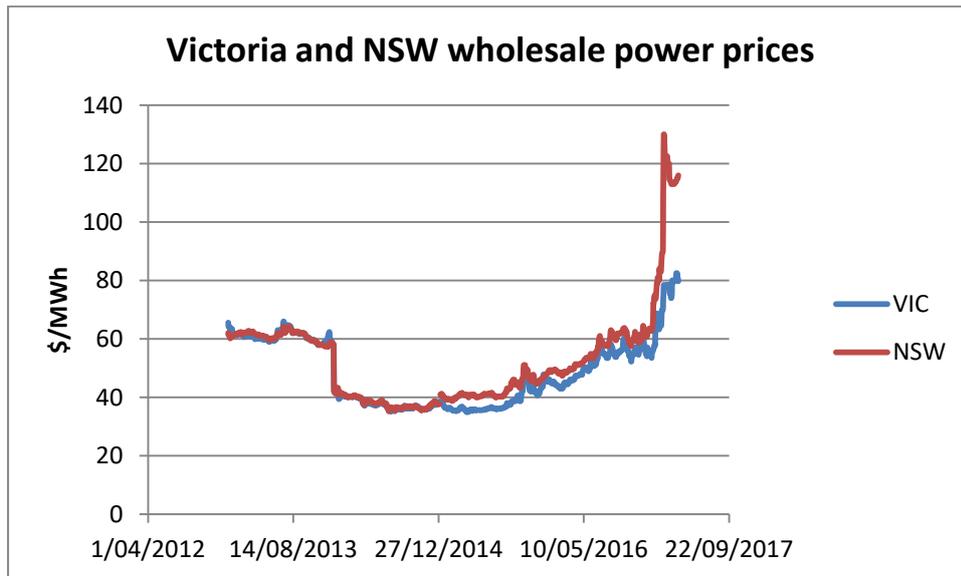


Figure 1: Victorian and NSW wholesale power prices (AEMO data)

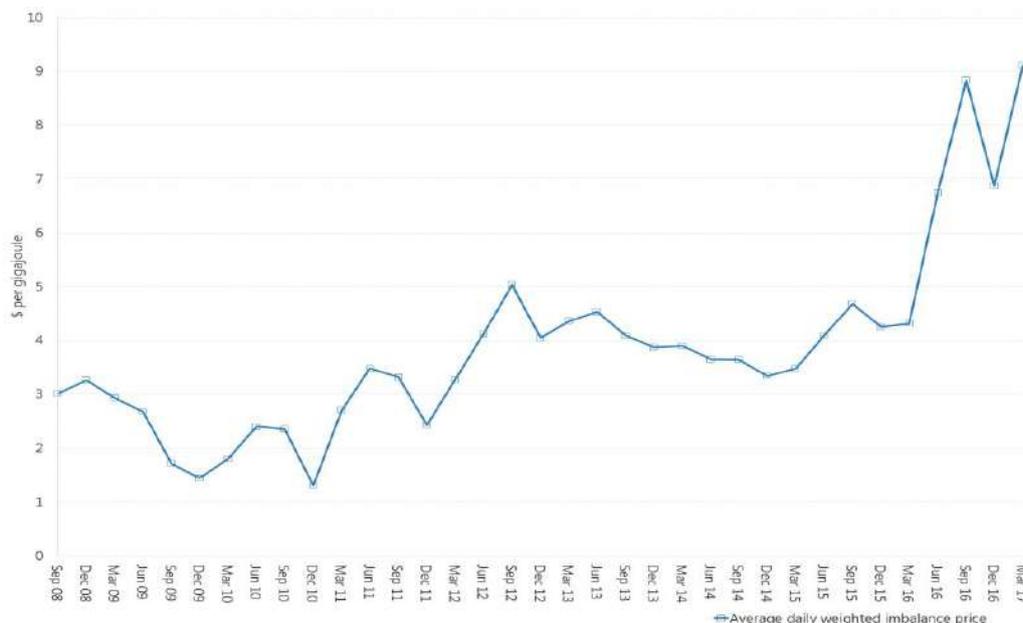


Figure 2: Victorian gas prices (Australian Energy Regulator website)