

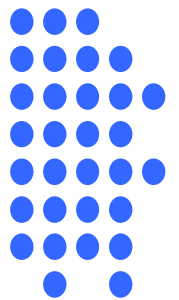
Section 2

Strategic Justification

Preamble

This section provides the strategic justification for the Narrabri Coal Seam Gas Utilisation Project in terms of the need for gas in NSW and its contribution to the staged development of a sustainable gas field able to contribute noticeably to the future power requirements for NSW's continued development. Other factors addressed that are relevant to the strategic justification of the Project relate to:

- *NSW's future electricity demand and supply;*
- *the Proponent's existing commercial arrangements for the supply of gas for power generation;*
- *the environmental benefits of gas-fired power generation plants; and*
- *the scale, scope and location of the Project.*



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2.1 The Need for the Project

NSW is almost entirely dependent upon gas imported from the Gippsland Basin (Victoria) and the Cooper Basin (South Australia) for supply of its residential, commercial and industrial needs. NSW currently imports in the order of 130PJ of natural gas annually. The availability of gas from the Cooper Basin is in decline and security of gas supply is an emerging major issue for Government and industry. If supplies of gas are not developed within NSW, the importation of gas from Queensland or further afield is likely to become necessary.

The cost of gas that is imported into NSW from other states is high, owing to the unavoidable costs of transporting the gas over long distances, and is both a deterrent to the competitiveness and continued growth of NSW industry and to expanded use of gas in environmentally friendly applications, for example, gas-fired electricity generation.

In addition, the State of NSW derives no royalty revenue from imported gas. The State will benefit significantly if its indigenous gas resources are developed, creating new streams of royalty income that can be used for other development or public service needs.

2.2 Current Demand and Supply of Electricity in NSW

2.2.1 Electricity Demand

In order of magnitude terms, the National Electricity Market Management Company ('NEMMCO') forecasts that growth in the NSW summer peak electricity demand will average around 430 MW per year over the next ten years (**Figure 2.1**).

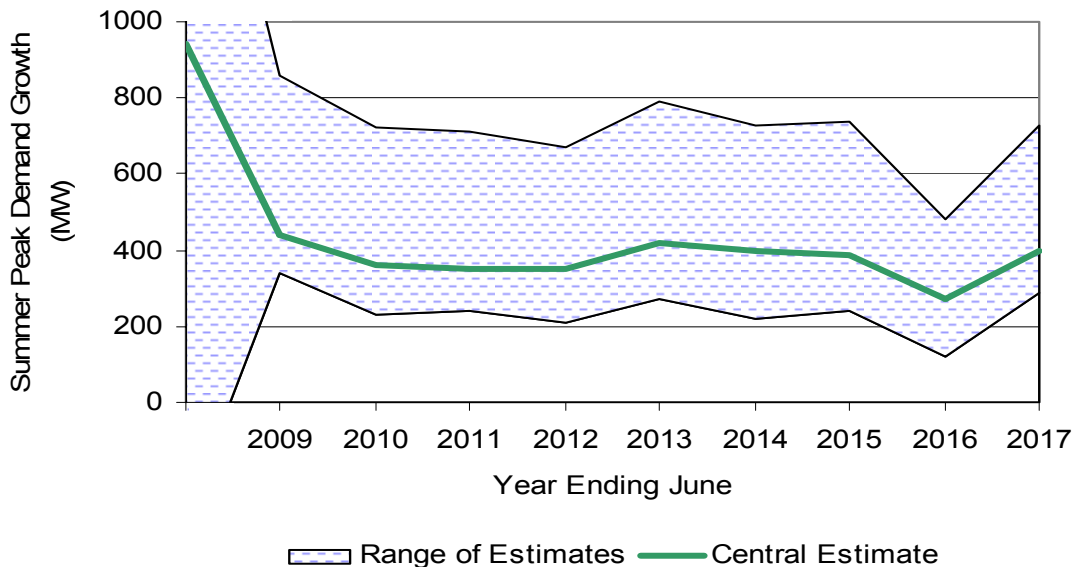


Figure 2.1
Forecast NSW Summer Electricity Demand Growth (Source: NEMMCO)

At the same time, growth in NSW’s overall electricity consumption is forecast to be around 150MW per annum (Figure 2.2).

The rapid growth in peak electricity demand relative to growth in the average rate of electricity consumption means there is a net requirement for development of peak generation plant.

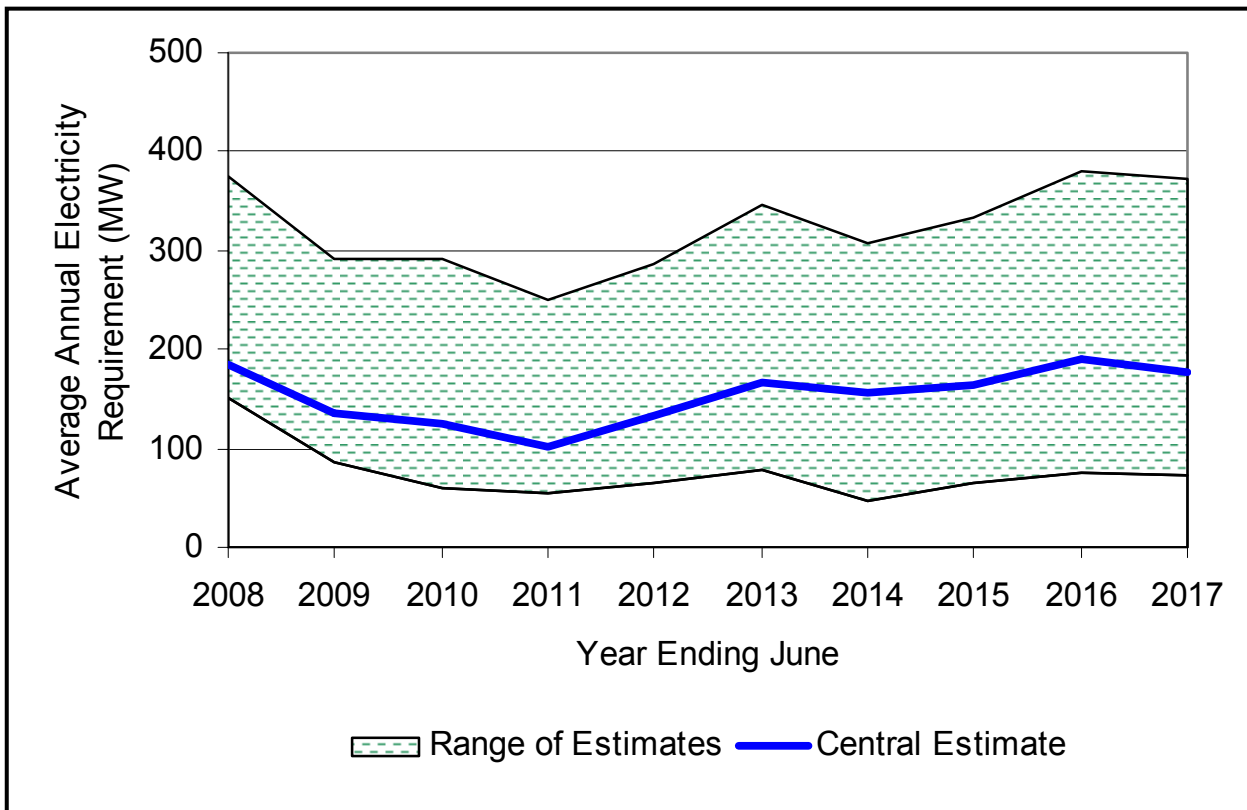


Figure 2.2
Forecast NSW Electricity Consumption (Source: NEMMCO)

2.2.2 Electricity Supply

In order to meet the demand discussed above, several gas fired generating facilities are already under construction or proposed for development within NSW in areas such as Tallawarra, Munmorah, Tomago, Wellington, Wagga Wagga and Tamworth. Gas-based generation is well suited to meeting peak electricity generation requirements since it has a low capital cost, can be brought on line quickly and offers advantages in terms of reduced greenhouse gas emissions (relative to coal-based power generation plants).

In addition to the requirement for peak electricity generating capacity, the underlying growth in electricity consumption leads to an increased requirement for base-load electricity generation.

The Project's Contribution to the NSW Electricity Supply

The proposed expansion of the Wilga Park Power Station, although small in comparison to the rate of growth in electricity consumption, will contribute to meeting this need. The Wilga Park Power Station will be a base-load operation since its purpose is to utilise gas from the pilot production project, which is produced on a continuous basis. The use of gas as a fuel for base-load electricity generation is consistent with the widely accepted need to reducing greenhouse gas emissions.

A further advantage of developing additional base-load electricity generation at the Wilga Park Power Station will be an improvement in the overall efficiency of operation of the NSW interconnected electricity system. At present, transmission system losses associated with supply of electricity to Narrabri are between 1.5% and 6.5%, depending upon the source of electricity supply. Base-load generation of electricity at the Wilga Park Powerstation:

- lead to a reduction in system losses and an improvement in system efficiency; and
- free up capacity within the NSW electricity transmission system.

In the event that a substantial and commercially viable gas field can be developed in the Narrabri area, the opportunity will arise to progressively increase the availability of natural gas and gas fired electricity generation capacity that is available in NSW. For example, the supply of up to 100 Petajoules of gas per annum from the field will support the generation of approximately 600 MW of electricity each year. The existing MOU entered into with Macquarie Generation and Babcock & Brown underpins the ongoing field development activities discussed throughout the assessment but plays no direct role in the Project.

2.3 Existing Commercial Arrangements

The Joint Venture has an existing 10 year contractual arrangement with Country Energy for the supply of electricity from the gas-fired Wilga Park Power Station. The bulk of the electricity fed into the Country Energy Grid is used in the Walgett area. Owing to the declining availability of conventional natural gas from the Coonarah Gas Field, the quantity of electricity and associated NSW Greenhouse Gas Abatement Certificates being supplied to Country Energy are below contracted levels.

The development of the proposed gas gathering system and gas flow line from the Bibblewindi and Bohena CSG Pilots will allow the Wilga Park Power Station to revert to continuous operation and existing contract commitments can be fulfilled.

In 2007, the Joint Venture entered into Memoranda of Understanding (MOU) with Macquarie Generation and Babcock & Brown for the supply of up to 500 PJ and 40PJ/pa of gas respectively for use in future power generation. The MOU's provide the Joint Venture with a potential market in the event the gas exploration and evaluation activities throughout PEL 238 are successful and are able support the development of a sustainable and commercially viable gas field.

The Joint Venture recognises that in order to fulfil any sales contract based upon the MOU's, further impact assessment and Government approvals will be required to permit the development of a production gas field and the construction of gas treatment plant and high pressure transmission infrastructure.

2.4 The Location, Scale and Scope of Project

The justification of the Project depends in part upon its location, scale and scope, each of which is addressed as follows.

The location of the Wilga Park Power Station during the development of the Coonarah Gas Field/PPL3 was specifically selected to allow ready connection to the high voltage (66kV) Narrabri - Walgett electricity transmission line. The location of the power station adjacent to electricity transmission infrastructure is desirable since transport of gas to the power station (through buried pipes) is lower in cost than extension of the overhead electricity transmission system. Up to 40 MW of electricity can be supplied into the line at Wilga Park without need for major infrastructure upgrades.

The Bohena CSG Pilot was installed in an area where previous petroleum exploration had confirmed the presence of thick coal seams. Since modern drilling exploration commenced in the Bohena prospect area, 10 petroleum wells have been drilled, three of which are currently involved in CSG production activities. The drilling and production activity carried out by the Eastern Star/Hillgrove/Gastar Exploration Ltd joint venture in 2004 included the completion of the Bohena-4L (lateral) CSG well and the Bohena-9 vertical CSG well which further complimented previous work carried out by First Source/Force Energy between 1998 and 2002.

The Bibblewindi CSG pilot was installed in an area where seismic and well data indicated there is some thinning of the target coal seam. It was anticipated this location will allow quicker dewatering of the coal seam and, in turn, a more efficient demonstration of gas production performance.

The Wilga Park Power Station can be progressively expanded to utilise gas produced from all petroleum exploration activities within PEL238 including further conventional exploration and in terms of the Project, petroleum assessment activities within PAL 2. Conceptually, the size of the power station will be increased to a total of 40 MW with a total gas requirement of around 10.8TJ/d.

Preliminary predictions of the performance of CSG wells within PAL 2 indicate that:

- the rate of gas production from individual wells will peak (by around production years 3 to 6) at 1.2TJ/d; and
- the average rate of gas production over the first ten years of the life of each well could be in the range 0.5 to 0.75TJ/d.

On the basis of the above, the availability of gas from the Bibblewindi pilot production project alone may reach 10.8TJ/d, which matches the requirement for generation of 40 MW of electricity at the Wilga Park Power Station. In net terms over a ten year period, and on the basis that the Wilga Park Power Station is expanded to 40 MW, the availability of gas from pilot production activities at Bibblewindi will be sufficient to allow operation of the power station at an approximate 60% capacity factor. In addition, gas is available from three unconfined production test wells at Bohena (also within PAL 2) and from the Coonarah Gas Field. Gas production from Coonarah can be reduced or curtailed if necessary to ensure gas from pilot production test activities can be utilised. Apart from outages for maintenance or unplanned failures, the pilot production wells need to be operated on a continuous basis.

Additional pilot production drilling will be necessary in order to establish a level of proven gas reserves that is sufficient to underwrite a full scale, commercial CSG production development. However, the location of the proposed gas flow line may enable gas from any such additional wells in PAL 2 to be utilised at the Wilga Park Power Station.

2.5 Environmental Benefits

Gas-fired power generation produces significantly less greenhouse gases per unit of energy generated than does coal-fired generation. Simplified estimates of the volumes of CO₂ emitted per unit of coal and natural gas indicate that coal releases approximately twice the volume of CO₂ than natural gas hence the attraction of gas-fired over coal-fired power generation.

Additional greenhouse gas benefits can be achieved by preferentially consuming all production gases over atmospheric venting. Global Warming Potential (GWP) as defined in the *Intergovernmental Panel on Climate Change (IPCC) 2001 Third Assessment Report* is a measure of how much a given volume of greenhouse gas contributes to global warming relative to same volume of carbon dioxide, whose GWP is by definition 1. Noting that the relative GWP of a substance is wholly dependent on time over which the potential is calculated, methane as the major constituent of CSG, has a GWP of 25 over a 100 year period (IPCC 4th Assessment Report 2007). In more simple terms, as a greenhouse gas emitted to the atmosphere, methane is up to 25 times more effective as a contributor to global warming than carbon dioxide.

The proposed collection and consumption of the gas collected during the trial stage carries significantly greater environmental benefits than the atmospheric venting of methane. The gas utilisation project carries the additional benefit of permitting the partial recovery of funds expended throughout the lengthy exploration and testing program to develop a sustainable gas field.

Further information on the comparison of the current and potential options available in managing methane emissions is presented in Section 5.2.

2.6 Project Benefits

The implementation of the Project will offer benefits to a range of stakeholders including local and regional communities and the Joint Venture. These benefits include:

- increased reliability of electricity supply to Country Energy networks during peak demand periods;
- the provision of additional social and economic benefits to the Narrabri local government area;
- the resumption of 24 hour operation of the Wilga Park Power Station with a view to expansion of power generation from 11MW to 40MW; and
- improved environmental outcomes from lower greenhouse gas emissions both in terms of methane venting to atmosphere and per unit of energy output when compared to conventional coal-fired generation.

2.7 The Staged Development of a Sustainable Gas Field

In order to achieve the objective of a sustainable and commercially viable gas field, a number of important milestones need to be met during the multi-phase exploration and production development process. The following discussion, specifically in terms of a CSG project as distinct from a conventional gas discovery, will furthermore clarify the strategic relationship between the Project and any subsequent gas production developments in PAL2 and PEL238.

- **Stage 1: Initial Exploration**
Usually based upon existing knowledge of underlying coal measures, this stage is characterised by the completion of extensive seismic (geophysical) exploration and analysis. Preliminary core hole or production well (wildcat) drilling may occur during this phase.
- **Stage 2: Detailed Exploration**
The completion of extensive core hole drilling to assist in the delineation of coal-bearing sequences also permits the collection of important data on the reservoir characteristics. The primary objectives of this stage are to provide further data on the quality of CSG reservoirs and the collection of baseline parameters on coal thickness, quality, composition, thermal maturity, permeability and adsorption capacity (gas holding capacity) and gas content, quality and composition. The installation of production wells is often completed concurrently with these processes as a means to understand the behaviour of the coal reservoir under production conditions (i.e. the dewatering of the coal seam and the manner in which CSG is desorbed). This technical data is a key component to the reserves certification process.

- Stage 3: Pilot Production

A production pilot involving three or more wells in close proximity can be utilised to demonstrate gas deliverability in addition to providing the further data required for reserves certification process. The key objective of developing CSG pilots is to demonstrate economic viability of a prospect. Production wells are drilled over a limited area of the prospect with the performance of the wells to contribute to the production model and further modelling of the number and spacing of wells in a full scale production field. The pilot project also provides an opportunity to test completion techniques such as hydraulic fracture stimulation of vertical wells and horizontal “in seam” drilling.

- Stage 4: Reserves Certification

The commercial viability of a potential CSG field cannot be understood in any detail until the following objectives have been reached.

- The production profiles from the CSG pilot have matured i.e. shown adequate development of the typical CSG well production profile illustrated in **Figure 1.4**;
- Sustained gas production rates have been reached;
- Any further core hole drilling is completed

At this point, the Project may undergo initial reserves certification that can assist in the marketing of gas supply and secure additional capital.

- Stage 5: Phased Gas Field Development

Following a successful pilot project, it is possible that a full scale gas field can be developed on the back of reserves certified to date. This phase itself also occurs in small stages each aiming to increase cumulative gas production in order to meet gas sales contracts. This phased approach also permits the development company to generate revenues prior to capital expenditure on the next stage.

The Narrabri Coal Seam Gas Utilisation Project is effectively an early component of Stage 4 as the 12 wells currently on production testing are yet to reach maturity.

2.8 Conclusions

The continuing growth of electricity demands across NSW coupled with the increased social and environmental responsibilities associated with greenhouse gas emissions favours the continued exploration and development of natural gas for electricity generation, industrial and domestic consumption. The nature of CSG exploration and development requires a longer period from the commencement of production until maximum gas generation is reached. Hence, the significant volumes of gas recovered during this period are best captured for the purposes of electricity generation so as to furthermore reduce the greenhouse gas impacts of the activity.

Strategically, the location of the existing Wilga Park Power Station and its current under-utilisation presents an ideal opportunity to supply gas from the existing Bibblewindi and Bohena CSG Pilots immediately with a view to expanding the facility as the CSG field is developed and larger numbers of wells are brought onto production. The proposed gas utilisation project represents one critical stage in the establishment of marketable gas reserves in PEL 238, and one of many steps in the development of the estimated 3.7 TCF of CSG resources within PAL 2.

The reservoir modelling undertaken to date indicates that the Bibblewindi CSG Pilot is capable of achieving sustained gas production that supports the installation of the gas gathering system, gas flow line and upgraded power station as a stand-alone project. The development of further gas exploration and production wells within PAL 2 will be subject to a separate environmental impact assessment and approvals in accordance with the terms of PEL 238 and PAL 2.

The Joint Venture is critically aware of the need to obtain sufficient long-term field data that will underpin the cost of the installation / maintenance of the infrastructure required to collect and distribute gas from a sustainable and commercially viable gas field. The uncertainties in new gas field developments such as those in the Narrabri area have already been highlighted by the substantial downgrading of recoverable conventional natural gas resources in the Coonarah Gas Field west of the Wilga Park Power Station.

Whilst the Narrabri Coal Seam Gas Utilisation Project is recognised as a stand-alone Project, it is an integral component of the Joint Venture's long term plans to develop a sustainable and commercially viable gas field for the continued economic growth of NSW. It remains the contention of the Joint Venture that it is not appropriate to undertake an environmental impact assessment of the long term gas field development as it is far too premature to define the types and areas of potential disturbance and impact. The Joint Venture clearly acknowledges that it will be necessary for the long term gas field development and its related infrastructure to be the subject of further environmental impact assessments and Ministerial approval once the plans for the gas field are well advanced.