chapter 3

Market Opportunities for South Australian Gas Domestic and International

3.1 Introduction

Australia has three separate gas markets that are not connected by pipeline infrastructure and hence operate independently, with different prices and factors affecting the supply, demand and price of gas. South Australia is part of the eastern Australian market, along with Tasmania, Victoria, New South Wales, the Australian Capital Territory and Queensland. To date, eastern Australian gas production has been solely for the domestic market, however one of the main factors beginning to influence the dynamics of this market is the creation of an export Liquefied Natural Gas (LNG) market.

3.2 Drivers

There are three main sectors of domestic gas use in the eastern Australian market: residential and commercial use; industrial use; and power generation. Residential and commercial demand is expected to account for approximately 24% of total gas consumption in 2012, and includes use for space and water heating, cooking and appliances. Industrial demand incorporates gas use in activities such as alumina refining, mineral smelting, fertiliser production, steel production, glass manufacturing, cement manufacture, fuel for industrial boilers, power generation for mining and in the manufacture of chemicals and other products. Industrial use of gas is the largest sector of use, and in 2012 it is expected to account for approximately 43% of the total eastern Australian gas demand. Approximately 33% of the total consumption of gas in 2012 is expected to be used for power generation[1].

Domestic demand for gas is strongly influenced by population growth and demographics. An increase in population will equate to a higher energy consumption and hence a higher demand of gas for power generation. Variations in the Australian climate, whether seasonal or long term, translate to variations in the demand for gas and energy for heating and cooling purposes.

Commencement of large industrial operations would also lead to growth in the domestic gas demand. Government policy also has a significant influence on the market. In particular, policy relating to carbon emissions reduction could lead to increased demand for gas for power generation in preference to coal. It is expected that a carbon price of greater than AUD 30 per tonne in an emission trading scheme (ETS) will make gas more competitive than coal. However improvements in technology, such as integrated coal gasification combined cycle and carbon capture and storage, may enable competitive low-emission generation of power from coal, and hence reduce the appeal of gas for power generation. Higher forecast prices and tightness of supply

1 Core Energy Group Pty Ltd (September 2012), Energy Outlook 2012

leading to difficulties obtaining contracts, combined with measures such as the Renewable Energy Target (RET) Scheme, may also slow the demand of gas for power generation and see an increase in the proportion of power that is sourced from areas such as wind and hydroelectricity. As a result it is not expected that gas demand for gas powered generation will increase significantly in the near future.

Improvements in efficiency in power generation, heating and cooling, and price increases leading to measures by consumers to modify their behaviour and limit gas consumption will also decrease the gas demand growth. In addition a global transition to a low carbon economy would influence and possibly decrease demand for gas and LNG internationally.

Environmental impacts of gas development need to be understood and significant adverse impacts avoided. At the limit, bans on particular activities in particular locations are the penultimate, prescriptive and precautionary mode for risk management for unconventional gas projects. Rigorous risk assessments and leading practice project planning can reveal how contemporaneous, compatible land use for unconventional gas projects can be undertaken in ways that reduce risks to as low as reasonably practical (ALARP) while simultaneously meeting community expectations for net outcomes. In this regard, potential health and environmental impacts should be identified early in planning for the development of unconventional gas projects, and it is essential that companies foster good stakeholder engagement and relationships so that potential issues can be raised early and if practically possible, compatible solutions found. This has not always been done everywhere. There have been a number of cases where unconventional gas projects in Australia and internationally have become contentious after community concerns were not adequately addressed, which has resulted in greater uncertainty within the community, deteriorating relationships with stakeholders. In response, to meet community expectations for net outcomes, some governments in Australia have imposed local to jurisdiction-wide moratoriums pending further assessment and prescriptive restrictions on company activities. Associated project delay and reduced options for innovation are consequential deleterious results that may be avoided, with salient, credible and well communicated risk assessments well ahead of when land access is sought.

The current (2012) ex field/plant gas price in the eastern Australian market is relatively stable at AUD 4 per Gigajoule (GJ) and delivered price closer to AUD 5-6 per GJ. This price will be dependent on the proportion of gas supplied from conventional gas, CSG, underground coal gasification and in the future shale and tight gas; more specifically the ex-field cost, required gas price of various sources of gas and transport costs. The price will also be driven by the competitive intensity between suppliers and customers, which in turn is dictated by the distribution in ownership of the gas reserves. One of the most important factors influencing eastern Australian domestic gas market dynamics and price is the introduction of an LNG export market.

The Core Energy Group report, *Price Pathways to 2020 – Gas and Electricity*[2] suggests that the increase in the price of gas is expected to be slight, outside of price review mechanisms, until approximately 2014/15. Largely contracted supply through to 2014 and the production of ramp gas that is required for the development of LNG projects will slow price increases. Beyond 2015, however, the price of gas is expected to rise significantly driven by:

- the slow but continual decline of production from discovered conventional resources;
- demand for gas for LNG export;

2 Core Energy Group Pty Ltd (February 2012), Price Pathways to 2020 – Gas and Electricity

- changes in the costs of extraction of unconventional sources; and
- demand for gas-fired power generation;
- competition between the key gas producers.

The EnergyQuest report Australian Coal Seam Gas 2011: From Well to Wharf[3] suggests a long term gas price of AUD 7 per GJ.

The Australian governments have developed a short term trading market to transparently indicate gas prices outside of current contracts. In addition a gas bulletin board has been developed to indicate pipeline capacity and usage, a gas statement of opportunity[4] report to indicate future gas reserves, supply and demand, and governments are currently developing a gas supply hub to trade gas adjacent the CSG fields. The markets and bulletin board are being monitored by the Australian Energy Regulator[5] for compliance. These initiatives will assist in the market gaining a better understanding of the current and future gas supply and demand situation and assist with decisions for developing new fields and pipelines.

As mentioned, in addition to the gas demand linked to domestic use, an important factor influencing eastern Australian gas market dynamics and forecasts is the creation of an export LNG market, with major LNG export projects currently under development in eastern Australia, the most significant projects located in Queensland. Urbanisation and a demand for gas-fired electricity in Asia combined with a shift away from nuclear energy in Japan following the March 2011 tsunami has caused an increase in the demand for LNG for power generation, which is expected to be a long term effect, and offers promising opportunities for export. However, an increase in the availability of substitute fuels and progression in unconventional gas development in Asia will reduce the demand for import of Australian LNG. The future price of LNG export will also be closely linked to the price of oil. The strength of the Australian dollar influences both the capital cost to build the LNG facilities and the performance of the LNG product on the international market.

3.3 Supply and Demand and Market Opportunities

The gas demand for the eastern Australian market is forecast to be 694 Petajoules (PJ) for 2012[6]. Gas demand is expected to grow by approximately 19% (using a Compound Annual Growth Rate, CAGR) to reach approximately 2,867 PJ in 2020, as shown in Figure 1.1. This includes, and is predominantly due to, LNG exports starting when the first LNG trains are expected to come on-line in 2014.

Eastern Australian Proven and Probable (2P[7]) gas reserves currently total over 51,000 PJ, over 85% of which are CSG reserves, which is demonstrated in Figure 1.2. This equates to nearly 74 years of domestic supply at current

3 EnergyQuest, (August 2011), Australian Coal Seam Gas 2011: From Well to Wharf, p.10

4 Australian Energy Market Operator, www.aemo.com.au/Gas/Planning/Gas-Statement-of-Opportunities/Previous-GSOO-reports/2011-Gas-Statement-of-Opportunities/Main-Report#chapter2

5 Australian Energy Regulator, www.aer.gov.au/node/6311

6 Core Energy Group Pty Ltd (September 2012), Energy Outlook 2012.

7 Long term gas sales contracts from the Cooper Basin for eastern Australian markets have traditionally and successfully relied on probable (2P) gas reserves to be proven and developed in synch with market demand. This balances the cost to both suppliers and buyers of pre-investing in gas deliverability ahead of market demand with risks associated with over-estimates of 2P gas reserves. Any misalignment in contracted gas volumes with trends towards the conversion of 2P to proven (1P) developed reserves will be apparent some years ahead of physical shortfalls, leaving scope for developing alternative gas resources. The multiple unconventional gas plays described in Chapter 2 are expected to act as a buffer for this gas resource portfolio management approach. Giving less weight to what gas markets have accepted as effective risk management leads to precautionary conclusions that fewer years of gas market cover are proven.

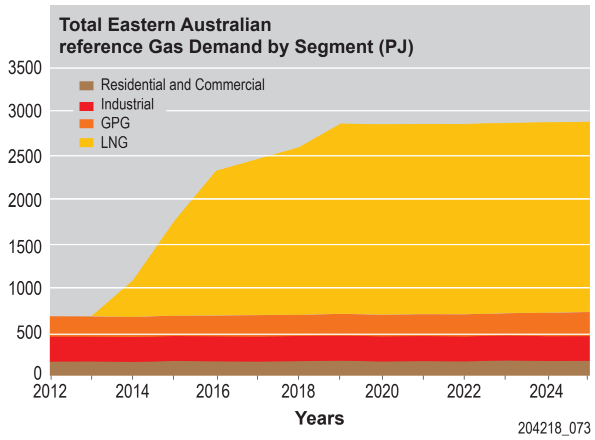

Figure 3.1 *Eastern Australian Gas Demand by Segment (source: Core Energy Group; September 2012).*

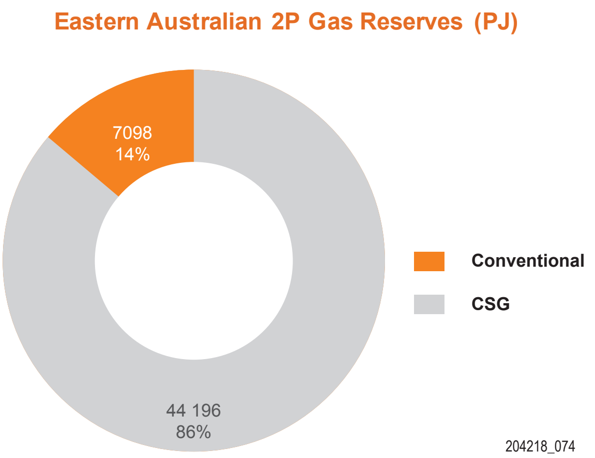

Figure 3.2 *Eastern Australia Proved and Probable (2P) Gas Reserves as at 31 December 2011 (source: Core Energy Group, September 2012).*

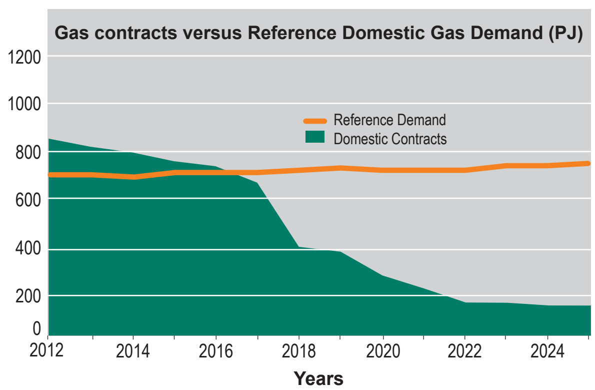

Figure 3.3 *Contracts and forecast demand for eastern Australia to 2020 (source: Core Energy Group, September 2012).*

demand levels, or closer to 18 years supply at the forecast 2020 demand level including LNG export. It is worth noting that this rough estimate does not account for future discoveries which would extend the current reserves. For South Australia, gas demand is forecast to be 106 PJ for 2012, 15% of the eastern Australian demand. Demand growth in SA is forecast to reach 117 PJ by 2025. This is not accounting for possible gas demand for potential future industrial projects.

There are growing expectations for:

- successful development of significant unconventional gas resources in Australia (and in particular shale, tight and deep coal seam gas in the Cooper Basin, tight gas in other plays, and further CSG development), and in North America (CSG, shale gas and tight gas). This has implications for supply: demand balance nationally and internationally;
- growth in exports from a number of countries competing to meet LNG markets;
- uncertain balance between domestic and international export gas demand and developed gas reserves in countries where the success, cost, and/or pace of developing unconventional gas is uncertain;
- local or regional restrictions on hydraulic fracturing and/or CSG operations in some Australian states, and in NSW in particular;
- uncertain but expected higher costs for unconventional gas development in the context of 'hot markets' for minerals and energy resource project services; and
- uncertain timing for the development and deliverability of significant volumes of shale gas and tight gas in eastern Australian markets, which will have an influence on the negotiated price for gas in eastern Australian gas markets.

The Core Energy Group report *2012 Energy Outlook*, forecasts that there are sufficient gas reserves and infrastructure in eastern Australia to meet both the domestic demand and the expected demand that would be generated from an export LNG market until at least 2025. Production from conventional gas reservoirs in the Cooper Basin, historically South Australia's main source of gas, has been declining. However, Cooper Basin reserves are now increasing[8] and producers are now undertaking exploration for unconventional resources and contingent resources that would be commercial at either higher gas prices or with lower production costs due to technology or process improvements. Gas production has increased from the Otway basin, Gippsland basin and offshore Victoria and further development in CSG in Queensland and New South Wales has also increased gas supply in the eastern Australian market.

It can be seen in Figure 1.3 that predictions indicate a significant proportion of the expected gas demand in eastern Australia will be met by contracted supply until around 2015. Hence it is expected that gas prices will not change significantly in this period outside of Price Review mechanisms until this time. In the longer term the cost of gas in South Australia is likely to increase due to higher gas development costs for unconventional gas and for conventional gas from offshore Victorian fields. Competition for eastern Australian gas reserves to alternatively supply domestic gas and international LNG markets is expected to also put upwards pressure on domestic gas prices. With an LNG export market operating in eastern Australia, it is expected that future domestic gas prices will be influenced by international LNG prices which in turn are expected to be influenced by international oil prices. However at higher prices, additional formerly uneconomic resources, including unconventional gas resources, are likely to enter the market which would minimise further gas price increases, but not below the level that returns an adequate profit from the cost of gas development and transport.

Incumbents in the eastern Australian gas supply chain have a vested interested in; sustaining and attaining maximum market share, keeping supply and demand so near equilibrium as practical, and leveraging economies of scale and maximum rent from third-party use of spare gas processing plant and pipeline capacity. New entrants in the eastern Australian gas supply chain have a vested interested in; competing for maximum profitable market share, having multiple competing options for the use of existing gas processing plant and pipeline capacity at competitive tariffs, and multiple alternative options for independence in processing and transporting gas to avoid paying tariffs that can approach monopoly rents.

The Core Energy Group report, 2012 Energy Outlook, highlights three LNG projects in Queensland which are committed. These are the Origin/ConocoPhillips Australia-Pacific LNG project, BG Group's Queensland Curtis Island LNG project and the Santos/Petronas GLNG project. Various plans for the ramp up gas for the commissioning of these LNG plants have been firmed up. These include gas swaps (BG and Origin/ConocoPhillips) and gas storage in extinguished Roma gas fields (Santos/Petronas). AGL's purchase of Mosaic provides gas storage options in depleted fields near Wallumbilla, Queensland. CSG now forms more than 85 per cent of eastern Australia's proven and probable gas reserves.

There is opportunity for the export of LNG and/or synthetic fuel from viable locations in South Australia, such as Port Bonython. Developments such as this may foster competition in gas supply chains, and hence support competitive gas prices for eastern Australia, especially South Australia. The 2011 Resources and Energy Sector Infrastructure Council recommendations to the South Australian Government highlight the need for a deep sea port at Port Bonython. Their recommendations also include proposed

8 EnergyQuest, ***Energy Quarterly***, February 2012.

infrastructure corridors to utility hubs, the aim of which is to expedite the development of infrastructure to service the needs of the minerals and energy sector.

The EnergyQuest report Australian Coal Seam Gas 2011: from Well to Wharf[9] predicts a high demand for LNG in the Asian market of up to 266 Million tonnes per annum (Mtpa) by 2020. Key Asian consuming countries include Japan, China, South Korea, Taiwan and India. Many contracts have already been confirmed; however the uncontracted demand by 2020 may still be as high as 50 Mtpa. In addition to the predicted LNG supply from Australian productions, Russia, Indonesia, Qatar, Malaysia and possibly Brunei are all potential sources of LNG for the international market demand.

In addition to LNG, there is scope for Gas to Liquid (GTL) production in Australia. The Core Energy Group report 2025 Unconventional Gas Outlook – The Next Wave?[10] predicts that the breakeven cost of a total integrated unconventional gas and GTL production operation would be in the range of AUD 50-60 per barrel. A trade balance between the import of liquid fuels and the export of gas is one of the key drivers for the eastern Australian market. Gas to Liquids production of diesel from local coal sources could provide a long term source of fuel for the Australian domestic market without importation costs and related variability of international oil prices[11]. The need for ensuring Australia's energy security is highlighted by the current trade deficit in liquid petroleum products of AUD 16 billion per annum, which is expected to grow to about AUD 30 million by 2015 (APPEA)[12].

9 EnergyQuest, (August 2011), Australian Coal Seam Gas 2011: From Well to Wharf, p.11

10 Core Energy Group Pty Ltd (August 2010), 2025 Unconventional Gas Out Look- The Next Wave?

11 Altona Energy (August 2012), The Future of Australia's Clean Energy

12 Australian Petroleum Production and Exploration Association, (2012) www.appea.com.au/oil-a-gas-in-australia/oil.html

3.4 National and International Experience of Unconventional Gas Development

3.4.1 Social and Economic Benefits of Using Natural Gas

Sustainably developed supply-side competition in Australian gas markets can:

- enable decades of simultaneous growth in both (1) LNG exports and (2) domestic use of competitively priced gas for: heating; power generation; and feedstock for manufacturing;
- additional royalty and tax revenues; and
- lead enterprises to hire more people in the operations and supply chains for gas exploration, development, processing, transport, and value-adding manufacture.

Additionally, with high integrity well and pipeline construction, the use of natural gas for power generation yields roughly half the life-cycle greenhouse gas emissions of coal-use for electricity generation.

A Februrary 2008 report entitled *Queensland LNG Industry Viability and Economic Impact Study*[13] examined the costs and impacts of two generic industries exporting LNG from Gladstone:

- a 3 million tonnes per annum (Mtpa) industry commencing deliveries in 2014, with no expansion (2014 is estimated to be the earliest feasible delivery start date for a 3 Mtpa industry); and
- an industry starting at 3 Mtpa and expanding to 10 Mtpa from 2019.

These studies found that on a national level, the development of the LNG industries woud lead to a rise in the real Gross Domestic Product, consumer living standards, national

13 McLennan Magasanik Associates, (February 2008), Queensland LNG Industry Viability and Economic Impact Study, www.industry.qld.gov.au/lng/documents/lng-impact-study-report-full.pdf

income and exchange rate. An increase in the value of the Australian dollar, however, would lower the demand for other Australian exports, such as in the agriculture and manufacturing industries. The report found that the output from the national mining industry would be greater than the baseline predicted case and the output from the construction industry would increase as a result of the LNG industries.

The September 2011 ACIL Tasman report *Economic significance of Coal Seam Gas in New South Wales*[14] compares economic outcomes under the following scenarios:

- New South Wales CSG production expands steadily so that it becomes the main source of gas supply in the state (the "Base Scenario"); and
- New South Wales CSG production does not expand beyond current levels (the "CSG Freeze Scenario").

This report found similar outcomes to the LNG export case study described above. The Base Scenario resulted in an increase in: gas consumption; the wholesale gas price in all States; and in annual CSG investment and revenues. The real income for New South Wales in the Base Scenario was also found to be much higher than in the CSG Freeze Scenario. The CSG Freeze Scenario resulted in a decrease in employment growth, particularly for managers, technicians and trades, machinery operators and professionals.

This economic growth could be repeated in South Australia. Should unconventional gas prove viable then a number of new wells and associated production facilities will be required. The Core Energy Group report 2012 Energy Outlook predicts that over the 2012 to 2025 period there may be pressure on existing gas pipelines, specifically the Moomba Adelaide Pipeline in South Australia, to provide the capacity required by the growing market. Construction of the wells, facilities, additional infrastructure and staff housing that may be required to accomodate this market growth will create jobs and require large amounts of materials such as steel and cement, much of which will be sourced locally.

An increase in production of gas will increase the royalties received by the State Governments, and also an increase in payroll tax revenue due to the higher levels of employment. An increase of employment will bring workers to the area for the construction phase, and operating life of the projects. Associated demand will increase for accommodation, education for families, health and community services, transport and retail (including restaurants). This brings obvious benefits to the local community. This will, however, draw workers from nearby regions or other states and may have negative effects on pre-existing industries and economies in these areas. These inter-regional and local impacts need be considered in planning for the regional workforce requirements for unconventional gas projects.

14 ACIL Tasman, (September 2011), Economic significance of Coal Seam Gas in New South Wales, www.appea.com.au/images/stories/Policy_CSG/nsw%20csg%20stage%201%20report%20vf%2013%209%202011.pdf