Project Need and Justification – Summary of Key Outcomes

The National Electricity Market (NEM) operator (NEMMCO) conducts an annual analysis of the supply-demand profile of the NEM and reviews the adequacy of electricity supplies to meet projected demand for the subsequent 10 years. Over the past several years, NEMMCO has highlighted the growth of electricity demand across NSW and, in particular, the growth of summer and winter peak demands.

Within the NEM, NSW is a net importer[1] of electricity - particularly reliant, in summer peak demand periods, on hydro-generation from the Snowy River Scheme and excess generation capacity in Victoria.

In its "*Statement of Opportunities 2006"* (SOO 2006) NEMMCO predicted an annual NSW peak demand growth of 2.1 - 3.2% (summer) and 1.4 - 2.7% (winter). This is reasonably consistent with its most recent "*Statement of Opportunities 2007"* (SOO 2007) released on 31 October 2007 which predicts[2] an annual NSW peak demand growth of 2.3 – 2.8% (summer) and 1.5 - 2.8% (winter).

Peak power demand is growing faster than base load demand, which necessitates investment in peaking power generation as proposed for Buronga by International Power (Australia) Pty Ltd (IPRA). The Buronga Peaking Power Plant Project is consistent with NSW Government policy[3], which is to promote private sector investment in new electricity generation assets.

It should be noted that the *Owen Inquiry* commissioned by the NSW Government - with the resulting report published in September 2007 - was directed at reviewing the need, technology and timing for new ***base load*** generation in NSW. It did not address peaking power generation of the type proposed by International Power (Australia) Pty Ltd (IPRA) for Buronga.

Demand growth of this order not only requires additional F generation capacity to meet demand but places existing high voltage transmission assets at risk in reliably delivering power to the relevant load centres.

The project is also, in part, a response to a TransGrid report in March 2003[4] that identified high voltage constraint scenarios on its transmission system and on regional NSW interstate connectors. Inter alia, TransGrid sought further comments on generation options having only received one such response to a 2002 report. At that time, a NSW/South Australia high voltage system connector ("SANI") from TransGrid's switching station was mooted. This project did not eventuate but, instead, a connector from Red Cliffs (Victoria) into South Australia ("MurrayLink") was subsequently built, primarily to moderate national grid import constraints into South Australia.

The MurrayLink interconnector however has not solved the problems in southwest NSW under certain demand scenarios or optimised the import/export efficiency on the NSW/SA/Victoria interconnected HV grid system as identified[5] by the National Electricity Market operator NEMMCO.

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1 NEMMCO *Statement Of Opportunities 2007* - inter alia Table 2.4
2 NEMMCO *Statement Of Opportunities 2007* - Tables 3.10 & 3.11
3 NSW Government Energy Directions Green Paper (December 2004)
4 *Supply to South West NSW* (TransGrid, March 2003)
5 *Interconnector Limit Forecast for MTPASA* (NEMMCO, November 2007) and related discussion papers

The proposed Buronga site is a strategic location for peaking power generation, being adjacent to an existing TransGrid 220kV high voltage switching station and associated high voltage network servicing the far west of NSW (including Broken Hill) and feeding into the Victorian system at Red Cliffs.

The facility proposed by IPRA would operate as peaking plant - that is, generating power on an as-required basis for an anticipated total maximum period of up to 10 % of any year to provide:

- NEM and NEMMCO support at times of high inter-regional demand and/or constraints;
- Transmission network support to ensure reliability and quality of electricity supply; and
- Security of local electricity supply at times of system (planned or accidental) shut-down.

The multi-unit Buronga Peaking Power Plant concept offers:

- significant mitigation of growing peak electricity demand within NSW; and
- significant regional reinforcement in the event of extensive transmission system problems.

The facility would be capable of providing up to 150MW of capacity until such time as the transmission system can be stabilised, at which point the facility would resume its normal peaking role.

2.1 Introduction

There are four distinct components of the supply of electricity: generation, transmission, distribution and retailing. The Buronga Peaking Power Plant Project relates to the "generation" component of the supply of electricity and deferral of costs stemming from the need to augment or upgrade the regional "transmission" network.

The National Electricity Market (NEM) governs the supply of electricity in Australia and is managed by the National Electricity Market Management Company (NEMMCO). NEMMCO in its latest "*Statement of Opportunities 2007"* predicts[6] that growth in peak electricity demand in NSW will exceed existing capacity in the near term (see **Figure 2-2**), requiring the construction and operation of new power stations. Due to the type of load growth, the immediate need is for power stations to meet the peak demand.

To partly meet this demand, IPRA has proposed the Buronga Peaking Power Plant Project comprising three gas turbines with a nominal total output of up to 150MW.

The NSW Government's *Energy Directions Green Paper* (December 2004) stated a preference for private investment in electricity generation in this state and the Owens Inquiry of 2007 endorsed this policy position. The electricity market and the drivers behind the supply and demand of electricity are discussed in more detail in this chapter.

This chapter addresses the project justification in terms of the National Electricity Market, the transmission network and IPRA's participation. **Chapter 3** of the Environmental Assessment addresses the alternative Development Site locations and technologies considered for the Buronga Peaking Power Plant Project. **Chapter 5** addresses the strategic direction of the region in terms of land use and planning while **Chapter 17** discusses socio-economic issues.

2.2 Background

2.2.1 The National Electricity Market

In December 1998, a single competitive national electricity market for the supply of electricity was introduced. The NEM introduced competition in the wholesale supply and purchase of electricity combined with an open access regime for the use of electricity networks that now extend across the Australian Capital Territory, New South Wales, Queensland, South Australia, Victoria and Tasmania. The regional boundaries and key interconnectors of the NEM are shown in **Figure 2-1**.

The NEM is a wholesale market for the supply and purchase of electricity; the arrangements for which are defined in the National Electricity Code. NEMMCO manages the operation of the wholesale electricity market and security of the power system.

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6 NEMMCO *Statement Of Opportunities 2007* - Section 2.4

Figure 2-1 Regional NEM Boundaries and Key Interconnectors

(Source: NEMMCO SOO 2007)

Generators bid their electricity into the NEM, which is split into regions based largely upon State boundaries. The last bid accepted sets the spot price for electricity and prices are set on a half-hour basis. Retailers purchase the electricity direct from the NEM and NEMMCO facilitates these purchases. The electricity is then on-sold to the consumer and transported by high voltage transmission lines and lower voltage distribution networks.

Prior to the NEM, prices did not play an important role in shaping energy infrastructure development. Since the creation of the NEM, the supply and demand mechanism determines price and how infrastructure is developed. Increasing prices provide an incentive for investors to invest in new generation capacity or build a transmission interconnect which allows excess supply in another State to be imported.

To illustrate the impact of capacity on price, over the past 12 months rising electricity demand in an environment of static installed capacity (notwithstanding drought impacts) has driven the average pool price from around $40 per megawatt hour (MWh) to around $60 per MWh at present.

2.2.2 Government Energy Policy

As the security of energy supply is a critical issue for the future of NSW, the NSW Government released their *Energy Directions Green Paper* (the Green Paper) in December 2004. This Green Paper states that while there is currently sufficient electricity generation capacity in New South Wales to meet demand, the level of maximum demand is increasing by around 4 per cent per year. The Green Paper notes that up to 6000MW of additional generation capacity or demand-side management reductions may be needed by 2020. This compares to an installed NSW generation capacity[7] of some 14,000MW at present.

To meet varying electricity demand across the NEM, generation plant is brought into and taken out of service. The price varies according to the capability of available generating plant to meet demand.

The NEM can be volatile, with the average price around $60 per MWh and a maximum price of $10,000 per MWh, which generally occurs when extreme peak demand coincides with constrained transmission lines and/or generation plant breakdown. Generators and retailers bear the market risk, which they mitigate by entering into a range of hedging and other market contracts.

It is for this reason that the NSW Government has expressed a preference for the private sector to invest in future generation assets. Whilst NSW Government policy is to retain its existing assets, it has determined that changes need to be made to the structure of these businesses and the nature of future generation investment - accordingly, the Government adopted two key policy objectives:

- *"Preservation of the value of the Government's significant investment in the electricity sector. This is to be achieved through more effective governance structures for the management of risk and business structures that can effectively compete in the national market; and*
- *Promotion of private sector investment in energy infrastructure. The Government does not consider it appropriate to invest further capital in high risk commercial activities like electricity generation, when this capital and risk exposure can be provided by the private sector."*

It should be noted that the *Owen Inquiry* commissioned by the NSW Government, and the resulting report published in September 2007, was directed at reviewing the need, technology and timing for new ***base load*** generation in NSW. It did not address peaking power generation of the type proposed by IPRA for Buronga.

2.2.3 Electricity Demand Forecasting by NEMMCO

Electricity demand is generally described as either "base load" or "peak load". Base load demand is the load on the electricity system that occurs most of the time. Peak load demand is the generally short-duration much higher demand that typically occurs during very hot summer weather (due to increased use of air conditioners) or during very cold winter weather (due to increased use of electrical heating).

7 NEMMCO *Statement Of Opportunities 2007* - inter alia Section 2.4

Each year NEMMCO releases its Statement of Opportunities (SOO) which analyses the supply and demand scenarios for each region of the NEM. NEMMCO forecasts supply/demand over the pending 10-year period and evaluates the capability of the electricity system to reliably meet the near and longer term demand.

In NSW - as reflected across the other participating NEM States - installed generation capacity is adequate to meet base load demand over the near and longer term. However, there is insufficient generation capability to meet peak load demand growth over the near and longer term - the highest peak load demand generally occurs during summer.

Figure 2-2(a) shows the NEMMCO SOO 2006 forecast growth in NSW peak summer load to 2015/2016 and, in particular, the report highlighted a shortfall[8] in NSW reserve peaking capacity of some 287MW requiring additional reserve capacity as early as 2007/2008.

This should be compared with the NEMMCO SOO 2007 forecast in **Figure 2-2(b)** which - due to a number of factors including different analysis techniques and new generation capacity - shows a revised assessment projecting that additional capacity would be required around 2013/2014.

While its latest report indicates an improvement in the NSW reserve capacity outlook and does not identify the previous 287MW reserve deficit, the NEMMCO SOO 2007 does state[9] that its analysis does not include any allowance for generation limitations arising from drought conditions restricting water availability. This is particularly important in considering NEMMCO's SOO 2007 projections that additional capacity in NSW will not be required until the summer of 2013/2014.

Further, the NEMMCO SOO 2007 does project[10] that NEM-wide summer demand deficits could occur as early as 2011/2012.

IPRA is of the view that additional peak generation capacity of the type it proposes for Buronga will be required as early as 2010, particularly if water restrictions as have been experienced during the period from 2006 impact on generation from existing base load and hydro-generators.

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[8] NEMMCO *Statement Of Opportunities 2006* - Table 2-2

[9] NEMMCO *Statement Of Opportunities 2007* - Section 2.2.4

[10] NEMMCO *Statement Of Opportunities 2007* - Section 2.8

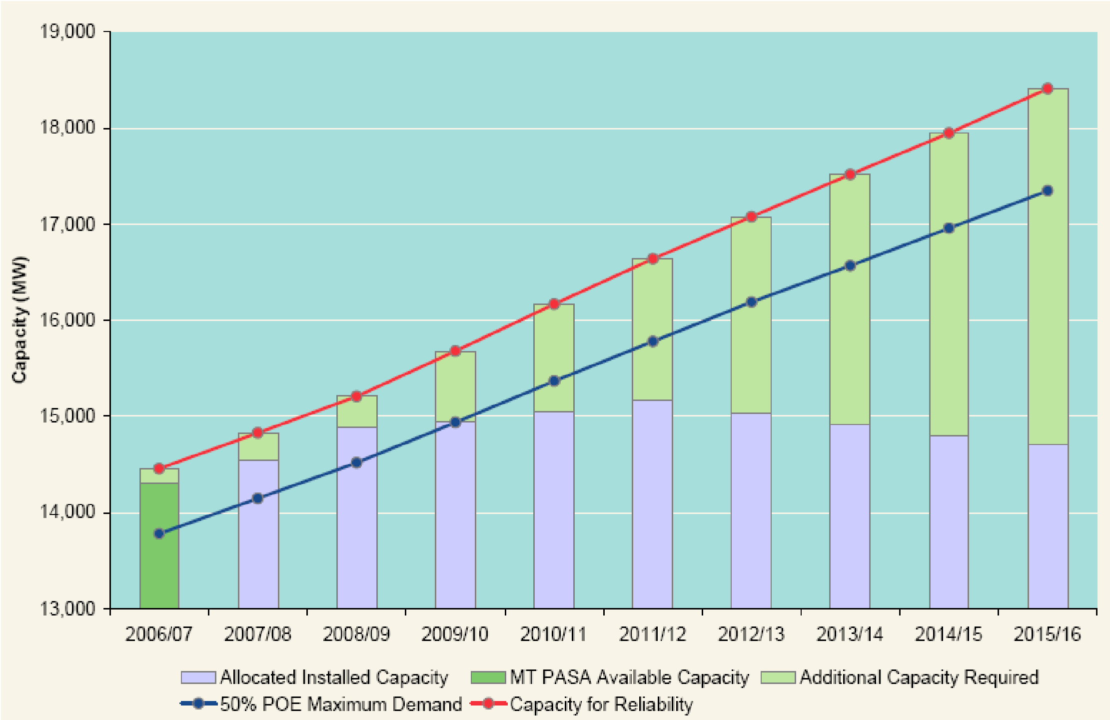


Figure 2-2(a) 2006 Projected NSW Summer Outlook to 2015/2016

(Source: NEMMCO SOO 2006)

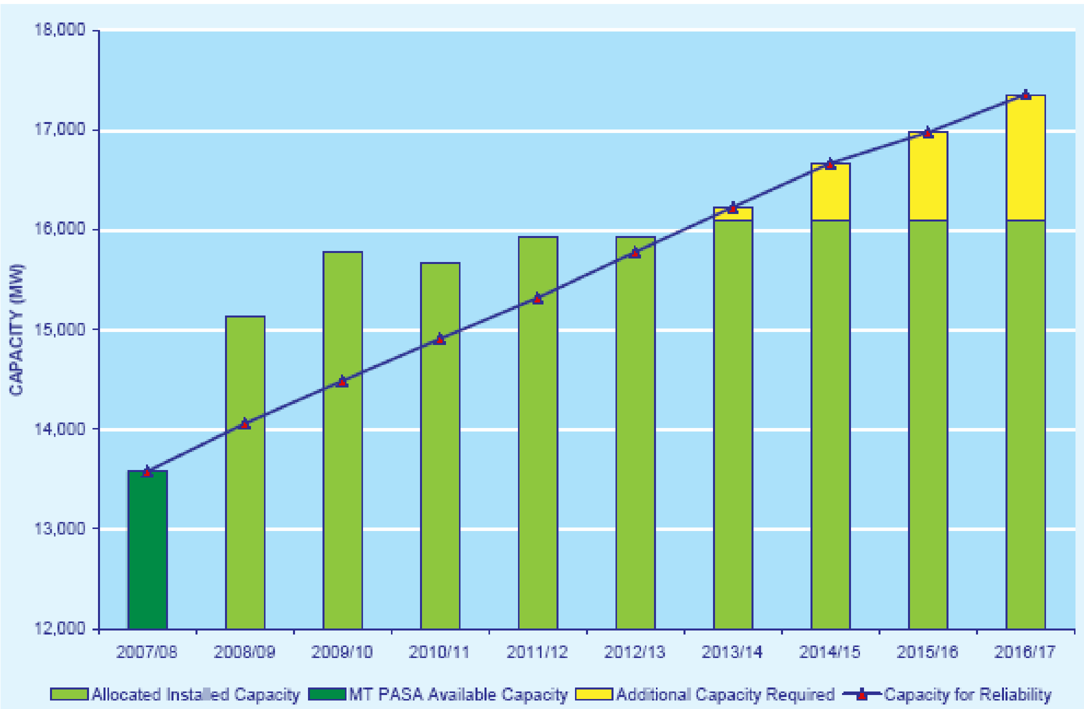


Figure 2-2(b) 2007 Projected NSW Summer Outlook to 2016/2017

(Source: NEMMCO SOO 2006)

2.2.4 Meeting Peak Load Demand

As acknowledged in the Government's 2004 Green Paper, peak demand is growing much faster than average demand. In NSW, summer peak demand has grown by around 3.8% per year for the past five years while base load growth has been significantly slower at around 2.8%. The Green Paper further notes that the trend toward 'peakier' electricity demand has significant cost implications for NSW consumers. Effectively 10% of NSW generation and network capacity is used for only 1 percent of the time. If current growth trends continue, in 10 years time around 18 percent of generation capacity will be required for only 1 percent of the year.

In canvassing possible options, the Green Paper notes that "open cycle" gas-fired generation plant are more cost-effective in meeting peak demand and can be built in a relatively short timeframe. In the absence of a commercial gas supply, distillate-fired gas turbine technology can also be constructed quickly and offers the same market response advantages in a peak demand situation.

A peaking power plant such as that proposed by IPRA at Buronga effectively fills a "plant merit gap" in the NSW generation profile. Hitherto, NSW has generally operated coal-fired base load plant with peak demand met by hydro-generation from the Snowy Mountains plant or by electricity import from interstate. Drought conditions exacerbate the supply situation when hydro-generation is limited or curtailed by water shortages such as has occurred both in the Snowy region and Queensland.

The NEM-wide growth of peak demand has meant that the opportunity to import is rapidly decreasing and consequently market supply-demand mechanisms will drive up the cost of electricity and hence the market risk exposure of electricity retailers. Retailers hedge that risk by contracting with generators for the output of plant such as the facility proposed by IPRA at Buronga.

In contrast to a base load plant which runs most of the time to meet "core" electricity demand, peaking plants start and run only at times of very high demand or when there are system problems such as a base load generator suddenly tripping off or a transmission line failure.

Consequently, peaking plants generally run only over short periods of time on any one day and for a relatively small proportion of time on an annual basis with a focus on high demand periods during winter and summer on a seasonal basis.

Peaking power plants improve the reliability and maintain the quality of electricity supply during peak periods. They also improve the security of supply, due to a faster start-up time, should a transmission system emergency (instability or shutdown) occur.

Distillate fired gas turbines of the type proposed at Buronga still produce significantly less greenhouse emissions than traditional coal fired base load power plants. One environmental benefit of the plant proposed by IPRA is that generation at Buronga will alleviate the need for additional coal-fired plant to run when peak load demand problems create a regional capacity shortfall.

2.2.5 TransGrid's Transmission Network

Quite separate from having adequate generating capacity is the issue of delivering electricity to load centres. The majority of NSW's electricity usage occurs in the Newcastle / Sydney / Wollongong area which accounts for over 75% of peak demand. The remaining 25% is spread across the regional load centres. The core 330kV and 220kV transmission network has been in place for many years and, because of increasing demand, some key elements of this system are being (or are planned to be) upgraded to or augmented by 500kV lines. The remainder of the transmission system comprises 132kV and 66kV lines.

Figure 2-3 shows the NSW high voltage transmission network and major substations.

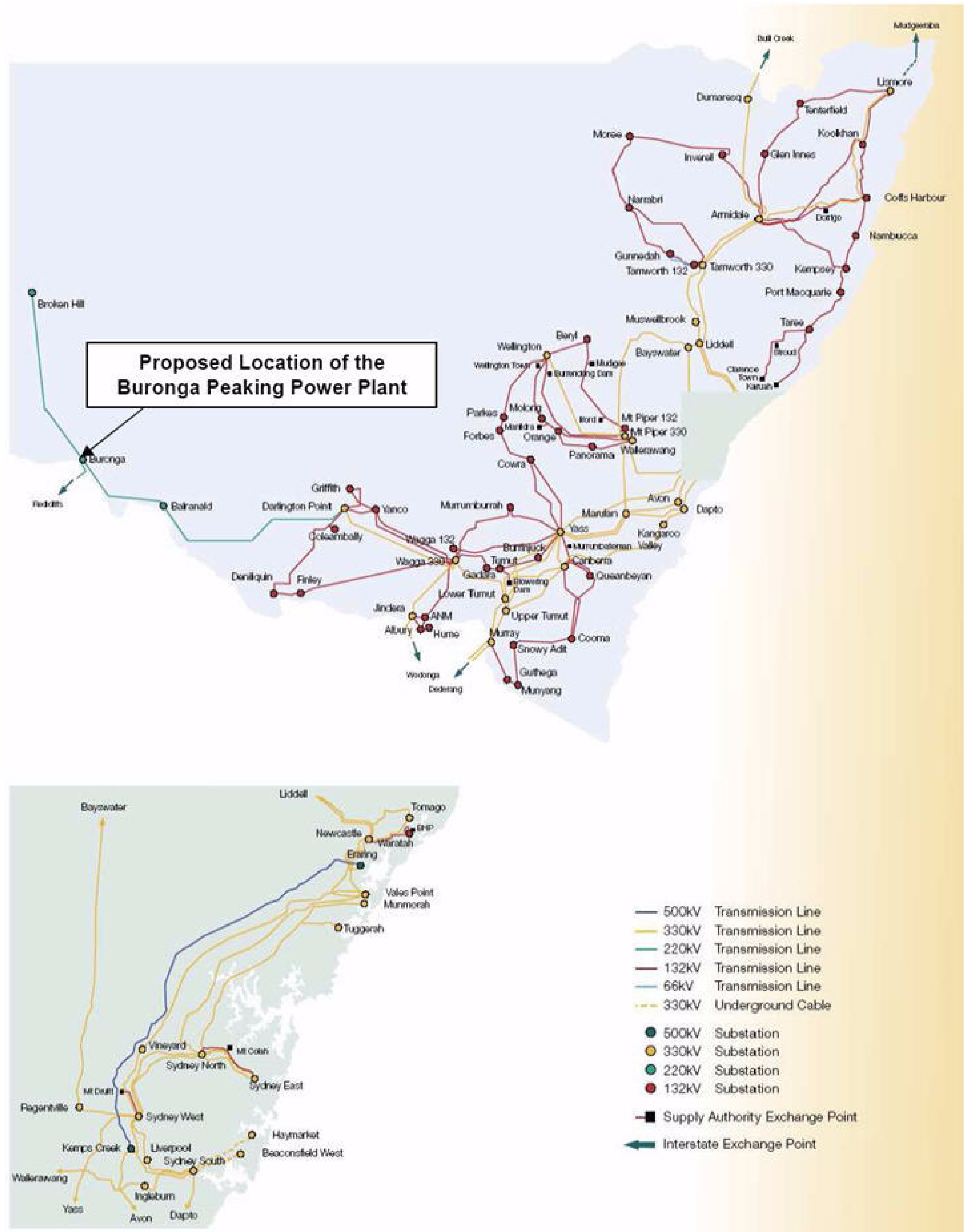
The State-owned transmission corporation TransGrid manages the system to ensure the output of existing generators reaches the major demand centres in NSW. TransGrid continually reviews the capacity of its system to deliver energy to the standards required of participants in the NEM and identifies existing or potential future problem areas.

The project is also, in part, a response to a TransGrid report in March 2003 that identified high voltage constraint scenarios on its transmission system and on regional NSW interstate connectors. Inter alia, TransGrid sought further comments on generation options having only received one such response to a 2002 report.

At that time, a NSW/South Australia high voltage system connector ("SANI") from TransGrid's Buronga switching station was mooted. This project did not eventuate but, instead, a connector from Red Cliffs (Victoria) into South Australia ("MurrayLink") was subsequently built, primarily to moderate national grid import constraints into South Australia.

The MurrayLink connector however does not solve the problems in southwest NSW under certain demand or import/export conditions on the NSW/SA/Victoria interconnected HV grid system[11]. The proponent contends that the peaking plant proposed for Buronga will assist in optimising the efficiency of the HV inter-regional system and associated market operations which in turn will benefit NSW consumers not least in terms of security and reliability of supply.

11 *Interconnector Limit Forecast for MTPASA* (NEMMCO, November 2007) and related discussion papers



Source: TransGrid, 2006

Client
INTERNATIONAL POWER (AUSTRALIA) PTY LTD

URS

Project
ENVIRONMENTAL ASSESSMENT
BURONGA PEAKING POWER PLANT

Drawn: AJW | Approved: CJ | Date: 22/05/2008

Job No: 43177455 | File No: 43177455.011.wor

Title
NSW HIGH VOLTAGE TRANSMISSION NETWORK

Figure: 2-3

2.3 IPRA's Proposal

2.3.1 The Proponent

The proponent is International Power (Australia) Pty Ltd ("IPRA"), a wholly owned subsidiary of International Power plc, a UK-based independent power generation and operation company with interests in 40 power stations in 18 countries around the world. International Power plc is listed on the London Stock Exchange and has a current market capitalisation in excess of A$11bn. Further information on International Power plc and IPRA is available on its website **www.ipplc.com**.

Since becoming established in Australia in 1996, IPRA has invested in excess of A$5bn and focused on becoming a leading player in the energy industry. The company owns and operates more than 3600MW of renewable, gas-fired and brown coal-fired generating plants in Victoria, South Australia and Western Australia. Its interests also extend across energy retailing (Energy Australia) and the (SEAGas) gas pipeline between Victoria and South Australia. **Table 2-1** illustrates the extent of IPRA's Australian energy interests.

Asset	Fuel / Type	Gross Capacity MW	Net capacity MW
Hazelwood, Victoria	Coal	1,675	1,541
Loy Yang B Power Station, Victoria	Coal	1,026	718
Synergen Peaking Units, South Australia	Gas/Distillate	371	371
Pelican Point Power Station, South Australia	Gas (CCGT)	487	487
Canunda Wind Farm, South Australia	Wind/renewable	46	46
Kwinana Power Station, Western Australia	Gas (CCGT)	118	58
SEA Gas underground pipeline	n/a	n/a	n/a
Simply Energy	n/a	n/a	n/a
		3,723	**3,221**

Table 2-1 IPRA Australian Energy Assets

(Source: IPRA, 2006)

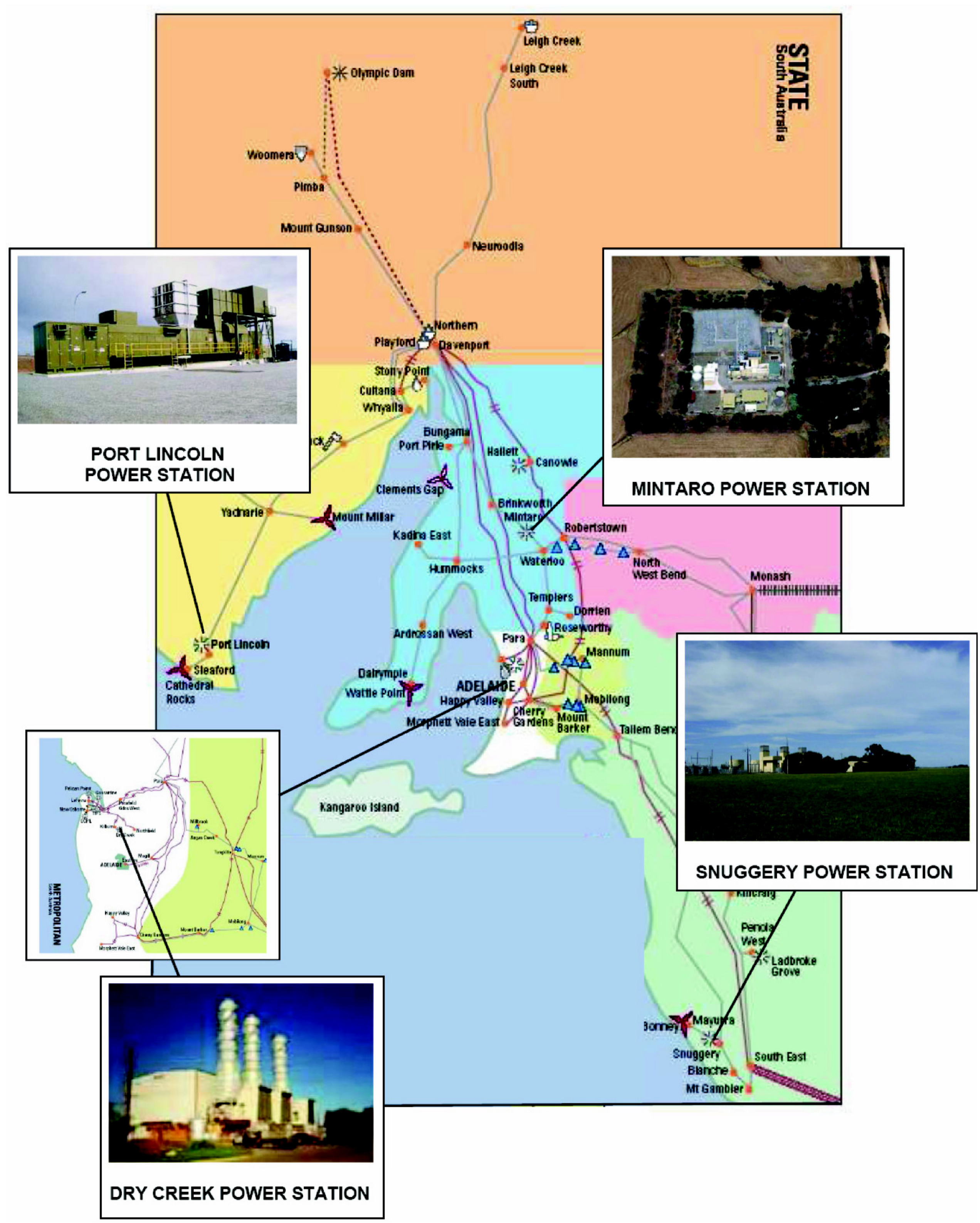
IPRA employs around 750 personnel across its national business and is an innovative and proactive company, highly regarded in the industry as a project developer and as an energy asset operator.

In addition to its plans for the proposed Buronga Peaking Power Plant Project, IPRA plans to invest in additional peaking power plants in NSW - at Parkes in the central west of the State and at Herons Creek on the mid north coast. Project Applications have been submitted for both of these other proposals.

Considered individually or together, these three peaking plant projects being proposed by IPRA would replicate in NSW the successful electricity network support business provided by its wholly owned subsidiary Synergen Power Pty Ltd (Synergen) in South Australia.

Synergen comprises four peaking power stations, totalling 360MW, geographically disparate but optimally located to provide network support to the South Australian region for the local high voltage transmission operator for over 25 years and support services to NEMMCO since the inception of the NEM in 1998. Both have benefited from higher system security and reliability and greater flexibility in managing system constraint conditions.

The Synergen suite of peaking plant assets, illustrated in **Figure 2-4,** has also allowed the system operator to defer significant capital expenditure on transmission system infrastructure upgrades and augmentation.



Source: IPRA, 2006

Client	Project	Title
INTERNATIONAL POWER (AUSTRALIA) PTY LTD	ENVIRONMENTAL ASSESSMENT BURONGA PEAKING POWER PLANT	**IPRA SOUTH AUSTRALIAN PEAKING PLANT ASSETS**
URS	Drawn: AJW · Approved: CJ · Date: 22/05/2008 · Job No: **43177455** · File No: 43177455.011.wor	Figure: **2-4**

2.3.2 The Proposal

IPRA's proposal to build the Buronga Peaking Power Plant Project will add a significant peak generation capability to the NSW regional electricity system and is consistent with NSW government policy directed at encouraging private sector investment in the provision of new generation infrastructure.

This infrastructure presently has a 287MW shortfall in peak capacity reserve and faces an impending worsening of this situation as the opportunity to import electricity reduces into the future as forecast by the National Electricity Market operator, NEMMCO. Drought conditions, as recently experienced, exacerbate the supply situation when peak demand hydro-generation is limited or curtailed by water shortages.

The injection of up to 150MW additional capacity also offers a level of inter-regional support to NEMMCO insofar as overall system stability and its management of the interconnected National Electricity Market.

Subject to final plant selection, the Buronga Peaking Power Plant would comprise three open cycle open cycle distillate-fired gas turbine generating units each of up to 50MW capacity. These units would have dual fuel capability and are therefore able to be converted to gas firing should sufficient natural gas become commercially available in the future.

Further, the project offers a potential solution to mitigate the transmission system stability and security risks identified by TransGrid in its report *Supply to South West NSW* of March 2003.

These units will be capable of operating individually or in conjunction, together providing a high level of reliable generation capacity embedded within the region. This multi-unit concept provides a reliability factor in excess of 99% on an annual basis.

The Buronga site is a sound strategic location for peaking power generation being adjacent an existing 220kV high voltage network servicing the NSW far west and a major inter-regional connector into Victoria and South Australia. Locating adjacent to the TransGrid switching station at Buronga allows the output from the facility to be directly connected to the 220kV grid. The final details and design standards of the connection will be as agreed by TransGrid.

The general layout and appearance of the Buronga Peaking Power Plant and other plant-specific matters are addressed elsewhere in this Environmental Assessment.

IPRA has analysed the market and system information provided by NEMMCO and TransGrid and proposes that the facility would operate as peaking plant. That is, generating power during periods of high demand or transmission system constraint on an as-required basis for an anticipated total maximum period of up to 10 % of any year to provide:

- NEM and NEMMCO support at times of high inter-regional demand and/or constraints;
- Security of local electricity supply at times of system (planned or accidental) shut-down; and
- Transmission network support services to ensure reliability and quality of electricity supply.

Peaking plants already in the IPRA Synergen portfolio in South Australia typically only operate for 2% to 3% of the time. Given NSW's much higher electrical demand profile and far greater generation and transmission system demographics, IPRA's expects that the plant would, except for emergencies as allowed in its operating licence, normally run less than 10% of any year.

However, run requirements will be dictated by market and system conditions that are worsening as demand growth occurs and with the ageing of existing transmission system and generating plant infrastructure. Except for air emissions, an annual 10% run regime is presented as the "worse case" scenario for stakeholder consideration of this Environmental Assessment. Air emissions are based upon a 100% run regime to demonstrate that air emissions would fall well within Regulated limits

2.4 Project Benefits

The location and plant proposed at Buronga NSW has been chosen to best meet IPRA's non-commercial project objectives, these being to:

- meet load growth through connection to the National Electricity Market and contribute to inter/regional supply security;
- provide a potential solution to the TransGrid 220kV transmission system constraint scenarios;
- minimise (visual, air emission, noise and traffic) community impacts;
- optimise connectability to the TransGrid electricity system;
- be dual-fuel capable to facilitate conversion to gas firing should sufficient natural gas become commercially available in the future;
- include, wherever possible, recycling of consumables, particularly water;
- comprise multiple generation units to ensure reliability; and
- be sized to operate in the short to mid term as peaking plant so as to both provide a fast start response to National Electricity Market load transients and mitigate as far as possible the TransGrid constraint scenarios.

The nominal 150MW Buronga Peaking Power Plant as proposed by IPRA:

- is a cost efficient and effective generation solution for peak demand and system constraint scenarios identified by NEMMCO and TransGrid;
- is consistent with Government energy policy and provides economic benefits for the State of NSW in reduced costs of managing the transmission network compared to other alternatives and avoided capital expenditure resulting from private investment;
- can provide network support to TransGrid's high voltage transmission network by providing local power generation capability during periods of peak demand at a critical location in the NSW grid, as identified by TransGrid network planning reports;
- delivers electricity with acceptable environmental outcomes. It has lower greenhouse gas emissions than coal fired plant and is located in an appropriately zoned area with adequate separation from sensitive receptors; and
- does not restrict the current use of adjacent land and allows for adjacent land to realise potential for other industries.