Mt Piper Power Station Extension

ENVIRONMENTAL ASSESSMENT

EXECUTIVE SUMMARY

- September 2009

Executive Summary

Delta Electricity (Delta) is seeking concept plan approval for the proposed Mt Piper Power Station Extension project, under Part 3A of the *Environmental Planning and Assessment* (EP&A) *Act 1979*, to provide baseload electricity generation capacity to meet future demand.

The Proponent

Delta Electricity (Delta) was formed in March 1996, when the New South Wales (NSW) Government Authority Pacific Power was separated into three State-owned generation companies. Delta's principal functions are to maintain and operate facilities for the generation and supply of electricity into the National Electricity Market (NEM) and it currently owns and operates the Mt Piper Power Station located at Mt Piper in central western NSW, near Lithgow (See **Figure 1**).

It is recognised that the NSW Government has indicated its intention to include the Mt Piper Power Station Extension Project as a Development Site which could be offered for sale as part of the NSW Energy Reform Strategy. Should this occur, then it is proposed that the approval being sought would be transferred to the new project owner. In this regard the term Proponent has been used in this document to refer to Delta Electricity currently, or to the future project owner.

Strategic Justification

Demand

The National Electricity Market (NEM) provides a wholesale market for the supply of electricity to retailers and end-users in NSW, Victoria, Queensland, South Australia, Tasmania and the Australian Capital Territory. The NSW Government's *Inquiry to Electricity Supply in NSW*, also known as the Owen Inquiry, examined the future of electricity generation in NSW and provided advice to the Government on the actions necessary for a timely investment in new baseload generation. The growth of the electrical energy use in NSW is very dependent on the growth rates forecast for the state and national economies and the continued increase in population. Electrical consumption in NSW has grown by 1,700 GWh per year for the past 30 years. The average growth rate for the next 10 years is expected to be around 1,600 GWh per year, factoring in demand management trends. NSW generators are capable of delivering about 85,000 GWh of energy per year and the Owen Inquiry concluded that NSW needs to be prepared for new baseload generation to avoid energy shortfalls. The Owen Inquiry forecast in 2007 that more than 85,000 GWh of electrical energy would be needed in NSW by 2013/2014 under a medium growth scenario and by 2016/2017 under a low growth one.

Subsequent forecasts published by TransGrid (2009) and the Australian Energy Market Operator[1] (AEMO – 2009) indicate that the growth rate in electricity demand has slowed due in part to the downturn in economic activity in Australia as a consequence of the global financial crisis. The 2009

[1] AEMO came into being on 1 July 2009 as a result of a merger of NEMMCO, VENCorp and other energy bodies. TransGrid is the NSW Government-owned Transmission Network Service Provider (TNSP) responsible for the planning, construction, operation and maintenance of the high voltage transmission network in NSW.

Electricity Statement of Opportunities (ESOO) published by AEMO in August 2009 indicates that additional capacity of 182 MW will be required in 2015/16, rising to about 625 MW in 2016/17 and about 1,050 MW in 2017/18 given the assumptions on demand and supply growth.

It is two years since the Owen Report was released and in that period projections for when new capacity will be needed have moved two years from 2013/14 to 2015/16, due in part to the global financial crisis and the downturn in the Australian economy. On the balance of probabilities, and reflecting improving economic growth in Australia since the analysis underlying the 2009 ESOO projections was carried out, it is anticipated that new baseload capacity will be needed in service in NSW in five to seven years. This period is about the timeframe estimated to conclude the sale of the Mt Piper Extension site and for the new proponent to contract, design, procure, construct and commission new baseload generation capacity to meet growth in demand and to maintain sufficient levels of reserve capacity.

Figure 1 Regional location

Alternative Energy Sources Considered

Additional electricity capacity could be provided in a number of ways, using a range of technologies, including:

- Renewable energy sources - including hydro-electric, wind, solar and biomass;
- Distributed generation (ie. small scale generators located largely within the electricity distribution network);
- Upgrading existing plant;
- Expanding transmission networks and interconnections;

- Gas-fired power stations;
- Coal-fired power stations.

An ultra-supercritical (USC) coal-fired power plant or a combined cycle gas turbine (CCGT) is considered to provide the best means of supplying electricity to the National Electricity Market at commercially competitive rates to meet future increased base-load demands in NSW. These types of plant have advantages over other options in terms of efficiency and commercial viability (availability and capital cost).

The other alternatives offer short-term solutions or provide small base load benefits or are not suitable for providing base-load capacity due to there variable output.

Overview of the Proposal

The project site is located in the Central West region of NSW, approximately 17 km north-west of Lithgow (refer to **Figure 1**). The nearest townships are Portland, located approximately 4 km to the west, Blackmans Flat approximately 3 km to the east and Wallerawang, approximately 6 km to the south-east. Mt Piper Power Station is located at the intersection of Castlereagh Highway, the main transport corridor to the site, and Boulder Road.

The existing Mt Piper Power Station was commissioned in two stages over 1992 and 1993. It was originally intended to construct four generators on the site, but the extra two units were not built. The Mt Piper Extension project would comprise the installation of new CCGT or USC generation located adjacent to, but largely independent of, the existing Mt Piper Power Station. The new power station would be located to the west of the existing plant, generally in the area previously prepared for Units 3 and 4 when Units 1 and 2 were constructed. This area is shown in **Figure 2**. The Mt Piper Power Station Extension project will have a total capacity of up to 2,000 MW and employ Air Cooled Condensers (ACCs) to minimise water usage.

For the USC plant the coal would be pulverised and used to fire two new boilers. The steam generated by the boilers would be routed to the high pressure turbines where some of the heat energy will be converted to mechanical energy. The steam would then return to the boiler for reheating before it flows through the intermediate pressure turbines and then to the low pressure turbine to convert more of the heat energy into mechanical energy. Steam discharged from the low pressure turbines would pass to direct to the ACCs to be condensed to water before it is returned to the boiler by way of feed heaters, which use steam extracted from the turbines. Heat would be dissipated to the atmosphere via fan-forced air flow over the ACCs. Ash would be collected and transported by conveyor and truck to the proposed ash storage areas used by the existing power station. Flue gas would be emitted to the atmosphere, via a single stack, approximately 250m in height.

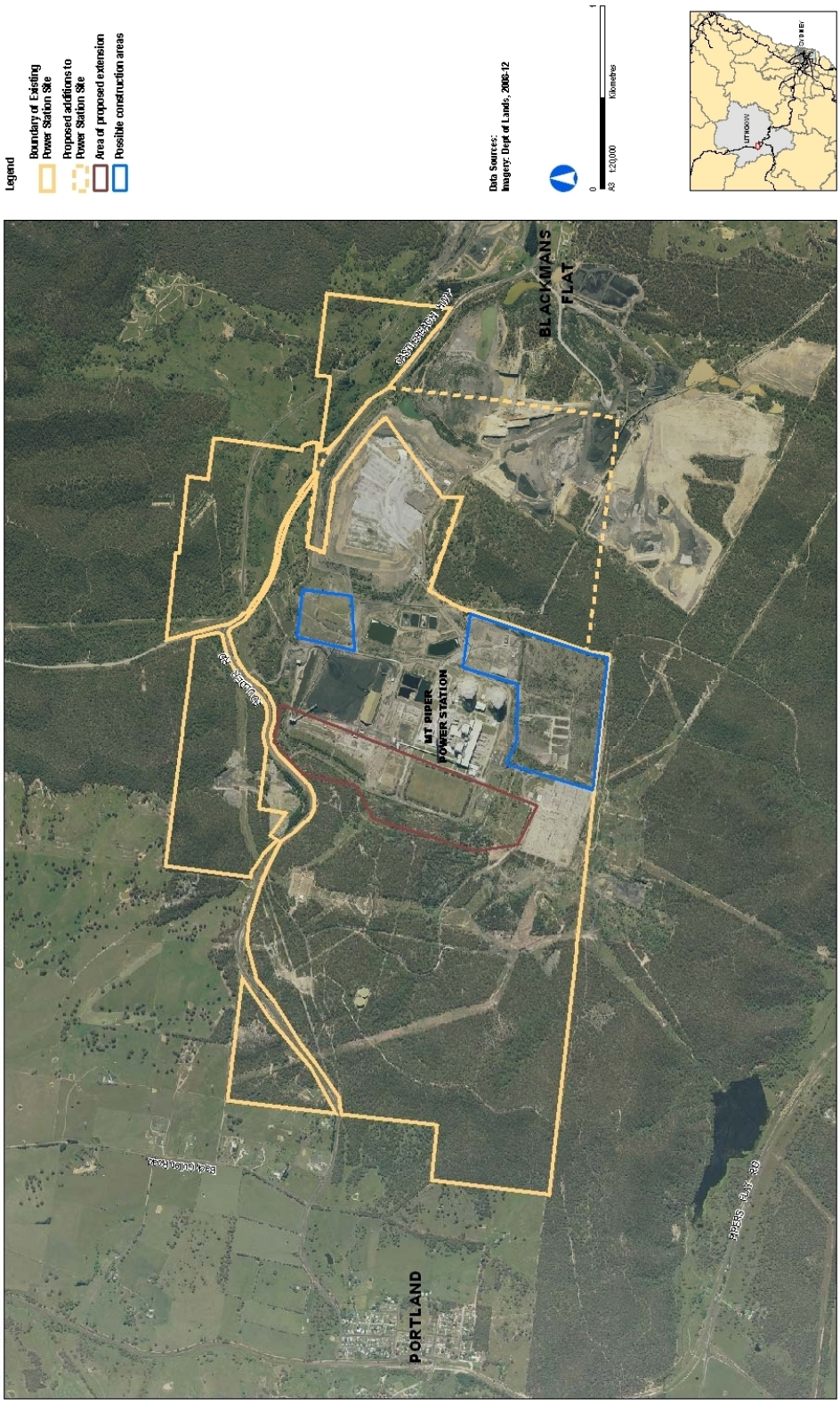

Figure 2 Aerial view of Delta's property (within yellow lines) at Mt Piper showing the existing power station, the proposed Mt Piper Power Station Extension (within red lines) and proposed temporary construction laydown areas (within blue lines)

CCGT plant utilises a gas turbine and a steam turbine to drive an electrical generator. The gas is fired in an open cycle gas turbine and hot exhaust gases generated from the gas turbine feed into a heat recovery steam generator (HRSG) which produces steam to drive a conventional steam turbine. The CCGT will exhaust combustion products at a low temperature through up to 6 stacks (one for each CCGT) with a nominal height of about 60-80 metres above ground level. The open cycle phase of the gas fired power station would utilise a closed cycle cooling system. This may include an evaporative cooling system using water to cool the air stream before it enters the combustion chamber of the gas turbine. The CCGT also requires additional cooling for the steam cycle and steam discharged would pass to ACCs to be condensed to water before being returned to the HRSG.

The electrical power output from the generators of the power station would be delivered, via step up transformers, to TransGrid's new 500 kV switchyard adjacent to its existing 330 kV switchyard to which the existing Mt Piper Power Station connects. High voltage transmission lines would typically connect each unit's generator transformer to the new switchyard. The 500 kV switchyard is currently being built by TransGrid and is not part of this environmental approval process. It connects directly into TransGrid's Western 500 kV transmission network which is planned for operation in 2010. Ultimately the Western 500 kV system will form part of the 500 kV ring main planned for the Greater Sydney region to meet increased demand and supply. The use of dry cooling (ACCs) would minimise water use to a few percent of that required by wet cooling systems which are currently used at Wallerawang Power Station and at the existing Mt Piper Power Station.

Water for Mt Piper Extension would come from the existing Coxs River supply to the existing power station. Given the small water demand of Mt Piper Extension it is envisaged that its waste water management would be provided by the Reverse Osmosis (RO) plant, brine concentrating plant and storage ponds of the existing station. Other on-site systems (such as the demin water plant) would be provided as part of the Mt Piper Extension project, reflecting the largely stand-alone nature of the project of the new proponent. A water drainage, treatment and discharge arrangement for the project would be designed similar to that used for the existing Mt Piper Power Station. The existing operations treat and reuse all potentially contaminated water on site and excess clean, uncontaminated rainwater water is discharged from the site to Neubecks Creek via a holding pond with an underflow weir. A similar discharge arrangement would be provided for the new plant. The proposed Mt piper Extension would have a zero discharge status like the existing power station.

Fuel for the plant would be brought to the plant from off-site. For a CCGT power station, gas would possibly be delivered to the site via a lateral pipeline system from the existing Moombah to Sydney Pipeline. The lateral would "off-take" near Young and follow the existing gas supply pipeline alignment between Young and Lithgow. Approval for this infrastructure is not being sought in this concept plan application.

For a USC power station, the coal would be sourced from a competitive market including both local mines and suppliers from a wider region. It is anticipated that coal for the new plant would be delivered via rail to the Mt Piper Extension from outside the local area or continue to be provided from local sources via conveyor or private haul road. Such rail transport of coal could utilise existing rail infrastructure and the proposed rail unloader at Pipers Flat. The rail unloader has been assessed

independently of the proposed extension and has Project Approval provided. In such a case, coal would be transferred by conveyor from the rail unloader, diverging near the existing coal handling plant at Mt Piper Power Station to supply it and a new coal handling plant and storage area for the Mt Piper Extension. Ash from the new power station's operation that could not be sold would be stored in the dry ash storage facilities of the existing power station. This is presently the subject of a separate major project application for additional storage for the existing power station and the proposed new power station.

Other components of the project include an area reserved for a future carbon capture plant for either CCGT plant or USC plant.

Approval Process

The proposed extension is a Critical Infrastructure and a Major Project, and is subject to assessment under the provisions of Part 3A of the EP&A Act. Under Part 3A a project application for concept plan approval is lodged and an Environmental Assessment report and a draft Statement of Commitments are prepared and submitted to the Department of Planning for public exhibition.

The responses received during the exhibition are addressed by the proponent and the project and the responses are assessed by the Department of Planning. The Minister for planning is the approval authority for the project.

Environmental Assessment of Key Issues

This Environmental Assessment has been prepared in accordance with the requirements of the EP&A Act, and specifically the key issues indicated in the Director-General's requirements. These key issues are discussed below, and generally indicate that the likely impacts from the proposed extension are able to be managed by appropriate mitigation measures. Following implementation of the mitigation measures, residual impacts would be low.

Water Cycle Management

The existing Mt Piper Power Station is a wet cooling system and uses water from the existing Coxs River and Fish River Supply Schemes, within the requirements of the existing Water Management Licence (WML). The proposed extension, whether coal or gas, would be a dry cooling system, and as a consequence extra water requirements would be limited to less than 1,100 ML/yr drawn from the existing approved water supply. The ongoing use of mine water would ensure no additional drawing on water from the existing schemes.

The water treatment system for the existing power station operates such that zero discharge from process and potentially contaminated areas to the environment is achieved. The same zero-discharge philosophy will apply to the Mt Piper Extension.

To reduce the potential water quality impacts of the site during construction, general measures to control erosion of soil and sedimentation would be implemented prior to construction works. These measures would be documented within a Soil and Water Management Plan (SWMP), prepared in accordance with the principles and practices in Soils and Construction (Landcom, 2004).

Noise and Vibration

The noise from general construction works has been assessed and in all cases the estimated construction noise levels would be below background for daytime noise emissions. Specific noisy activities such as impulsive or explosive noise emissions or night time works may require a more detailed review at the design stage, although the predicted levels indicate that construction noise would remain within the criterion of 32 dB(A) at the nearest receiver. No additional noise mitigation measures are recommended at this time other than the implementation of appropriate management strategies during construction.

The Mt Piper Power Station Extension has the potential to increase noise levels, as a result of operations, by approximately 3 dB(A), and the use of ACCs as the primary cooling method would provide a potential increase of approximately 5-6 dB(A) above existing noise levels. Where background noise levels are low the INP recommends that a minimum RBL of 30 dB(A) is applied and that the L_{Aeq} intrusiveness criteria is then set as a minimum of 35 dB(A). Based on this requirement and the predicted results under neutral conditions, it is expected that specific noise mitigation measures would not be required for the proposed Mt Piper Power Station Extension Project.

An assessment of meteorological conditions has determined that under the DECC guidelines, temperature inversions for this area occur frequently enough during the winter months to be included in an assessment of adverse weather conditions. Predictions of noise levels under temperature inversion conditions indicate the potential for exceedances of the intrusiveness noise goals are possible.

The potential for exceedances of the noise goals under adverse weather conditions are based on estimated equipment sound power levels for the proposed extension. Reductions of equipment noise emission levels should be sought during the design stage by the specification of equipment with low noise characteristics. Where noise reductions are possible the revised levels should be incorporated into the noise model to refine the predictions at the nearest residences. Areas of particular benefit from noise reduction would be the in the design of the stack using passive or active attenuation measures and the design and type of duty fans for the air cooled condensers.

Air Quality

This assessment has followed the DECC's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005). Ground-level pollutant concentrations have been predicted using the air dispersion model CALPUFF.

Results from the dispersion modelling indicates that NO_2 and SO_2 have the highest potential to cause exceedances of the DECC and these pollutants were the focus of the assessment. All other pollutants are predicted to comply with DECC by one or more orders of magnitude at the most affected ground-level location for all assessment scenarios.

Nitrogen oxides are produced in most combustion processes. The highest 1-hour average NO_2 concentration due to the existing Mt Piper power station is predicted to be 249 µg/m^3. This result is above the 246 µg/m^3 criterion and assumes that 30% of the NO_x is NO_2.

If the coal option were to be adopted, the modelling suggests that:

- Maximum 1-hour average NO_2 concentrations would increase from 249 to 338 µg/m^3, and the maximum number of hours above 246 µg/m^3 would increase from 1 to 2 hours per year, due to Mt Piper sources (ie the existing Mt Piper PS and the proposed Mt Piper Extension), and
- The highest levels would be close to the plant (that is, within 2 km).

If the CCGT option were to be adopted, the modelling suggests that:

- There would be no change to maximum 1-hour average NO_2 concentrations. That is, the highest 1-hour average NO_2 concentrations would be 249 µg/m^3, with a maximum of 1 hour above the criterion.
- The highest levels would be close the plant, with no exceedances of 246 µg/m^3 at any sensitive receptor location.

The results above show that the number of additional exceedances of short-term NO_2 criteria due to Mt Piper Extension would be small, for either the coal or gas options.

The annual average NO_x concentration of all scenarios, is 10.2 µg/m^3. This demonstrates compliance with the DECC criterion 62 µg/m^3, even when assuming all the NO_x is NO_2. Adding background NO_2 concentrations to predictions would not result in cumulative levels exceeding the 62 µg/m^3 criterion.

The following observations were made from the model results of maximum 1-hour average SO_2 concentrations:

- Impacts due to existing sources (that is, Mt Piper and Wallerawang) are dominated by the contribution of Wallerawang emissions;
- There is a maximum of 5 hours per year when the SO_2 concentration is predicted to exceed 570 µg/m^3, due to existing (that is, Mt Piper and Wallerawang) sources;
- The maximum number of hours above 570 µg/m^3 is predicted to remain unchanged at 5 hours if either the coal or gas plants is added to all existing sources;
- The maximum number of hours above 570 µg/m^3 due to Mt Piper sources only, is predicted to increase from 2 to 4 hours if the coal plant is added; and
- The maximum number of hours above 570 µg/m^3 due to Mt Piper sources only, is predicted to remain unchanged at 2 hours if the gas plant is added, since the SO_2 emissions from the CCGT plant would be zero.

None of the cumulative options (that is, Mt Piper with coal or gas) would increase the maximum number of exceedances above the five hours per year, although for the coal case, some areas are predicted to experience one or two more exceedance hours, compared with the modelled existing situation.

The performance of the model was investigated by comparing the results with monitored data, for the Blackmans Flat and Wallerawang monitoring sites. The purpose of the performance assessment was to gauge how close the model predictions might be to actual levels (as measured), both with and without the project. The predictive modelling showed clearly that there is conservatism in the assessment. Although the Environment Protection Licence for Mt Piper Power Station (13007) does not specify a requirement to monitor ambient air pollution levels, continuation of the existing monitoring program would be useful to quantify any change in air quality at the closest populated areas.

TAPM-CTM has been used to assess the impact of NO_x emissions from the Project on photochemical smog formation in the Sydney metropolitan region and surrounding areas, referred to as the Metropolitan Air Quality Study Region.

The main objective of the TAPM-CTM modelling was to predict regional levels of NO_2 and ozone (O_3), both with and without the Project. Ozone is of particular concern, due to observed exceedances of the DECC's 1-hour and 4-hour average criteria (100 ppb and 80 ppb respectively) in recent years. The DECC's 1-hour average criterion for NO_2 (246 µg/m^3 or 120 ppb) is rarely exceeded.

Modelling results showed that:

- Regional maximum 1-hourly average NO_2 concentrations may increase by up to 3.3 ppb for the USC plant and up to 2.6 ppb for the CCGT plant;
- Regional maximum 1-hourly average O_3 concentrations may increase by up to 4.8 ppb for the USC plant and up to 2.2 ppb for the CCGT plant; and
- Regional maximum 4-hourly average O_3 concentrations may increase by up to 2.9 ppb for the USC plant and up to 1.3 ppb for the CCGT plant.

While the emissions from the options are unlikely to cause additional exceedances of NO_2 or O_3 criteria, some areas outside the Sydney basin are predicted to experience increases in hourly O_3 of up to 15 ppb. These increments are predicted for existing concentrations between 40 and 70 ppb.

Greenhouse Gas Emissions

Greenhouse gas emissions have been estimated for the two project options, namely a USC coal-fired plant or a CCGT plant. The direct (Scope 1) and indirect (Scope 2 and 3) emissions were estimated, and are summarised as follows:

- 10.47 Mt CO_2-e of direct emissions for the USC proposal;
- 4.91 Mt CO_2-e of direct emissions for the CCGT proposal;
- 10.92 Mt CO_2-e of total (direct and indirect) emissions for the USC proposal; and
- 7.03 Mt CO_2-e of total (direct and indirect) emissions for the CCGT proposal;

These estimates can be compared Australia's net GHG emission estimates for 2006 of 287 Mt CO_2-e for stationary sources from the energy sector and 401 Mt CO_2-e for the total energy sector.

The NSW Greenhouse Gas Abatement Scheme (GGAS) estimated NSW pool coefficient for 2009 is 0.967tCO_2-e/MWh. Applying the GGAS emissions calculation methodology to Mt Piper Extension gives an emissions intensity of 0.838tCO_2-e/MWh (including coal mine fugitive emissions), well below the current estimated pool coefficient.

The management of greenhouse gas emissions through reductions or offsets include sequestration through carbon capture and storage, the use of carbon sinks and or geosequestration, carbon credit trading and renewable energy production.

Carbon Capture and Storage (CCS) is suggested as the means by which greenhouse emissions from the proposed extension would be considered. Although elements of the technology are relatively mature, currently there are no fully integrated commercial scale CCS projects in operation. Carbon capture technologies are based on those that have been applied in the chemical and refining industries for many years, but the incorporation of this technology in the specific context of power generation remains to be demonstrated.

Initially CCS costs are expected to be of the order of €60-90/tCO_2 or approximately AUD100-150/t CO_2, though decreasing as the technology develops. The trigger point for the implementation of carbon capture and storage will be when the cost of implementing CCS reduces to less than the cost of carbon emissions under the operating carbon trading scheme. Given the uncertainty in the capital costs of CCS technology due to its pre-commercial status and also the uncertainty in projected cost of CO_2 emissions under the Federal Government's proposed Carbon Pollution Reduction Scheme (CPRS) it is not possible to make a reasonable assessment of the trigger point time for CCS implementation. However as CCS technology matures and the CPRS becomes operational, assessment of whether the trigger point has been reached should be made periodically.

As CCS in not currently commercially available, the Mt Piper Extension USC coal power plant would need to be built as CCS ready to facilitate future retrofit of CCS.

With the implementation of a Carbon Pollution Reduction Scheme a CPRS cost of \$50/tCO_2 may be sufficient to make the retrofitting of CCS to the plant economic. CPRS costs of \$10/tCO_2 or \$25/tCO_2 would be insufficient to support retrofit of CCS and the cost to the plant would be \$105 million and \$264 million per annum respectively, depending on the cost of CCS technology.

As the retrofit cost of CCS for natural gas fired CCGT plant is likely to be significantly higher than a CPRS cost of \$50/tCO_2 it would not be economic. The cost to the plant would be \$50, \$125 and \$250 million per annum respectively for CPRS costs of \$10/tCO_2, \$25/tCO_2 and \$50/tCO_2 respectively.

Hazard, Risk and Incident Management

The proposed extension would require the storage of Dangerous Goods in excess of the threshold quantities in the Department of Planning's "*Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines*". Furthermore, the existing power station has not been subjected to a hazard assessment as it was constructed prior to the introduction of SEPP33. However, a preliminary hazard analysis (PHA) for the proposed new power station was undertaken.

The PHA found that the postulated release of chlorine from a pigtail failure in the chlorine drum storage area could result in an injury of maximum consequence severity at the site boundary. The estimated risk of injury from a release at the chlorine storage is 5 chances in a million per year, which is one order of magnitude below the risk criteria.

A gas pipeline failure (rupture), and ignition, would result in the jet flame being directed parallel to the pipeline, with heat radiated from the flame towards the areas adjacent to the piperack. The heat radiation impact at the boundary for the site is estimated at 0.7 kW/m^2 and is considered insignificant is risk terms. The probability a jet fire is dependent on the ignition probability and the failure of the isolation valve to activate. The failure probability of a shut down valve to close on demand was calculated to be 3.75×10^{-8} per year.

A review of the distance from the gas turbines to the fenced site boundaries indicates that, as a result of the postulated explosion in the turbine enclosure, explosion overpressure at the fence line surrounding the site exceeds 100kPa. However, the power station site boundaries extend well beyond the fenced area and a buffer zone has been established around these sites such that no industrial, residential or commercial developments can be established within a specific distance of the power station site. The analysis conducted in the study identified that in the event of an explosion, there would be insufficient overpressure at the buffer zone boundary to cause fatalities. However, the analysis indicated that there would be sufficient pressure to cause injuries. The fatality risk for the turbine enclosure explosion was calculated to be 0.158 pmpy. *Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 - Risk Criteria for Land Use Safety Planning* (DIPNR 1997) indicates that the accepted injury risk at residential areas is 1 pmpy (taken as the nearest boundary of the site), hence, the criteria is not exceeded in this case.

The proposed power station can be classified as potentially hazardous and not actually hazardous and the installed safeguards that would be provided at the facility are considered adequate.

The existing stack at Mt Piper Power Station and the proposed stack(s) for Mt Piper Extension may pose a hazard to aircraft flying in the vicinity of the exhaust plumes. A screening level assessment has been undertaken to quantify the existing and potential aviation hazard. The assessment included:

- Identification of the nearest airport;
- Plume rise modelling for a one year simulation period; and
- Analysis of model results for the regions of space where plume vertical velocities are predicted to exceed 4.3 m/s.

Bathurst is the nearest airport to Mt Piper, approximately 40km to the west. Over the one year modelling period, the maximum height at which the plume vertical velocity falls below 4.3 m/s for the existing Mt Piper stack is predicted to be 885 m. For the proposed USC plant, the maximum height of the critical vertical velocity is slightly higher at 1,076 metres. For the CCGT plant, the maximum height of the critical vertical velocity is only 222 metres, which is lower than the height of the existing stack.

The maximum height of the plume vertical velocity exceeding 4.3 m/s is located approximately above each stack location. For the USC plant, the potential aviation hazard area changes slightly from the existing hazard area, approximately 400 metres further to the west and approximately 200 metres higher above local ground level. It is likely that CASA has already identified a region of space around Mt Piper Power Station that poses a potential hazard to aircraft. The proposed Mt Piper Extension options are unlikely to change the existing restricted area.

Flora and Fauna

The site of the proposed power station has already been predominantly cleared for the existing power station and as such the vegetation primarily comprises maintained grassland (planted and landscaped areas), with some remnant woodland / open forest. The remnant areas are generally good both structurally and in species richness, although there is evidence of past clearing and some invasion by introduced species. The most intact native vegetation remnants are located to the west of the power station access road and to the west of the existing switchyard. Habitat for fauna within the proposed extension areas is limited by the extent of previous clearing.

During the field survey, one plant species listed as threatened under the TSC Act and the EPBC Act, *Eucalyptus cannonii* (A Red Stringybark / Capertee Stringybark) was recorded to the west of the existing access road. The design of the development will ensure the species will not be directly affected. Whilst no threatened fauna species listed under the TSC Act or EPBC Act were identified during the field survey, several species have previously been identified in the vicinity of the power station. Of these species, the Microchiropteran bats and Bathurst Copper Butterfly could potentially be found within the proposed extension areas. The tests of significance for threatened species concluded that there would not be a significant impact on local populations of these species. Areas of potential habitat for the Bathurst Copper Butterfly and the individuals of *Eucalyptus cannonii* identified in this study would be avoided.

Visual Landscape

Due to the topography and vegetation screening around the existing plant, the existing power station is not a dominant visual feature in the landscape. The majority of the plant is hidden from view, although the top of the exhaust stack and the water vapour from the cooling towers are visible from the surrounding areas.

The new plant would have a similar appearance to the existing plant as it would essentially be duplicated to the west of the existing plant. The new exhaust stack for the USC would be up to 250m high and it would have a similar appearance to the existing stack. The CCGT would have up to 6 stacks, but their height would be between 60 and 80 metres.

The main difference in the visual appearance of the new plant would result from the presence of air cooled condensers rather than cooling towers. The two air cooled condenser units for the coal-fired option would be large structures but, due to their relatively low height (30m), they would not be visible from the surrounding sensitive viewpoints. Those for the gas-fired option would be smaller again.

Whilst the new plant would contrast with the surrounding natural environment, the visual modification of the existing built environment would be relatively low, given the size, scale and appearance of the new plant compared with the existing plant. Given the distance between sensitive viewing locations and the power station, the visual impact of the new plant would be low.

Cultural Heritage

No Aboriginal or European heritage sites, objects or potential archaeological deposits were located during the field survey of areas affected by proposed Mt Piper Power Station Extension. The majority of the study area lies outside preferred landscape locations for Aboriginal occupation. When combined with the very high degree of ground disturbance evident in the study area, it is considered that there is negligible potential for Aboriginal or historic archaeological sites to be located within the majority of the Mt Piper Power Station study area.

Waste Management

During construction, waste products would primarily comprise excavated material, green waste, general building waste and domestic waste. It is not anticipated that the waste products would contain contaminated or hazardous material. All waste products would be re-used, recycled or disposed of in accordance with a Waste Management Plan.

Environmental Assessment of Other Issues

Geology and Soils

The proposed Mt Piper Power Station Extension would be undertaken in a landscape that has been heavily modified by past open cut and shallow underground coal mining, and by extensive cutting and filling during the construction of the existing power station. The bedrock unit below the proposed extension is a coarse sandstone of low to medium strength, which overlies the worked-out Lithgow Seam at depths in the order of 10m.

No significant impacts on geology or soils are anticipated, however, a minor amount of settlement in filled areas could occur due to piling, movement of construction plant, surcharging and water infiltration. Heavier structures are likely to be founded on piles set on buried bedrock at depth and therefore, this settlement should only affect the ground surface and shallow footings. No coal resources are likely to be sterilised by the proposed works and no other mineral resources are known to occur beneath or near the proposed new plant.

A more detailed subsurface investigation of the geological and soil conditions would be undertaken during detailed design.

Traffic and Transport

The Mt Piper Power Station is located at the intersection of the Castlereagh Highway and Boulder Road, approximately 17km north-west of Lithgow. The road network surrounding the Mt Piper Power Station has significant spare capacity. The major traffic impacts of the proposal relate to the movement of staff to and from the site.

During construction, large numbers of additional staff would be required. For the most part, construction traffic would have only minor impacts on intersection operation and road capacity. However, during the peak construction period, the Castlereagh Highway / Boulder Road intersection would have an acceptable level of overall operation, although significant delays on the eastbound right turn movement could be experienced. The impacts of the construction traffic could be mitigated by staggering shifts to avoid the concentration of staff departures during the 2-3pm period and / or implementing car pooling and shuttle bus arrangements.

During operation, there would be no increase in the amount of coal transported by public road to the power station and hence, the main traffic impact would arise from the movement of additional staff. The effect of the extra traffic on intersection performance and volume / capacity ratio would be negligible.

Overall, the proposed extension of the Mt Piper Power Station would only have a negligible impact on traffic operation in the area.

Socio-Economic

An important social and economic benefit of the proposed Mt Piper Power Station Extension is employment generation, particularly during the construction phase. Construction is expected to take up to five years to complete. It is estimated that a peak workforce of 950 people would be required for a period of about 10 months. During operation, 50 extra people would be employed as a result of the extension.

During construction, the potential for adverse impacts would primarily be associated with increased numbers of workers in the area placing an increased demand on services within the area. A well defined plan for the provision of services to the increased population would be required to be in place before construction begins.

There is also the potential for construction traffic and activities which generate noise and/or dust. These impacts would be managed in accordance with the mitigation measures presented in this EA and the Construction Environmental Management Plan. Due to the distance between the construction site and sensitive receptors, the potential impacts are not considered to be significant.

During operation, the potential adverse impacts predominantly relate to air quality, noise and the visual environment. These impacts would be managed in accordance with the mitigation measures presented in this EA and the Operational Environmental Management Plan. Due to the surrounding topography, vegetation and the distance between the proposed power station and sensitive receptors, the potential impacts are not considered to be significant.

The potential adverse impacts associated with the proposal are considered to be outweighed by the benefits associated with new plant such as the increased power generating capacity and the creation of jobs and associated economic benefits during construction and operation.

The safeguards and mitigation measures identified in this EA would ensure that many of the potentially adverse social impacts are minimised as far as practicable.

Environmental Management and Statement of Commitments

The mitigation measures identified as commitments in this Environmental Assessment, along with any conditions of approval issued by the Minister for Planning, would be incorporated into the detailed design, as well as where appropriate, the preparation of Construction and Operational Environmental Management Plans (EMPs) for the project.

Project Justification

The alternative to going ahead with the proposed Mt Piper Power Station Extension is to rely on other sources of electricity generation or demand management to overcome NSW's electricity deficiency in the future. Although demand management techniques and supply side management options, such as renewable energy sources and distributed generation, are desirable energy sources, they are not considered to be a viable alternative for this proposal as they cannot provide the capacity or availability required to meet the future large base-load demand for electricity at a competitive price.

Upgrading existing plants is a cost effective way of providing new generation. However, the potential capacity from plant upgrades is likely to be limited to a year or two of demand growth. Expanding transmission interconnection is unlikely to be economically and technically feasible for NSW to rely solely on as a means of addressing all future supply shortfalls. Currently NSW has reserve capacity to meet both peak and base-load demands. However, it is predicted that NSW will experience a reserve deficit and reliability of supply may be compromised unless additional capacity is brought to the market within the next 5-7 years. The proposed extension of the Mt Piper Power Station is considered to provide the best means of meeting these demands in the long term.

The consequences of the proposal not proceeding may result in interruptions to the State's power supply which could have serious social, economic and environmental impacts.

It is concluded that the development of the proposed Mt Piper Power Station Extension is justified in terms of addressing NSW Government policy aims for providing power generation capacity economically while minimising the extent of greenhouse gas emissions. The potential adverse impacts associated with the proposed extension can be managed such that the proposal would not detrimentally affect the health, diversity and productivity of the environment and would assist in these elements being maintained for the future benefit of generations.