3. Strategic Justification

This Chapter provides a strategic assessment of the need, scale and location of the project in relation to the National Electricity Market, the existing electricity supply constraints and the predicted electricity demand in NSW. The Chapter also considers the outcomes and conclusions of the Inquiry into Electricity Supply in NSW (Owen Inquiry) in relation to future electricity generation in NSW.

An assessment of the alternatives considered is described, comparing the relative merits of the alternatives and justifying the preferred solutions. An analysis of the preferred site, with respect to potential land use conflicts with existing and future surrounding land uses, is provided in a strategic planning context.

3.1. Need for the project

3.1.1. The National Electricity Market

The National Electricity Market Management Company Limited (NEMMCO) administers and operates the National Electricity Market (NEM), which is a wholesale market for the supply and purchase of electricity across the Australian Capital Territory, New South Wales, Queensland, South Australia, Victoria and Tasmania. The NEM commenced on 13 December 1998 and allows generators and retailers to purchase and sell electricity from the most competitive sources. It consists of a high voltage transmission network extending from Port Douglas in Queensland to Port Lincoln in South Australia. Interconnectors are used to transport excess electricity capacity from one State to supply electricity to another State that is connected by the grid.

The establishment of the NEM allowed for the wholesale price of electricity to be determined by the interaction of supply and demand. The resulting energy price feeds into market based decisions on infrastructure investment. Energy demand profiling is another important element in establishing which type of generation is required. This interacts with the trade off between capital and variable costs of various technologies as a key driver in plant selection; with the lower capital and higher variable costs of open cycle gas turbines being more suitable when the duration of demand peaks is quite short (peaking generators); and the higher capital costs but lower variable costs of combined cycle gas plants or coal fired plants more appropriate when demand is present for long periods (base load periods).

The *Inquiry into Electricity Supply in NSW* (Owen Inquiry) was established in May 2007 to advise the NSW Government on the activities that need to be undertaken in order to provide for a timely investment in new electricity generation. The results of the inquiry were released in September 2007. They acknowledged the dynamic nature of the electricity market and its dependence upon region, population, temperature and industrial and commercial needs. The Owen inquiry recognised that

shortly after an analysis of market conditions has been undertaken, the results become outdated as the conditions have changed. It concluded that taking into account the lead times associated with planning, design, approval and construction, the earliest date that a CCGT gas-fired plant could be operational is between 2010 and 2011. The lead time required for a gas fired CCGT power station is approximately 3 years shorter than the timeframe required for a base load coal fired power station, which could not be operational until 2013/2014.

Due to the extensive lead times and preparation required for new generation facilities, TRUenergy is undertaking the planning, design and approval requirements for a gas fired power plant (either OCGT or CCGT) to ensure timely delivery of the appropriate project once market analysis is complete. In order to match the growth in the electricity market, both on a capacity and energy basis, and limit the risks associated with the dynamic electricity market, TRUenergy will undertake extensive modelling of market conditions at the latest possible opportunity prior to deciding whether to invest in the project. Additionally, this modelling will inform the type of generation required, be it an OCGT to meet peak capacity or a CCGT to cover the intermediate or base load range. This process is consistent with the view of the Owen Inquiry which stated that the planning and design of new generation facilities could be suspended, withdrawn or terminated if there is no longer a need for new generation.

3.1.2 Supply constraints

The majority of electricity usage in NSW occurs between Wollongong and Newcastle, accounting for over 75 percent of the State's power demand (TransGrid, 2006). TransGrid, the owner and operator of high voltage transmission lines in NSW, published the "Development of Supply to the Newcastle – Sydney – Wollongong Area" application notice in May 2006, which identified requirements for NSW to ensure ongoing supply reliability. TransGrid acknowledged that the existing 330kV network is reaching the upper limit of its capacity in supplying these areas during periods of high demand and an upgrade of the network is required.

The limited capacity of the transmission network between Wollongong and Newcastle constrains the location of future electricity generation facilities. While new generation outside the Wollongong – Sydney – Newcastle area would be constrained by the limited capacity of the network to supply these major load centres, new generation situated within the Wollongong – Sydney – Newcastle load areas would not necessitate significant additional network investment. The Tallawarra Stage B site provides a site with existing infrastructure, resources and cooling that is located on the 132kV transmission network, within the Wollongong – Sydney – Newcastle major load area and is therefore situated in an ideal location for providing a reliable electricity supply to this area without the need for costly transmission augmentation.

3.1.3 Electricity demand

In December 2004, the NSW Government released the *Energy Directions Green Paper* (the Green Paper) with an aim of providing certainty for the planning of future electricity generation to meet additional demand. The paper identified two types of electricity demand, stating that average demand in NSW was around 8,500 MW in 2004 and peak demand reached 12,838 MW in July 2004. Peak demand is currently growing much faster than average demand, with average demand increasing at a rate of 2.8 percent per year whilst peak demand has grown by approximately 3.8 percent each year from 1999 to 2004. This growth is expected to continue for a number of years and, if the trend for growth in peak demand continues, in 10 years time approximately 18 percent of all generation capacity would be required for only 1 percent of the year. To meet such low capacity factor requirements peaking power stations are the most appropriate. The Green Paper has highlighted that a suitable site for the development of a gas-fired peaking plant would be at Tallawarra.

In relation to base load generation, the Owen Inquiry (2007) highlighted that no base load generation plant has been built in NSW in the last 15 years, since the commissioning of Mount Piper Power Station in 1993. The Owen Inquiry stated that NSW has had a surplus generation capacity for the last 15 years, which has been more than sufficient to meet the growth in consumption.

As a result of increasing population growth and electricity usage, the demand for base load generation is reaching the current supply capacity. One of the key recommendations of the Owen Inquiry was that to avoid potential energy shortfalls, NSW should be in a position where new base load generation can be operational by 2013/14 if necessary and preparation for this should commence now.

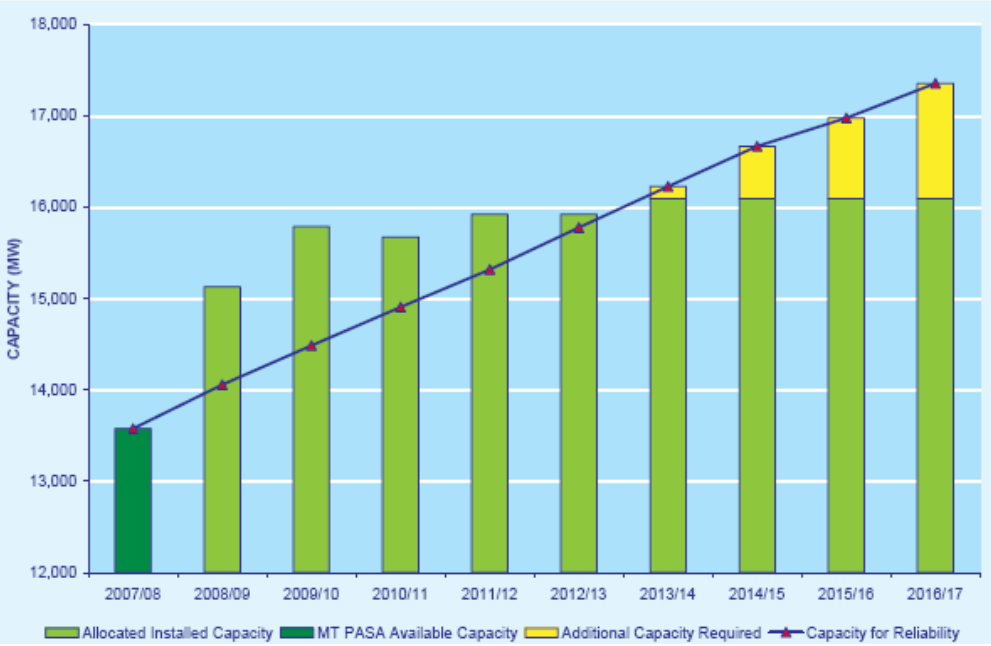
NEMMCO Statement of Opportunities

Based on conservative assumptions of population growth, demand growth forecasts, no upgrading of existing power plants and no new demand measures, the 2006 Statement of Opportunities published by NEMMCO has forecast that additional peak electricity capacity would be required by 2010/11 to meet expected demand. The 2007 Statement of Opportunities states, however, that additional peak electricity capacity would not be required until 2013/14 (refer to **Figure 3-1**).

The difference between the 2006 and 2007 projections results from several advanced generation proposals identified in 2006 being reported as committed projects in 2007, such as Colongra and Uranquinty. Both the 2006 and 2007 forecasts take into account that NSW will receive some additional capacity in the summer of 2008/09 through the commissioning of the Tallawarra Stage A CCGT power station.

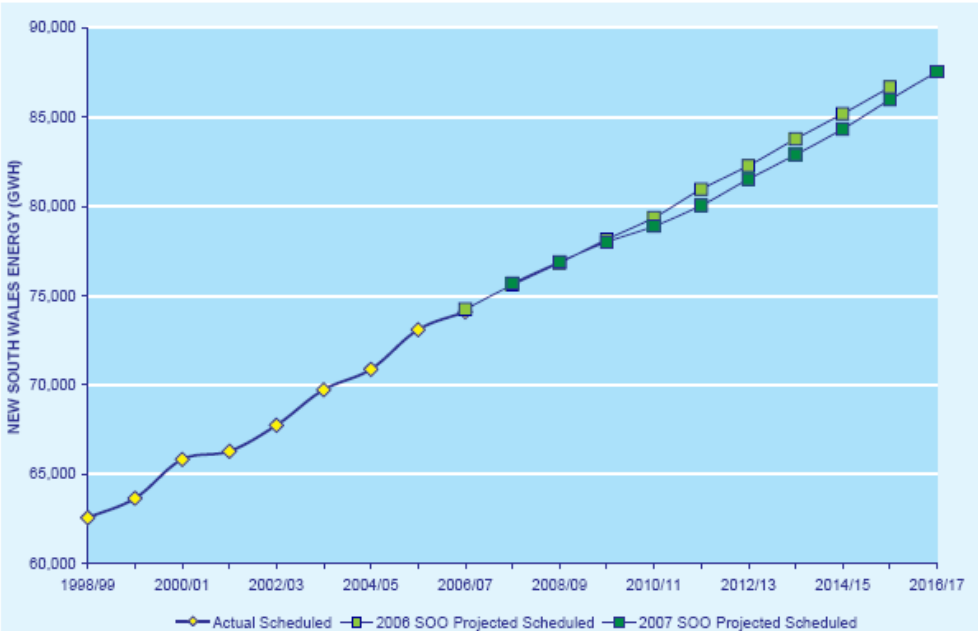
TransGrid has forecast that over the next 10 years, total energy consumption will grow at a rate of approximately 1,600 GWh per year under a medium growth scenario (**Figure 3-2**). This annual rate of growth is below the historical average growth and is partly the result of new energy efficiency measures.

- **Figure 3-1 New South Wales Summer Supply-Demand Outlook**



Source: NEMMCO Statement of Opportunities for the National Electricity Market 2007 – Section 2.4.2

- **Figure 3-2 Annual scheduled energy medium-growth projections for NSW in 2006 and 2007.**



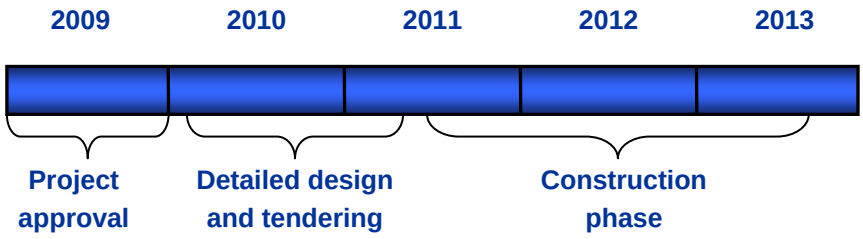
Source: NEMMCO Statement of Opportunities for the National Electricity Market 2007 – Section 3.2.2

3.1.4 Future electricity generation

Electricity generation is the largest single contributor of greenhouse gas emissions in NSW (approximately one third of the total greenhouse gas emissions), predominantly as a result of the high proportion of black coal used in generation (NSW Government, 2004). Between 1990 and 2002, greenhouse gas emissions in NSW grew by 44 percent (NSW Government, 2004). This trend will continue if future electricity demand continues to be met by high greenhouse intensity generation, such as coal-fired power stations. In the Green Paper, the NSW Government recognises that further development of the State's gas industry is advantageous, as gas-fired power plants, particularly CCGT plants, produce lower volumes of greenhouse gases per unit of output than other electricity supply facilities and there are opportunities for expansion. Currently, less than 2 percent of electricity generation plant capacity in NSW comprises gas facilities, which is a significantly smaller proportion in comparison to other states such as Queensland (8%), Victoria (18%) and South Australia (75%).

A key finding of the Owen Inquiry (2007) was that NSW should be in a position where a new base load generation facility can be operational by 2013/14, although an intermediate plant could be commissioned slightly earlier than 2013. Due to lead times, the earliest date that a CCGT gas-fired plant could be operational is between 2010 and 2011, whilst a coal-fired generator could not be operational until about 2013/14. In order for the Tallawarra Stage B plant to be operational to provide base load power generation, an application for the development would need to be approved during 2009 to ensure the construction and commissioning timeframes are sufficient (**Figure 3-3**).

- **Figure 3-3: Timeframe for commissioning of Tallawarra Stage B**



Additional base load capacity may be required as a result of the lengthening of seasonal peaks. The extension of these peaks within summer and winter is narrowing the gap between peak periods and the length of the seasonal troughs. This is affecting the 'maintenance windows' that are available in spring and autumn for maintenance of the generation and transmission systems, meaning that maintenance activities would be required to be undertaken during peak periods. To ensure that electricity supply and reliability is not compromised during these periods, additional capacity would be required.

It was recommended that most of the future base load generation should be supplied through either coal-fired or gas-fired facilities. CCGT plants are more efficient and produce lower volumes of greenhouse gases than equivalent sized coal-fired power stations and, due to quicker construction times, are able to meet demand earlier. According to the Owen Inquiry, combined cycle gas turbine technology is an attractive option for a future intermediate plant, as it is recognised that future development would occur within a carbon-constrained environment and a new CCGT power station could provide less than half the carbon emissions of a new coal-fired plant. Adequate gas supply is anticipated to be available into the foreseeable future, with existing supplies plus additional transport and production hubs coming on line in Queensland and NSW.

In order to meet projected peak electricity demands, open cycle gas facilities, with relatively low capital costs, are preferred. Historically, electricity from the Snowy Mountains hydro-electric scheme and older coal-fired plants that can no longer operate economically as base load plants have provided the peak electricity requirements for NSW (NSW Government, 2004). Today, the main options for supplying additional peaking capacity are through the development of new hydro-electricity plants or gas-fired peaking plants. Opportunities for expansion of hydro-electricity facilities are limited in NSW, with the construction of new dams for hydro-electricity considered non-viable in terms of environmental impacts (NSW Government, 2004). Consequently the preferred option for meeting peak electricity demands in NSW is the commissioning of open cycle gas turbine facilities.

There is potential for future electricity generation in Queensland to support the energy requirements of NSW. The Owen Inquiry highlighted, however, that significant transmission losses over long distances (as high as 10-15 percent) may occur and, depending on fuel prices within the two States, there may not be any significant benefits to new generation facilities within Queensland. In addition, generation within Queensland to support NSW would require the construction of a new transmission line at a cost of around $1.7 billion.

As highlighted in the Owen Inquiry, it is generally agreed that future electricity generation should entail a combination of open cycle gas-fired power stations, combined cycle gas-fired power stations, or coal-fired power stations within the Wollongong – Sydney – Newcastle major load areas. The precise mix and timing of these stations would depend on market conditions and demand requirements.

3.2. Consideration of alternatives

3.2.1. Alternative locations considered

As a major supplier of electricity, TRUenergy is investigating potential power station sites on an ongoing basis. For NSW, these investigations include sites within the Wollongong – Sydney –

Newcastle major load centre, as sites outside this area would be constrained by the limited capacity of the network to supply the major load centre.

TRUenergy, formerly TXU, commissioned a site selection study for a new gas-fired peaking plant in NSW in 2002. Eleven potential sites were reviewed in the early stages of the study and through evaluation this number was reduced to four options, upon which a detailed evaluation was carried out. These four sites were:

- Tallawarra;
- Wagga Wagga;
- Marulan; and
- Nowra.

Each site was assessed for its performance against the following selection criteria:

- proximity to gas supply;
- proximity to electrical transmission system;
- ease of obtaining environmental approvals and licences;
- land costs; and
- availability of water.

Of the four sites evaluated, Marulan was dismissed as there would be competing power station development in the area, reduced performance due to altitude and temperature conditions and insufficient quantities of water to allow even simple cycle operation. Nowra offered a location within reasonable proximity to gas and transmission networks but has competing power station development in the area (e.g. Bamarang), land availability constraints (due to nearby National Parks, water catchment areas and escarpment), would require an upgrade of the existing 132kV transmission line and would not be able to provide water in sufficient quantities. The potential sites within the Wagga Wagga area could provide sufficient quantities of water for mechanical draught cooling but would require an extensive gas pipeline upgrade due to capacity limitations. These sites were also exposed to competing power station development and would require an upgrade of the existing 132kV transmission line.

The proposed site at Tallawarra was identified as the preferred location for a power station as the site is already owned and operated by TRUenergy and the Tallawarra Stage A power station has already been approved and recently been commissioned on this site. The Tallawarra Stage B power plant would be designed to utilise some of the existing equipment, resources and infrastructure associated with the Tallawarra Stage A power station. In addition, the proposed Tallawarra Stage B power station would be located within a highly disturbed area associated with the former coal fired power station. The former coal fired power station was situated upon a greater footprint than required for

the proposed gas-fired power station and therefore a benefit of this site is that the proposed works would be contained to a previously disturbed area and would not affect any natural areas. The preferred site would also have the benefit of being within the Wollongong – Sydney – Newcastle major load centre and therefore be able to provide reliable electricity supply to this high demand area without transmission network constraints. This location is therefore an ideal site and TRUenergy's preferred location to provide electricity supply to the local and regional market.

In addition, TRUenergy has gained approval for its Tallawarra Lands pre-rezoning submission, for which a Local Environmental Study (LES) has been prepared. The LES made recommendations regarding the future use of the site, largely determined by the constraints of the site including the presence of the power station. The LES was adopted by Wollongong City Council in April 2007 and the Tallawarra Lands have been included in Council's draft Local Environment Plan 2008 (LEP). The LEP zonings for Tallawarra reflect the outcomes and recommendations of the LES. Future development within the Tallawarra Lands site would be subject to a separate approval process, although such development has been taken into consideration as part of the environmental assessment for the Tallawarra Stage B power station development, thereby minimising conflicts with existing and future land uses.

As part of the rezoning of the Tallawarra Lands site, a buffer zone has been established between the proposed power station and the future surrounding land uses in order to minimise potential land use conflicts. The buffer zones around the power station site extend well beyond the fenced area such that no industrial, residential or commercial developments can be established within a specific distance of the power station site. The buffer zone allows for a distance of approximately 145 metres from the power station site to the proposed residential zone to the west and approximately 185 metres to the proposed residential zone to the north.

TRUenergy will undertake ongoing investigations to confirm or calibrate the modelling predictions for Tallawarra Stage B in relation to noise impacts. This information would be used to verify the scale of buffer land required and appropriate zoning of surrounding land to ensure the potential for future conflict is mitigated, during the development application and approval phase of Tallawarra Lands Project.

3.2.2. Alternative network connections

Four network connection options were considered for the proposed Tallawarra Stage B plant:

- Option A – Stage B connected to the Stage A switchyard with no additional line augmentations (i.e. 2 feeders to Springhill and 2 feeders to Dapto);
- Option A.2 – Stage B connected to Stage A switchyard with an additional feeder to Dapto (i.e. 2 feeders to Springhill and 3 feeders to Dapto);

- Option B – Stage B connected to Stage A switchyard with the remaining two feeders (982, 982Y) cut into an extended Stage A switchyard; and
- Option C – Stage B connected via a dedicated high capacity 132kV line to Dapto. Stage A used for the new line and generator bay.

Power system studies were conducted on each of the options considering normal power flows, contingency power flows, voltage profiles and fault levels. Option B is the preferred option as it provides significant benefits in terms of contingent operation, load flow and network management over the other options, although it would be more expensive.

3.2.3. Cooling options

During the planning phase a number of cooling options were considered for a CCGT power station. CCGTs require additional cooling for the steam cycle. These options included:

- once through lake water cooling;
- wet cooling towers with lake water make up; and
- air cooling.

Dry air cooled condensers require the least amount of water consumption but have the highest installation and operating costs and the highest efficiency penalty of all the options. In addition, this option would produce the highest noise impact, as options for noise attenuation of the fans are limited.

Once through lake water cooling would require approximately 11550L/s throughput and result in a 250MW thermal load being introduced into Lake Illawarra. This load would be in addition to the existing 240MW thermal load of Tallawarra A.

Wet mechanical draft cooling towers have significantly reduced withdrawal rates (271L/s) and thermal load (9MW) when compared to once through cooling, but they decrease plant efficiency. In addition, wet cooling towers have a higher capital costs than the other options.

Nevertheless, the wet mechanical draft cooling towers were selected as the preferred cooling option as they would minimise the thermal load on Lake Illawarra, aquatic biota impacts and noise impacts.

3.2.4. Alternative water supply

While gas turbine power stations require significantly less water for cooling than an equivalent MW coal fired power station, due to the small steam section and minimal cooling requirements, a range of water supply options were considered to provide the necessary fresh water requirements (i.e. excluding lake water make-up). The existing Tallawarra A site infrastructure includes two 1ML potable water storage tanks, a 200kL raw water tank, a demineralisation plant of 16.6kL/h capacity and a 500kL demineralised water tank. It is understood that Sydney Water has indicated a possible

limitation of about 1ML per day on supply of potable water from its mains due to the expected condition of the private main to the power station site.

Grey water

There are no known sources of grey water in the area, although future industrial and residential development within the Tallawarra Lands may provide grey water that can be used to feed the demineralisation plant. TRUenergy has investigated the potential quality and quantity of grey water that could be sourced from this future development and the various treatment options that could be used. It is Sydney Water's intention that grey water sourced from residential development should, following treatment, be recycled back to these houses for domestic non-potable reuse. As a result, only the surplus grey water could be collected and this volume would not meet the water requirements of the plant.

Treated effluent

The nearest tertiary treated sewage treatment plants are located more than 10 kilometres from the power station and, due to the capital and operating costs for pipelines of this length (in the order to $10.2M for construction alone which equates to about 2 percent of the total construction costs), the use of tertiary treated water is not considered a viable option.

Water could be sourced from the sewage pumping station on the shores of Lake Illawarra, although there are potential problems regarding the disposal of reject water from the process and a Membrane Biological Reactor (MBR) would be required to produce 100kL water of water daily. This option is also not considered viable.

3.3. Consequences of not proceeding

To meet future electricity growth in NSW a number of additional power plants will be required to serve both peaking capacity as well as intermediate and base load requirements. TRUenergy is seeking to construct and operate the Tallawarra Stage B CCGT/OCGT power station to mitigate against power shortages and increased user demand.

Tallawarra is the ideal site for a new plant, being located adjacent to the Tallawarra A CCGT power station and utilising existing resources and on site infrastructure including buildings, electricity transmission and gas pipelines. The new plant will occupy a small area of the overall site.

The key objective of the proposal is to provide additional electricity supply in NSW to address the predicted market requirements. The proposed development would also improve the reliability and security of electricity supply, provide direct and indirect employment opportunities and provide improved environmental outcomes when compared to conventional power generation technologies.

The consequences of not proceeding with the proposal would result in the loss of the benefits of the project.

Although there are environmental impacts associated with the project, these are manageable through the implementation of safeguards and mitigation measures, as outlined in **Chapter 7** and **Chapter 8**. Additionally, it is considered that the economic and social benefits of the project would outweigh the environmental impacts.

Therefore, the alternative of not proceeding with the project is neither desirable nor justifiable.