Project Need and Justification – Summary of Key Outcomes

The Dalton Power Project would contribute to ensuring the adequate, reliable and consistent supply of electricity during times of peak demand / high price in NSW.

The Dalton Power Project is consistent with NSW Government policy indicating a preference for private investment in electricity generation. Peaking power generation enables AGL to manage its cost of electricity sold to consumers and minimises market exposure along with providing rapid start up generation capacity at times of reduced supply or generation capability from other plants or sources.

The NSW Government's *Energy Directions Green Paper* (2004) and Australian Energy Market Operator (AEMO) *Statement of Opportunities* (2010) predict that over the next decade rising electricity demand from the whole of NSW will exceed existing generation capacity. To meet the immediate growth in demand for electricity, a number of additional power plants will be required.

The Dalton Power Project would contribute positively to the NSW electricity market by providing a peaking plant to service demand in addition to minimising AGL's market exposure and complementing the introduction of intermittent renewable generation sources into the NSW electricity market.

Chapter 2 Project Need and Justification

2.1 Introduction

There are four distinct components of the supply of electricity: generation, transmission, distribution and retailing. The Dalton Power Project relates to the 'generation' component of electricity supply.

The National Electricity Market (NEM) controls the supply of electricity in Australia and is managed by the AEMO. AEMO predicts that growth in electricity demand in NSW will exceed existing capacity, requiring the construction and operation of new power stations. Due to the type of load growth, the immediate need highlighted is for power stations which meet peak electricity demand only.

The NSW Government's *Energy Directions Green Paper* (December 2004) has provided an indication of the Government's receptivity for private investment in electricity generation in this state. The Owen Inquiry (September 2007) has also supported private investment arrangements towards electricity generation. The electricity market and the drivers behind the supply and demand of electricity are discussed in further detail in **Section 2.3**. The proposed Dalton Power Project would contribute to the improvement of the state's future electricity security, and the Project complies with current NSW Government policy direction.

This chapter addresses the project justification in terms of the NEM, the transmission network and AGL's market participation. **Chapter 3** *Alternatives to the Proposal* addresses the alternative Development Site locations and technologies considered for the Dalton Power Project.

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 across the Australian Capital Territory, New South Wales, Queensland, South Australia and Victoria.

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

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 with prices set on a half-hour basis. Retailers purchase the electricity direct from the NEM. AEMO facilitates these purchases. The electricity is then on-sold to the consumer and transported by transmission lines (high voltage) and distribution networks (lower voltage).

As the NEM can be volatile, with the average price below $50 per megawatt hour (MWh) and a maximum price of $12,500/MWh, retailers (and generators) often enter into derivative contracts to mitigate market risk. These contracts can involve setting the price paid (or received) for a defined volume of electricity over a period of time or paying an ongoing premium to limit the maximum price paid for electricity. Derivative contracts are necessary as the price for electricity received by AGL from retail consumers is regulated and fixed.

The cost of power in the market varies each half hour based on the prices bid in by generators that wish to sell power. As demand varies, different power plants run and the price of power varies. NSW, Snowy Mountains, Victoria, South Australia and the Queensland regions of the NEM are interconnected and electricity flows between the regions based on the half hour price that prevails between adjacent regions.

Historically, prior to the NEM, prices did not play a pivotal role in shaping energy infrastructure development. However since the creation of the NEM, price determines how infrastructure is developed through the supply and demand mechanism. Increasing prices provide an incentive for investors to secure new generation capacity or transmission connections to facilitate the importation and distribution of excess supply from other States.

2.2.2 Transmission Network

The majority of the State's electricity usage occurs in the Newcastle – Sydney – Wollongong area which accounts for over 75 % of peak demand. Transmission access to this peak demand area is important in selecting a power station site. A stylised diagram of TransGrid's network is presented in **Figure 2-1.**

In formulating the current proposal, potential sites reviewed for the Dalton Power Project included the Dalton site; the Central Coast and Newcastle area; an area between Young and Culcairn; an area between Culcairn and Albury; south-west of Nowra; and an area between Nowra and Wollongong. These sites are discussed further in **Chapter 3** *Alternatives to the Proposal*.

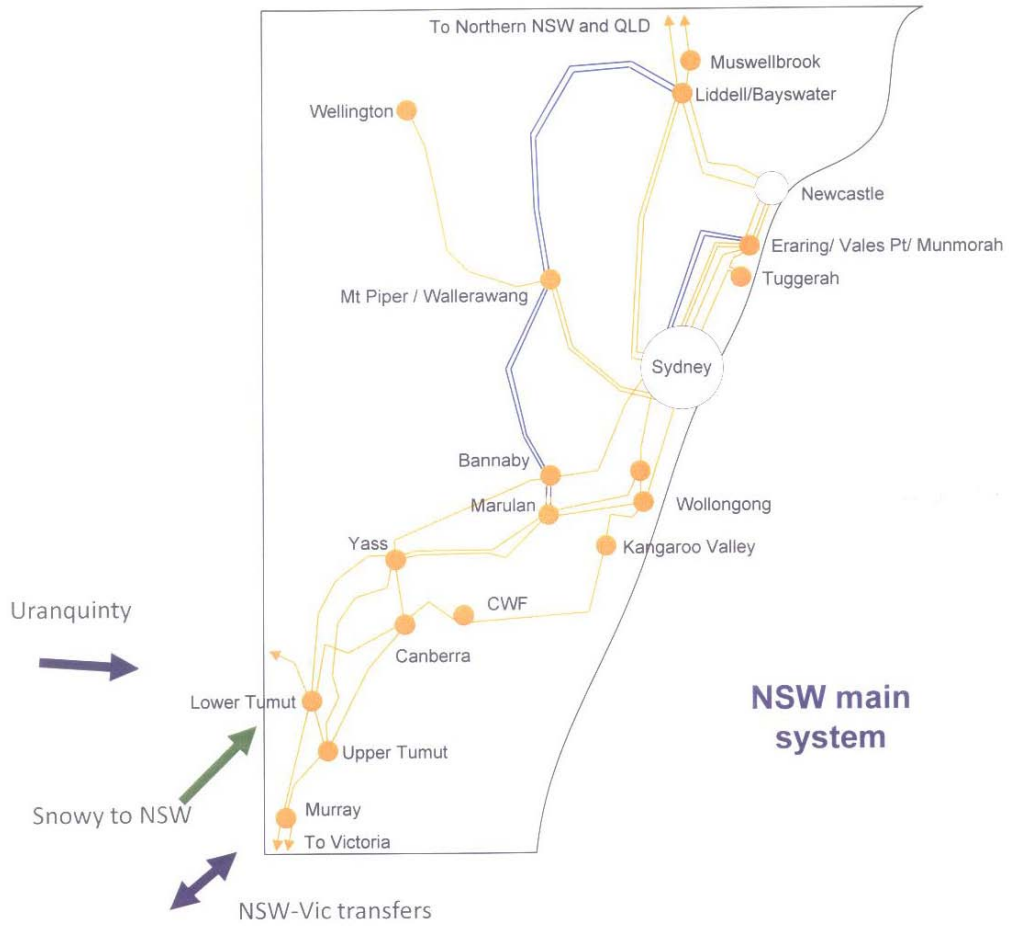
Each site was assessed in terms of network reliability, losses and potential overloads. The clear benefits of the Dalton site in comparison to alternatives included a crucial transmission advantage in that Line 39, a 330 kV transmission line, traverses the project site. This would enable easy connection between the proposed power station and the existing transmission network.

TransGrid is nearing completion of the Western 500 Project, which is the largest upgrade of TransGrid's transmission line infrastructure ever undertaken. The project focuses on operating the western backbone of the core NSW transmission network at 500 kV rather than 330 kV to maximise the useful capacity of all the transmission lines that supply the Newcastle, Sydney and Wollongong load centres.

The Western 500 Project links major electricity generating locations in the Hunter region, western NSW and the Snowy Mountains Scheme. A key component of the Western 500 Project also involved the construction of a new 500kV / 330kV Substation at Bannaby which is now complete. It is envisaged by the proponent that in the future TransGrid may increase the capacity of the Bannaby to Yass 330 kV transmission line, Line 39, which traverses the Dalton Power Project site, allowing up to 1500 MW of generation to be installed.

Chapter 2 Project Need and Justification

Figure 2-1 Stylised NSW Network



Source: Provided by AGL as sourced from TransGrid 2010.

2.3 Electricity Demand

2.3.1 Energy Directions Green Paper

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. The Green Paper states that while there is currently sufficient electricity generation capacity in New South Wales to meet demand, capacity will be exceeded by demand in the future. The potential for demand management is significant and can be achieved through the interruption of supply, energy efficiency and the substitution of gas for electricity as an energy source. Such initiatives are normally left with Government to implement, although AGL does participate in energy efficiency programs. This was demonstrated in 2006 when AGL won a Green Globe Award from the NSW Minister for Energy for *"superior performance in the development and delivery of energy efficiency initiatives"*. However the Green Paper notes that even where demand management potential is realised, the *"effect will be to defer the need for new supply by a year or two, rather than eliminate it."* As such, demand

management is not considered to materially affect the requirement for new generation capacity in NSW.

Over the next decade, it is predicted that rising electricity demand from the whole of NSW will exceed existing generation capacity.

2.3.2 AEMO Statements of Opportunities

Each year, AEMO releases its Electricity Statement of Opportunities (ESOO) which, in part, analyses the supply and demand scenarios for each region of the NEM. The ESOO includes a supply-demand balance for each of the five interconnected states that form the National NEM – indicating the point, known as the Low Reserve Condition (LRC), when additional capacity may be needed to maintain the established level of electricity supply reliability.

If no capacity in addition to that already committed is made available to the market, this point in time is reached for NSW somewhere around 2014 and 2015. After a prolonged period without substantial investment in power generation capacity in NSW, there is a requirement for new generation capacity investment that will be sustained over a number of years. Regardless of which forecast is used to predict the requirement for new generation capacity in NSW, the underlying message does not change.

The ESOO is only one of several factors that determine project need and timing. Other factors that determine the project need and timing include the retail position of AGL. This is influenced by AGL's ability to hedge market exposure through contracting. As the time approaches where demand becomes equal to supply, the wholesale price of electricity to AGL rises, sometimes dramatically, while sales to consumers remain at a fixed, regulated price. This affects the contract market and increases the cost of electricity for AGL that it supplies to consumers at a fixed price. The Dalton Power Project is fundamental to allowing AGL to continue to supply electricity to consumers at a competitive and regulated price.

In order to reduce its exposure to electricity price volatility, AGL seeks to construct and operate a gas fired peaking power station to mitigate against potential substantial losses during times of high price. This is in addition to a number of gas fired power stations which have been considered and progressed through the NSW approvals process to fulfil this peaking generation demand. It is clear that the short run operating cost of gas peaking generation plant has proven to be significantly higher than the other technologies such as coal fuelled power stations meaning that it will be less economic to run at times when prices are not high. For this reason, more cost efficient power plants will be constructed to meet intermediate and base load electricity demand.

2.3.3 Response to Electricity Demand

The Federal Government's Renewable Energy Target (RET) is resulting in increased penetration of renewable energy sources such as wind and solar generation. Most of these renewable sources rely on a variable and uncontrollable natural resource (i.e. wind and solar energy) and are not assured to be available at times of high electricity demand or price. Complementary and controllable generation sources are needed to support the renewable energy generation sources. Gas fuelled turbines operating in open cycle arrangement are the most efficient and environmentally friendly method of complementing uncontrollable renewable generation sources.

Chapter 2 Project Need and Justification

Open cycle gas turbines are able to be quickly started and stopped (typically less than 30 minutes from off to full output) meaning they are not required to operate constantly like thermal power stations, which typically take up to eight hours to start from cold and as a result are rarely turned completely off.

This form of generation allows AGL to meet times of high demand and manage commercial risks associated with high price. If AGL's generation portfolio had only renewable energy sources of electricity and there was a high electricity price, then AGL could be exposed to paying the high prices. The development of the Dalton Power Station is part of AGL's strategy to mitigate commercial risk, so that AGL can supply it's customers at time of high prices.

AGL has demonstrated that it is prepared to invest in low emissions and renewable energy technology through its previous generation activities involving:

- the acquisition of hydro assets from Southern Hydro in Victoria;
- acquisition of the 1280 MW natural gas fired Torrens Island Power Station;
- construction of the 95 MW Hallett wind farm in South Australia;
- construction of the 71.4 MW Hallett II wind farm in South Australia;
- construction of the 63 MW Oaklands Hill windfarm in Victoria; and
- construction of the 130 MW Bogong Hydro Project in Victoria;
- construction of the 420 MW Macarthur wind farm in Victoria; and
- development of the approximately 150 MW Ben Lomond wind farm in NSW (Site under option; permitting ongoing).

2.3.4 Owen Inquiry

The NSW Government established an inquiry into Electricity Supply in NSW in May 2007 to advise the Government on the actions it needs to take for the timely investment into new base load generation. The inquiry was undertaken by Anthony Owen, Professor of Energy Economics at Curtin University of Technology (generally referred to as the Owen Inquiry), with the terms of reference to:

- review the need and timing for new base load generation that maintains both security of supply and competitively priced electricity;
- examine the base load options available to efficiently meet any emerging generation needs;
- review the timing and feasibility of technologies and / or measures available both nationally and internationally that reduce greenhouse gas emissions; and
- determine the conditions needed to ensure investment in any emerging generation, consistent with maintaining the NSW AAA Credit Rating.

The Owen Inquiry noted that *"Generation reliability means that New South Wales needs to generate or import enough electricity to meet customer needs at all times, including times of peak demand. The State's everyday energy needs should be met in a way that gives its customers value for money[1]".*

Further it stated that:

> *"Peaking generators can start up at short notice, operate over a wide range of output and respond rapidly to short-term peaks in demand. In New South Wales, hydro generators have mainly filled the peaking role. However, further potential for hydro peaking plants is very limited. Open cycle gas turbines are now used for peaking duty[2]"*

The Owen Inquiry concluded that

> *"The private sector has demonstrated it will invest in new generation in the NEM under the right conditions (including access to a stable revenue stream, to generation development sites and to fuel sources). The private sector can manage the commercial risks in developing a power station but has less capacity to handle policy and regulatory risks.[3]"*

Further it stated that

> *"Vertically integrated firms, such as AGL, Origin Energy and TRUenergy, are able to insulate their business's earnings from potentially volatile movements in wholesale electricity prices through having both retail customers and power stations. Such models, commonly referred to as 'gentailers', have evolved largely from the requirement for large electricity retailers to add generation capacity to offset the risk from variable input costs (wholesale electricity prices) being sold at a fixed cost to customers (regulated price caps or contestable contracts).[4]"*

Whilst AGL gained approval for the Leafs Gully Gas Fired Peaking Power Plant, it is insufficient to meet AGL's peak generation needs and AGL does not currently have access to any peaking generation plant in NSW over which it has control. This significantly limits AGL's ability to mitigate its exposure to the volatile movements in wholesale electricity prices referred to in the Owen report and to also contribute to competition for customers in NSW.

2.4 Peak Energy Demand

There are two common measures of electricity demand:

- *Average (base load) demand*: demand that occurs most of the time; and
- *Peak demand:* demand that typically occurs when customers use air conditioning or heating at times of very high or very low temperatures respectively.

The Green Paper states that peak demand is growing much faster than average demand. In NSW, summer peak demand has grown by around 3.8 % (500 MW) per year for the past five years. Average demand growth has been significantly slower at around 2.8 %. The Green Paper further notes that effectively 10 % of NSW generation and network capacity is used for only 1 % of the time. If current

[1] Owen, A.D. *Report of the Owen Inquiry into Electricity Supply in NSW*, September 2007, page 1-2
[2] Owen, A.D. Report of the Owen Inquiry into Electricity Supply in NSW, September 2007, page 1-5
[3] Owen, A.D. *Report of the Owen Inquiry into Electricity Supply in NSW - Summary*, September 2007, page 9
[4] Owen, A.D. *Report of the Owen Inquiry into Electricity Supply in NSW*, September 2007, page 7-6

growth trends continue, in 10 years time around 18 % of generation capacity will be required for only 1 % of the year. The Green Paper states that trend toward 'peakier' electricity demand has significant cost implications for NSW consumers. The Green Paper further notes that this trend has further implications for the types of new generating plants that are likely to be cost effective in the future.

Historically, NSW peak electricity requirements have been met by the Snowy Mountains hydro-electric scheme and through older coal plant. However as demand has risen, the older coal plants are required to meet base load demand. As a result, the NSW Government has acknowledged that new peaking capacity will be needed in the next few years while the need for new power plant to meet base load demand will not be required for some time.

AGL expects that without a carbon price, additional base load would not be required for some time. However, if a carbon price is introduced this will put price pressures on the least carbon efficient power stations and likely result in them closing down and a subsequent increased need for combined cycle power stations.

The Dalton Power Project would form part of AGL's diverse energy portfolio which also includes investments in hydro and wind farms, base load power plants, gas production facilities as well as gas and electricity retailing. Different energy sources have unique limitations and uses. Gas is used in open cycle peaking plants because gas turbines can be turned on and off quickly to meet surges in demand for power, but is expensive to run continuously. While hydro is also used for peaking capacity, there are increasing limitations on the amount of water available for this purpose.

AGL is a retailer of electricity and as noted previously, during periods of peak demand the wholesale price that AGL pays to other generators can increase by 200 times the cost of base load power. To avoid such high prices AGL must have the capacity to generate electricity at times of peak demand.

The need for AGL to have more Peaking Power Generation in NSW was exemplified in January/ February 2011. During this period, there was a high demand in NSW, Victoria, and South Australia due to the high temperatures. AGL's contracted electricity supply in Queensland, however, was limited and/or not available due to the effects of the floods and Cyclone Yasi in Queensland. This resulted in the demand and supply in NSW being out of balance, resulting in very high electricity prices.

AGL is prepared to invest large sums of money in a power plant that operates infrequently in order to avoid heavy financial losses and costs associated with buying electricity from wholesalers at periods of peak demand.

The capital cost per megawatt of capacity for an open cycle gas turbine is lower than that for combined cycle gas turbines or coal fired generators making it more cost effective for short periods of operation during peak times. However the operating cost is higher than the other technologies such that it will generally not be economic to run when the price of electricity is lower, for example at average prices of less than $70 per megawatt hour.

Based on the high operating costs for continuous running of open cycle gas turbines, it is unlikely the operating hours of the gas turbine will increase over time as other power plants will be constructed to meet intermediate and base load demand. In the event that gas-fired generation is more competitive than coal due to emissions trading or a similar scheme, then gas-fired power stations would be developed for base load operation. However, due to fluctuations in electricity demand at different

times of the year, a peaking plant is still required in the market and the full capacity of the Dalton Power Project would be utilised for that purpose.

Should AGL decide to develop a base load gas-fired power station in addition to a peaking plant, it would be required to go through a separate approvals process to determine the feasibility at various locations and assess environmental impacts. Base load gas-fired power stations, whilst having similar NO_X emissions, are significantly more efficient at producing electricity. There is no requirement for combined cycle gas turbines in the AGL portfolio in NSW at this time and as such, they are not being considered.

AGL has demonstrated that it is prepared to invest in peaking power plants through its generation activities involving:

- securing approvals for the Leafs Gully Power Project;
- operation of the Somerton gas peaking power station in Victoria;
- construction of the 140 MW Bogong hydro power station in Victoria; and
- acquisition of hydro assets from Southern Hydro in Victoria.

2.5 Operation of the power station

It is envisaged that the Facility would operate in open cycle mode during times of peak electricity demand, typically for less than 15 % of the year.

The normal operation of the plant is expected to be approximately 3 % of the year (260 hours). This is the historical average for the operation hours for AGL's peaking plants. However, this has quite a wide variance. Some years it can be as low as 1% (90 hours) or as high as 5 % (450 hrs).

The one instance in the past decade when operation of the AGL's Peakers was higher than 5 % was around 2007 / 08. The demand was high due to a concurrent heat wave in Queensland, NSW, Victoria and South Australia, and the supply was significantly reduced, due to the output of several power stations in Queensland being reduced. Under normal scenarios, this sort of issue lasts for a limited time (maybe a couple of 5 day periods in a summer). In 2007 / 08, the issue went on for a long time and the peaking requirement was much longer than normal (approximately 10 % of the year).

Operation of the Dalton Power Station for up to 15 % of the year allows for these rare and extreme events.

2.6 AGL's Environmental Record

2.6.1 Environmental Principles

AGL has established a set of overarching principles that define how they manage and measure their impact on the environment. AGL has committed to the following:

- Compliance - AGL will meet or exceed statutory obligations and relevant codes of conduct and Company standards;
- Monitoring, Reporting and Communication - AGL's environmental performance measurement and reporting will be consistent with recognised national and global reporting standards. AGL will

apply the assurance and verification principles of materiality and completeness and responsiveness when measuring, monitoring and reporting environmental performance;

- Impact Minimisation - AGL will reduce risk to the environment and minimise our environmental impact, by integrating considerations of environmental sustainability in all activities. Key considerations for AGL and our stakeholders in minimising environmental impact include pollution prevention, promotion of waste minimisation, reuse and recycling, the efficient use of resources such as water and energy and protecting cultural heritage;
  - AGL will provide products, services and information to help customers make informed energy choices to benefit their home, business and the environment; and
  - Contractors and suppliers are expected to demonstrate consistency with AGL's approach by fulfilling their environmental responsibilities.
- Climate Change and Renewables - Consistent with business objectives and AGL's Greenhouse Gas Policy, AGL will work in consultation with its external stakeholders to improve greenhouse gas emission outcomes;
- Stakeholder Engagement - AGL will provide leadership and actively participate in the policy debate on energy and environmental matters; engage with government, industry and community, our people and other stakeholders about how to achieve sustainability in the energy sector;
  - AGL's employees are encouraged to contribute to improving the Company's environmental performance; and
  - AGL aims to build knowledge, capability and understanding of environmental management issues for their employees.

These principles would govern the construction and operation of the Dalton Power Project.

2.6.2 Proceedings

AGL has not been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources.

2.7 Relationship to other projects in the region regarding EPBC matters

A search of the EPBC referral website was undertaken for the last two years for the areas of Dalton, Crookwell, Gunning and Goulburn. It was identified that the project 132 kV Transmission Line from Gunning wind farm to existing Yass-Goulburn transmission line was in the region of the Dalton Power Project.

Table 2-1 summarises relationship of the above projects to the Dalton Power Project.

Table 2-1 Relationship to other projects

Project	Proponent	Status and Relationship to Dalton Power Project
132 kV Transmission Line from Gunning wind farm to existing Yass-Goulburn transmission line.	ACCIONA Energy Oceania Pty Ltd	EPBC Referral. Determined to be not a controlled action 18 December 2008. No operational issues anticipated related to Dalton Power Project.

The proposed action is not related to any known proposals in the region.

Further detail about other projects in the region is provided in **Chapter 16** (**Section 16.8**).

2.8 Project Benefits

The Dalton Power Project would be an important addition to the electricity infrastructure for NSW. In relative terms of electricity provision, generation would be close to the areas of consumer demand, therefore the Project would contribute to ensuring a reliable and efficient electricity supply during peak consumption times. As the proposed Facility would be able to operate without water in times of emergency, it would not be impacted by drought conditions which affect other forms of generation. Further, natural gas is clean burning and has comparatively low greenhouse gas emissions. New power generation will continue to be required in future years and the Dalton Power Project would enhance the local electricity network in the interterm and into the future.

The Project would create economic benefits both for the state of NSW and AGL. For NSW, private investment in generation would offset Government expenditure requirements. The Project would generate a modest level of additional employment to operate the plant and would contribute to higher levels of employment generation during the construction period. Peak power generation also enables AGL to better manage its cost of electricity sold to consumers providing better competition in the retail, wholesale and industrial electricity market with consumer benefits as well.

The Dalton Power Project 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.