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Economic Note No 13 Coal Seam Gas and the Future of Manufacturing in NSW

Executive Summary

Australia's new east coast LNG export industry based at Gladstone is creating benefits for Queensland and the nation, but higher gas prices from opening up an export market are adding to existing pressures on gas-intensive manufacturing throughout eastern Australia, especially in NSW. Most of the gas to be liquefied at Gladstone will come from coal seam gas fields in Queensland. But in the early years, Queensland coal seam gas supplies will struggle to meet the massive LNG demand, causing gas to be diverted to Gladstone from South Australia's Cooper Basin.

Wholesale gas prices in NSW and the rest of eastern Australia have already more than doubled in anticipation of the new LNG market, which will take off in late 2014 with the commencement of operations at the first LNG plant and escalate as the second and third projects come on stream in 2015. At that time, six plants – known as 'trains' – will be liquefying gas, each project operating two trains. With the progressive depletion of low-cost gas reserves, Eastern Australia was heading towards higher-cost gas anyway, but the LNG industry is accelerating the trend. At these higher prices, gas that otherwise would have remained in the ground, including in the Cooper Basin, is becoming economic to extract.

However, the commercial viability of many gas-intensive manufacturing operations in NSW, some of them already facing difficulties from other cost increases, will come under greater pressure at these higher gas prices. Adding to these pressures, forecasted gas shortages during winter peak periods from 2016 are likely to cause supply interruptions to major industrial gas users, creating uncertainty of supply and sharp fluctuations in price. Supply interruptions can only further damage the ongoing viability of gas-intensive manufacturing in NSW.

NSW produces less than 5 per cent of the gas it uses for households, hospitals, commercial operations and major industrial plants. It is estimated that NSW has 5,000-15,000 petajoules (PJ) of potentially recoverable coal seam gas, compared with Queensland's 60,000-80,000 PJ, which is being dedicated to LNG customers. But an earlier NSW government moratorium on coal seam gas development and new restrictions on areas that can be developed have severely curtailed the availability of gas from within NSW to help meet the state's needs.

Existing pipeline capacity for transporting gas from other states can and will be augmented by inserting loops into the pipelines and adding further gas compression stations. But this might not be sufficient to avoid supply shortages

in the peak winter months of 2016 under typical weather conditions and assuming limited industrial plant closures in the meantime. A gas storage facility nearing completion at Newcastle will help supply gas to NSW users during the peak months, but capacity is limited and once exhausted the storage facility cannot be quickly replenished. Even with these measures in place, gas shortages during the winter peaks from 2016 are likely.

Around 3,000 manufacturing jobs could be lost in NSW from the transformation of the eastern Australian gas market and supply shortages within NSW. The following areas are most vulnerable because of their large numbers of gas-consuming businesses and heavy reliance on manufacturing for jobs: Smithfield, Auburn, Parramatta, Campbelltown, Heffron, East Hills, Lane Cove, Menai, Toongabbie, Maroubra, Bathurst, Port Stephens, Murrumbidgee, Wollongong, Sydney, Lake Macquarie, Baulkham Hills, Mt Druitt, Maitland and The Entrance.

If a new coal seam gas development at Gloucester in the Hunter Valley proceeds without further delay it could be producing by 2017. Although this would not be a major addition to supply, it could buffet NSW's forecast loss of income by $1.8 billion and save around 230 jobs. Gloucester, too, would solve for some time the problem of gas shortages during the winter peaks. Thereafter, coal seam gas development near Narrabri, if approved, could add substantially to NSW supplies and eliminate shortages during the peak winter months.

When total eastern Australian gas supplies from the Gippsland, Otway and Cooper Basins and coal seam reserves in Queensland and NSW eventually rise beyond the total LNG export demand at Gladstone, it is possible that real gas prices will begin to decline again. They will not fall back to their historically low levels but, in the absence of a further major expansion of LNG capacity at Gladstone, they would settle at a level that in real terms lies between the historical price of $3-4 per gigajoule (GJ) and the estimated long-run export parity price of around $8 per GJ.

Full export parity pricing with sporadic episodes of scarcity-pricing events could be sustained well into the future if additional LNG trains were developed at Gladstone, since marginal plant capacity is typically commissioned at much lower cost. However, there are doubts about the economic viability of adding to the LNG capacity at Gladstone through the installation of a seventh train or more. These doubts arise from the rising long-run marginal cost of eastern Australian gas supply, which is more than double the historic field cost of less than $3 per GJ. A seventh train, processing higher-cost gas, would need to compete against extra trains in overseas locations with lower construction costs and lower marginal gas supply costs.

Production from coal seam gas reserves in NSW would help ease the heavy pressure on the state's gas-intensive manufacturing sector by reducing or eliminating the risk of supply interruptions during the peak winter months and reducing peak prices.

Increases in NSW gas supply that meet stringent environmental standards would therefore be beneficial to households and to the preservation of manufacturing jobs within the state. Without extra gas supplies the outlook for gas-intensive manufacturing in NSW is bleak.

The Rise of Coal Seam Gas

The extraction of natural gas from coal seams is a new industry in Australia, based predominantly in Queensland. While the existence of coal seam gas resources was known in the 1980s, their extraction was possible only after subsequent advances in drilling technology. Queensland's proven and probable (2P) reserves have increased from 3,400 PJ in 2005 to more than 41,000 PJ in 2013.[1] NSW has 2P reserves of around 2,800 PJ,[2] plus vastly greater potentially recoverable resources of 5,000-15,000 PJ. Queensland, by comparison, has 60,000-80,000 PJ of potentially recoverable resources.[3] Estimates of potentially recoverable shale gas reserves in eastern Australia range up to a massive 290,000 PJ.[4]

Queensland's coal seam gas reserves are contracted to the export market following liquefying at three plants at Curtis Island, Gladstone. Each plant will have two trains. Extra LNG trains are more likely to be built in other gas-rich locations with lower construction costs, such as Papua New Guinea and Africa. The consensus view among energy industry executives and analysts is that future Australian east coast LNG developments are unlikely any time soon.[5]

The first LNG plant is scheduled to begin production in late 2014, with the other two scheduled for 2015. In 2013, eastern Australian demand for gas was 700 PJ per annum. By 2016 it is expected to treble to 2,100 PJ per annum. In the early years of operations, production from Queensland's coal seam gas fields is unlikely to be sufficient to meet the demand of these LNG plants. Since LNG plants are required to meet their contractual supply obligations, they will need to draw gas from other eastern states for several years. Substantial quantities of gas from South Australia's Cooper Basin will therefore be diverted to Queensland for export to the Asia-Pacific region. At the higher prices created by LNG demand, more of the gas reserves in the Cooper Basin will be developed, so there will not be a one-for-one diversion of gas from domestic usage.

The Effect of LNG Exports on NSW Prices

Even though the first LNG tanker is yet to leave Gladstone, some of the effects on domestic gas prices of opening up eastern Australian gas production to an export market have already been felt. Historically, gas prices have been in the range $3-4 per GJ but in mid-2014 short-term marginal supplies of gas were priced at around $10-12 per GJ.[6] As more coal seam gas becomes available, NSW prices are expected to fall. But with the existence of an export market alternative and the increasingly higher cost of marginal gas supplies, prices will not retreat to their historically low levels.

The Effect of LNG Exports on NSW Manufacturing

Industries that use gas as an industrial feedstock, such as those producing fertilisers, plastics, explosives and methanol, are highly vulnerable to sharp increases in gas prices. They are typically exposed to import competition and cannot substitute out of gas. Industries that are moderately dependent on gas are those using gas for heat or steam – including the production of cement, pulp and paper, glass, food and beverages – and in the refining of alumina and non-ferrous metals. These industries could substitute out of gas, but only to coal, with much higher carbon emissions.

It is estimated that the emergence of an eastern seaboard LNG export industry will cause a cumulative loss of Australian manufacturing income of around $118 billion in net present value terms over the period 2014-2021, with one-fifth of that loss occurring in NSW.[7] Manufacturing job losses are estimated at more than 14,000 nationally, almost 3,000 of which would occur in NSW.[8]

The Effect of LNG Exports on NSW Gas Availability

NSW produces less than 5 per cent of the gas it consumes. It is heavily dependent upon the Cooper Basin and Gippsland for its gas supplies. Existing long-term contracts are due to expire over the period 2016-2017. Cooper Basin and Gippsland gas suppliers, enjoying the opportunity of selling gas to LNG exporters while Queensland coal seam gas supplies ramp up, are reluctant to enter into long-term supply contracts for NSW at the low historical prices.[9]

Within NSW, coal seam gas has been produced near Camden since 2001. However, in early 2011 the NSW Government imposed an 18-month moratorium on further coal seam gas development. In February 2013, the State Government announced exclusion zones, including the prohibition of coal seam gas development within two kilometres of residential areas. This had the effect of precluding development of the Camden North coal seam gas reserves. The reserves at Camden are the only significant source of existing gas supply within NSW and are in decline.

As large quantities of Cooper Basin gas are diverted to Queensland's LNG facilities, NSW faces a supply cliff during the peak winter months of 2016. This change in the flow of natural gas from the Cooper Basin away from NSW and to Queensland LNG terminals is the basic cause of the supply cliff. It is exacerbated by the lack of NSW gas to backfill the emerging gap and the inability of Queensland gas production to satisfy the LNG demand at least in the short run.

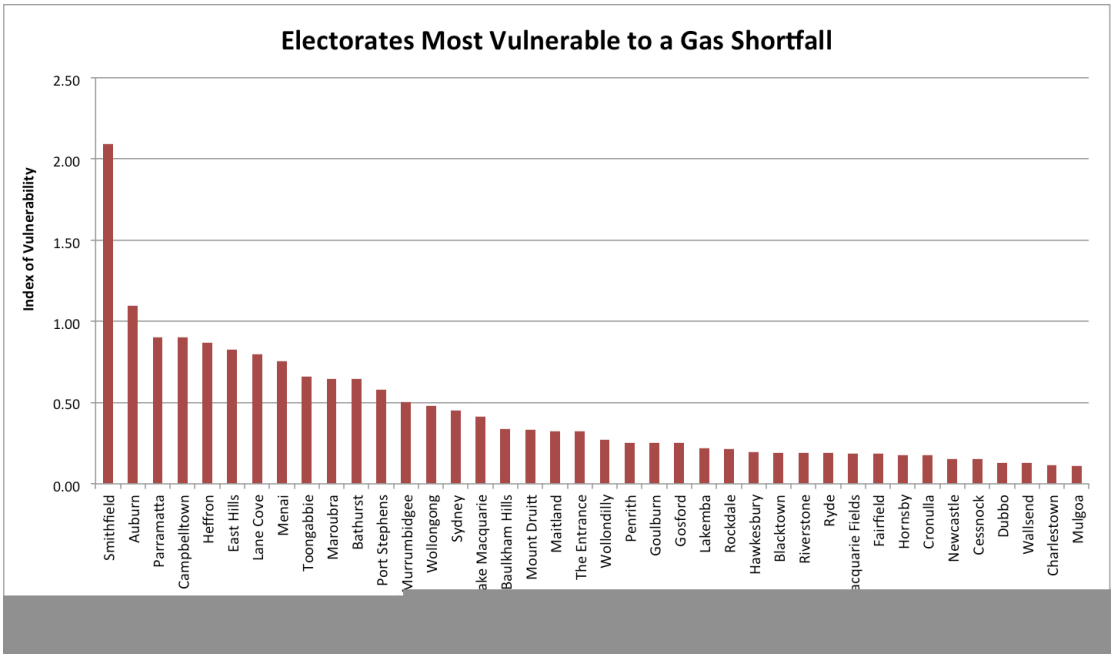
Additions to gas pipeline capacity between Victoria and NSW through compression and looping will help.[10] So, too, will the imminent completion of a gas storage facility at Newcastle. But there are physical limits to the enhancement of gas pipeline capacity through looping and compression and the Newcastle gas storage facility cannot be replenished anywhere nearly as fast as it is depleted.

Even with existing pipeline capacity enhancements and the Newcastle storage facility, based on current demand and supply forecasts it is estimated that serious gas shortages could still occur during 21 days of peak demand in the winter of 2016. This assumes median weather conditions and limited closures of gas-intensive industrial plants in the meantime.

When gas shortages occur, the state authorities will cut supplies to large industrial users rather than to hospitals and households. In the likely scenario of a tight market coupled with the risk of supply interruptions, gas-intensive industrial users will face three options: pay a substantially higher price for gas; reduce factory production; or close down their operations.[11]

Regional NSW Manufacturing Jobs at Risk

Any area that has a large number of gas-consuming sites and a high proportion of employment in manufacturing will be especially vulnerable to any gas supply shortfalls. This has been quantified as follows. First, areas that have large numbers of gas-consuming sites were identified.[12] Next, manufacturing jobs in each area were given a number as a proportion of total employment in that area. Multiplying the two values thus obtained provides an index of vulnerability to a gas supply shortfall. Of 40 NSW urban and regional areas that are vulnerable to gas supply shortages, the most exposed are Smithfield, Auburn, Parramatta, Campbelltown, Heffron, East Hills, Lane Cove, Menai, Toongabbie, Maroubra, Bathurst and Port Stephens.



Effect of Developing Coal Seam Gas in NSW

If no further coal seam gas development were permitted in NSW, the state would suffer an estimated income loss of $5.6 billion in net present value terms and a loss of around 770 jobs.[13]

If the Gloucester coal seam gas reserves are developed without further delay they could be brought into production by 2017. Compared with a freeze on new coal seam gas developments, in net present value terms the Gloucester project would recover $1.8 billion of the predicted loss and save 232 jobs.[14]

While the commencement of gas supply from the Gloucester project in 2017 would be too late to avoid the supply interruptions forecast for the winter peak months of 2016, supply interruptions could be avoided thereafter. Security of supply could be maintained through 2020 if the Narrabri project came on stream in 2018.

The Gloucester and Narrabri gas projects therefore can play a vital role in re-establishing security of gas supply to NSW manufacturers, but can they affect the price of gas? The answer is yes, once the demand of the Gladstone LNG plants is fully met. Queensland has sufficient coal seam gas reserves to meet the demand of the six LNG trains under construction. Beyond that, surplus eastern Australian gas will not be able to attract the export parity price unless and until a seventh train is built – which is considered highly uncertain.

On their own, the Gloucester and Narrabri projects will not lead to a large eventual fall in real gas prices after the demand of the six LNG trains at Gladstone is met but, along with other gas supplies from eastern Australia, Gloucester and Narrabri can contribute to Sydney gas prices being around 8 per cent lower than if there were a freeze on coal seam gas development in NSW.[15] The Gloucester and Narrabri projects can also contribute to the gas price settling below the estimated long-run LNG export parity price of around $8 per GJ if there is no expansion in liquefying capacity beyond the six trains already committed at Gladstone.[16] At gas prices below $8 per GJ, but above the historical average of $3-4 per GJ, at least NSW gas-intensive manufacturing has some chance of survival.

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REFERENCES

ACIL Allen Consulting (2014), *Future NSW gas supply and usage: economic benefits of increased coal seam gas development*, July http://www.acilallen.com.au/cms_files/ACILAllen_NSWGas2014.pdf

Australian Energy Market Operator (2013), *Gas statement of opportunities*, November http://www.aemo.com.au/Gas/Planning/Gas-Statement-of-Opportunities

Australian Energy Market Operator (2014), *Gas statement of opportunities update*, May http://www.aemo.com.au/Gas/Planning/Gas-Statement-of-Opportunities

Australian Government (2014a), *Eastern Australian domestic gas market study*, Department of Industry, Bureau of Resources and Energy Economics, Canberra, January http://www.industry.gov.au/Energy/EnergyMarkets/Documents/EasternAustralianDomesticGasMarketStudy.pdf

Australian Government (2014b), *Energy policy white paper: green paper 2014,* Department of Industry, Canberra, September http://ewp.industry.gov.au/sites/prod2.ewp.industry.gov.au/files/egp/energy_green_paper.pdf

Australian Industry Group (2013), *Energy shock: the gas crunch is here*, Sydney, July http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE_CONTENT/Publications/Reports/2013/13219_energy_shock_gas_crunch_is_here_web.pdf

Deloitte Access Economics (2014), *Gas market transformations – economic consequences for the manufacturing sector*, July http://pdf.aigroup.asn.au/Deloitte%20Gas%20Market%20Transformations%20-%20Manufacturing%20Impacts%20Report%20-%20web%20final%20-%20July%2014%202014.pdf

Nelson, Tim (2013), "2012 PESA industry review: ensuring domestic supplies of natural gas for Australian businesses and households", APPEA 2013 – *Journal and Conference Proceedings*, Vol. 53, pp. 177-184.

Simshauser, Paul and Tim Nelson (2014), "Solving for 'x' – the New South Wales Gas Supply Cliff", AGL Applied Economic and Policy Research, Working Paper No. 40, Brisbane, March http://aglblog.com.au/wp-content/uploads/2014/03/No.40-Solving-for-X-FINAL.pdf

[1] Simshauser and Nelson (2014), pp. 1-2; Australian Government (2014), p. 21.
[2] See Australian Government (2014a), p. 21.
[3] ACIL Allen Consulting (2014), p. 1.
[4] Nelson (2013), cited in Simshauser and Nelson (2014, p. 33).
[5] Nelson (2013), cited in Simshauser and Nelson (2014, p. 33).
[6] Deloitte Access Economics (2014), p. 10.
[7] Deloitte Access Economics (2014), pp. 3-5.
[8] Deloitte Access Economics (2014), pp. 63-83.
[9] See Australian Government (2014b, p. 42).
[10] Additional looping and/or compression is assumed for the Eastern Gas Pipeline connecting the Longford hub in Victoria to the Sydney hub, and to the Culcairn Interconnect which connects the Moomba-Sydney pipeline to the Victorian transmissions system.
[11] Simshauser and Nelson (2014), pp. 9-10.
[12] For this purposes, AGL Energy's customer base has been used, but given AGL's large market share, this is indicative of the overall concentrations of gas-consuming sites.
[13] ACIL Allen Consulting (2014), pp. 24-27.
[14] ACIL Allen Consulting (2014), pp. 30-35.
[15] ACIL Allen Consulting (2014), p. 15.
[16] Simshauser and Nelson (2014), pp. 30 and 34). See also ACIL Allen Consulting (2014), pp. 15-19.