NSW GOVERNMENT | Planning

# *MAJOR PROJECT ASSESSMENT*
# *Bayswater B Power Station*


Director-General's
Environmental Assessment Report
Section 75I of the
*Environmental Planning and Assessment Act 1979*

December 2009

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# EXECUTIVE SUMMARY

Macquarie Generation (the Proponent) has lodged a concept plan application seeking the Minister for Planning's approval of the Bayswater B Power Station in the Upper Hunter Region. The power station will be capable of generating up to 2000 megawatts of electricity. The power station footprint would be located within the Singleton local government area while auxiliary infrastructure such as roads, conveyors and/or pipelines would be located within the Muswellbrook Local Government Area. Concept approval for the Bayswater B Power Station is being sought for two fuel alternatives:

- gas-fired combined cycle gas turbine (gas-fired) plant; or
- pulverised coal-fired ultra supercritical (coal-fired) thermal plant.

The project includes:

- a power station, either gas fired consisting of five 400 megawatt gas-fired units, or coal fired consisting of two 1000 megawatt units;
- an access road and water pipeline between the project site and the existing Bayswater Power Station;
- a 500 kilovolt transmission switchyard, connecting to the existing dual 500 kilovolt transmission lines which pass the proposed Bayswater B site;
- for the gas-fired option; a natural gas spur pipeline linking into the approved Queensland to Hunter Gas Pipeline, approximately 18 kilometres north east of the project site;
- for the coal fired option, a coal conveyor connecting into the Proponent's existing Antiene Rail Coal Unloader and existing conveyor, as well as an ash conveyor and an ash haulage route to an ash disposal site proximate to the project site; and
- some additional infrastructure such as water treatment systems.

The electricity generated by the project would cater for electricity demand expected within the next ten years. The project will manage the risk of the expected energy generating shortfall, if and when it eventuates. The project has a capital value of $2 billion dollars. It would employ up to 1000 people during its construction and up to 160 during the operational phase of the project.

Public reaction to the project has been strong with some 362 submissions being received during the public exhibition period. The majority of submissions received opposed the proposal. Key issues raised in submissions included:

- greenhouse gas emissions and the potential of emissions resulting from the project to contribute to human induced climate change;
- diversification of NSW's energy generation to include a greater proportion of renewable energy generation;
- justification for baseload generation on the scale proposed;
- air quality impacts to the local and regional area; and
- water supply and availability for the project.

A Submissions Report, prepared by the Proponent, addressing the issues raised in the submissions on the Project was submitted to the Department. In addition, the Department commissioned three independent reviews to be undertaken on the project in the areas of greenhouse gas, air quality and noise.

The Department has undertaken a comprehensive assessment of the technical merits of the project and considers that, at a concept level, the project can be approved subject to a number of recommended conditions of approval. A new application will be required to be submitted and approved prior to the construction and operation of any project associated with the concept approval.

The Department considers that the project is required to meet the State's baseload electricity demand requirements and therefore is in the public interest. The project is also strategically located within close proximity to the recently approved Hunter to Queensland gas pipeline as well as a number of coal mines to allow for the preferred fuel option to be sourced for the project with relatively minimal additional infrastructure requirements being required.

With regards to greenhouse gas impacts, the Department considers that the assessment undertaken is sufficient to provide an indication of the likely greenhouse gas emissions resulting from the proposal. It is noted, however,

that additional detail will be required as part of a project application to confirm these impacts, and the Department has recommended a condition of approval to this effect. While there will be an increase in the total greenhouse gas emissions in NSW from either a coal or gas facility, the impact of these emissions must be balanced against the risks associated with an electricity generation shortfall and the significant social and economic implications to the State should such a situation eventuate. Therefore on balance, the Department has recommended for this stage of concept approval, a number of conditions which require the Proponent to clearly demonstrate that best practice technology is to be implemented to minimise greenhouse gas emissions, and to demonstrate that it is investigating carbon reduction technologies that could be feasibly retrofitted to the plant, as well as other emission reduction or offset measures, to reduce or offset greenhouse gas emissions. Specifically in relation to greenhouse gas minimisation, the Department has recommended a specific condition to require the Proponent to, on a triennial basis, evaluate and report on the availability of viable greenhouse gas reduction, mitigation and/or offset options for incorporation into the final project design taking into consideration relevant contemporaneous economic drivers including any applicable legislation such as an emissions trading scheme and updated electricity demand and supply projections. The Department has also required as part of this condition that the report is made publicly available to ensure transparency in the process and to enable the public to have access to the information presented.

Based on the Department's assessment, as detailed in this report, the Department recommends that the Minister grant concept approval to the project, subject to a number of conditions. Many of these recommendations have been framed for the purposes of conducting further assessment of the identified key environmental and amenity impacts, should the Proponent lodge a project application for the preferred option in future.

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# 1. BACKGROUND

## 1.1 Location

The proposed Bayswater B power station is located in the Upper Hunter Region (refer to Figure 1) within the Singleton local government area, and borders the Muswellbrook local government to the north and west. The existing Bayswater power station site comprises a total area of approximately three square kilometres and is characterised by grassland flats and low angle terrain with woodland patches of various size and conservation value. The site is located within the catchment of the Hunter River.

Access to the site is via the Sydney to Newcastle Freeway (F3), Pacific Highway, New England Highway and Golden Highway. The principal entrance to the site would be off the New England Highway. Figure 1 also shows existing road infrastructure surrounding the site. The Golden Highway to the south, Edderton Road to the west and Lemington Road to the north also border the proposed development site.

## 1.2 Surrounding Land Uses

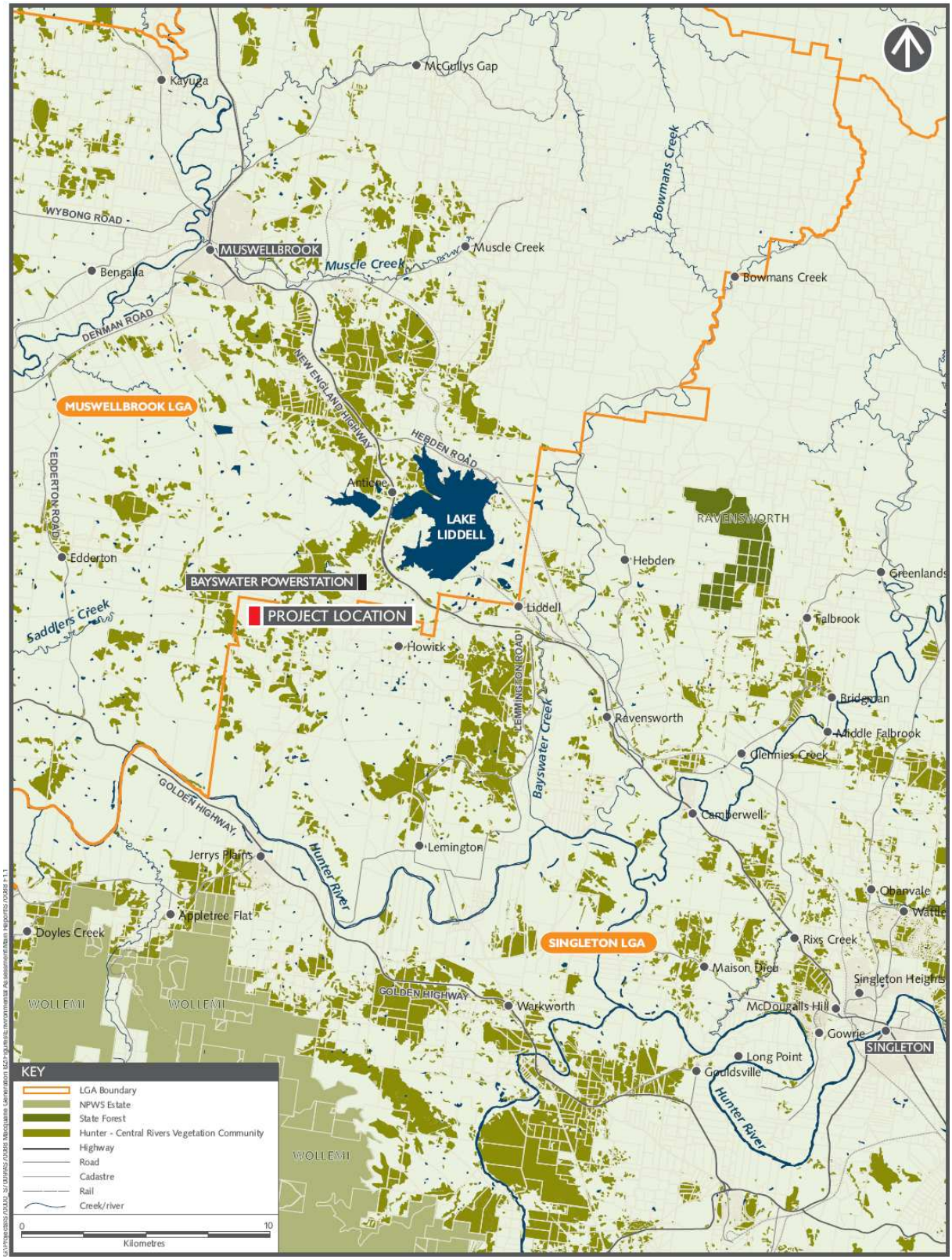
The project site, shown on Figure 2, is currently owned by Macquarie Generation (the Proponent) and leased for grazing purposes. Associated infrastructure for both the gas-fired option (i.e. the gas pipeline) and the coal-fired option (i.e. the coal conveyor) would be required to traverse neighbouring landholdings.

The Proponent currently operates the Bayswater and the Liddell Power Stations which are two coal-fired power stations located in the vicinity of the site. Bayswater Power Station is located five kilometres east of the site as well as the associated Pikes Gully Ash Dam. Liddell Power Station is located nine kilometres north east of the site and includes the Liddell Ash Dam. Currently, there are five open cut coal mines located within 10 kilometres of the site. The Antiene Rail Loop, located 10 kilometres north east of the site, is utilised by the Proponent to supply coal to existing power station operations.

Plashett Dam, located approximately one kilometre south of the site and Lake Liddell, nine kilometres to the south, supply water for a range of purposes including industrial uses, environmental flows, domestic use, irrigation, and stock watering. Outside the 10 kilometre radius of the site, the land is generally used for agricultural purposes, however, a number of other open cut coal mines are located to the south east of the site.

The township of Muswellbrook is located 14 kilometres to the north of the site. It has a population of 10,707 residents (based on the 2006 census). Singleton township is located 30 kilometres south east of the site and has a population of 13, 665 (2006 census).

**Figure 1 – Proposed Power Station Site**




Source: Figure 1.1 from Proponent's Environmental Assessment (September 2009).

**Figure 2 – Surrounding Land Use**


Source: Figure 1.2 from Proponent's Environmental Assessment (September, 2009).

# 2. PROPOSED DEVELOPMENT

## 2.1 Project Description

The Proponent seeks concept approval from the Minister for Planning for the construction and operation of a new power station that is either coal- or gas-fired and capable of generating 2000 MW of electricity on land within its ownership adjacent to the existing Bayswater Power Station in the Upper Hunter region. The power station application has sought approval for two fuel alternatives, including:

- pulverised coal-fired ultra supercritical thermal plant; or
- gas-fired combined cycle gas turbine plant.

In addition, the Proponent seeks concept approval for the associated infrastructure and utilities for each option. This would comprise a gas pipeline for the gas-fired option and an ash haulage route, ash conveyor and coal conveyor for the coal-fired option. The project has a capital investment value in excess of $2 billion.

The key features for each option are outlined in Tables 1 and 2 below.

**Table 1 – Key Project Components for Coal-fired Option**

| Project Element | Description |
|---|---|
| Raw Product Supply Infrastructure | • Coal conveyer from existing Antiene rail coal unloader to coal bunkers and coal storage area<br>• Fuel oil storage tanks |
| Main Plant- two ultra super critical coal-fired units each producing 1000MW comprising the following: | • Coal pulverising mills<br>• Boiler furnaces<br>• Turbine house containing steam turbine generators<br>• Steam exhausts<br>• Ash handling including pulveriser rejects handling plant, furnace ash collection and handling plant, flue gas cleaning plant, fly ash handling plant, ash conditioning plant and ash disposal plant<br>• Stack (300 metres in height and 10-11.6 metres in diameter)<br>• Other plant including chemical dosing plant, condensate polishing and regeneration plant, fire protection systems, hydrogen plant, carbon dioxide plant, compressed air plant, station electrical plant and auxiliary cooling systems. |
| Transmission Infrastructure | • Generator circuit breaker and transformers<br>• Transmission switchyard<br>• Existing Transgrid 500kV transmission lines |
| Utilities and General Infrastructure | • Water management including raw water supply utilising existing Bayswater/Liddell entitlements, drainage systems, sewage treatment and water sprays for air-cooled condensers<br>• Electrical plant including transformers and switchgear to supply electricity on site.<br>• Access to site and within the site. |

**Table 2 - Key Project Components for Gas-fired Option**

| Project Element | Description |
|---|---|
| Raw Product Supply Infrastructure | • Gas supply involving the transport of natural gas via pipeline direct to the site |
| Main Plant - five combined cycle gas turbine units are proposed each producing 400 MW with each unit including the following: | • Gas turbine<br>• Heat Recovery Steam Generator<br>• Steam turbine<br>• Generator<br>• Air cooled condensers<br>• Five stacks from which exhaust gases from the Heat Recovery Steam |

| | |
|---|---|
| | Generator would be discharged<br>• Other plant including, chemical dosing plant, condensate polishing and regeneration plant, fire protection systems, hydrogen plant, carbon dioxide plant, compressed air plant, station electrical plant and auxiliary cooling systems. |
| Transmission Infrastructure | • Generator circuit breaker and transformers<br>• Transmission switchyard<br>• Existing Transgrid 500kV transmission lines |
| Utilities and General Infrastructure | • Water management including raw water supply, drainage systems, sewage treatment and water sprays for air-cooled condensers<br>• Electrical plant to supply electricity on site<br>• Access to site |

The coal-fired option would require up to approximately 6.3 million tonnes of coal per year which would be supplied by rail. Coal trains delivering approximately 9,000 tonnes each would deliver the coal via the existing Antiene Rail Coal Unloader which currently delivers coal to both the Bayswater and Liddell Power Stations. The current approval for the rail loop allows the Proponent to receive up to 15 million tonnes of coal per year. The Environmental Assessment states that should the project be coal-fired, the increase in coal deliveries to the rail loop would require a modification to the approval to increase the capacity of the rail loop up to 21 million tonnes per year. The Environmental Assessment has identified that the modification would be assessed and submitted at the same time as a project application for the proposal.

For the gas-fired option, gas would be supplied to the power station via a pipeline, approximately 18 kilometres in length, connecting the power station to the approved Queensland to Hunter gas pipeline.

The coal-fired option would comprise a total construction period in the order of 54 months and employ a maximum of 1000 people during the peak construction period. Accommodation for construction employees would be provided in the form of construction camps including hostel type accommodation. The Environmental Assessment states that two camps would be required at an off-site location and a shuttle bus service would be used to transfer personnel to the project each day. The gas-fired option would take approximately 38 months to construct and employ a maximum of 800 people during the peak construction period. Accommodation for construction employees would be similar to that for the coal-fired option.

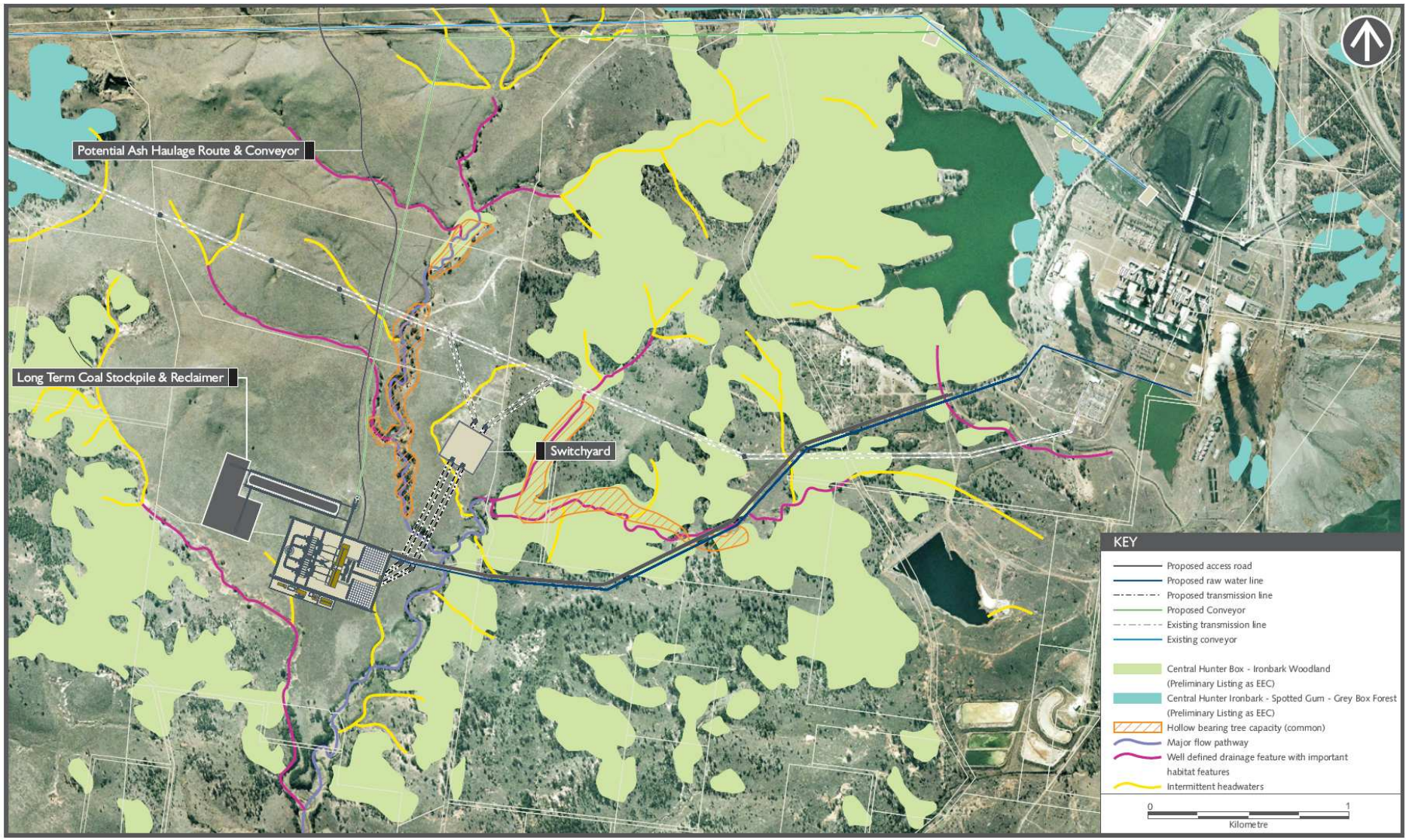
Regardless of the fuel option selected, the power station would have an expected economic life of not less than 30 years and an operational workforce of up to 160 people. Once the project has reached the end of its economic life, the Environmental Assessment states that plant items would be decommissioned and removed. Aboveground structures would be demolished while below ground facilities and structures would be sealed. The site would then be landscaped, drained and/or rehabilitated.

## 2.2 Proposed Layouts

The Proponent has identified indicative layouts for each of the power station options as outlined in Figure 3 and Figure 4. The coal-fired option would take up an area of approximately 15 hectares, while the gas-fired option would cover approximately 13 hectares.

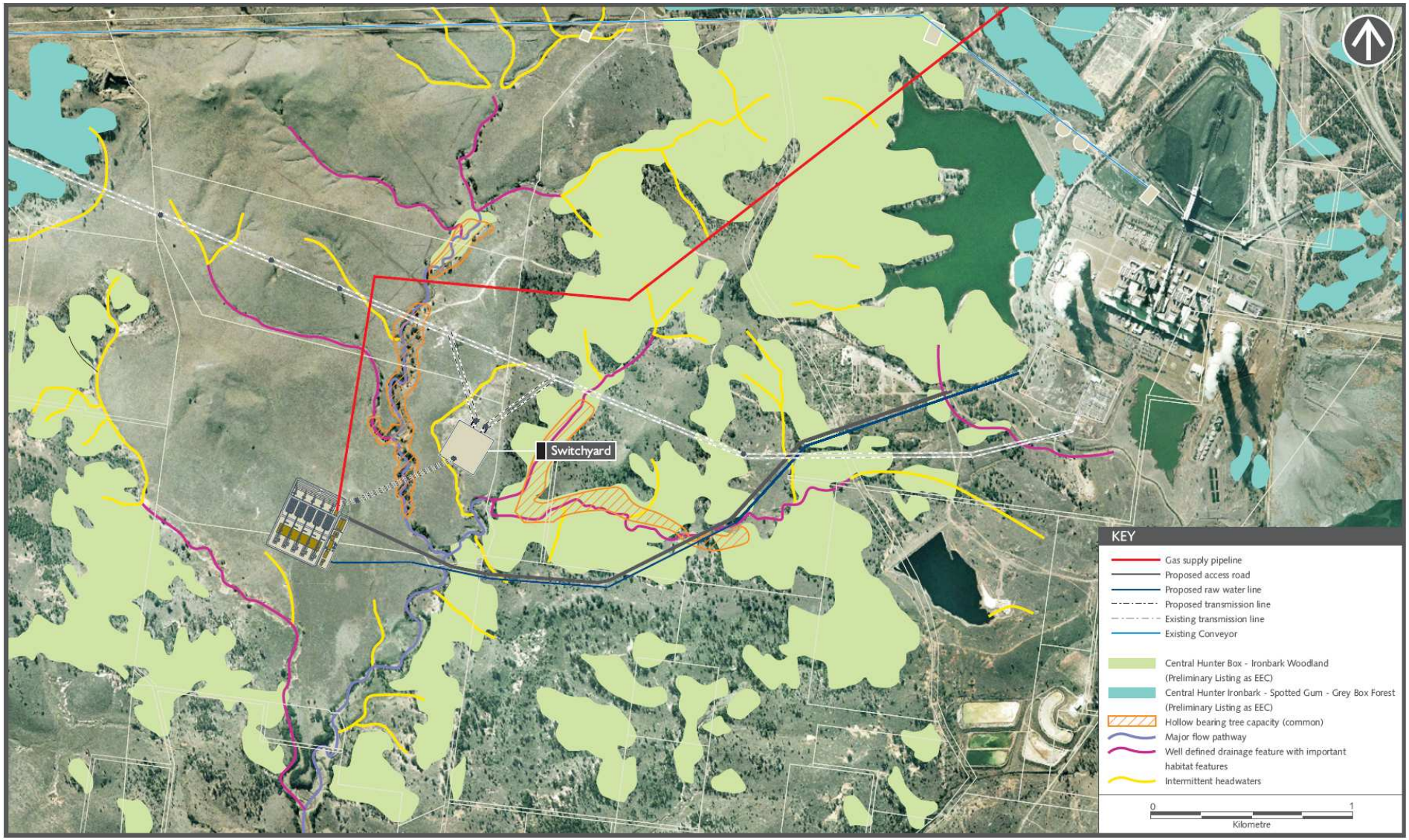
The proposed coal conveyer would extend in a north east direction to the Antiene coal unloader approximately nine kilometres away. Coal would be stored in a long-term stockpile and reclaimer site immediately west of the power station. The combined size of this area would be 6.5 hectares. The location of a potential ash haulage and conveyor route would extend in a northerly direction to an, as yet, unidentified disposal site. The Environmental Assessment, however, states that it envisages that ash would be disposed of within an existing mine void located to the north of the site although some material may be re-used in landscaping and the construction industry including cement manufacture.

**Figure 3 – Indicative Layout for Coal-fired Option**




Source: Figure 4.1 from Proponent's Environmental Assessment (September, 2009)

**Figure 4 – Indicative Layout for Gas-fired Option**




Source: Figure 4.2 from Proponent's Environmental Assessment (September, 2009)

For the gas-fired option, the proposed gas supply pipeline alignment would extend in a north easterly direction away from the site. Both options would require an access road, switchyard and transmission lines for the distribution of electricity. An access road and raw water supply line would extend together in an easterly direction to the existing Bayswater power station and associated infrastructure. Similarly, both options would require a switchyard which would be located approximately 650 metres north east of the power station. From there, transmission lines would be constructed to connect to the existing 500kV Transgrid transmission line half a kilometre north of the proposed switchyard location.

## 2.3 Emissions Control

The Environment Assessment has stated that a number of measures would be implemented relative to each fuel option to reduce emissions from the power station. For the coal-fired option the Environmental Assessment identified that the following technology would be implemented:

- ultra supercritical technology to maximise thermal efficiency and minimise greenhouse gas emissions;
- dry cooling (through the use of air cooled condensers) to cool and condense the steam exhausted from the steam turbine reducing water usage to approximately 2.4 gigalitres of water per annum;
- use of low-sulfur domestic grade coal and the application of table mills for the coal pulverising plant, both minimising sulphur emissions;
- low nitrogen oxide burners in the furnaces to control combustion temperatures to minimise the formation of nitrous oxides;
- use of fabric filter plant to filter the fly ash from the flue gas and minimise particulate emissions;
- use of a 300-metre high stack to increase the dispersion of atmospheric emissions and achieve appropriate ground level concentrations;
- ash handling and dry ash disposal; and
- carbon capture readiness employing post combustion carbon capture (provision made for future deployment).

The Environmental Assessment indicates that while solar augmentation through the introduction of solar heat into feedwater systems is currently being undertaken at the Liddell Power Station, it is not viable for Bayswater B.

For the gas-fired option, the Environmental Assessment states that the following emissions control and sustainability technology would be included:

- combined cycle gas turbine technology maximising the use of fuel and F class gas turbine technology to maximise thermal plant efficiency and minimise greenhouse emissions;
- dry cooling (through the use of air cooled condensers) to cool and condense the steam exhausted from the steam turbines;
- low nitrogen oxide burners in the gas turbine combustion chambers; and
- carbon capture readiness employing post combustion carbon capture (provision made for future deployment).

## 2.4 Project Need and Justification

The issue of whether additional baseload electricity generation is needed, the justification for proceeding with a fossil-fuelled power station now or in the future and the balance between the benefits (and "disbenefits") of such a generator compared with alternative measures to address energy demand have been issues of substantial debate since inception of the current proposal. It is clear from submissions received in response to the subject application that the issue of justification of the proposal, particularly in light of alternative energy supply measures and the impacts of climate change, are of significant public concern (90 per cent of all comments made in submissions related to these issues).

Public sentiment on the proposal has been strong, with a focus not only on the impacts of climate change, but also questioning the need for additional baseload electricity generation. Submissions consider that the Government has not adequately consulted with the public over the need and justification for additional (fossil-fuelled) baseload power, and whether such a power station is preferable in light of alternative electricity supply and demand management measures, which may be less greenhouse intensive.

While the Department considers that the direct environmental impacts associated with the proposed power station can be mitigated and managed to achieve acceptable environmental outcomes, the strength of sentiment in public submissions suggests that implementation of either the coal- or gas-fired option, whether now or in the future, is likely to meet public opposition, irrespective of how the proposal may be modified or amended.

The Department considers that an assessment of the need and justification for the proposed power station must begin at first principles and be undertaken in the context of the essential nature of energy and a robust approach to risk management. In undertaking such an assessment, the Department considers that arguments around need and justification are based in analysis of four key points:

1. the need for, and timing, of additional electricity generating capacity;
2. the consequences of not providing additional electricity generating capacity at the appropriate time;
3. the role of diversity and alternatives in a robust risk management framework; and
4. consideration of the temporal nature of regulatory and market-based issues.

***Need for and Timing of Additional Electricity Generating Capacity***

*Owen Inquiry into Electricity Supply in NSW (2007)*

On 9 May 2007, the then Premier announced the establishment of the Inquiry into Electricity Supply in NSW, and the appointment of Professor Anthony Owen, professor of energy economics at the Curtin University of Technology, to undertake the Inquiry (now commonly referred to as the "Owen Inquiry"). One of the terms of reference for the Owen Inquiry required a [r]*eview of the need and timing for new baseload generation that maintains both security of supply and competitively priced electricity*. The Owen Inquiry Report was finalised and publicly released on 11 September 2007.

The Owen Inquiry Report (Owen, 2007) presented a comparison and analysis of energy demand forecasts (based on data from the 2007 Transgrid Annual Planning Report) and an expected maximum energy capability of New South Wales power generators. Owen made a number of reasoned assumptions about the achievable capacity factors of generators, the future status of some generators (including the decommissioning of Munmorah and the commissioning of Colongra, Tallawarra and Uranquinty power stations), the future potential for inter-regional transfers with Queensland and Victoria and the capacity for energy demands to be reduced through energy efficiency savings. Taking all of these factors into account, the Owen Inquiry Report estimated that additional energy generation of approximately 9,500 GWh may be required to supply New South Wales by 2013/14 (10,500 GWh if energy efficiency measures are not taken into account). Based on the lead times associated with the construction of new power generating facilities (particularly coal-fired, and to a lesser extent, gas-fired power stations), the Owen Inquiry Report recommended that measures be taken to ensure that additional generating capacity was available by 2013/2014. Such measures include securing relevant environmental and planning approvals.

As with any predictive exercise that seeks to determine the position of a complex system at some point in the future, Owen's attempt to pinpoint the time in future at which New South Wales may require additional generating capacity carries with it the cumulative uncertainties of each of the assumptions on which it is based. Owen's task in this case was made even more challenging by the fluid and evolving nature of energy policy, regulation and markets. While any one of the many assumptions that went into Owen's considerations may be debated by the relevant stakeholders, the Department considers that such debates do not shift the broader, fundamental findings presented in the Owen Inquiry Report and reiterated in Owen's separated response to criticisms of that report (Owen, 2009):

1. based on forward projections of energy demands, there is expected to be a point sometime in the next five to ten years where energy demands will exceed energy generation capacity;
2. energy efficiency measures, carbon pricing and renewable energy initiatives have the potential to offset growing energy demands; and
3. if growing energy demands are not fully offset by measures such as these, then New South Wales needs to be prepared for investment in additional generating capacity. This means having additional 'shovel-ready' generating capacity available for implementation if and when it is required, and by corollary, taking steps now to ensure 'shovel-readiness' in future.

The Department considers that these fundamental principles are sound, and should form the basis of consideration of the Bayswater B project (as well as the two other baseload power stations currently under

assessment: the Mount Piper Extension and the Munmorah Refurbishment). In the Department's view, Owen identified a future risk of an energy generating shortfall and recommended that the State be in a position to manage that risk, if and when it eventuates.

*Recent Transgrid Annual Planning Reports (2008-2009)*

Since the Owen Inquiry Report (based on a medium economic growth scenario in Transgrid's 2007 Annual Planning Report supporting a forecast 1,600 GWh per annum growth in energy demand), Transgrid's Annual Planning Reports have presented a decline in forecast energy demand growth. In 2008, this figure had fallen to approximately 1,400 GWh (Transgrid, 2008: 3) and is currently approximately 1,200 GWh (Transgrid, 2009: 3). The two key factors contributing to these reductions in forecast energy demand growth are a lower economic growth outlook and allowances made for residential energy demand reduction measures, specifically, the phasing out of incandescent light bulbs, accelerated uptake of solar hot water systems and small-scale rooftop photovoltaics (Transgrid, 2008: 21; Transgrid, 2009: 19). In its most recent Annual Planning Report, Transgrid has also highlighted a predicted reduction in forecast scheduled energy demand based on assumed 'much stronger energy contributions from non-scheduled generators, particularly wind farms' (Transgrid, 2009: 22).

In both the 2008 and the 2009 Annual Planning Reports, Transgrid also highlights the uncertainty around the timing, scale and effect of the Commonwealth Government's Carbon Pollution Reduction Scheme (CPRS). The CPRS has the potential to affect electricity prices, and demand for electricity, but the extent to which this effect presents itself will depend on the timing of the CPRS and, more significantly, the net carbon reduction outcome targeted by the Scheme.

*Current Australian Energy Market Operator Statement of Opportunities (2009)*

Based on forecast energy demand growth consistent with Transgrid's medium growth estimate (Transgrid, 2009), among other contributing sources, the Australian Energy Market Operator (AEMO) has prepared and published the annual Statement of Opportunities for 2009. In that report, AEMO predicts that low reserve conditions (LRC) may occur in New South Wales during 2015/ 2016, and that the additional capacity requirement at that time would be approximately 182 MW (AEMO, 2009). In its simplest terms, the LRC point is the time at which the network reliability standard may not be met, and at which point loadshedding may be required and brown-outs may occur in some areas. It is important to note that the LRC does not equate to widespread blackout conditions, although continued demand growth beyond the LRC without provision of additional generating capacity increases the need for loadshedding and exacerbates issues with the quality and reliability of supply (ie brown-out extent, severity and duration).

The predicted 2009 LRC point in 2015/2016 is a revision from the 2008 estimate of 2014/2015, principally due to the commissioning (or expected commissioning) of a number of gas-fired power stations in New South Wales (including Uranquinty, Tallawarra and Colongra) and the expected completion of the upgrade to the Eraring power station. The 2009 LRC is also a revision from the Owen Inquiry estimate of 2013/2014 and also the 2007 Statement of Opportunities LRC in 2013/2014. A key assumption applied in the 2009 Statement of Opportunities (as with previous Statements and in the case of the Owen Inquiry) is the decommissioning of the Munmorah power station around 2014/ 2015, with a consequent reduction in New South Wales generating capacity of 600MW.

*Expected Timing of Additional Generating Capacity Requirements*

It has only been two years since the publication of the Owen Inquiry Report, but during that time, the predicted timing of a generation capacity shortfall in New South Wales has similarly shifted by two years. This in itself is sufficient to suggest that a level of caution should be applied to predictions made about events five to ten years into the future, based on several assumptions which themselves carry levels of uncertainty. Further, the changing regulatory, policy and market setting for electricity generation in New South Wales and more broadly across the National Electricity Market is another significant factor that has the potential to substantially and rapidly affect future predictions.

It is in this context that the Department considers that estimates of the New South Wales LRC point in 2015/2016 should be viewed with requisite caution and as a current 'best guess' estimate. On the one hand, this estimate may prove to be too early if significant progress is made with demand management, energy efficiency, new (and currently approved) additional generation capacity, and if domestic and international economic activity remains

depressed. Further, if refurbishment and continued operation of the Munmorah power station is approved and proceeds, the LRC is likely to be pushed back by a number of years. However, and equally, the 2015/2016 date may prove to be too late if update of demand management and energy efficiency measures is less vigorous than expected and if there is a significant improvement in economic activity (for example, if Transgrid's high economic growth scenario eventuates, rather than the medium/ base scenario). On this latter point, the Department also highlights that demand growth predictions and estimates of the New South Wales LRC point have not accommodated any potential for sudden significant increases in demands, as may be expected with the establishment of major new energy-intensive developments or industrial complexes. As an example of this, the existing Tomago Aluminium smelter has a constant energy demand of 900MW – establishment of another (hypothetical) energy-intensive industry such as the smelter has the potential to shift the LRC *forward* by several years. In short, it is prudent to bear in mind that energy supply-demand balances have been based on extrapolation of current and historical information (with some reasoned accommodation of variability and change over time), and that potentially different future conditions (relative to the assumptions underpinning the forecasts) may change the conclusions reached by Owen, Transgrid and AEMO.

Based on this reasoning, the Department considers it prudent to take a broad, strategic approach to the issue of timing of additional generating capacity by accepting that such additional capacity *may be required* at any point in the period 2014-2020. That is to say, additional generating capacity should be available for implementation within that period, *if required*, rather than conclusively determining a date for implementation at this time. To do otherwise is to fail to recognise that estimates such as the LRC point are not fixed and determinative, but rather constrained by the uncertainties inherent in the assumptions around matters such as future market conditions, domestic and global economics, demand management and energy efficiency uptake. This approach is consistent with the Owen Inquiry recommendations, and Owen's own clear distinction between the need to be *prepared* and the act of *implementation* (Owen, 2009: 575).

***Consequences of Not Providing Additional Generating Capacity***

The Department considers that the consequences associated with reaching the LRC point in New South Wales, and the consequences of potentially going beyond that point, are fundamental to contextualisation of the need and justification arguments for the project. As noted above, low reserve conditions represent the point at which the National Electricity Market Reliability Standard may not be met – that is, less than 99.998 per cent of consumer demand is met (or alternatively, that annual levels of unserved energy demand over the long-term exceed 0.002 per cent). It is at this point that network intervention may be required to loadshed.

Any loadshedding event will have negative economic and/ or social impacts, and in some circumstances may even have negative environmental impacts (including, for example, the impacts associated with alternative, temporary power supplies). Around the LRC point, these negative impacts may simply be no more than inconvenience, with the net economic loss potentially being limited. However, beyond the LRC point continued growth in demand will place greater pressure on the network and will ultimately lead to more significant impacts. While any loadshedding that may occur across the network under these circumstances will be managed and undertaken in a controlled manner, it is inevitable that without action to address generating capacity shortfalls that non-essential consumers (including, for example, energy-intensive manufacturing) will be called upon to shed some or all of their usual load. Shortly beyond the LRC point, the negative economic impacts of such actions may be limited, but if allowed to continue over the longer term, or to worsen in frequency, duration or extent then it is likely that cumulative economic impacts will become significant. Loadshedding may also affect the extremities of the network, generally rural and regional communities, with impacts ranging from initial inconvenience to more significant economic and social impacts in the longer term.

The adverse impacts of operating up to and beyond the LRC point are also an issue in terms of perception and in terms of future growth. Development is attracted to New South Wales based on a number of contributing factors, including the availability and security of essential services, such as electricity provision. Even if the LRC point is not reached, but simply approached, the perception that there isn't, or will not be, sufficient secure energy supplies to continue to support development and to accommodate future development could have a very significant negative effect on further investment in the State. This is particularly relevant in the case of larger-scale, more energy-intensive industrial and manufacturing developments (noting again that demand growth forecasting has not assumed any major new industrial load). This effect is likely to remain as a perception as the State approaches the LRC point, but would become a clear reality once the LRC point is reached: development

and investment potential would be significantly impacted in those areas and those sectors that rely on a secure energy supply and for which such a supply has not been provided.

In this context the Department considers it highly undesirable for the State to reach the LRC point or to move beyond it. Ideally, the State will have sufficient installed capacity at any one time to accommodate growth in demand for at least the lead time(s) necessary to implement further measures to keep pace with the growth in demand. The consequences of not doing so (and going beyond the LRC point) are considered so significant that all reasonable measures should be implemented to minimise the likelihood of those consequences becoming reality.

***Diversity and Alternatives in a Robust Risk Management Framework***

Consistent with rigorous risk management practice, where a consequence is considered unacceptable, the principal focus should be on minimisation of the likelihood of occurrence. There are a number of measures available to deal with the risk (likelihood) of New South Wales reaching low reserve conditions. These can be broadly grouped into those measures that reduce or limit demand (demand management measures), those that aim to improve the efficiency of existing energy consumption (energy efficiency measures) and those that provide additional generation capacity (generation capacity measures).

It may be tempting to select and elevate one of these groups of measures (demand management, energy efficiency or generation capacity), or a subset of those measures as the single, preferred solution for energy supply-demand management in New South Wales. However, a single group of measures in isolation is inadequate, and inappropriate, in the context of a comprehensive and robust risk management approach and, in some cases, insufficient to fully address the extent of the predicted supply-demand imbalance. As a consequence, the preferable and prudent approach to take is support of all three groups of measures in order to provide the greatest protection against an adverse supply-demand imbalance and to provide a balance between the benefits and constraints of each set of measures.

On the one hand, measures focused on demand management and energy efficiency have practical, social and economic limits. There is a practical extent to which energy efficiency can be improved given current technological advancement, and demand management is similarly constrained by the limits of what can be realistically achieved. There is also a limit to which society at large can and will accept constraints on energy consumption. Ultimately there will be an economic limit placed on the extent to which demand management and energy efficiency measures can be applied if economic growth is still desired. On the positive side, however, many demand management and energy efficiency measures can be pursued with minimal direct environmental or amenity impacts and without significant capital investment. Demand management and energy efficiency are therefore fundamental requirements moving forward with management of energy supply and demand in New South Wales (and more broadly across the National Electricity Market). Further, there is question as to whether demand management measures and energy efficiency schemes and programs could, on balance, support a reduction in energy consumption sufficient to offset the entire average annual growth in energy demands. While these measures may offset energy demands in the short to medium term, it is likely that in the longer term, annual growth in energy demands will outstrip demand management and energy efficiency measures (based on existing technology).

While demand management and energy efficiency measures have a major role to play, it is apparent that these approaches will not serve to entirely mitigate the risk of a supply-demand imbalance. Therefore, additional generating capacity is a real and necessary requirement to ensure a secure energy system for the State into the medium and longer term. Options available in the suite of generation capacity measures include fossil-fuelled projects, such as the development the subject of the current application, and renewable energy projects, including wind farms, solar power, geothermal facilities, hydro-electric installations and similar technologies.

Renewable energy developments are likely to play an important role in the provision of sustainable energy to address the State's demands into the future. However, and despite a number of approved and proposed wind farm projects in New South Wales, the implementation of wind energy projects (and other renewable energy proposals) is currently not being undertaken at a rate sufficient to address the predicted generation shortfalls. This circumstance may change in future, but at this time it would be imprudent to rely solely on renewable energy projects to address the energy supply-demand balance predictions. There are also existing technical constraints

with connection of developments such as wind farms to the grid that need to be resolved if renewable energy projects are to move from being a contributor to a majority component of the State's energy supplies.

In short, the Department considers that the most effective means of ensuring an energy generation and supply system that is effective, secure and environmentally balanced is to deliver a diverse range of energy generating options. Beyond that, market factors, consumer choices and carbon regulation will ultimately regulate generation options from the diverse suite of alternatives available. Demand management and energy efficiency measures will make an important contribution to addressing the future energy-supply demand balance, and wind farms (and other renewable energy projects) similarly have the potential to make significant contributions in this regard. However, it would be imprudent to rely solely on these measures to secure the State's energy supplies given the potentially significant consequences of reaching or passing the LRC point. It is important to have a suite of approved, environmentally acceptable energy generating developments that *could be implemented* if required in future. As highlighted by Owen, the State needs to be *prepared* to implement these options if they are needed (Owen, 2009: 575). If demand management, energy efficiency and renewable energy projects by themselves negate the need for significant additional non-renewable power generation capacity in future, it will be a positive outcome for the State. However, if these measures are relied upon solely to address the predicted energy supply-demand imbalance, the State runs a serious, unacceptable risk of deleterious outcomes in future if these measures fall short of that mark. It is in the interests of the State, and the public, to make all options available for implementation, if needed in future.

***The Temporal Nature of Regulatory and Market-Based Issues***

If it is accepted that a new non-renewable power generating facility is required in New South Wales in future, then two questions naturally flow in the context of the assessment of the subject and similar applications:

1. why is approval required for gas-firing and coal-firing options?
2. why is approval required for all three baseload power station projects: Bayswater B, Mount Piper Extension and the Munmorah refurbishment?

The responses to these two questions largely lies in the arguments already presented above in relation to the uncertainties associated with predicted future conditions (in this case, regulatory and market conditions) and the need to facilitate a diversity of options to manage risk. On the first point, a significant number of submissions have argued that if gas-firing and coal-firing are current viable options, then gas-firing should be approved and coal-firing excluded based on the superior environmental performance of the gas option (particularly in relation to greenhouse gas intensity). While this argument may hold some weight under existing regulatory and market conditions, it may not continue to be so into the future. In future there may be constraints in place that affect the viability of either the gas- or the coal-fired option. The most simple of these possible constraints may be availability and cost of fuel, the ability to economically source the necessary technologies, the existence of a carbon price or other market instrument that affects the viability of one technology over another, or a regulatory or policy framework that tips the balance between the technological options. In the context of risk management, it would be imprudent to exclude either fuel source option, based on a comparison of the relative impacts of the two, if both options meet acceptable environmental and amenity outcomes. To do so would be to run the risk that future conditions in fact make the approved technology unviable, with no approved alternative.

This issue also calls into question the role of the planning system, and the environmental impact assessment process, in determining or influencing issues such as fuel source/ nature and independent market mechanisms (such as exist in the National Electricity Market). The Department is required to assess the merits of applications that come before the Minister for Planning against established standards, guidelines and policies. It is beyond the role of the New South Wales Planning system, and this assessment, to set policy relating to carbon regulation and pricing, to set policy on preferred fuels and renewable energy targets, or to establish and implement market-based instruments that would influence these matters. The Department has, however, considered the project (including both gas-fired and coal-fired options) against existing regulations, policies and standards and considers that both fuel options are not contrary to or inconsistent with existing regulations, policies and standards set by State or Commonwealth Governments.

The second question raised in submissions focuses on the need for all three current baseload generating projects: Bayswater B, Mount Piper extension and the Munmorah refurbishment. In broad terms, the answer again lies in the need to provide a diverse set of options for possible implementation, if required. It is important to

highlight, as has been done in submissions, that all three projects will not be required in order to address the generating capacity shortfall predicted over the coming decade. However, there is no guarantee that if all three projects are approved that all three will be viable for implementation at the time they are required and that the relevant owner of the planning approval will be in a position to act on the approval at that time. The Department therefore considers it justified that all three could be approved, subject to demonstration of acceptable environmental and amenity outcomes. Ultimately it will be the electricity market, and the regulation and policies that influence its operation, that determines whether any or all of the projects are implemented and the timing of implementation. It is difficult to conceive that any of the approvals would be acted upon unless the party acting on the approval was reasonably confident that there was or would be a market to accept its supply of electricity. Such a market would either be present as a result of an identified shortfall in generating capacity to meet demand, or if the relevant party considered that its particular power station project was appropriately placed to out-compete another generator. On this latter point, submissions have also suggested that if all three baseload power projects are approved and implemented, they have the potential to displace renewable energy generators and to entrench coal-fired power generation. The Department recognises that entry of any or all of the three baseload power projects into the market has the potential, under some conditions, to displace other generators within the 'market hierarchy' – this may include renewable energy projects as well as generation from non-renewable sources. This is, however, the fundamental and necessary nature of the independent, competitive energy market. It is beyond the scope of the planning system and the Department's assessment of these projects to influence or set the direction of such an independent, competitive market. It is, however, the responsibility of Government (State and Commonwealth, as appropriate) to implement regulatory and market instruments (such as the Carbon Pollution Reduction Scheme) to give effect to Government policy on these matters, and to ensure that the 'market-hierarchy' aligns with any applicable Government policy in these areas.

***Conclusion***

In summary, the Department considers that the Bayswater B project is justified as an important and necessary component of a broader suite of demand management, energy efficiency and capacity generating measures to secure the State's energy supplies into the future. This position is derived from considerations as follows:

1. the need to address the potential for a demand-supply imbalance predicted to occur between 2014 and 2020;
2. the potential significant adverse consequences of not addressing this demand-supply imbalance;
3. the need to comprehensively minimise the risk (likelihood) of these potential significant adverse consequences through a diverse suite of options, including demand management, energy efficiency and generation capacity measures;
4. the importance of not pre-empting future regulatory, market and practical conditions by limiting fuel supply options at this time (subject to both fuel supply options being demonstrated as compliant with established environmental and amenity standards);
5. the risks inherent in delivering large-scale infrastructure projects, and the need to manage such risks through the provision of more than one potential option for future implementation, if required; and
6. the importance of regulation and market-based instruments, not the NSW planning system, in delivering Government policy outcomes in the independent, competitive energy market.

# 3. STATUTORY CONTEXT

## 3.1 Major Project

The project is declared to be a Major Project under *State Environmental Planning Policy (Major Development) 2005* because it is development for the purposes of an electricity generation facility that has a capital investment value of more than $30 million for gas or coal-fired generation (clause 24 of Schedule 1). On 19 June 2009, the Director-General, under delegation from the Minister, formed the opinion that the project meets the requirements of the Major Development SEPP and declared the project to be a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act). Therefore, the project will be assessed and determined by the Minister for Planning under Part 3A of the Act in accordance with section 75D(1).

Also on 19 June 2009, the Director-General, under delegation from the Minister, authorised the submission of a concept plan under section 75M(1) of the Act for the project.

The Director-General's requirements for the preparation of an Environmental Assessment were issued on 4 July 2009. For the purpose of section 75H of the *Environmental Planning and Assessment Act 1979*, the Environmental Assessment complied with the Director-General's requirements and the Proponent was notified of this compliance on 17 September 2009.

## 3.2 Critical Infrastructure

The project is for the generation of nominally 2000 MW of electricity and therefore, by virtue of an Order made by the Minister for Planning on 26 February 2008, is deemed to be a critical infrastructure project under section 75C of the *Environmental Planning and Assessment Act 1979.*

The Order declares development for the purpose of an electricity generation with capacity to generate at least 250 MW to be critical infrastructure, if an application is lodged before 1 January 2013. The subject project relates to a power station with the capacity to generate up to 2000 MW and the subject application was received on 19 June 2009. It therefore meets the criteria to be considered a critical infrastructure project.

## 3.3 State Environmental Planning Policies

There are no State Environmental Planning Policies that apply to the proposal that substantially govern the carrying out of the development.

## 3.4 Exhibition and Notification

The application and Environmental Assessment were placed on public exhibition from Friday 25 September to Monday 26 October 2009 and submissions invited in accordance with Section 75H of the Act. Exhibition locations were as follows:

- Department of Planning's head office;
- Department of Planning, Hunter Regional Office;
- Nature Conservation Council;
- Singleton Council;
- Singleton Library;
- Muswellbrook Council; and
- Upper Hunter Regional Library/Muswellbrook Library.

The Environmental Assessment was also provided for viewing and/or download from the Department's website.

Notification of the exhibition period was made through advertisements in the following newspapers, and on two separate occasions in each (10 advertisements in total):

- *Sydney Morning Herald* (30 September 2009 and 14 October 2009);
- *Daily Telegraph* (30 September 2009 and 14 October 2009);
- *Newcastle Herald* (25 September 2009 and 10 October 2009*)*;
- *Singleton Argus* (25 September 2009 and 9 October 2009); and

- *Muswellbrook Chronicle* (25 September 2009 and 9 October 2009).

The Department agreed to accept late submissions from a number of stakeholders up until Friday 30 October 2009.

### 3.5 Minister's Approval Power

The Department has met all its legal obligations so that the Minister can make a determination regarding the project.

# 4. CONSULTATION AND ISSUES RAISED

The Department received a total of 362 submissions in relation to the project. Of these, 353 were submissions made by community groups and the general public. The remaining nine submissions were made by local, State and Commonwealth Government agencies. Form letters represented the majority of the total public submissions with three different form letters received.

Of the 362 submissions received on the project:

- 286 submissions (79%) objected to the project in its entirety;
- 60 submissions (17%) objected to the coal-fired option only;
- 1 submission supported the project in its entirety;
- 1 submission supported the gas-fired option only; and
- 14 submissions (4%) neither stated support for nor objection to, the project.

In relation to Government submissions, no agency explicitly expressed opposition to the project, with only Muswellbrook Council expressing support subject to issues of concern being addressed. The remaining agencies did not state a position regarding the proposal although raised issues of concern to be addressed as part of the assessment of the project or recommended further environmental assessment as part of any project application.

### 4.1 Nature of Submissions

**Submissions from Government**

Submissions were received from four State Government agencies, as listed below:

- **NSW Department of Environment, Climate Change and Water (DECCW)** – does not object to the project, as described in the Environmental Assessment, provided the Proponent addresses a number of issues that have been raised, specifically in relation to the data, methodology and predictions made regarding the air quality assessment, the potential for acid deposition, hydrogen fluoride criteria exceedances, indigenous heritage consultation and commitments regarding mitigation and management measures and the generation and management of ash waste. DECCW has also recommended a number of specific conditions of approval in its submission.
- **NSW Department of Environment, Climate Change and Water – NSW Office of Water (NOW) –** did not state a position regarding the proposal however raised water supply security as a key issue for power generation. The submission states that in periods of low water availability the available major utility, high security and general security access licence volumes may be subject to a reduction in available share. In the event of severe drought conditions, Bayswater B and other users may be subject to further curtailments as a result of Ministerial determination. NOW requires that appropriate water supply arrangements be made to service the proposed power station sufficient to maintain output during the drought of record (1930s to 40s) and ensure that the ability of the existing Bayswater and Liddell power stations maintain 80 per cent annual capacity factors during the drought of record. NOW has recommended that a number of water-related conditions be satisfied at the time of lodgement of an application for project approval including:
    - that the Proponent ensure it has adequate water supply for all existing and future electricity generation demands.
    - the Proponent demonstrate that water has been secured sufficient to maintain the power stations full output during the drought of record; and
    - in the event that water supply is not adequate to meet the Bayswater B demands additional water rights shall be sought via the water market or by other means identified in the Environmental Assessment for concept approval.

  The submission states that it is critical that any additional water requirements for power generation be met through the water market transfer system in accordance with water licence dealing rules and the provisions under the Hunter Regulated River Water Sharing Plan.
- **NSW Roads and Traffic Authority (RTA)** – did not state a position regarding the project, however, provided comments regarding road safety and traffic impacts of the proposal on the New England Highway. The RTA has indicated that the interchange at the intersection of the New England Highway and Bayswater River Road should be upgraded to the satisfaction of the RTA and has outlined a number

of requirements to be incorporated into the upgrade of the interchange in its submission. The RTA's submission also indicates that the Proponent will be required to enter into a Works Authorisation Deed with the RTA concerning the upgrade works.

- **NSW Department of Industry and Investment (DII)** – did not state a position regarding the proposal, however, stated that if the coal-fired option was selected it would be required to use world's best practice low emission technology. The submission stated that whether the fuel source selected is coal or natural gas, the power station should also be carbon capture and storage ready as stated in the Proponent's Statement of Commitments and it recommended that this requirement become a condition of approval. DII also requested clarification of the air quality impact of the proposal on properties south-west of the power station as it stated that vineyards, horse studs and other rural properties in this area along the Golden Highway north of Jerrys Plains appeared to have been overlooked as a sensitive receptor in the Environmental Assessment.
- **NSW Department of Health - Hunter New England Population Health** – did not state a position on the proposal however indicated that air quality is a concern to the broader population with many enquiries received regarding the impact of air quality on the environment and human health. The submission stated that it would be preferable to choose the proposal with the least impact on air quality both during construction and operational phases. NSW Health also stated that the Proponent should put measures in place to protect groundwater, traffic and transport and noise and vibration during construction.

Submissions were also received from four local Government agencies including Singleton, Muswellbrook, the City of Sydney and Marrickville Councils. A summary of the issues or comments made in these submissions are outlined as follows:

- **Singleton Council** – did not state a position regarding the proposal however considered that the timeframe to make a submission regarding the proposal was insufficient. The Council raised the fact that no health impact assessment was undertaken as part of the Environmental Assessment and considered that an assessment should be undertaken to consider air quality, water quality impacts on the Singleton community as well as impacts from noise associated with rail movements. The Council identified that specific details regarding the proposed worker camps was not provided and would need to be resolved. The Council was also concerned with the increase in traffic predicted in terms of it further exacerbating capacity issues with the Bridgman Road/New England Highway intersection as well as contribute to further traffic congestion on the Highway through the Singleton urban area.
- **Muswellbrook Shire Council** – stated that based on a number of suggested changes being made to the Proponent's Statement of Commitments, it supported the proposal. Council indicated that the Proponent should become a signatory to the Upper Hunter Air Quality Monitoring Network and that the next phase of air quality assessments should assess the effects of Hydrogen Fluoride emissions on viticulture, agriculture and habitat areas specifically for the coal-fired option. Other comments made by Council in relation to the Proponent's Statement of Commitments included further consultation with both Muswellbrook and Singleton Councils, an assessment of $PM_{2.5}$ dust generation, the assessment of impact of the purchase of any additional water entitlements, allowing for the future widening of the New England Highway should project infrastructure be required to traverse it, prepare an apprenticeship and traineeship plan for the training of staff, and other comments related to traffic, social and economic assessment, flora and fauna and rehabilitation.
- **City of Sydney Council** – stated its objection to any concept for new baseload coal-fired power generation in NSW based on the impact to national, state and local greenhouse gas emission targets; increased costs being passed onto consumers; funding would be better allocated to decentralised low-carbon energy projects and demand management; the efficiency of existing coal-fired power generation plants should be improved in preference to the construction of new plant. The Council also objected to the project due to the amount of energy that would be wasted, high emissions per energy output, the unsustainable use of limited water resources and the incompatibility with low-carbon decentralised energy generation given the limited scale-ability of coal-fired generation. The Council also stated that the NSW Government should re-assess options for new power supply in the state on the basis that the Owen Report was developed before there was a commitment to carbon pricing and within a substantially different economic climate. The City of Sydney Council did not make any specific comments regarding the gas-fired option.
- **Marrickville Council** – stated its objection to the proposed new coal or gas-fired power station based on the need to reduce greenhouse gas emissions at a strategic level. Council indicated in its submission that

the project would result in a significant increase in greenhouse gas emissions, particularly in light of the NSW State Plan targets for cleaner air and progress on greenhouse gas reductions to a return to 2000 greenhouse gas emission levels by 2015 and a 60 per cent reduction in greenhouse gas emissions by 2050.

**Submissions from Special Interest Groups**

Of the total submissions received, thirty submissions were from specific interest, industry and/or environment groups, namely:

- Greenpeace (two submissions);
- The New School [Not Old School] Collective (an affiliation of Friends of the Earth);
- Rising Tide Newcastle;
- Total Environment Centre;
- Bellingen Environment Centre;
- Hunter Valley Water Users Association;
- Wollongong Climate Action Network;
- Greenearth Fengshui;
- Carbon Reduction Institute;
- Aidwatch;
- Hunter Environment Lobby;
- Jamberoo FutureCare;
- Dissenting Members of the Muswellbrook Shire Council Environment Committee;
- Macquarie University;
- Beyond Zero Emissions;
- Climate Action Newcastle;
- Greens Nature Conservation Council;
- Manly Warringah Climate Action Group;
- Queensland Hunter Gas Pipeline;
- Climate Change Balmain-Rozelle;
- Edmund Rice Centre;
- North Shore Climate Action;
- Lake Macquarie Climate Action Inc.;
- Climate Action Pittwater;
- Singleton Shire Healthy Environment Group;
- The Greens NSW (two submissions);
- Environmental Defender's Office Ltd on behalf of Rising Tide Australia; and
- Nature Conservation Council.

All of the abovementioned groups objected to the proposal. The main issues raised in submissions centred around the issue of greenhouse gas emissions and its impact on climate change. The issues raised by interest groups have been summarised as follows:

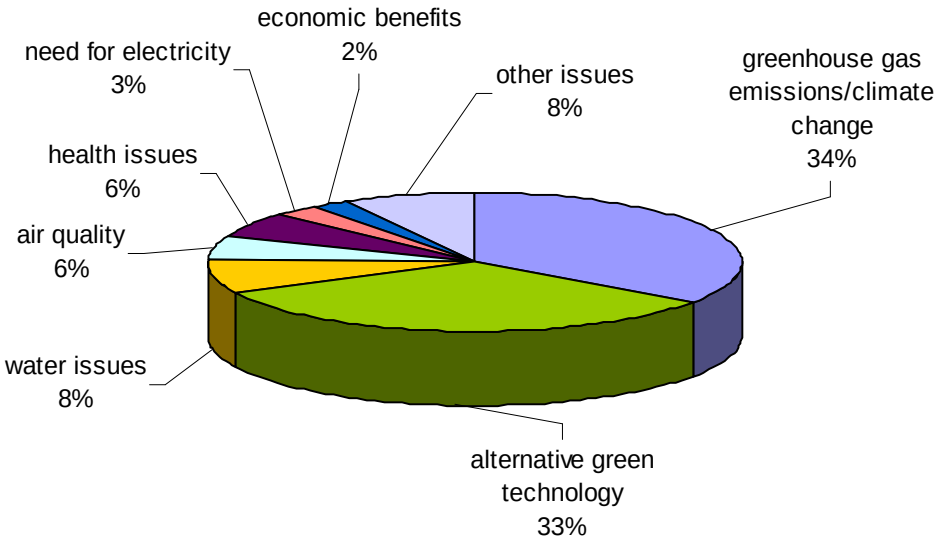
- there must be a moratorium on any new coal-fired power station being built in NSW;
- additional emissions are unacceptable;
- there is no strategic justification for the power station;
- it is no longer morally or scientifically acceptable to build new coal-fired power stations or new baseload gas plants;
- given the amount of greenhouse gas emissions from the proposal, both proposals should be rejected based on the Commonwealth and NSW government attempts to reduce emissions;
- unacceptable to be increasing emissions in the context of rapid global warming;
- together with Mt Piper the coal-fired option would represent an increase of 34 per cent in emissions from stationary energy in NSW;
- the Government should be facilitating an urgent transition to a clean energy future;
- modern generators are slightly more efficient than older generators, however, this is irrelevant if the emissions are additional to current emissions;
- carbon capture and storage is a long way from being a feasible and deployable option;

- support for gas-fired generation can only be provided if it is replacing existing base-load generation or providing limited peak generation;
- any new power for NSW must be renewable;
- power needs should be met by demand management, energy efficiency and renewable power generation;
- conclusions of the Owen Inquiry were severely limited by narrow terms of reference that failed to consider demand management and energy efficiency;
- coal-fired power stations in NSW are currently operating at 65 per cent capacity which indicates that more base-load power is not required for some time;
- a range of green energy options combined with energy efficiency measures would result in NSW having surplus power in 2019/2020;
- NSW would be better served by policies aimed at reducing the demand for electricity through the smart management of the demand for energy and energy efficiency measures;
- solar thermal is far more cost effective and sustainable;
- new power stations would drive an expansion of existing coal mines;
- Australia has plenty of sun, wind and water to create power;
- coal should not be contemplated;
- neither option is considered acceptable as a baseload power source;
- loss of vegetation;
- discharges of saline water;
- ability of the Upper Hunter to supply sufficient water to justify the investment during severe drought periods; and
- other factors should be considered in developing the preferred option other than pure commercial cost.

### 4.2 Summary of Issues Raised

The main issues that were raised in the submissions are summarised in Figure 5 shown as a percentage relative to all the issues that were raised. The majority of the submissions raised more than one issue of concern regarding the project, however, this was mainly due to the large number of form submissions which were received with a number of issues raised in each submission.

**Figure 5 - Issues Raised in Submissions**




As illustrated, the main issues that were raised included issues related to greenhouse gas emissions and climate change, the need to focus on alternative green technology/renewable energy, water supply issues, air quality and health related impacts, the need for electricity and the economic benefits that would result from the project. While greenhouse gas emissions/climate change and renewable energy made up the majority of the issues raised

relative to other issues of concern, in absolute terms, 327 submissions raised the issue of climate change (90 per cent of all submissions received) and 310 submissions raised the argument that the Government should be focusing on alternative green technology such as renewable energy (which amounts to 85% of all submissions received).

A large number of "other" issues were also raised in the submissions and these have been grouped together in Figure 5. The "other" issues that were of concern and the number of times they were raised are summarised below in Table 3.

**Table 3: Other Issues Raised in Submissions**

| "Other" Issues Raised | Number of Times Issues Raised |
|---|---|
| Adequacy of Environmental Assessment | 11 |
| Infrastructure impacts | 10 |
| Flora and fauna impacts | 9 |
| Waste management issues | 7 |
| Traffic impacts | 5 |
| Land use/property impacts | 5 |
| Cumulative impacts | 4 |
| Consultation issues | 4 |
| Noise and vibration issues | 4 |
| Demand on services | 4 |
| Construction impacts | 3 |
| Heritage impacts | 3 |
| Visual impacts | 2 |
| Hazards/risk issues | 2 |
| Alternative site location | 1 |
| Feasibility of transporting fuel to the site | 1 |

Twenty eight submissions raised the issue of project justification/project need as an issue of concern. The issue of project need was previously addressed in Section 2.4 and has not been repeated in Section 5.

### 4.3 Submissions Report

On review of the submissions received, the Department directed the Proponent to prepare a Submissions Report. The Proponent's response to submissions did not lead to any changes to the project and therefore a Preferred Project Report was not prepared. However minor changes to the Proponent's Statement of Commitments were undertaken to address concerns raised in submissions. The Submissions Report (including finalised Statement of Commitments) was made publicly available on the Department's website and a copy provided for comment to the Department of Environment, Climate Change and Water (DECCW). The Department has considered other agencies' recommendations in formulating recommended conditions of approval for the project. A copy of the Submissions Report is provided as Appendix C to this Report.

### 4.4 Department's Consideration

The Department's consideration of issues raised in public and agency submissions is summarised in Table 4.

**Table 4: Consideration of Issues**

| Issue Raised | Where Addressed |
|---|---|
| Greenhouse gas emissions/climate change | Section 5.1 |
| Project need/need for electricity | Section 2.4 |
| Air quality and health | Section 5.2 |
| Water supply and availability | Section 5.3 |
| Noise | Section 5.4 |
| Flora and fauna impacts | Section 5.5 |

| | |
|---|---|
| Adequacy of Environmental Assessment | The Department reviewed the draft Environmental Assessment and deemed it adequate for public exhibition purposes. |
| Waste management issues | Ash disposal was raised as the primary issue relating to waste management. Considering the information presented in the Environmental Assessment, the commitments made by the Proponent, and the issues raised by DECCW and Muswellbrook Shire Council, the Department has recommended specific conditions of approval in relation to ash disposal focusing on the detail of assessment that will be required as part of the submission of a project application, should coal be selected as the preferred fuel for the power station. Waste management issues would be addressed in further detail as part of a subsequent project application request. |
| Traffic impacts | As part of their submission, the RTA indicated that the interchange at the intersection of the New England Highway and Bayswater River Road should be upgraded to the satisfaction of the RTA and has outlined a number of requirements to be incorporated into the upgrade of the interchange in its submission. The Proponent has responded that as traffic volumes generated by operation of the proposal are not predicted to be significant, the upgrade is not justifiable. The Department has recommended a condition of concept approval that requires the Proponent to provide additional assessment at the project application stage for both the construction and operational traffic, and once the fuel type and site of the proposed construction camps are known.<br><br>No further assessment regarding traffic issues is considered warranted by the Department at this stage of the project. |
| Consultation issues | The application and Environmental Assessment were placed on public exhibition from Friday 25 September to Monday 26 October 2009, in accordance with Section 75H of the EP&A Act. Late submissions were also accepted from a number of stakeholders up until Friday 30 October 2009. The Proponent consulted with local councils and a number of community stakeholders during preparation of the Environmental Assessment, and held an open day for the community. The Department also undertook consultation with a number of agencies throughout the assessment process. The Department considers that all consultation requirements for the concept plan application have been met. |
| Infrastructure impacts<br>Land use/property impacts<br>Cumulative impacts<br>Demand on services<br>Construction impacts<br>Visual impacts<br>Hazards/risk issues<br>Feasibility of transporting fuel to the site | The Department is satisfied that these matters have been adequately addressed in the Proponent's Submissions report and/or Statement of Commitments for this level of concept plan application. The Department has identified a number of additional information requirements and details to be provided by the Proponent at the project application stage, specifically related to cumulative impacts in relation to air quality and hazards and risks for the preferred final project design. |
| Indigenous heritage | At the time that the Environmental Assessment was placed on public exhibition, the heritage impact assessment was incomplete in relation to consultation requirements with the indigenous community. As part of the Proponent's |

| | |
|---|---|
| | Submissions Report, the Proponent provided further information on the consultation undertaken with the indigenous community and provided evidence of consultation. As stated in the Proponent's Submissions Report, Aboriginal stakeholders that were consulted as part of the project, were satisfied with the assessment of significance undertaken and the management measures proposed as part of the concept plan, noting that further consultation with the community would be undertaken as part of the project application stage.<br><br>DECCW raised concerns with the lack of detailed methodology presented in the Environmental Assessment regarding mitigation measures to avoid or mitigate impacts to indigenous heritage. The Proponent has stated that until a preferred option is selected and the detailed design is prepared, the conceptual methodology presented in the Environmental Assessment cannot be further developed regarding mitigation and management measures. The Proponent, has, however, correctly indicated that without a preferred technology and design, the final disturbance footprint of the project is not conclusively known. The Department has therefore recommended, as a condition of concept approval, that the Proponent be required to conduct further investigations including site surveys for the entire footprint of the project as part of the project application stage in consultation with DECCW and the indigenous community and from this develop appropriate management and mitigation measures to protect significant heritage items. |

# 5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

Key issues raised in the submissions in response to the public exhibition of the project and/or identified during the Department's assessment included:

- greenhouse gas emissions/climate change issues;
- air quality and associated health impacts;
- water supply and availability issues;
- ecological impacts; and
- noise impacts.

While ecological issues and noise were not raised as key issues of concern in the submissions received, the Department considers these issues to be significant and has therefore undertaken as assessment of these components for the project and recommended either further assessment be undertaken or specific conditions be implemented as part of the concept approval.

All other issues raised in the submissions are considered to be minor and have been addressed as part of the Proponent's Statement of Commitments or via specific conditions of concept approval and therefore have not been separately addressed in this section of the document.

## 5.1 Greenhouse Gas Emissions/Climate Change Issues

**Issues**

The Environmental Assessment included an assessment of the greenhouse gases predicted to be emitted as a result of the Proposal. The assessment focussed on carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$). The assessment used methodologies from the Australian Government's *National Greenhouse and Energy Reporting System (NGERS) Technical Guidelines* and the NSW *Greenhouse Gas Reduction Scheme (GGAS)* reporting structure. The Environmental Assessment included:

- prediction of total greenhouse gas emissions for construction and operation of the project;
- comparison of greenhouse gas emissions against NSW and national averages;
- predictions of thermal efficiency and consideration of best available technology; and
- methods for emissions reduction and carbon offsetting.

Brief discussion was also provided on the impacts of the Australian Government's *Carbon Pollution Reduction Scheme* (CPRS) on the proposal.

***Generation of greenhouse gas emissions***

Construction of the coal-fired power station is predicted to generate approximately 712,860 tonnes of $CO_{2\text{-}e}$ over the construction period (54 months), with the gas fired power station generating approximately 286,640 tonnes of $CO_{2\text{-}e}$ over a 38 month construction period. Operation of the coal-fired power station would generate approximately 12.45 million tonnes of $CO_{2\text{-}e}$ per year, and the gas-fired option would generate in the order of 5.93 million tonnes of $CO_{2\text{-}e}$ per year.

The assessment undertaken by the Proponent predicted Scope 1, 2 and 3 emissions, based on activities at the existing Bayswater and Liddell Power Stations. Scope 1 emissions include direct or point-source emissions controlled by the company, for example, on-site stationary combustion of gas or coal for electricity generation. Scope 2 emissions account for indirect emissions from the generation of electricity that is purchased and consumed by the organisation (negligible in this case as Bayswater B would use electricity generated on site, rather than purchased from another generator) and Scope 3 emissions include all other indirect emissions, including those that are a consequence of the activities of the Proponent, but occur from sources not owned or controlled by them. A breakdown of the predicted emissions, for both construction and operation are provided in Table 5 and Table 6 below.

**Table 5: Estimated Greenhouse Gas Emissions during Construction**

| Emissions | Activity | GHG Emissions (tonnes $CO_{2-e}$ p.a.) | |
|---|---|---|---|
| | | Coal fired option | Gas fired option |
| Scope 1 | Transport emissions from Proponent-owned or operated vehicles during construction | 60 | 40 |
| Scope 2 | N/A | 0 | 0 |
| Scope 3 | Emissions related to manufacture of steel for construction | 472,000 | 176,000 |
| | Emissions related to concrete batching plant for construction | 151,000 | 59,600 |
| | Transport emissions from non-Proponent-owned vehicles during construction | 89,800 | 51,000 |
| **Total** | **Scope 1, 2 and 3 emissions construction** | **712,860** | **286,640** |

**Table 6: Estimated Greenhouse Gas Emissions from Operation**

| Emissions | Activity | GHG Emissions (tonnes $CO_{2-e}$ p.a.) | |
|---|---|---|---|
| | | Coal fired option | Gas fired option |
| Scope 1 | Combustion of fuel during operations | 12,147,000 | 5,771,000 |
| | Transport emissions from Proponent-owned or operated vehicles during operation | 60 | 40 |
| Scope 2 | Emissions from purchased electricity (maximum) | 89 | 89 |
| Scope 3 | Fugitive emissions from fuel extraction | 281,200 | 147,600 |
| | Emissions from transporting fuel to site (coal via trains or gas via pipeline) | 13,200 | 6,100 |
| | Transport emissions from non-Proponent-owned vehicles during operations | 5,400 | 1,100 |
| **Total** | **Scope 1, 2 and 3 emissions operations** | **12,446,949** | **5,925,929** |

***Comparison against NSW and national averages***

The Proponent provided an indication of the predicted greenhouse gas emissions intensity and thermal efficiency of the project against current NSW averages. The predicted greenhouse gas emissions intensity for the proposed Bayswater B power station is 0.840 tonnes $CO_{2-e}$/MWh for the coal-fired option and 0.398 tonnes $CO_{2-e}$/MWh for the gas-fired option. The Proponent compared these emission intensities against the NSW Pool Coefficient, which represents the emissions of greenhouse gases (in tonnes of carbon dioxide equivalent) per MWh of electricity supplied from the 'pool' of major power stations serving the NSW electricity grid. For 2009, the NSW Pool Coefficient is 0.967 tonnes $CO_{2-e}$/MWh (greenhouse gas emission intensity). For comparison purposes the greenhouse gas emissions intensity for the existing Bayswater and Liddell power stations were also provided, at 0.960 tonnes $CO_{2-e}$/MWh and 0.981 tonnes $CO_{2-e}$/MWh respectively. The Proponent has noted that both the coal- and gas-fired options for Bayswater B will have greenhouse gas emission intensities lower than the current NSW Pool Coefficient.

The Environmental Assessment included a prediction of the greenhouse gas emissions from the proposed power station against Australia's total annual greenhouse gas production, for both the start and end of operations (2015 and 2044 respectively). For the coal-fired option, the Proponent has predicted Bayswater B will comprise between 2.02% and 1.28% of national emissions, while the gas-fired option will comprise between 0.96% and 0.6% of national emissions. The national emissions have been predicted as 614,480,000 tonnes $CO_{2-e}$ p.a in 2015 and 973,700,000 tonnes $CO_{2-e}$ p.a in 2044, based on a worst case scenario energy demand growth rate of 1.6% per annum on the 2007 figure (541,200,000 tonnes $CO_{2-e}$).

***Thermal efficiency and best achievable technology***

The Proponent predicts Bayswater B, using dry (or air) cooling technology, would have a thermal efficiency of approximately 39.5% for the coal-fired option and about 50.0% for the gas fired option. World's best practice thermal efficiency for ultra super critical coal fired power stations is estimated to be 43.0% or higher (on a sent out

basis), however the Environmental Assessment noted that these efficiencies are achieved through the use of direct water cooling, and in locations with lower ambient temperatures. Due to the high water demand required, direct water cooling is not proposed for Bayswater B, and due to the higher temperatures of the area, the Proponent has suggested that those efficiencies cannot be achieved for the proposal.

For the gas-fired option, the Environmental Assessment notes that best practice would be the use of an H class plant with cold water direct cooling. H class machines use steam, as well as operating with higher cycle (firing) temperatures compared to other classes of plant. High thermal efficiencies are optimised with low air and cooling water temperatures which are available at high latitudes. However, as stated above, water cooling is not an option for this project, and in addition, Bayswater B is located in a warm temperate climate. The Proponent has therefore argued that the efficiency benefits of the H class technology would be marginal (i.e. the marginal net gain would not justify the additional expenditure), and therefore proposes to use F class technology if the gas option is selected.

***Emissions reduction and offsetting***

The Environmental Assessment identified a number of emissions reduction options for both the coal- and gas-fired options, including wet cooling, selective catalytic reduction, selective non-catalytic reduction, dry low $NO_x$ systems, flue gas desulphurisation, and theoretical high efficiency thermal design. Of these, the Proponent has noted that should the gas-fired option be selected, Bayswater B will include dry low $NO_x$ systems as they are included as standard equipment on F Class gas turbines. The Proponent has not proposed to use any of the other emission reduction technologies at this stage, as a result of either high cost or additional technical constraints.

In accordance with the Director-General's requirements, the Proponent considered opportunities for emissions offsetting and carbon capture and storage (CCS). In regards to emissions offsetting, the Environmental Assessment noted that there are a variety of potential opportunities to offset greenhouse gas emissions, such as renewable energy augmentation or carbon offset projects, however these would need to be reviewed by the Proponent as part of the project application. The Proponent considered a variety of CCS technologies as an emissions reduction approach. The Environmental Assessment noted that at this stage, post-combustion carbon capture was the most promising method, however that this technology requires further development before large-scale implementation would be feasible. As such, the Proponent has committed to designing the plant to be carbon capture ready and to undertake a review process every two years to monitor and consider opportunities, level of development, and availability and feasibility of various emission reduction and CCS technologies.

**Submissions**

A total of 327 submissions (90 per cent) received on the project raised increasing greenhouse gas emissions and associated climate change impacts from the operation of the power station as issues of significant concern. Further, 86 percent of submissions indicated that the focus should be on renewable or alternative forms of energy generation. The comments made in relation to greenhouse gas and climate change can be summarised as follows

- objection to the development of any new fossil fuel power stations in NSW, particularly new coal-fired power stations;
- noting that the proposal will significantly increase national, state and local greenhouse gas emissions and that the additional generation of greenhouse gas emissions is unacceptable, with various submissions including estimates of increases to NSW emissions by between 10 and 50%, depending on whether one or both proposals (i.e. Mt Piper) are pursued;
- stating that it is unacceptable to be increasing emissions in the context of rapid global warming and the findings of the International Panel on Climate Change that global emissions should be reduced by 60-80% immediately;
- suggesting that the proposal should be rejected in light of the Australian and NSW government's attempts to reduce emissions, and reference was made to the NSW State Plan targets for progress on greenhouse gas reductions to a return to 2000 greenhouse gas emission levels by 2015 and a 60 per cent reduction in greenhouse gas emissions by 2050;
- discussion that modern generators are slightly more efficient than older generators, however, that this is irrelevant if the emissions are additional to current emissions; also noting that coal-fired power stations in

NSW are currently operating at 65 per cent capacity, that coal technology wastes energy, with high emissions per energy output,

- identified that carbon capture and storage is a long way from being a feasible and deployable option; and
- noted that increased costs will be passed onto consumers, including through an Emissions Trading Scheme.

Agency submissions (such as DECCW and DII) noted the proposal would result in significant increases to NSW greenhouse gas emissions, and emphasised the need to continue to evaluate the availability and feasibility of emissions reduction and offset measures. The City of Sydney and Marrickville Councils objected to the proposals in relation to the impact to national, state and local greenhouse gas emission targets, associated increased costs for consumers, and stated preference for demand management and alternative energy generation measures.

**Consideration**

The Department recognises that the issue of greenhouse gas emissions is both complex and contentious, and that it would be preferable to provide electricity with no additional greenhouse gas emissions. Section 2.4 discusses the need for additional baseload electricity.

***Independent review***

The Department commissioned Arup Pty Ltd (Arup) to undertake an independent peer review of the Proponent's greenhouse gas assessment. The review confirmed that the Proponent had undertaken a technically appropriate greenhouse gas assessment of the project. In relation to the estimates of Scope 1 and 2 emissions, Arup considered the estimates to be acceptable or conservative, however noted that as the calculations and methodologies were not provided, detailed review was difficult. Furthermore, Arup considered that the estimates of Scope 3 emissions for operation were a significant underestimate. Notwithstanding this, the review noted that it had become industry standard to report only Scope 1 and 2 emissions as these comprise the most significant emissions, and it is difficult to determine with certainty whether Scope 3 emissions would not occur even without the Project.

Arup also considered that the Proponent may have underestimated the emissions intensity which would be achievable in practice due to the use of a high capacity factor (92 percent) for comparison against the NSW average (i.e. noting that under normal operation the project is likely to operate at a lower capacity factor than the theoretical maximum and therefore at a lower thermal efficiency). On this basis, Arup also stated that use of the NSW pool co-efficient is not an acceptable representation of current NSW average emissions intensity for comparative purposes, as the "pool" only considers existing steam/coal and one gas power station, and thirteen hydro-electric plants operating in 2003, and is not based on all electricity generated in NSW (e.g. other gas, wind farms, biomass or cogeneration plants, etc). Furthermore, Arup suggested that by the time the power station is built the coal-fired option would have an emission intensity greater than the average NSW emissions intensity, due to Government policies encouraging more renewable generators into the market which would reduce the emissions intensity of the average over time. It should be noted that Arup recognised that the gas-fired option is likely to have an emission intensity significantly lower than the average NSW emissions intensity, both at current levels and into the foreseeable future.

Similarly, with regard to the predictions against the national emissions, Arup noted that the assessment did not consider the impact of a CPRS when calculating the percentage of emissions against the national total. Arup suggested that the assumption of worst case annual growth of 1.6 per cent of national emissions per year may be a misrepresentation as it provides a best case scenario for the project. In this regard, Arup calculated that if the CPRS comes in to force both the coal- and gas-fired options will emit a significantly larger proportion of national emissions by 2044 than in 2015 and would represent between 1.6 per cent (gas-fired option) and 3.4 per cent (coal-fired option) of national emissions over the lifetime of the project, based on a mid range scenario selected from the CPRS projections.

Arup questioned the conclusions made by the Proponent that the proposed Bayswater B coal- and gas-fired options represent the best achievable practice for emissions intensity and thermal efficiency. For the coal-fired option, Arup considered that the various plant equipment and layout identified in the Environmental Assessment for the theoretical high efficiency thermal design could be achieved for the proposal. The Proponent suggested the cost of installing and operating the plant at theoretical high efficiency at this location ($120/tonne of $CO_2$

reduction) was not commercially viable, for an improvement of up to one per cent in thermal efficiency and a two per cent decrease in emissions intensity. Arup suggested that this conclusion may not be accurate, considering the technology is achievable and details have not been provided to substantiate how the costs have been calculated. In relation to the gas-fired option, Arup considered the F class plant proposed does not represent best achievable practice, and noted that an H class based combined cycle gas turbine is achievable which has a higher thermal efficiency and lower emissions intensity. Furthermore, while the Proponent did not present a figure for the thermal efficiencies of the H class plant, Arup suggested, based on its review of Mt Piper's Environmental Assessment, that the thermal efficiency of a H class plant (air-cooled) would be approximately 52.9 per cent compared with the proposed F class plant thermal efficiency of approximately 50 per cent.

In relation to emissions offsetting, Arup suggested that renewable energy augmentation measures such as solar or biomass co-firing have not been appropriately considered and are likely to be feasible by the commencement and/or throughout the life of the project, particularly if the CPRS is implemented. Arup noted that while the Environmental Assessment includes nomination of carbon capture technology (post-combustion carbon capture and storage), should the plant be designed to be carbon capture ready, based on pre-nomination of a preferred technology, this may then prohibit the selection of alternative technologies which may become more advanced and cost effective over time. Furthermore, Arup questioned the retrofit cost calculations and potential year of a retrofit, influencing the cost predictions.

Arup noted that the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is currently under review and there is a proposal to include a greenhouse trigger in the reviewed Act. Arup suggested that under any of the proposed trigger scenarios, the project would be required to seek approval from the Australian Government under the reviewed Act, and that the greenhouse gas emissions would be considered significant. Furthermore, Arup queried why the Environmental Assessment did not include evaluation of the project with and without mitigation measures when considering the costs of the CPRS. Arup undertook a brief analysis and suggested that a coal carbon price of less than $25 per tonne could result in gas becoming a more viable technology, and that solar augmentation may be preferable over CCS technology.

In response to the Arup review, and in relation to the Scope 3 emissions calculations, the Proponent provided revised figures for the operation of the plant, increasing the fugitive emissions from fuel extraction from 281,200 to 630,000 tonnes $CO_{2\text{-}e}$ p.a for coal and 147,600 to 360,000 tonnes $CO_{2\text{-}e}$ p.a for the gas-fired option. This increases the total annual greenhouse gas emissions to 12,795,749 tonnes $CO_{2\text{-}e}$ p.a for the coal-fired option and 6,138,329 tonnes $CO_{2\text{-}e}$ p.a for the gas-fired option. The Proponent noted that these increases were due to a transpositional error during initial calculations, and that overall, the revised figures would increase national greenhouse gas emissions to 2.08 per cent for the coal-fired option (up from 2.02 per cent) and 0.99 per cent for the gas-fired option (up from 0.96 per cent) at the start of operations. Again, these figures are based on an annual increase of 1.6 per cent of national greenhouse gas emissions and do not account for any reductions to emissions as part of a CPRS.

In relation to Arup's query regarding the use of a high capacity factor (of 92 per cent) which results in an underestimate of the emissions intensity, the Proponent responded that the power station would not operate at lower capacity factors due to the financial and commercial context of the National Electricity Market and that if high capacity factors could not be attained, the power station would more likely operate in a two shift regime. A two shift regime would mean the power station would start up and shut down each day (or frequently), rather than operate continuously or at part load. While this would reduce total greenhouse gas emissions produced, it may slightly increase the emission intensity of the plant due to lower efficiencies during start up and shut down. The Proponent also noted that with the implementation of a CPRS, the power station would be more likely to operate at a lower capacity factor, two shift operating regime, with annual generation reducing over time.

The Proponent disagreed with Arup's view that the best achievable practice was not identified for either the coal- or gas-fired options. In relation to the use of theoretical high efficiency thermal design for the coal-fired option the Proponent stated that this design requires higher capital cost due to additional feedwater heaters and larger air cooled condensers, which then increases auxiliary loads and reduces sent out electricity. In this regard, the Proponent noted that the impact on capital cost, as well as the operational constraints (increased auxiliary loads and reduced sent out electricity) would impact project economic viability. In relation to the gas-fired option the Proponent disagreed that H class gas turbines with air cooled condensers have higher thermal efficiency than the

F class plant, and noted a number of additional considerations for selecting the F class plant that had not been considered by Arup, such as:

- only two manufacturers produce H class gas turbines so competitive tendering is limited;
- H class turbines are not proven technology with only limited service hours;
- H class gas turbines are more expensive to maintain due to the coatings utilised;
- H class gas turbines have a higher pressure than F class machines which increases gas compressor auxiliary demand;
- there is a small capital cost differential between the developmental H class turbines and proven F class gas turbines; and
- F class machines currently incorporate many features of the H class plant and have comparable performance.

In relation to measures to reduce and/ or offset emissions, the Proponent emphasised that the level of detail provided related to concept plan approval only, and that as part of its statement of commitments, periodic review of available options and technologies will be undertaken. However, the Proponent also directly addressed a number of matters raised within the independent review as follows:

- solar augmentation is not currently viable for Bayswater B due to shading, high capital cost and economic feasibility, insufficient data availability for future operating and maintenance costs, and the requirements for large areas of land; and
- biomass is not currently proposed due to the lack of available locally sourced biomass, high costs, and transport and handling requirements.

Finally, the Proponent stated that its Environmental Assessment considered greenhouse gas implications in the context of economic feasibility of the project, and that the assessment provided was in accordance with the Director-General's Requirements in relation to being economically viable, operationally feasible and realistic to market conditions. The Proponent noted that while some aspects might be speculated as being more advantageous, these had to be discounted on the basis of prohibitive economics, technological limitations or operational practicalities, and not limiting design options for a potential future owner (in the context of the project being sold to the private sector as part of the NSW Government's *Energy Reform Strategy*).

***Department's Consideration***

The Department has reviewed the Environmental Assessment, the independent review of the greenhouse gas assessment and the Proponent's response to the independent review, as well as the submissions received on this issue. The Department considers that the assessment undertaken is sufficient to provide a robust indication of the likely greenhouse gas emissions resulting from the proposal. It is noted, however, that additional detail will be required as part of a project application to confirm these impacts, and the Department has recommended conditions of approval to this effect.

As outlined in section 2.4 of this report, renewable energy sources, energy efficiency and demand management, while being important measures for reducing energy demands and total greenhouse gas emissions, do not by themselves represent a sufficiently robust approach to addressing the risk of an energy supply-demand imbalance in future. While these measures may well expand in future to provide a greater contribution towards addressing these matters, it would be imprudent to assume they will develop rapidly enough to fully resolve predicted shortfalls in energy generating capacity over the coming decade. As a consequence, there is a real need to be prepared for implementation of a fossil-fuelled power generating facility if and when it is required.

In this context, it is not possible to fully remove greenhouse gas emissions from the solution to the predicted supply-demand imbalance. There will be greenhouse gas emissions associated with this solution, regardless of whether a gas-fired or a coal-fired facility is built. Further, and as outlined Section 2.4 of this report, it would be imprudent to select a fuel at this time (and, arguably, not the role of the planning system to do so) given that the economic and commercial situation at the time of needing additional baseload capacity may be different from current conditions, and such that one or the other fuel is not viable at that time. It is the role of separate Government policy, regulation and relevant market instruments to influence the economic and commercial conditions that would drive energy generation towards or away from coal or gas fuel. By approving both gas- and coal-fired options, the planning system not only delivers approvals that sufficiently deal with the risk of an energy-generation shortfall (including risks associated with the delivery of a fuel-specific project), but it also leaves open

the appropriate role of Government policy, regulation and market instruments to influence the direction of new energy generation.

The Department considers, therefore, that the question to be addressed as part of this assessment is not whether coal-fired or gas-fired options are preferable (to the alternative fuel option) based on a comparison of the total predicted greenhouse gas emissions from each (or for that matter, a comparison of the greenhouse gas intensity of the two fuel options). Rather, it is to consider whether each fuel option, in isolation from the other, represents the most efficient and least greenhouse gas intensive configuration for that particular fuel. That is – whether the Proponent has presented the most greenhouse efficient coal option currently commercially available, and the most greenhouse gas efficient gas option currently commercially available. The Department is satisfied that the Proponent has done so, on both counts, taking into account the commercial availability of technologies and local conditions (including meteorology and cooling water available, for example). The relevant components of this position are outlined further below.

*Generation of greenhouse gas emissions*

Operation of the proposal will generate approximately 12,795,749 tonnes $CO_{2\text{-}e}$ per year from the coal fired option, and 6,138,329 tonnes $CO_{2\text{-}e}$ per year with the gas fired option. The Department concurs with the consideration by Arup and the Proponent, that the estimates of the Scope 1 and 2 emissions are appropriately conservative, and notes the revised predictions provided for the Scope 3 emissions. Notwithstanding this, the Department has recommended a condition of concept approval which requires the Proponent to undertake further refinement and confirmation of the predicted emissions (for Scope 1, 2 and 3) to be generated by the proposal, at the project application stage, and associated with design and selection of the preferred fuel source, delivery and technology.

As noted in the submissions received, the total annual production of greenhouse gases generated from the proposal will increase both the NSW and Australian greenhouse gas emissions, with either fuel source selected. While this increase in total greenhouse gas emissions would be driven by energy demands, to appropriately consider the potential greenhouse gas impacts of the proposal, it is first important to contextualise the potential impact within recent NSW and Australian performance.

*Comparison of greenhouse gas emissions against NSW and national averages*

In 2007, it was estimated that total greenhouse gas emissions in Australia, as carbon dioxide equivalents, were 597.2 million tonnes, up by 9.3 per cent from 1990 levels (Commonwealth of Australia, 2009). The major contributor to this increase came from the stationary energy sector, which alone grew in emissions by 49.5 per cent to 291.7 million tonnes $CO_2$-e. Recorded total greenhouse gas emissions in New South Wales have generally remained stable during the period 1990 to 2007, slightly increasing from 160.7 million tonnes in 1990 to 162.7 million tonnes in 2007 (Commonwealth of Australia and DECCW, 2009). Reduced emissions in other sectors have offset a recorded increase in emissions from the New South Wales stationary energy sector from 59.9 million tonnes of $CO_2$-e in 1990 to 79.4 million tonnes in 2007 (approximately 33 per cent increase).

In the context of 2007 greenhouse gas emissions, the Department has calculated the percentage impact of the proposal, which without any mitigation or offsets, would:

- increase total New South Wales emissions by approximately 7.8 per cent for the coal-fired option and 3.7 per cent for the gas-fired option; and
- increase total Australian emissions by approximately 2.1 per cent for the coal-fired option and one per cent for the gas-fired option (Macquarie Generation and Commonwealth of Australia, 2009).

Whilst these figures appear significant, particularly in the context of attempts to reduce emissions, it is important to note that the above figures are conservative as the calculations are based on reported/ recorded greenhouse gas emissions at State and national levels. Although these emission inventories are good estimates, they are at best estimates and in some cases may not account for all emission sources. They may well then represent an underestimate of inventories of emissions within a particular region at a particular time, and as a result, overestimate the percentage increases that would be attributable to the proposed power station. In addition, the calculations do not take into account any energy conservation/ efficiency measures or CCS that may be applied to the plant, nor any offset developments to reduce net greenhouse gas impacts.

The Arup report also queried whether the emissions intensity estimated by the Proponent (0.840 tonnes $CO_{2\text{-}e}$ /MWH for coal and 0.398 tonnes $CO_{2\text{-}e}$ /MWH for gas) would be achievable in practice. The Department considers that the estimates provided by the Proponent are satisfactory for this stage of the project. The greenhouse gas intensity of each power station varies from year to year depending on the quality of coal burned, the mix of other fuels and the overall operating efficiency. In relation to the impacts of the project on the electricity market, and in particular, the NSW Pool Coefficient, the Proponent has argued potentially significant benefits from the project 'displacing' other less-efficient generators with a resultant drop in the Coefficient. While this may be the case, depending on market conditions and the status of other existing and proposed generators, the Department considers that the net effect on the Pool Coefficient is likely to be small, if reduced at all. Furthermore, the Department concurs with Arup's suggestion that by the time the power station is built, if the coal-fired option is ultimately selected, the proposal is likely to have an emissions intensity greater than the average NSW emissions intensity (as distinct from the NSW Pool Coefficient). However, the Department also considers that at the time the power station is built, the CPRS (or equivalent) is likely to be in effect, and other factors (such as those discussed in Section 2.4) will play the key determining role in the ultimate selection of fuel, plant and emissions intensity gained.

With regards to the Proponent's assumptions of a national greenhouse gas emission increase of 1.6 per cent per annum on 2007 figures and Arup's argument that this worst case scenario provides a "best case scenario for the project", the Department notes that under either scenario (the Proponent's or Arup's) the result is additional greenhouse gas emissions, ranging from approximately 2.08-3.4 per cent of the national average for coal and 0.99-1.6 per cent of the national average for gas. However, these figures vary significantly depending on forecast national growth, and the role of the CPRS.

The Department acknowledges that the Australian and NSW Governments have made a commitment to reducing Australia's GHG emissions by 60 per cent by 2050 on 2000 levels, however, recognises that at this stage, it is unclear whether the CPRS interim targets will be set at a five per cent or 25 per cent reduction (or somewhere in-between) on 2000 levels by 2020. As such, it is difficult to quantify the effect of the CPRS and therefore, to accurately calculate the effect of the power station on national emissions, except to note that the proposal *will* increase national greenhouse gas emissions by some amount. Arup noted that the power stations are going to make reducing national greenhouse gas emissions more difficult, and will likely increase the costs passed on to the wider community. Again, such a consideration at this stage of the CPRS is beyond the scope of this assessment, and is for the market (and associated Government policy) to determine. Notwithstanding this uncertainty, the quantum of greenhouse gas increase represents the inevitable cost of meeting consumer energy demand in the case that market forces (influenced by consumer choice and regulation) retain the viability of fossil-fuel generators compared to alternatives.

*Predictions of thermal efficiency and consideration of best available technology*

In relation to the use of the high capacity factor and the implications for the emissions intensity predicted, the Department has queried the appropriateness of the Proponent's response on the potential operation of the proposal in a two shift regime as this appears contradictory to the stated need for the project providing baseload electricity generation. However, the Department does not consider that this is a matter that can be resolved until the next stage of the approvals process, due to the uncertainties with the market and the regulatory changes, and as such, has recommended a condition of concept approval which requires the provision of additional information as part of the project application. The Department considers that market forces will ultimately drive the level of generation of the power station and its fuel source such that it would be unnecessary to place restrictions on the operating mode at this stage.

Furthermore, the Department notes that the project as with other generators in the NSW energy sector would be subject to regulation by the CPRS (or equivalent), when it comes into effect in the future. The CPRS would provide a market based mechanism for regulating greenhouse gas generators, setting a level playing field for all generators through standard carbon pricing which would in effect result in less carbon efficient generators being out-competed by those with greater carbon efficiencies. The Department considers that the CPRS and other State and National greenhouse gas/ climate change policies are likely to play a significant role in both the fuel selection process for the project, and the need for proposals to be as efficient as possible. As discussed in Section 2.4, the CPRS has the potential to affect electricity prices, and demand for electricity, but the extent to

which this effect presents itself will depend on the timing of the CPRS and, more significantly, the net carbon reduction outcome targeted by the Scheme.

With respect to technology selection (and therefore the thermal efficiency of the plants proposed), the Department recognises that the Arup review has raised some questions on whether or not the Proponent has selected the best available technology for each option. At this concept plan application stage, this specifically relates to:

- whether theoretical high efficiency thermal design could be used for the coal fired option; and
- whether the Proponent is justified in selecting the F class technology over the more efficient H class technology for the gas fired option.

While the Proponent argued that the current proposal achieves the desired outcome, and is the best available commercially feasible technology, the Department has suggested a condition of approval which seeks further rationale for the technology selected for the project application stage.

*Emissions reduction and carbon offsetting*

The Department concurs with DECCW and Arup that the Proponent has undertaken a detailed review of the available emissions reduction options and that currently, post-combustion carbon capture appears to be the most promising technology being developed at this time. However, the Department also concurs with Arup that emission offsetting measures (such as renewable energy augmentation, for example solar augmentation, which is currently used at Liddell) may become more commercially viable over time, and may also be preferable to implementing CCS options. In this regard, the Department notes the Proponent's commitment to undertake an annual review of the options available for emissions reduction, offsetting and other technologies, however that the ultimate selection will depend on market factors at play at the time of detailed design/ technology selection.

With regard to the Proponent's commitment to designing the plant to be 'carbon capture ready', the Department considers it preferable not to 'lock-in' a preferred technology at this time, noting that any such technology may be superseded by advancements that may occur by the time of the next planning and design phase. As such, the Department has suggested a condition of approval to allow for the flexibility of the offset measures which are to be implemented at the time of the next application stage.

In its report, Arup noted that the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* is currently under review, and if greenhouse gas emissions are included as one of the matters of national environmental significance (NES), the proposal would likely have a significant impact under the Act. The Department notes that a referral has been submitted to the Commonwealth Department of Environment, Heritage and the Arts (DEWHA), but greenhouse gas emissions are not currently a matter of NES. Furthermore, in the event that greenhouse gas emissions are included as a matter of NES, it would be the Proponent's responsibility to submit a revised referral to DEWHA, who would then determine the appropriate course of action (designation as a controlled action, additional assessment, etc). It is not within the scope of this Department's mandate to attempt to predetermine the outcome of the Commonwealth review nor to regulate under the *Environment Protection and Biodiversity Conservation Act 1999*.

Many of the submissions raised the issue of the link between increased greenhouse gas emissions leading to increased climate change impacts. The Department does not disagree with these submissions. However, the Department considers its role is to assess the proposal based on best available technology and project need, considering the environmental, social and economic impacts of the proposal. The Department considers that there are likely to be other opportunities to offset the greenhouse gas emissions generated by the proposal, and that it is not in the public interest to allow a situation to eventuate when the demand for electricity exceeds the available supply, which would also have deleterious economic and social impacts. In NSW, approximately 90 per cent of electricity generated is sourced from black coal, and greenhouse gas emissions from the electricity sector represent around one-third of the state's emissions (Department Infrastructure and Investment, 2009). However, as noted in the NSW State Plan (2009), the Government is developing and implementing a detailed *Climate Change Action Plan* and *Clean Energy Strategy* which includes measures such as supporting distributed co- and tri-generation energy in offices, industry, shopping centres and apartment blocks, supporting natural gas supply and pipeline projects across NSW, and investing $100 million to support development of carbon capture and storage technology to reduce emissions from coal-fired power generation.

*Conclusion*

While renewable generation, demand management and energy efficiency measures are currently being pursued in the market, as noted in Section 2.4, there remains a risk that these options by themselves will not be sufficient to address growing power demands and the need to secure the State's energy future.

Furthermore, despite the fact that the Minister for Planning has approved more than 1,000 megawatts of wind farms over the last few years, only a small number of the wind farms are currently operational, or in the process of construction. Given this experience, it is clear that although renewable energy proposals are being approved, there is a lag in their implementation. Notwithstanding this, with the NSW and Australian Government's targets of 20 per cent renewable energy consumption by 2020, additional wind and other alternative/renewable energy generation proposals are being submitted and are currently in various stages of assessment with the Department. However, while the market is pursuing this generation, it is unlikely that enough alternative energy generation will be implemented in the short to medium term at a sufficient rate to address demand growth.

The reality is that baseload (coal- and or gas-fired) generation is likely to remain a necessity in the short to medium term. It is prudent therefore, that opportunities are examined to address this risk. In doing so, there is also opportunity to investigate and implement performance and efficiency improvements to ensure that any fossil fuel-fired proposal reflects best practice. The current project applies this prudent approach to managing risk in the context of baseload generating capacity. While there will be an increase in the total greenhouse gas emissions in NSW from either facility, the impact of these emissions must be balanced against the risks associated with a generating shortfall and the significant social and economic implications to the State should such a situation eventuate. On balance, therefore, the Department has recommended for this stage of concept approval, a number of conditions which require the Proponent to clearly demonstrate that best practice technology is to be implemented to minimise greenhouse gas emissions, and to demonstrate that they are investigating carbon reduction technologies that could be feasibly retrofitted to the plant, as well as other emission reduction or offset measures, to reduce or eliminate greenhouse gas emissions.

### 5.2 Air Quality and Health Impacts

**Issues**

The Environmental Assessment included a description of the existing air quality environment and a discussion of the potential impacts from the construction and operation of either a coal- or gas-fired power station. Sensitive receptors were identified as residential, non-commercial/non-industrial premises within a 10 kilometre radius of the proposed Bayswater coal-fired power station stack as shown on Figure 6.

The air quality impacts from the construction phase were described as being similar for the coal- or gas-fired power station options and mainly included the potential for dust to be generated from construction related activities such as open excavations, material stockpiles and bulk earthworks. The coal-fired option would take over five years to construct and the gas-fired option approximately three years.

The results of the air quality modelling found that both options would have a relatively minor impact on air quality during its operational phase with the most important air pollutant for the coal-fired option being sulfur dioxide and nitrogen dioxide being the most important pollutant for the gas-fired option. The potential operational air quality impacts for each option and for each pollutant are summarised below.

***Coal-fired Option***

*Sulfur Dioxide ($SO_2$)*

The amount of sulfur dioxide emitted from the power station would depend on the coal sulfur content. For the modelling, the Proponent indicated that it was conservative and calculated the emission rate from a maximum (i.e. worst-case) coal sulfur content as well as for a typical scenario (i.e. average coal sulphur content) taking into account a 300 metre stack. The model indicated that the typical scenario would not result in any exceedances of the 1-hour $SO_2$ impact assessment criterion of 570µg/m$^3$ at any sensitive receptor location due to the operation of the power station in isolation. The addition of background concentrations resulted in a maximum of two additional times that the air quality criteria would be exceeded across the simulation years. The model indicated that both the typical and maximum coal sulfur content scenarios would not result in any exceedances of the 24-hour $SO_2$ impact assessment criterion of 228µg/m$^3$ at any sensitive receptor location in either isolation or when background

**Figure 6: Air Quality Receptor Locations**


concentrations are factored into the modelling. Similarly, the annual average $SO_2$ impact assessment criterion of 60µg/m$^3$ was not predicted to be exceeded for either the typical or worst-case sulphur content scenario.

*Nitrogen Dioxide ($NO_2$)*

The modelling found that the power station would only contribute a small amount to total concentrations of $NO_2$ with 1-hour ground-level concentrations being predicted to be below the assessment criterion of 246µg/m$^3$. The maximum ground level concentration was found to occur at R1, R5, and R6 with 202µg/m$^3$. Similarly, the annual average concentration of $NO_2$ was found to be below the impact assessment criterion of 62µg/m$^3$ at all sensitive receptor locations with the maximum concentration recorded at R9 and R10 with 20.3µg/m$^3$.

*Lead*

Ground-level concentrations of lead at sensitive receptor locations were found to be very low and would make up only a very small proportion of the annual average impact assessment criterion of 0.5µg/m$^3$ and therefore the Proponent considered an assessment of lead for the power station in combination with background concentration levels to be unnecessary.

*Carbon Monoxide*

Predicted ground-level concentrations of carbon monoxide in isolation and in combination with background concentrations from existing power stations for the 1-hour and 8-hour averaging periods were found to be low and well below the air quality criterion of 30,000 and 10,000µg/m$^3$ respectively.

*$PM_{10}$*
Ground-level concentrations of $PM_{10}$ were found to be low and well below the air quality criterion.

*Hydrogen Flouride*
The model predicted maximum 24-hour, 7-day, 30-day and 90-day average ground-level concentrations of hydrogen fluoride at sensitive receptor locations. There are two impact assessment criteria for hydrogen fluoride dependent on land use. For generalised land use the criteria is 2.9 µg/m$^3$ (24-hour average), 1.7µg/m$^3$ (7-day average), 0.84µg/m$^3$ (30-day average) and 0.5µg/m$^3$ (90-day average) while the criteria for specialised land use (such as for the cultivation of grapes) is 1.5µg/m$^3$ (24-hour average), 0.8µg/m$^3$ (7-day average), 0.4µg/m$^3$ (30-day average) and 0.25µg/m$^3$ (90-day average). The only specialised land use in the vicinity of the Bayswater B proposal is the Arrowfield Winery. The model predicted that the 24-hour average hydrogen fluoride level would be 2.88 µg/m$^3$ which is almost double the criteria, however, the Environmental Assessment stated that an exceedance of the 24-hour average criterion is unlikely to significantly affect the cultivation of grapevines with the most significant indicator being the 30-day or the 90-day average impact assessment criteria which provide for the assessment of air quality in relation to the longer growing season. Both the 30-day and 90-day averages of hydrogen fluoride at the Arrowfield Winery were predicted to be 0.31 and 0.24 µg/m$^3$ and therefore below their respective criteria. The Department notes, however that the 90 day average ground-level concentration of hydrogen fluoride at the Arrowfield Winery is very close (0.24 µg/m$^3$) to the limit of the criteria for specialised land use (0.25 µg/m$^3$).

The model found that hydrogen fluoride for the 24-hour average criteria is exceeded at R7, R8 and R9 for generalised land use while being well below the other criteria for the 7-day, 30-day and 90-day averages.

The conclusions of the air quality study indicated that while the coal-fired option would increase exceedances of some air quality criteria for certain scenarios many of the exceedances were related to the spontaneous combustion of coal and spoil heaps associated with mining activities in the locality and were unrelated to the plume dispersion associated with Macquarie Generation operations. The assessment concluded that the proposed power station would cause a relatively minor change to ambient air quality and that ground-level concentration of certain pollutants could be managed through the design of the plant. The Proponent stated the ground-level concentrations of sulphur dioxide, for example, could be managed and minimised through the use of low sulphur coal.

***Gas-fired Option***
*Nitrogen Dioxide*
Ground-level concentrations of $NO_2$ were found to be well below the 1-hour average criterion of 246µg/m$^3$ and the annual average criterion of 62µg/m$^3$ with the highest concentrations being the same as the coal-fired option (202 and 20.3µg/m$^3$ respectively).

*Carbon Monoxide*
Predicted ground-level concentrations of carbon monoxide were found to be low and well below the air quality criteria.

For the gas-fired option, the air quality assessment found that the proposed power station would cause a relatively minor impact on ambient air quality with nitrogen dioxide being the most important air pollutant. The assessment, however, concluded that ground-level concentrations of nitrogen dioxide can be managed and minimised with the proposed use of low emissions technology. The assessment found that there were no exceedances of any air quality criteria for this option.

**Submissions**

A total of 54 submissions (15 percent) were received raising the issue of potential air quality impacts from the operation of the power station. Health impacts were raised by a similar number of submissions as being an issue of concern. The comments that were made in relation to air quality and health can be summarised as follows:

- air pollution from stacks at all heights should be accounted for not just ground level data;
- health issues with fine particulates down wind of stacks requires analysis;
- the proposal will exacerbate local health issues;

- data relating to air pollution is not comprehensible - short and long term health should be assessed for the proposal;
- Katestone (air quality consultants) failed in its assessment because it could not use emission information from other existing facilities;
- meteorological modelling used in the report is inaccurate;
- no health risk analysis of air quality assessment (annual compliance reports were not included in full) and health risk assessment should be performed on air toxics;
- processes should be in place so that the community can seek remedial action in a timely fashion should air quality (dust emissions) become problematic;
- it is preferable to choose the option that has the least impact on air quality both in construction and operational phases and this would appear to be the gas fired option;
- a health assessment should be performed on the potential impacts to the local area particularly the air quality impacts from $PM_{10}$ and $PM_{2.5}$; and
- air quality impacts of the proposal on properties to the south west of the power station - vineyards, horse studs and other rural properties along the Golden Highway north of Jerry's Plains appear to have been overlooked as a sensitive receptor in the Environmental Assessment and further clarification of the impact on this area should be provided.

DECCW undertook a detailed review of the air quality assessment, focusing on consistency with its assessment guidelines and environmental assessment requirements. Key issues were raised by DECCW in its submission in relation to the meteorological and emissions data used in the assessment, assessment methods and results (including predicted exceedances) and model performance. On balance, DECCW considered that sufficient information was provided to demonstrate that the proposal could be developed so that compliance with all current air quality criteria was achieved. DECCW, however, sought clarification and further information from the Proponent and outlined its requirements as part of its submission. Some of the information requested would be required as part of any further project application regarding the preferred option.

DECCW also raised queries with regard to the cumulative impact assessment undertaken for nitrogen dioxide, sulphur dioxide, hydrogen fluoride and carbon monoxide and stated that the incremental concentration should have been added to the background concentration levels to determine cumulative impacts from the proposal. DECCW also raised the fact that not all the results for all the sensitive receptors in the locality were documented in the assessment for the pollutants modelled with some results provided for only five out of the 12 receptors rather than for all the receptors. Based on its assessment of the air quality assessment, DECCW recommended a number of specific conditions of approval that relate to air quality.

The Department of Health raised air quality as a concern to the broader population and stated that it would be preferable to select the proposal which has the least impact to air quality.

## Consideration

The Department has reviewed the air quality assessment provided as part of the Environmental Assessment. Coupled with this review, the Department also commissioned an independent review of the assessment to assist with its consideration of potential air quality impacts associated with the proposal.

### *Independent Review*

The independent review concluded that the air quality assessment undertaken by the Proponent was generally satisfactory, however, it questioned the methodology used by the Proponent to select the meteorological data that was used in the modelling. It also requested clarification regarding the modelling undertaken and whether it included local observational data to "nudge" the model predictions and it sought clarification regarding why load based licensing limits (for the coal-fired option) and US EPA AP-42 emission factors (for the gas-fired option) instead of manufacturers specifications was used in the air quality modelling. In addition to this, a number of other specific queries were raised in relation to the model prediction results, including:

- clarification on whether the contribution of the Redbank Power Station was taken into account as part of the assessment of background hydrogen fluoride concentrations and therefore in the assessment of the potential impact of hydrogen fluoride from the power station; and
- clarification of the likely cumulative $PM_{10}$ impacts at sensitive receptors including the township of Denman.

The Proponent submitted a response to the Department regarding the issues raised by the independent review and indicated that the meteorological data used in the modelling was selected on the basis that it incorporated at least one non-normal and two normal periods to represent a wide range of meteorological conditions. The Proponent stated that the model performed well without local data assimilation (or "nudging") and therefore given its good performance at simulating the local meteorological conditions and the varied quality and availability of data for assimilation, the justification to not include local data assimilation in the model was considered to be valid.

In relation to the third query, the Proponent stated that the air quality assessment was conducted based on a combination of manufacturer's specifications, the *Protection of the Environment Operations Act (Clean Air) Regulation 2002* limits and emission factors derived from existing operating power stations and expected coal quality. It stated that manufacturer's typical specifications are normally available for oxides of nitrogen, solid particles and carbon monoxide emissions from a coal-fired power station as well as oxides of nitrogen and carbon monoxide emissions from a gas-turbine. Whilst there are a significant number of other air pollutants for which DECCW has specified regulatory limits for power stations, the Proponent stated that manufacturers are unlikely to provide performance guarantees for these pollutants because they are unlikely to be produced in power stations due to the nature of combustion and the fuels, they are dependent on the levels of the contaminants in the fuel (e.g. fluorine, chloride or heavy metals) or a combination of both (e.g. dioxins, furans or volatile organic compounds). Where manufacturer's typical specifications were not available, the Proponent stated that it utilised either the *Protection of the Environment Operations (Clean Air) Regulation 2002* limits or emission factors. The Proponent indicated that it will obtain manufacturer's typical specifications for the plant and equipment that will be installed. For other air pollutants, the Proponent will determine appropriate emission limits based on the air quality assessment conducted and any future assessment required to secure a project approval for the proposal, in consultation with DECCW.

The Proponent provided specific responses to the other queries raised by the independent review. One of the questions raised was that Redbank Power Station did not seem to have been taken into consideration as part of the air quality modelling. Given the location of this power station 22 kilometres to the south-east of the proposed Bayswater power station and due to the significant proportion of south-easterly winds, it was highlighted that the operation of Redbank, together with the operation of the proposed power station, could have the potential to impact on receptors within the modelling domain. The Proponent indicated in its response to its review of the independent assessment that the assessment utilised background air quality monitoring data rather than being based purely on modelling and therefore included the incremental impact from all sources in the region, including existing power stations in the locality such as the Redbank Power Station. In relation to hydrogen flouride levels, the Proponent stated that for a given year (2007) 11,000 kilograms of fluoride compounds were emitted from the Redbank Power Station compared to a total of 415,000 kilograms emitted from Bayswater and Liddell Power Stations for the same reporting period. The Proponent stated that the contribution of Redbank Power Station is less than three per cent of the emissions from Bayswater and Liddell and therefore given the significant distance from sensitive receptors, the change in predicted hydrogen fluoride impacts would be minor.

The Proponent indicated that a cumulative $PM_{10}$ assessment was not undertaken for the power station as the maximum 24-hour average $PM_{10}$ concentration predicted at any sensitive receptor from the addition of Bayswater B would be 3.54 $\mu g/m^3$ which is a very small increment when compared to the air quality criterion of 50 $\mu g/m^3$.

***Department's Consideration***

The Department has reviewed the responses provided by the Proponent and considers that they are satisfactory for the assessment of the concept plan application noting that the Proponent has committed to undertake further detailed air quality impact assessment as part of a subsequent project application. This is also reflected in the Department's recommended conditions of approval which requires the Proponent to provide an updated air quality assessment as part of any subsequent project application.

The Proponent commissioned Dr David Doley from the University of Queensland to independently review the air quality assessment provided in the Environmental Assessment specifically in relation to potential hydrogen fluoride impacts from the proposal. A summary of his findings were provided in Section 5.5 of the Proponent's Submissions Report. In his summary of advice, Dr Doley indicated that background atmospheric fluoride concentrations included a 40 per cent over-estimate of the likely rate of fluoride emission from a coal-fired power

station (based on actual concentration recorded from operating stations of design equivalent to the proposal) and that the adjustment of the over-estimate would result in ground-level concentrations below criterion concentrations at several, but not all, sensitive receptor locations. Dr Doley further stated that the predicted 90-day average fluoride concentrations at the Arrowfield Winery would be closer to 0.2µg/m$^3$ and foliar fluoride concentrations are such that there should be no adverse effects on the health of grapevines or on the yield or quality of the fruit. He also indicated that ground level fluoride concentrations may exceed the criteria for sensitive land use in the vicinity of the Muswellbrook-Denman vineyard area but he considered that these exceedances would not result in detectable reductions in grape yield or quality. Dr Doley stated the levels of hydrogen fluoride would be such that there would be no adverse effects to olive trees or the yield of olives. The Proponent has also stated that the ongoing monitoring of crops within the Hunter Valley has not shown any adverse impacts to the growth of crops resulting from the operations of the existing power stations in the locality.

The Department considers from the Environmental Assessment undertaken by the Proponent as well as the responses provided in relation to the submissions received and the matters raised by the independent peer review has demonstrated that the Proponent would be able to construct and operate Bayswater B as either a coal- or gas-fired power station which complies with current air quality criteria. Notwithstanding the expert advice of Dr Doley that the modelling included an over-estimate of the likely rate of fluoride emissions from a coal-fired power station, the Department has recommended that the Proponent be required to demonstrate, as part of a subsequent project application, that if coal is selected as the preferred fuel, that the plant can be designed and operated to comply with both the generalised land use and specialised land use criteria for hydrogen fluoride and to provide a monitoring protocol as part of the project application to demonstrate how it will monitor sensitive land uses in the vicinity of the site to demonstrate ongoing compliance with specialised land use criteria for hydrogen fluoride concentration levels.

A number of submissions raised health impacts and the fact that a separate health impact assessment was not undertaken as part of the Environmental Assessment. The Proponent has correctly stated that an assessment of human health was not a requirement of the Director-General for the preparation of the Environmental Assessment. The Department, however, considers that the air quality assessment is an adequate measure of the potential health impacts from a proposal. Air quality criteria and emission standards/limits imposed by the DECCW have been developed and applied within New South Wales based on the protection of the environment, human health and amenity and therefore the Department considers that the potential health impacts of the proposal have been adequately addressed via the air quality assessment and the subsequent information provided as part of the Proponent's Submissions Report.

Considering the information presented in the Environmental Assessment, the issues raised by DECCW and other public submissions, the Department has recommended specific conditions of approval in relation to air quality focusing on the detail of assessment that will be required as part of the submission of a project application for the preferred option. The Department has also recommended specific conditions of approval in relation to air quality to require the Proponent to design the plant to meet specific emission limits for $NO_x$ and solid particles, depending on the preferred option selected.

### 5.3 Water Supply and Availability

**Issues**

The Environmental Assessment included a water cycle balance to estimate average annual water demands for the proposed project, for both the coal and gas fired options. The estimated water demand is summarised in Table 7, and it should be noted that both options are based on using Air Cooled Condenser (ACC) technology.

The maximum volume of treated raw water required for the Project is up to 7.2 ML/day for the coal fired option (2,628 ML per year), which is regarded by the Proponent as a worst case scenario. Two options have been provided for supplying raw water to Bayswater B, with the preferred option being to supply treated raw water from Bayswater Fresh Water Dam for the common water systems. Raw water would be used on site for plant wash down, equipment cooling, auxiliary cooling tower make-up, dust suppression, fire/hydrant supply, irrigation, ash conditioning (coal fired option only), furnace ash submerged chain conveyor supply (coal fired option only), and after treatment, for domestic water and demineralised water treatment plants.

**Table 7: Average annual water demand and usage (ML/ year)**

| Service | Coal fired power station | Gas fired power station |
|---|---|---|
| Treated raw water | 2,400 | 1,620 |
| Potential drains recovery | 590 | 220 |
| Service water | 1,160 | 580 |
| Demineralised water | 650 | 160 |
| Domestic water | 10 | 10 |
| Auxillalry cooling tower make-up | 230 | 270 |
| ACC sprays | 510 | 830 |
| CCGT evaporative cooling | - | 120 |
| **Total** | **5,550** | **3,810** |

The Proponent considers that sufficient water is available for use by the proposal from their existing water entitlements, which the Proponent has been purchasing over the past few years from the marketplace with the intention it would be available for either a future power station, or to increase the level of water security for the existing power stations. The Proponent has estimated that about 4,640 ML per year is available for use by the project. Of the 4,640 ML additional supply, 1,750 ML (38%) is high security water, while 2,890 ML (62%) is classified as general security water.

The Environmental Assessment noted that the Proponent has been using the additional 4,640 ML water entitlement to assist in recovering from drought, and to improve salinity levels in Lake Liddell. However, the Proponent emphasised that the water is supplementary to the operational needs of the existing power stations, and has not been included in the current long term planning (modelling) of the existing power stations' water requirements.

Analysis of the effect of drought conditions was undertaken based on the 'worst case drought' scenario, which occurred in the area in the late 1930s to late 1940s. Modelling undertaken demonstrated that during a worst case drought, while the existing Bayswater and Liddell power stations could operate at 80 per cent capacity, the proposed Bayswater B would not have the same level of certainty, as:

- the 4,640 ML committed to Bayswater B, the 1,750 ML of high security water would be expected to be available for all but a negligible amount of the time, even within a worst case drought situation.
- the 2,890 ML of general security water would be obtained when available and would be expected to be available on average about half of the time

The Proponent noted that this is due to the reliance of the proposal on lower security water (general security and high security) compared to the security of supplies of the existing power stations. Under the *Hunter River Water Sharing Plan* there is a protocol for placing restrictions on water use during drought periods. The Proponent has identified a number of potential actions and alternative water sources to obtain additional water security, if necessary, however considers that the raw water requirements for both the coal and gas fired options (using air cooling) would be met in both average and drought situations. The Proponent emphasised that, as such, there would be no significant or discernible impacts on Hunter River flows from the proposed project.

**Submissions**

Just under 20 percent of submissions raised the issue of water use and availability as an issue of concern. A large number of these submissions indicated that development of new coal fired power stations, and associated mines would consume large amounts of water, would result in impacts to rivers, and would further impact the scarcity of water as a resource. Many submissions suggested the proposal would result in human health issues in the Upper Hunter Area associated with water pollution.

A number of the submissions noted the location of the site within an inland water catchment area reliant on rainfall and suggested that water supplies may be affected by climate impacts, noting that water for agriculture would be a better use than the proposed power station. Many of the submissions questioned the ability of the Hunter River/Glenbawn Dam system to supply the power stations, and recollected the impacts to the operation of

the existing power stations of the 2005/2007 drought. Other water related issues raised by the submissions included:

- questioning the assumptions provided regarding water use for the technologies selected;
- why the Environmental Assessment did not address the water use for mining and washing coal;
- the issues associated with selecting a dry cooled plant with higher greenhouse gas emissions compared with a water cooled plant with larger water demand;
- increasing the vulnerability of the existing power stations in relation to water security due to the co-location of the Bayswater B proposal, including suggesting the proposal should be located in a smaller rural community where more water supply may be available, and therefore a wet cooled plant may be feasible;
- the suggestion that further modelling should be undertaken now regarding the long term water availability to ensure the proposal has sufficient supply regardless of the drought conditions;
- discussion around the effects of different classifications under the Hunter Water Sharing Plan, and the effects the proposal would have on other water users/entitlements in the area;
- concerns regarding the future owner of the power station, and the agreements relating to onsite water storage and delivery; and
- the impacts to both surface water and groundwater from ash disposal and leachate, and the requirement for additional data to be provided regarding the ash disposal system.

DECCW did not provide specific comments relating to water use and availability, however noted that the project could operate within current water allocations, including for the majority of time, during drought conditions. DECCW further noted that all wastewater would be treated and contained on site with no water being discharged to the Hunter River, however that the Environmental Assessment does not describe how groundwater will be managed and treated during construction. DECCW recommended two conditions of approval with regard to water pollution and implementing soil and water management measures. DECCW noted that little detail has been provided at this stage for the ash disposal and implications for water use, however has recommended that there be no discharge of waters from the ash disposal facility, unless it is clean water.

The NSW Office of Water raised water supply security as a key issue for power generation. The submission states that in periods of low water availability the available major utility, high security and general security access licence volumes may be subject to a reduction in available share. In the event of severe drought conditions, Bayswater B and other users may be subject to further curtailments as a result of Ministerial determination. NOW requires that appropriate water supply arrangements be made to service the proposed power station sufficient to maintain output during the drought of record (1930s to 40s) and ensure that the ability of the existing Bayswater and Liddell power stations maintain 80 per cent annual capacity factors during the drought of record. The submission states that it is critical that any additional water requirements for power generation be met through the water market transfer system in accordance with water licence dealing rules and the provisions under the Hunter Regulated River Water Sharing Plan. The submission also notes that the proposed power station would use significantly less water per MWH than either of the existing power stations. NOW also recommended a number of conditions of approval relating to water for the Proponent to satisfy during lodgement of the application for project approval.

Singleton Council, in its submission suggested that a Health Risk Assessment be undertaken which includes consideration of water quality impacts on the Singleton community. The submission also raised concerns that if the wet cooling method is proposed, there may be insufficient water availability, particularly during drought conditions, and as such, additional assessment would be required relating to impacts on local water use.

Muswellbrook Shire Council, in its submission stated support for the project subject to a number of recommended conditions of approval and revisions to the Proponent's statement of commitments, which included additional assessment of impacts associated with the purchase of any additional water entitlements in the detailed design phase, including the impact on other potential holders of such allocations including the mining and agricultural industries.

NSW Health noted that the Environmental Assessment indicates that both construction and operational phases of the proposed power station would not impact downstream off-site waterways, or result in down-stream water pollution or negative impacts on other water users. The submission also stated that the Proponent should put measures in place to ensure groundwater is not affected by the proposal.

**Consideration**

The Department has reviewed the submissions received and the Proponent's response to the submissions and considers that an adequate level of assessment has been undertaken for the assessment of the concept plan application.

The Department considers from the Environmental Assessment undertaken by the Proponent as well as the responses provided in relation to the submissions received, including the responses of the NSW Office of Water and DECCW, that the Proponent has identified sufficient water allocations to supply either the gas- or coal-fired option of the proposed power station for this concept plan application. The Department notes that, once the power station is operational, the additional entitlement will no longer be used for improving salinity levels in Lake Liddell and drought recovery. Notwithstanding the above, the Department has recommended that the Proponent be required to provide, as part of a subsequent project application, additional detail regarding the likely operational regime of the plant, including in worst case drought conditions.

A number of submissions raised health impacts and the potential for water pollution to affect the health of receivers within the area. A health assessment was not a requirement of the Director-General for the preparation of the Environmental Assessment. The Department, however, notes the findings of the Environmental Assessment that as all wastewater generated will be treated and contained on site and no water will be discharged to the Hunter River, and considers therefore, that it is unlikely that health impacts would occur associated with pollution of waterways. Furthermore, the Proponent has committed to preparing a number of environmental management plans for both construction and operation of the proposal, including a Water Quality Monitoring Program, Soil and Water Management Plan and an Emergency Spill Preparedness and Response Plan.

Ash disposal and the potential for groundwater contamination were raised as an issue. The Environmental Assessment noted that mine voids within 10 kilometres of the site would be used for ash disposal, where onsite reuse options are not available. The Proponent has committed to preparing an Ash Disposal Management Plan which would include further details at the project application stage should coal be selected as the preferred fuel. The Department has recommended a condition of approval requiring further detail regarding the ash disposal options (should the coal fired option be selected) to accompany the Project Application.

### 5.4 Ecological Impacts

**Issues**

In order to assess the ecological impacts of the project, a review of flora and fauna databases, previous literature and a five day field survey were undertaken for the site and that part of the pipeline route that is owned by the Proponent. The remainder of the pipeline route was only assessed via a desktop analysis, however, the Proponent has stated that any areas not surveyed will be undertaken at a later date as part of the detailed design stage of the project. The Flora and Fauna Technical Paper also stated that extensive flora and fauna surveys were not undertaken as the season of the survey was outside optimal survey conditions for particular species.

The Environmental Assessment states that the site has been subject to human activity including grazing and agricultural pursuits. The site comprises disturbed grassland and pasture, except for the eastern portion which contains remnant woodland which is stated as being in moderate to good condition. Rabbits are abundant on the site and have had a localised effect on biodiversity. Kangaroos were also stated to be abundant in the modified grassland. The condition of the natural drainage system has been degraded through the clearing of riparian and adjacent vegetation which has resulted in bed and bank erosion, deposition of sediment and reduced water quality.

No threatened flora species were identified as occurring on the site during the field investigations, however, two vegetation communities proposed to be listed as endangered ecological communities under the *Threatened Species Conservation Act 1995* were recorded, namely Central Hunter Box-Ironbark Woodland and Central Hunter Ironbark – Spotted Gum-Grey Box Forest. While no threatened flora species were found, the Environmental Assessment stated that the survey was conducted outside the flowering season of two threatened

orchid species (*Diuris pedunculata* – Small Snake Orchid and *Diuris tricolor* – Pine Donkey Orchid) which could potentially occur on the site.

In terms of fauna, four vulnerable woodland bird species were recorded during the site survey, including the Diamond Firetail (*Stagonopleura guttata*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), Hooded Robin (*Melanodryas cucullata*) and Speckled Warbler (*Pyrrholaemus sagittatus*). While some threatened fauna species were not recorded during the field survey, the preferred habitat for a number of threatened species is found on the site and therefore a number of threatened species including the Barking Owl, Grey-headed Flying Fox, and the Green and Golden Bell Frog are likely to occur on the site. Other threatened fauna species such as birds and bats are considered to potentially occur on the site and include the Black-chinned Honeyeater, Regent Honeyeater, Large-eared Pied Bat, Eastern Bentwing Bat, East-coast Freetail Bat, Large-footed Myotis, Yellow-bellied Sheathtail Bat and the Greater Broad-nosed Bat.

***Coal-fired Power Station***

Based on the current location of proposed plant and infrastructure, the flora and fauna consultant provided preliminary estimates of flora and fauna impacts from the construction of the coal-fired option, as follows:

- *Impact area from the main plant* – the main plant would impact on approximately 18.75 hectares of modified grassland which has few biodiversity values, however, the Environmental Assessment stated that the impact area is expected to be larger to incorporate car parking, outside storage areas and landscaping treatments;
- *Impact area of construction works* – this would involve levelling of building sites and may impact on approximately 56.25 hectares of modified grassland of low biodiversity value;
- *Impact area of roads* – the access road would result in impact to approximately 7.45 hectares of native vegetation, comprising 2.57 hectares of Central Hunter Box – Ironbark Woodland in moderate to good condition and 4.88 hectares of grassland which provides habitat for threatened birds. The access road would also cross semi-permanent creeks, some of which represent potential habitat for the Green and Golden Bell Frog;
- *Impact area of raw water line* – construction of the raw water line would require the removal of approximately 2.82 hectares of Central Hunter Box – Ironbark Woodland in moderate to good condition and 7.83 hectares of modified grassland and will cross Saltwater Creek;
- *Impact area of transmission infrastructure* – the construction of the switchyard and transformer yard will involve the removal of 3.65 hectares of vegetation and the transmission line corridor would impact on 11.43 hectares of modified grasslands, 0.04 hectares of Central Hunter Box – Ironbark Woodland;
- *Impact from increased traffic movements* – the majority of construction traffic would comprise heavy vehicles which could increase the risk to ground dwelling fauna from vehicle strike;
- *Increase runoff and sedimentation* – construction works would involve excavation which has the potential to result in increased rates of runoff and sedimentation of nearby watercourses which could impact on water quality and aquatic habitats and fauna such as the Green and Golden Bell Frog;
- *Impact area of the conveyor* – the new conveyor and associated buildings would remove approximately 5.09 hectares of modified grassland, 1.11 hectares of Central Hunter Box – Ironbark Woodland and approximately 0.25 hectares of Central Hunter Ironbark-Spotted Gum-Grey Box Forest.

Operational impacts of this option were summarised as:

- increased noise disturbance from operation 24 hours per day, seven days per week, mainly confined to a small area of woodland habitat surrounding the main power plant operations which has the potential to impact breeding frogs with females unable to hear the calls of males;
- increased water use and sourcing water from waterbodies considered to provide moderate to good condition aquatic habitat with the impact being described as not significant;
- increased light disturbance from lighting of roads and the main plant;
- impacts on water quality of Plashett Dam and nearby watercourses;
- increased traffic movements resulting in potential vehicle strike;
- increased use of the Antiene Rail Coal Unloader; and
- increased dust emissions including fly ash emitted from the main plant.

**Gas-fired Power Station**

For the gas-fired power station option, the construction impacts on flora and fauna were summarised as follows:

- *Impact area from the main plant* – the main plant would impact on approximately 11.75 hectares of modified grassland which has few biodiversity values, however, like the coal-fired option the Environmental Assessment stated that the impact area is expected to be larger to incorporate car parking, outside storage areas and landscaping treatments;
- *Impact area of construction works* – this would involve levelling of building sites and may impact on approximately 35.37 hectares of modified grassland of low biodiversity value;
- *Impact area of roads* – the access road would result in impact to approximately 8.35 hectares of native vegetation, comprising 2.55 hectares of Central Hunter Box – Ironbark Woodland in moderate to good condition and 5.77 hectares of grassland which provides habitat for threatened birds. The access road would also cross semi-permanent creeks, some of which represent potential habitat for the Green and Golden Bell Frog;
- *Impact area of raw water line* – construction of the raw water line would require the removal of approximately 2.24 hectares of Central Hunter Box – Ironbark Woodland in moderate to good condition and 5.18 hectares of modified grassland of low biodiversity value;
- *Impact area of transmission infrastructure* – the impact area for gas-fired transmission infrastructure would be 0.10 hectares of Central Hunter Box – Ironbark Woodland and 7.37 hectares of modified grasslands;
- *Impact from increased traffic movements* – would be similar to the coal-fired power station option as the majority of construction traffic would comprise heavy vehicles which could increase the risk to ground dwelling fauna from potential vehicle strike;
- *Increase runoff and sedimentation* – the impacts would be similar to the coal-fired power station option and would involve excavation which has the potential to result in increased rates of runoff and sedimentation of nearby watercourses which could impact on water quality and aquatic habitats and fauna such as the Green and Golden Bell Frog;
- *Impact area of gas pipeline* – a 15 kilometre spur pipeline would require construction to connect to the approved Queensland to Newcastle gas pipeline which would result in the removal of approximately 34.22 of modified grassland and other native vegetation, 5.04 hectares of Central Hunter Box – Ironbark Woodland, 5.74 hectares of Central Hunter Ironbark-Spotted Gum-Grey Box Forest and 0.31 hectares of Hunter Valley River Oak Forest;

In terms of operational flora and fauna impacts, the Environmental Assessment stated that the impacts would be similar for both options, however the coal-fired option may result in additional impacts on biodiversity when compared to the gas-fired option as a result of potential stormwater runoff impacts and settlement of dust emissions.

The Proponent has indicated that it would consider offsetting residual flora and fauna impacts if required following the finalisation of the location of infrastructure and determination of the existing native vegetation lost as part of the project.

**Submissions**

Flora and fauna was not raised as an issue of concern in the majority of submissions received regarding the project. Where issues where raised, the main concerns stemmed from the potential impact of the project on climate change and the resultant indirect impacts on flora and fauna. One submission indicated that the Environmental Assessment did not attempt to quantify the damage that could result from the project as a result of increased greenhouse gas emissions and impacts on climate change. Another submission indicated that significant impact on natural ecosystems such as the Great Barrier Reef and the Murray-Darling River system could result from increased greenhouse gas emissions from the proposal and that the project should be referred to the Commonwealth Department of the Environment, Water, Heritage and the Arts due to the potential impacts that may result on matters of national environmental significance as outlined in the *Environment Protection and Biodiversity Act 1999* including listed threatened species and communities, listed migratory species, RAMSAR wetlands of international importance and the Commonwealth marine environment.

Two submissions raised concerns regarding the direct impact of the project and the resultant loss of vegetation and the potential detrimental impacts to wildlife.

The Department of Environment, Climate Change and Water (DECCW) undertook a detailed review of the ecological assessment that was provided in the Environmental Assessment and raised a number of issues as part of their submission about the proposal. DECCW noted that the survey effort did not include the entire route for the gas pipeline and therefore recommended that the Proponent be required to assess flora and fauna impacts along the entire route length. In terms of the timing of fieldwork, DECCW acknowledged the Proponent's commitment to conduct targeted surveys in the warmer months for the Green and Golden Bell Frog, both species of *Diuris* orchid and also possibly the Barking Owl. DECCW indicated that any surveys planned for hollow-bearing trees on the footprint of proposed infrastructure should also include the consideration of rough-barked trees as these trees may provide roosting habitat for a range of threatened microbats. Regarding biodiversity, DECCW noted that both coal and gas-fired options would require some clearing of preliminary listed endangered ecological communities, threatened vegetation species and native vegetation and therefore the Proponent will be required to outline how it proposes to avoid, mitigate and/or offset unavoidable impacts in accordance with DECCW's biodiversity offsetting principles or alternatively using its Biobanking Assessment Methodology. DECCW recommended that specific conditions be included in any concept approval in relation to flora and fauna.

**Consideration**

Greenhouse gas emissions and climate change has been addressed in Section 5.1 of this report and therefore has not been repeated here. The Department has focussed its review of ecological impacts on the direct impacts of the proposal rather than the indirect impacts which could result from increased greenhouse gas emissions and resultant climate change as indirect impacts would depend on a large number of other factors beyond the Proponent's control and therefore is considered beyond the scope of this Department's assessment.

The Department has reviewed the Environmental Assessment and considers that it provides an adequate assessment of potential flora and fauna impacts of the proposal at a concept level given the limitations of the survey effort and the unfavourable timing of the survey. The Department also considers that the level of information provided was adequate to gauge the potential impacts of the project and takes into account the fact that the Proponent is seeking a concept rather than a project approval for the proposal at this stage. The Department notes that the Proponent has confirmed its commitment to undertake further flora and fauna surveys as part of a subsequent project application, as outlined in its Submissions Report.

As a result of the limitations of the ecological assessment, as presented in the Environmental Assessment, and the potential impacts outlined regarding flora and fauna, including the removal of preliminary listed endangered ecological communities, the Department has recommended that the Proponent undertake further investigations and assessment as part of a subsequent application for project approval of its preferred option and has recommended specific conditions related to flora and fauna impacts in the concept approval. These investigations and assessment would be required to encompass (as relevant to the preferred option) the entire gas pipeline route, any required railway upgrades for the proposed delivery of coal to the site, conveyors to transfer coal to the site and roadways, including the planned road to transfer ash from the site. As part of these recommended conditions, the Department considers that the Proponent should also detail the actions that it will take to avoid or mitigate impacts to flora and fauna or to compensate or offset any unavoidable impacts on native vegetation, threatened species, populations, ecological communities and their habitat as part of its application for project approval. This has been reflected in the Department's recommended conditions of concept approval.

### 5.5 Noise and Vibration Impacts

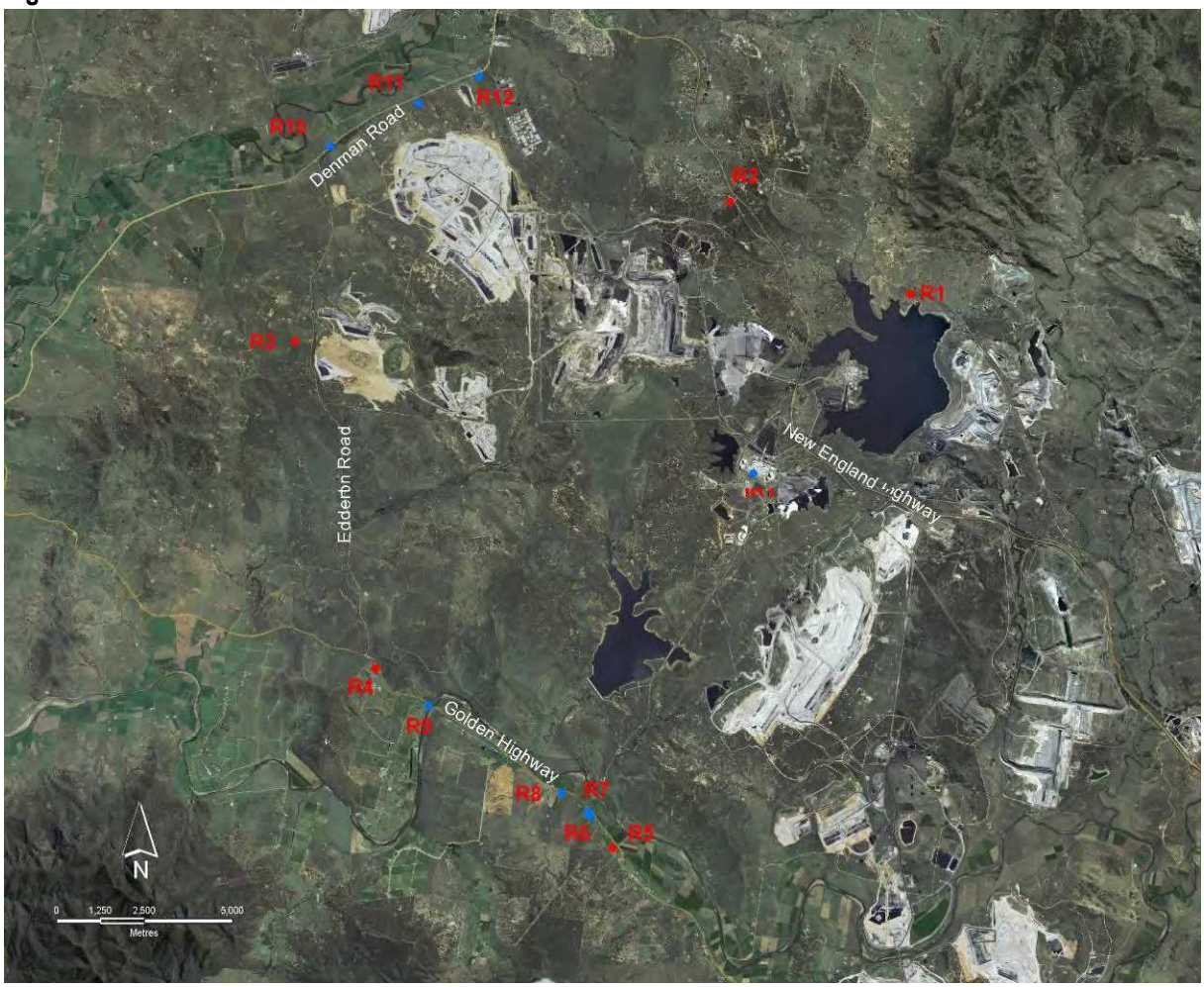
**Issues**

As stated previously in Section 2, the project is located within the Singleton LGA on land that is rural in nature and surrounded by operating coal mines and is in close proximity to the existing Bayswater and Liddell Power Stations. The Environmental Assessment states that the nearest residential receivers to the project site are located as follows and shown on Figure 7:

- residences located approximately 10 kilometres north of the site adjacent to the New England Highway (represented by assessment location R2);
- residences located approximately 10 kilometres north east of the site adjacent to Hebden Road (location R1);

- residences located approximately nine kilometres south of the site adjacent to the Golden Highway (locations R5, R6, R7 and R8);
- residences located approximately 8.5 kilometres south west of the site next to the Golden Highway (locations R4 and R9);
- residences located approximately 11 kilometres north west of the site next to Edderton Road (location R3); and
- residences located approximately 13 kilometres north west of the site next to Denman Road (locations R10, R11 and R12).

**Figure 7: Residential Receiver Locations**




Source: Figure 1 from Proponents Environmental Assessment (Appendix E) September, 2009

Ambient noise monitoring was undertaken at five representative locations and the rating background noise levels and the ambient noise levels determined. Based on these levels, the construction noise management levels were calculated, as outlined in Table 8.

**Table 8: Construction Noise Criteria for Residential Receivers**

| Location | Rating Background Levels – $L_{A90}$ | | | Construction Noise Criteria | | |
|---|---|---|---|---|---|---|
| | Day | Evening | Night | Day | Evening | Night |
| R1 | 36 | 36 | 36 | 46 | 41 | 41 |
| R2 | 48 | 40 | 37 | 58 | 45 | 42 |
| R3 | 31 | 30 | 30 | 41 | 35 | 35 |
| R4 | 30 | 30 | 30 | 40 | 35 | 35 |
| R5 | 35 | 30 | 30 | 45 | 35 | 35 |

| | | | | | | |
|---|---|---|---|---|---|---|
| R6 | 35 | 30 | 30 | 45 | 35 | 35 |
| R7 | 35 | 30 | 30 | 45 | 35 | 35 |
| R8 | 35 | 30 | 30 | 45 | 35 | 35 |
| R9 | 30 | 30 | 30 | 40 | 35 | 35 |
| R10 | 30 | 30 | 30 | 40 | 35 | 35 |
| R11 | 30 | 30 | 30 | 40 | 35 | 35 |
| R12 | 30 | 30 | 30 | 40 | 35 | 35 |

The Environmental Assessment states that the noise monitoring and/or assessment was carried out for each of the receptor locations with modelling undertaken for "worst case" impacts of likely site activities and types of equipment. The primary noise sources during construction were outlined in the Environmental Assessment as large civil construction equipment such as concrete batching plant, pile drivers, compactors, backhoes and the use of various trucks as well as cranes pneumatic tools, welders, forklifts and generators.

The modelling undertaken for the Environmental Assessment indicated that there is a low potential for noise impacts to occur during construction with all expected noise levels being below the established noise criteria at all locations and for all times during the day, evening and night time periods.

During operation, the Proponent identified in the Environmental Assessment that potential noise would be generated by the operation of plant, truck movements, train movements on the Antiene Loop to deliver coal to the site, loading and unloading activities and from mechanical services associated with site buildings. Given the distance between the site and the nearest residential receivers, the Environmental Assessment indicated that all predicted operational noise levels for both the coal and gas-fired options for the project would comply with the specific operational noise criteria during the day, evening and night-time periods. The Environmental Assessment stated that the noise modelling took into consideration neutral and adverse weather conditions, worst wind conditions and the incidence of temperature inversions.

The Environmental Assessment also concluded that given the distances between the proposal and existing residential and industrial land uses, vibration levels from the operation of the project and the additional traffic that it may generate are considered extremely low such that no further vibration assessment was undertaken.

**Submissions**

Four submissions identified noise and vibration as an issue of concern for the proposal. These included submissions from the Department of Environment, Climate Change and Water, Muswellbrook Shire Council, NSW Department of Health and a submission from the community.

The issues raised were fairly broad, however, it was acknowledged that the main potential for noise and vibration would be during the construction phase of the project. One submission stated that the Proponent should have processes in place so that the community can seek timely remedial action should noise generation become problematic to nearby residents. This and a number of other comments made in the submissions specifically related to the construction phase of the project and therefore is not considered relevant to the concept plan application as construction cannot occur until the Proponent is granted a project approval.

The DECCW indicated that the noise impact assessment has been carried out in accordance with the Industrial Noise Policy and satisfied DECCW's environmental assessment requirements. DECCW stated further that it considered that the Environmental Assessment provided sufficient information to demonstrate that the proposal could be developed so that compliance with the relevant noise criteria could be achieved.

**Consideration**

The Department has reviewed the Environmental Assessment, including the specialist noise technical assessment and considers that the project will not result in any noise impacts at the nearest residential receivers to the site during its construction or operation.

The Department is satisfied that construction noise impacts can be appropriately and adequately managed through the application of best practice construction techniques. Even though construction related traffic is not

anticipated to be a significant issue for the project, the Proponent has stated that it would seek to prepare a Traffic Management Plan to further mitigate noise impacts to sensitive receivers and reduce construction related traffic impacts on the arterial roads in the locality.

***Independent Review***

The Department commissioned Heggies Pty Ltd to undertake an independent peer review of the noise assessment. The review indicated that the Proponent adopted a minimalist approach to background noise monitoring with some data required to be discarded resulting in an incomplete dataset. Given the noise monitoring that was undertaken, the review recommended that a background level of 30 dB(A) be assumed for all residential monitoring locations for day, evening and night time period which would produce a stringent intrusiveness criteria of 35 dB(A) at all locations and construction criteria of 40 dB(A) at all locations for the day time period and 35 dB(A) for evening and night time periods. The Proponent's response to the independent review indicated that even with the recommended background level of 30 dB(A) at all sensitive residential receivers, the proposal is expected to be able to comply with a maximum intrusiveness criteria of 35 dB(A).

The review concluded that the Proponent undertook a construction and operational noise assessment generally in accordance with the DECCW's Industrial Noise Policy. In addition, the review stated that a qualitative assessment of construction and operating vibration impact was generally carried-out with respect the DECCW's *Assessing Vibration: A Technical Guideline* with minimal potential impact at the nearest residential areas. The assessment of off-site construction project generated traffic noise was also generally assessed in accordance with the DECCW's *Environmental Criteria for Road Traffic Noise* with any impacts identified as being acceptable. In terms of train noise, while the Proponent states that the Antiene Rail Loop currently has approval to accommodate additional train movements associated with the project, the peer review correctly indicated that the capacity of the Antiene Rail Unloader is currently capped at 15 million tonnes per annum and therefore a modification to the existing approval would be required to increase capacity over this level in order to deliver the required coal to the plant.

***Department's Consideration***

The Department has reviewed the noise impact assessment undertaken by the Proponent and considers that it provides an adequate level of assessment to determine whether noise and vibration is expected to be a major issue for the proposal. The Department has incorporated the recommendations of the independent review and relevant conditions recommended by the DECCW into its recommended concept approval conditions in relation to the background noise levels at residential receptors to ensure that the Proponent is aware that it will need to design the project in a way to ensure that noise from the project does not result in any unacceptable impacts to nearby residential receivers during its construction and operational phases. The Department has recommended that the Proponent ensure that the final project design meets specific limits for noise at the closest residential receivers to the site.

In addition, the Department has recommended that the Proponent be required to submit an updated Noise and Vibration Impact Assessment as part of any subsequent project application to detail the noise impacts from the project (inclusive of any impacts from the proposed construction camps) and to outline what mitigation measures would be implemented to mitigate and manage noise from the project.

# 6. CONCLUSIONS AND RECOMMENDATIONS

The Department has undertaken a detailed assessment of the Bayswater B Power Station project, having regard to the Proponent's Environmental Assessment, Submissions Report, the issues raised in the 362 submissions received and the independent reviews which were commissioned by the Department to review the greenhouse gas assessment, the air quality assessment and the noise impact assessment.

The Department considers that the Proponent has undertaken an adequate and appropriate level of environmental assessment of the concept plan application and the Department is satisfied that it can recommend approval of the concept plan application subject to specific conditions of approval. The Department considers that the project can be designed in a manner that minimises and manages predicted environmental impacts so as to ensure an environmental performance which is considered acceptable.

While there is substantial debate over the benefits and disbenefits of the project, particularly in relation to its predicted greenhouse gas emissions, the predicted shortfall in electricity generation cannot be met purely by renewable energy projects, contrary to the majority of community sentiment. The Department considers that the project is justified as an important and necessary component of the broader suite of demand management, energy efficiency and capacity generating measures required to secure the State's energy supplies into the future as it would contribute to satisfying the demand-supply imbalance of electricity generation expected to occur between 2014 and 2020.

The Department considers that while the project will take a considerable time to construct (approximately three years for the gas-fired option and almost five years for the coal-fired option), the resultant environmental impacts can be mitigated through best practice environmental management measures to reduce potential adverse construction environmental impacts. As outlined in the Environmental Assessment and in this report, it is the operation of the project that has the potential to result in significant environmental impacts in relation to greenhouse gas emissions, air quality and water management.

Operation of the project is predicted to generate approximately 12.45 million tonnes of $CO_{2\text{-}e}$ per year for the coal-fired option and 5.93 million tonnes of $CO_{2\text{-}e}$ per year for the gas-fired option. Additional detail will be required as part of a project plan application to confirm these levels and this has been recommended as part of the Department's recommended conditions of approval. Considering the need for the project, as outlined in Section 2.4 of this report, and the level of predicted greenhouse gas emissions, the Department has recommended that the Proponent be required to clearly demonstrate that it is continually investigating carbon reduction technologies with the intention that these measures could be retrofitted to the plant, as well as other emission reduction technologies or offset measures that could be implemented as part of the project to reduce or offset greenhouse gas emissions.

In relation to air quality, and depending on the final fuel selected for the preferred option, the Department has recommended that the Proponent be required to design the plant to ensure that it meets strict concentrations levels for nitrogen oxides, and specifically for the coal-fired option, specific criteria for solid particles and for the project to meet specialised land use criteria for hydrogen fluoride. The Department has also recommended that the Proponent prepare an updated air quality assessment as part of its Environmental Assessment for the preferred option. This recommendation has also been made by the Department for noise, water supply and availability, noise, ecology, heritage and traffic and transport to ensure that the Environmental Assessment contains detailed information of the potential environmental impacts for the preferred fuel option and the final project design on these environmental issues.

The Department recommends that the Minister for Planning:

- consider the findings and recommendations of this report;
- approve the concept plan application, subject to conditions, under section 75J of the *Environmental Planning and Assessment Act 1979*; and
- sign the attached concept approval (Tagged "A").

# 7. REFERENCES

AEMO (2009), *Electricity Statement of Opportunities for the National Electricity Market*, AEMO, Australia, 2009

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# APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL

# APPENDIX B – SUBMISSIONS REPORT

# APPENDIX C – STATEMENT OF COMMITMENTS

# APPENDIX D – ENVIRONMENTAL ASSESSMENT

# APPENDIX E – INDEPENDENT REVIEWS