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Munmorah Power Station
Rehabilitation

# Preliminary Environmental Assessment

Delta electricity

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# Delta Electricity

# Munmorah Power Station Rehabilitation Preliminary Environmental Assessment

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# Contents

# Acronyms and Glossary[1]

| Term | Meaning |
|---|---|
| Base load generation | Power plants optimised economically and in an engineering sense to a relatively constant, steady and reliable stream of energy |
| CEMP | Construction Environmental Management Plan |
| $CO_2$ | Carbon dioxide |
| $CO_{2-e}$ | Carbon dioxide equivalent |
| DCS | Distributed Control System |
| DECC | Department of Environment and Climate Change |
| EMS | Environmental Management System |
| EP&A Act | NSW Environmental Planning and Assessment Act 1979 |
| EPA | Environment Protection Authority |
| EPBC Act | Commonwealth Environment Protection and Biodiversity Conservation Act 1999 |
| EPL | Environmental Protection License |
| GGAS | NSW Greenhouse Gas Reduction Scheme |
| GGE[2] | Greenhouse Gas Emissions – gases covered by the Kyoto Protocol, including carbon dioxide, nitrous oxide, methane, sulphur hexafluoride, perfluorocarbons (PFCs) and hydrofluorocarbons (CHFCs |
| GWh | gigawatt hours – one billion watt-hours (or 1000 MWh). The amount of energy produced or consumed over one hour in a system operating at a capacity level of one gigawatt. |
| INP | NSW Industrial Noise Policy |
| kg | kilogram |
| kV | kilovolt – one thousand volts |
| LEP | Local Environmental Plans |
| LBL | Load based licensing |
| $L_{eq}$ | Equivalent continuous noise level |
| $L_{10}$ | Average maximum noise level – the noise level exceeded for 10% of a sampling period |
| $L_{90}$ | Background noise level – the noise level exceeded for 90% of a sampling period |
| LGA | Local Government Area |
| $m^3$ | Cubic metre |
| m/s | Metres per second |
| $mg/m^3$ | Milligrams per cubic metre |
| MW | Megawatt – one million watts (or 1000 kW) |
| MWh | Megawatt hours – one million watt-hours |
| NEM | National Electricity Market |
| NES | National Environmental Significance |
| NETS | National Emissions Trading Scheme |
| NGACs | NSW Greenhouse Abatement Certificates |
| $NO_X$ | Nitrogen Oxides |
| PCR | Plant Control Room |
| PEA | Preliminary Environmental Assessment |
| POEO Act | Protection of the Environment Operations Act 1997 |
| REP | Regional Environmental Plans |
| SEPP | State Environmental Planning Policy |
| $SO_X$ | Sulphur Oxides |
| t | tonne |

[1] For consistency, this Glossary uses the same meanings as the Owen Inquiry, where applicable
[2] Definition from Garnaut Climate Change Review Final Report

# Executive Summary

Munmorah Power Station, located on the NSW Central Coast, originally comprised four 350 MW units (1,400 MW total capacity) which were progressively commissioned between 1967 and 1969. The units at Munmorah were down rated to 300 MW capability in 1984 and Units 1&2 were subsequently decommissioned in 1996. Units 3&4 have remained in service and have continued to generate electricity as required.

Delta Electricity is proposing to rehabilitate the Unit 3&4 generating plant to replace worn and obsolete components with the currently available technology. The purpose of the rehabilitation is to improve the reliability and efficiency of the generating units returning unit output to the original 350 MW such that they are able to continue to generate electricity for the NEM in the short to medium term (up to 20 years) while reducing the carbon footprint per unit of electricity generated.

Recognising the environmental benefits of gas as a fuel source, it is also proposed that the rehabilitation will make provision to use gas either in combination with coal or as a replacement. This flexibility of fuel source would provide for potential changes in the availability of gas.

This Preliminary Environmental Assessment (PEA) has been prepared to:

- Support a submission by Delta Electricity to the NSW Department of Planning requesting confirmation of the Major Project and Critical Infrastructure status of proposal;
- Support an Application for Project Approval under Part 3A of the (EP&A) Act;
- Provide information to assist the Director – General of the Department of Planning to comprehend the environmental implications of the project and to issue the requirements for an Environmental Assessment (EA) under Part 3A of the (EP&A) Act.

An investigation of rehabilitation options (Worley Parsons, 2007) concluded that rehabilitation to achieve the originally installed generating capacity of 350 MW per unit (700MW total) with high reliability provided the best technical outcome and achieved significant environmental benefits. This option has been adopted as the preferred option by Delta Electricity and is the subject of this Project Application.

Following rehabilitation, the Power Station would operate more reliably and efficiently and be more cost and carbon emission competitive. As a result, it would be expected that the power station would supply electricity into the NEM more frequently for longer periods, re-establishing Munmorah as a base load generator.

The improved efficiency of the power station would result in a reduction in coal consumption per unit of energy generated and reduced emissions per unit of energy generated. A reduction in greenhouse gas emissions (GGE) per GWh generated will place Munmorah in the same NSW pool coefficient category as the most efficient NSW coal fired power stations. Further reductions in GGE per unit of energy could be achieved by substituting gas for some or all of the coal.

The key environmental issues associated with the proposed rehabilitation have been reviewed. Issues requiring further consideration have been identified as: Greenhouse Gas Emissions, Air quality, Water Management, Hazard, Risk and Incident Management, Traffic and Transport, Waste Management, Noise and Socio-Economic Issues.

Many aspects of the power station operations, such as the fabric filters, flue gas and cooling water systems will not be affected by the proposed rehabilitation. Accordingly, the environmental impacts associated with these aspects would be the same or less than approved for current operations.

The project will result in improved station performance and life extension of existing infrastructure. The environmental impacts of the rehabilitated power station will be consistent with and potentially less than the impacts from the currently operating approved and licensed power station. Careful planning, implementation and monitoring of a construction environmental management plan would ensure that impacts during the rehabilitation works are effectively managed.

This PEA recognises that the NSW Government has indicated its intention to include the Munmorah Project as a Development Project which could be offered for sale as part of the NSW Energy Reform Strategy. Should the sale of Munmorah occur, it is proposed that the development approvals 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.

Approval of this proposed development will provide a viable option to satisfy the forecast need for additional base load generation in NSW, operational from 2014-2016, on a fuel neutral basis.

# 1. Introduction

## 1.1 Purpose of this report

Delta Electricity is proposing to rehabilitate Munmorah Power Station Units 3&4 to improve its performance and reliability while reducing the carbon footprint per unit of electricity generated.

This Preliminary Environmental Assessment (PEA) has been prepared to support the submission by Delta Electricity to the NSW Department of Planning to assist the Department to confirm the relevant planning process and assessment requirements for the project proposal under the requirements of the Environmental Planning and Assessment (EP&A) Act.

The document provides a broad description of the project proposal and its potential for environmental impacts.

## 1.2 The Proponent

Delta Electricity is a State Owned Corporation that operates four large coal fired power stations (Munmorah, Vales Point, Wallerawang and Mt Piper Power Stations) and is involved in the development of a range of other power projects including gas turbine power stations and cogeneration facilities fuelled by sugar mill waste.

**Table 1.1 Existing Generation and Development Projects**

| Site | Capacity (MW) | Annual Generation 2007 (GWh) | Fuel | Operational Status (2008) |
|---|---|---|---|---|
| Munmorah | 600 | 2,110 | coal | Intermediate |
| Vales Point | 1,320 | 6,092 | coal | Base Load |
| Wallerawang | 1,000 | 5,951 | coal | Intermediate |
| Mt Piper | 1,320 | 9,297 | coal | Base Load |
| | **4,240** | **23,450** | | |
| Broadwater Cogeneration Plant | 30 | 200 (1) | biomas | Operational |
| Condong Cogeneration Plant | 30 | 200 (1) | biomas | Operational |
| Hydro stations | 0.57 | About 1 | water | Operational |
| Colongra Gas Turbines | 667 | N/A | gas | Under Construction |
| Bamarang Gas Turbine Project | 400 | N/A | gas | Planning Approved |
| Marulan Gas Turbine Project | 450 | N/A | gas | In Planning Approval |

NOTE: (1) – estimated using 80% capacity factor

Delta Electricity produces about 12% of the electricity used by the NEM. Reliability of supply and competitive pricing are important business performance criteria and each of Delta Electricity's plants are subject to routine performance monitoring and management reviews to ensure that Delta Electricity continues as a viable electricity generation business.

The operation of a successful business is also of benefit to:

- Delta Electricity's stakeholder, the NSW Government
- consumers that receive reliable electricity supplies at competitive pricing

- employees of Delta Electricity who are remunerated for application of their knowledge and skills to assist the Corporation achieve its business objectives
- the local economy through direct employment and flow on benefits through the provision of services.

Delta Electricity has been very active in the investigation of future directions for its business and has identified feasible options for both new generation capacity and existing plant improvements. Following the rehabilitation of Munmorah Power Station Units 3&4 the power station would operate more reliably and efficiently and contribute to a reduction in GGE emission rate for power generation in NSW.

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

## 1.3 Background

Munmorah Power Station, located on the NSW Central Coast, originally comprised four 350 MW units (1,400 MW total capacity) which were progressively commissioned between 1967 and 1969. The location of the power station is shown in Figure 1.

The units at Munmorah Power Station were down rated to 300 MW capability in 1984 (Worley Parsons, 2007) and Units 1&2 were subsequently decommissioned in 1996. Units 3&4 have remained in service and have continued to generate electricity as required.

In 2007, the Government established the Owen Inquiry into electricity supply in New South Wales. The Inquiry reported (the 'Owen Report') that meeting additional energy needs prior to 2013-14 would require completion of gas-fired plant and/or a refurbishment of Munmorah Power Station. The Report predicted a need for new base load generation by 2013-2014. Subsequent to the Owen Inquiry, analysis of later data reflected in the 2008 Statement of System Opportunities suggests an additional base load requirement in 2014-2016.

Delta Electricity is now proposing to rehabilitate Units 3&4 to improve their reliability and efficiency such that they are suitable to continue to generate electricity for the NEM in the short to medium term (up to 20 years), while reducing the carbon footprint per unit of electricity generated. This will provide a viable option to satisfy the above forecast need for base load generation.

## 1.4 Project Objectives

The objectives of rehabilitating Munmorah Power Station project are to:

- Maintain coal and/or gas fired base load generating capacity using the existing infrastructure to meet short to medium term (up to 20 years) energy requirements of NSW and the NEM
- replace outmoded and worn components with the currently available technology
- Reduce the greenhouse gas emissions (GGE) per unit of electricity generated
- Include modifications or provisions required to enable Munmorah to be carbon capture ready
- Identify, minimise and manage environmental and social impacts that might arise as a result of the rehabilitation


Source: UBD Australian Regional Digital Mapping

SCALE

0 4 8km

Munmorah Power Station **Rehabilitation**

**FIGURE 1:** Location Plan

# 2. Project Need and Strategic Justification

## 2.1 Project Need

Providing reliable and competitively-priced electricity to the people of NSW is an essential service. It allows NSW businesses to compete domestically and overseas, and supports the quality of life that is enjoyed across NSW.

The 'Owen Report' found that the State's energy consumption has grown consistently over the last 30 years and is expected to continue. As no base load generation plant has been constructed in NSW since 1996, the energy consumed in NSW is catching up with supply. A major finding was that the forecast rise in energy consumption in NSW will require considerable investment to meet projected demand.

A summary of key findings of the Owen Inquiry is provided below:

- Electricity consumption has grown at a rate of about 1,700 GWh per year for the past 30 years
- A slightly lower growth rate of 1,600 GWh is forecast over the next 10 years
- Forecast growth in electricity indicates that around 91,000 GWh of electrical energy will be required in 2013-14. This is about 10,500 GWh above current annual consumption (equivalent to the yearly output of the Mt Piper power station)
- Renewable energy and small-scale generation schemes, including wind, solar and wave, are forecast to provide over 1,500 GWh of the 10,500 GWh needed. The remainder will need to be met by gas or coal-fired generation.
- Part of this gap will be met by energy efficiency measures, new energy generation and increased output from existing generators
- New base load generation needs to be operational by 2013-14 to avoid potential energy shortfalls
- The lead time to develop new base load generation is around 6 to 7 years.
- While NSW currently imports about 10% of its energy needs, future imports of electricity may be constrained by growth in those other States
- The growth in demand could be impacted by the introduction of a carbon emissions trading scheme.

The above conclusions of the Owen Inquiry were based on the 2007 estimates available at the time.

Subsequently, as reflected in the 2008 Statement of System Opportunities, NEMMCO has revised these estimates having regard to assumptions on the yet to be finalised Carbon Pollution Reduction Scheme and the assumed level of non-scheduled "embedded" generation in NSW required to meet the proposed expanded RET.

An analysis of these latter forecasts suggests that a "risk-averse" approach (consistent with the Owen Inquiry Approach) would require new base load generation by 2014-2016.

The rehabilitation of Munmorah Power Station Units 3&4 would improve its existing generating capability while reducing the overall carbon emissions per unit of electricity generated by the power station.

Subject to timely development approval, the Proponent could implement the project in either coal or gas fired mode by 2014. On this basis the Munmorah project can be seen as a viable option in meeting the forecast base load generation needs for NSW.

## 2.2 Strategic Justification for Rehabilitating Munmorah Power Station

Munmorah Units 3&4 were each designed to have 350 MW of generation capacity. Due to the age of the plant they currently generate at about 270 to 280 MW with their maximum output being around 300 MW. The shortfall in generated output is despite the associated boiler plant operating at near full capacity.

The Power Station has a thermal efficiency of around 30%, compared with Delta Electricity's newest most efficient coal fired power station, Mt Piper, which has a thermal efficiency of around 37%. Despite this, the generation from Munmorah Power station has been required to increase in response to market demand with 2,664 GWh of electricity generated in 2007/2008.

The higher efficiency means that following the rehabilitation the station would consume lower amounts of fuel per unit of electricity generated, the emissions per unit of electricity generated would be lower. Additional reject heat is recovered in higher efficiency steam turbines, resulting in less heat being rejected to the cooling water system for the same output. This delivers the same or lower temperatures in cooling water discharges, with generation restored to 350 MW per unit.

The project could be expected to have the following benefits for the local and regional community, including:

- Continued use of an existing development with established electricity transmission and fuel supply infrastructure
- Improved reliability and security of electricity supply
- Improved environmental outcomes due to lower GGEs per unit of output
- Social and economic benefits associated with an improved NSW electricity supply network
- Employment opportunities during construction and extended operating life

## 2.3 Consideration of Options

### 2.3.1 Unit 3&4 Upgrade

The Munmorah Units 3&4 upgrade study, conducted by Worley Parsons (2007), included a number of scenarios for the proposed plant upgrade. The scenarios were defined by Unit output, projected plant life and plant reliability. The study concluded that 350MW output up to 20 years at high reliability is the preferred option.

### 2.3.2 Provision for later carbon capture

This is discussed in Section 2.5.

### 2.3.3 Coal and/or Gas Firing

Recognising the potential to using gas as a fuel source to operate the power station, a further preliminary investigation of the feasibility of using gas was undertaken. Figure 2 shows the effect of reducing the quantity of coal used in the fuel mixture from 100% to 0% while increasing the proportion of natural gas. For the figure below, the 100% coal $CO_2$ emission is based on the greenhouse emission coefficient (See Section 2.5) of 860 kg/MWh which is estimated to be achievable for the rehabilitated plant.

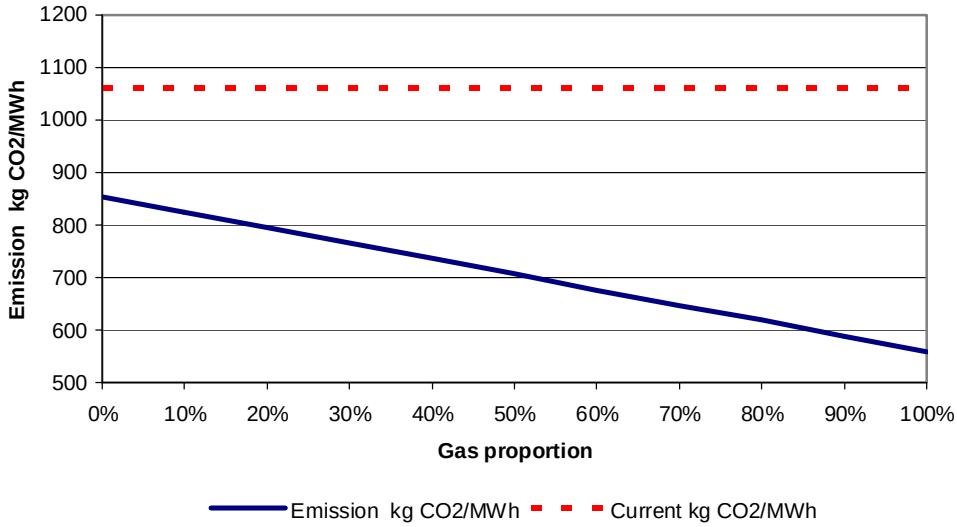



**Figure 2: GGEs in kg/GWh versus proportion of natural gas replacing coal in the boiler**

From Figure 2 it can be seen that the $CO_2$ emissions would reduce as the proportion of gas to coal increases. This could further contribute to improving the carbon footprint of the power station.

It should be noted that technical constraints of the existing boiler may prevent the possibility of 100% gas firing. Further investigations would be undertaken to confirm this.

Potential Gas Supply constraints are also an issue for the implementation of possible gas firing options. The current gas supply infrastructure enables gas to be delivered to the site but is constrained in its ability to provide the gas for large scale fuel substitution. However, there are a number of developments currently under investigations that may dramatically alter competitive gas supply to the region.

The application therefore seeks approval for gas firing but recognises, that even should gas supplies improve the facility may not burn 100% gas. This would be determined by gas availability and technical and economic considerations at the detailed design stage.

## 2.4 Consideration of Alternatives

Alternatives to rehabilitating Munmorah Power Station involve removing the existing power station and replacing it with a new facility. The capital cost of the proposed plant improvement works is estimated to be significantly lower than the capital cost of a new power station of similar capacity on a per unit of energy capacity basis.

There are no practicable alternatives for the rehabilitation of the existing Munmorah Power Station that will enable the current investment in the site infrastructure to continue to be used.

## 2.5 Greenhouse Gas Management

GGEs are considered to be the most environmentally significant environmental issue for the proposal. A greenhouse emission coefficient of about 860 kg/MWh is estimated to be achievable by rehabilitating the power station. Munmorah currently has a greenhouse emission coefficient of 1,065 kg/MWh, which is about 10% more than the 2009 NSW pool coefficient for greenhouse gases.

Delta Electricity has long recognised the growing concern by communities and governments of the issues of global warming and emissions of greenhouse gases, such as carbon dioxide ($CO_2$) from the

combustion of fossil fuels. Delta Electricity not only monitors the quantity of carbon dioxide emissions and thermal efficiencies at each power station site, but implements programs to improve operational performance and reduce GGE. The programs include:

- Development of renewable generation sources
- Membership of the Greenhouse Challenge Program since 1997
- Legally binding targets under the Australian Government's Generator Efficiency Standards (GES).

Delta currently generates NSW Greenhouse Abatement Certificates (NGAC)s under the NSW Greenhouse Gas Abatement Scheme. This scheme will be replaced by the Commonwealth Carbon Pollution Reduction Scheme (CPRS).

As part of the CPRS proposed by the Commonwealth Government Delta Electricity would be required to estimate and report GGE for the National Greenhouse and Energy Reporting System and the Generator Efficiency Standards (GES) program. The GES programme aims to achieve movement towards best practice in the efficiency of fossil-fuelled electricity generation; and to deliver reductions in the greenhouse gas intensity of energy supply.

It is recognised that carbon capture and geo-sequestration are unlikely to be commercially available by the time the detail design for the rehabilitation is undertaken. However, as a minimum Delta will ensure that the layout and space provide for the future retrofit of carbon capture plant. Delta's commitment to reducing GGEs will be demonstrated in the EA.

### 2.5.1 Provision for later carbon capture

To enable the impact of GGEs from the power station to be minimised in a potentially more greenhouse gas constrained environment, the development of the project aims to ensure that the rehabilitated power station will be 'carbon capture ready'.

The International Energy Association (2007) definition carbon capture ready plant is:

- "It is one which can include $CO_2$ capture when necessary regulatory or economic drivers are in place"
- "Developers of capture ready plant should take responsibility for ensuring that all known factors in their control that would prevent installation and operation of $CO_2$ capture have been identified and eliminated. This might include:
  - A study of options for $CO_2$ capture retrofit and potential pre-investments
  - Inclusion of sufficient space and access for additional facilities that may be required
  - Identification of reasonable route(s) to storage of $CO_2$."

The EA will include the above considerations.

Delta Electricity and CSIRO are jointly developing a $5 million research scale pilot facility at Munmorah Power Station on the NSW Central Coast to capture (and release) up to 3,000 tonnes per year of $CO_2$.

Delta Electricity recognises that "capturing" the $CO_2$ at the power station is only one step in the process of capturing and sequestering $CO_2$ so that greenhouse gases are not released into the atmosphere. Suitable locations will need to be found for the long-term storage of $CO_2$. Recognising this, Delta Electricity is also supporting research and development work necessary to allow $CO_2$ to be sequestered after the carbon capture conversion is completed.

# 3. Description of Project

## 3.1 Overview

Figure 3 shows the site location and boundary and Figure 4 provides a Schematic of the Power Station. The components of the project considered by this assessment include:

- Removal of the existing Units 3&4 steam turbine plant off site
- Replacement, upgrade, modification and/or maintenance of Units 3&4 and ancillary systems
- Provision for gas firing
- Commissioning of the rehabilitated plant
- Operation of the rehabilitated plant.

The major components of the rehabilitation include:

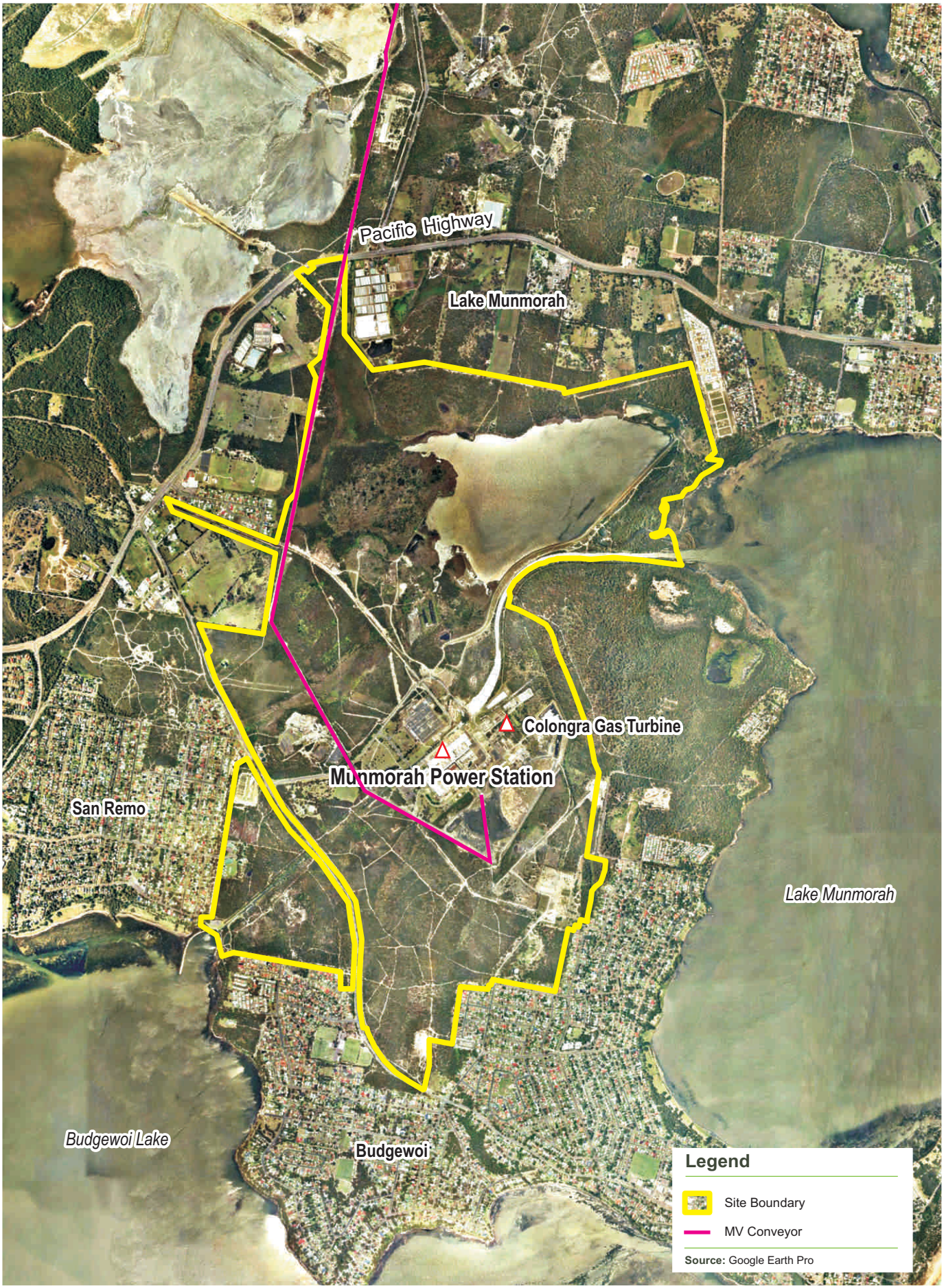
- Main steam turbine replacement
- Condenser air extraction silencer upgrade
- Circulating water system debris filter and ball cleaning system upgrade
- Attemperation pumps installation
- Feed pump and turbine upgrade
- Replacement of existing auxiliary cooling water system arrangement
- Air heater upgrade
- Economiser upgrade
- Furnace upgrade
- Gas firing modifications
- Increase capacity of MV conveyor from Vales Point to Munmorah or alternative fuel delivery arrangement
- Upgrading of the electrical and controls system and
- other minor upgrades to related ancillary plant and equipments

The replacement steam turbines will be designed to achieve or improve on the maximum condenser temperature rise and the cooling water system flow rates.

## 3.2 Project Location

Munmorah Power Station is located between Lake Munmorah and Lake Budgewoi, about 110 km north of Sydney and 50 km south of Newcastle (Figure 1) on land owned by Delta Electricity, while the site is within the Wyong Shire Local Government Area (LGA). It is also near to the southern extent of Lake Macquarie LGA.

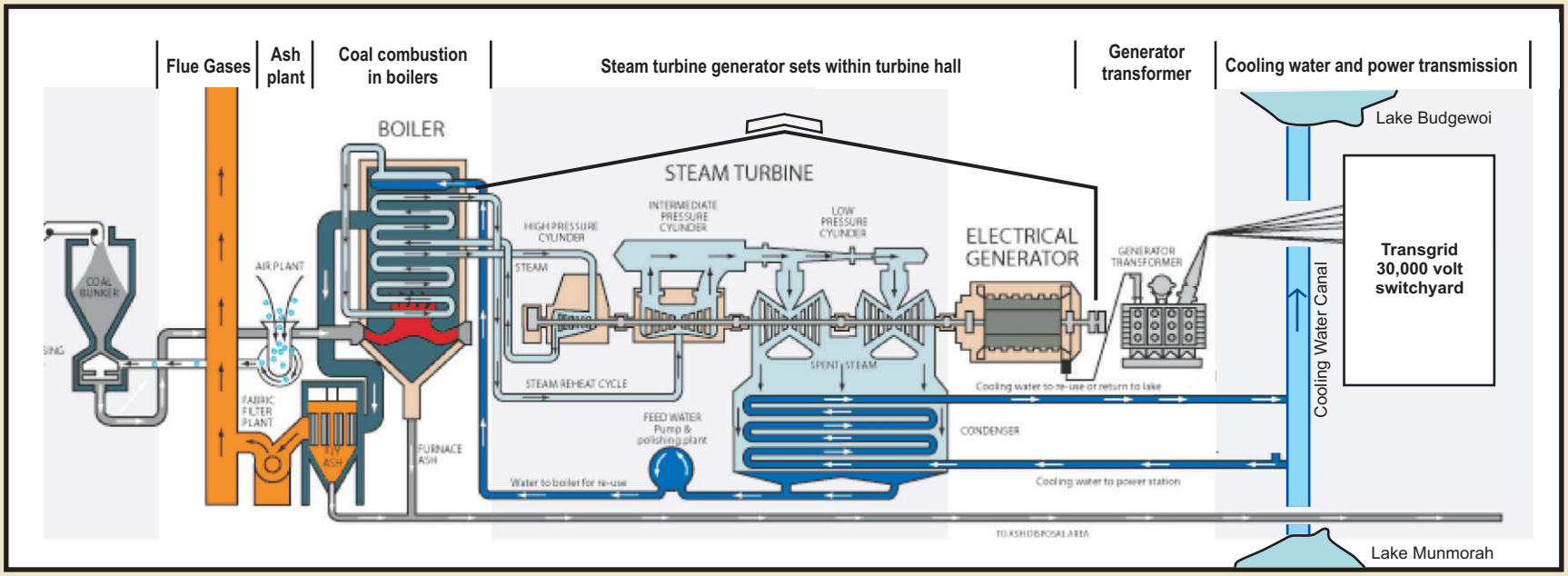
The land is generally low lying with Lake Munmorah to the east and Lake Budgewoi to the south. Large tracts of bushland surrounding the power station site and provide a buffer between the power station and the residential and industrial areas. Residential developments occur from about one kilometre from the power station (See Figure 4).




SCALE
0 500m 1km

Munmorah Power Station **Rehabilitation**

**FIGURE 3:** Site Plan




External view of turbine hall

Inside turbine hall units 3 and 4

Generator transformer outside turbine hall

SCHEMATIC ONLY



**FIGURE 4:** Schematic - Munmorah Power Station and Site Photos

## 3.3 Key Elements of the Project

### 3.3.1 Layout

Rehabilitation of the power station will not involve any significant changes to the current layout of the site. The majority of the works will occur within the existing turbine hall of the power station. Any upgrading of the Vales Point – Munmorah coal conveyor would not significantly alter its location.

### 3.3.2 Power Station Rehabilitation

Replacement of the Units 3&4 steam turbines would be preceded by work on the boiler and other plant not connected with the steam turbines. These works are needed to match the capacity and reliability of the respective components to enable the steam turbine plant to deliver the necessary output.

The construction works to replace the steam turbine plant would be staged to allow one unit to continue generating electricity at all times. Following the required ancillary works, the rehabilitation would involve:

- Shut down of the unit
- Decommissioning of the existing steam turbine
- Removal of the steam turbine components in manageable size sections using the large electric overhead crane is positioned in the upper level of the turbine.
- Removal of the old parts off site, most likely for recycling
- Any minor modification of the turbine footings to receive the new steam turbines
- Transport and delivery of new steam turbines to the power station as required. If delivered in advance of the installation works they may need to be stored temporarily on site. It is expected that an equipment lay down area will be required as part of the works
- Progressive installation of the new steam turbine components
- Connection of steam pipes, oil systems, generators and monitoring instrumentation
- Commission of the new plant including Unit performance reviews

An equipment lay down area located within the power station site will be required for the works. This would be used for storage and assembly of the new turbines are required.

### 3.3.3 Water Supply and Management

The cooling water system was designed to service the four units of the original 1,400 MW station. Cooling water is drawn from Lake Munmorah, passes through the power station condensers located below the steam turbines before being discharged via the outlet canal to Lake Budgewoi. Discharges are regulated by the Environmental Protection License (EPL).

The rehabilitation will not change the existing cooling water system capacity.

### 3.3.4 Fuel Supplies and Infrastructure

Former coal mines that operated adjacent to Munmorah Power Station have been closed and coal supply to the station is now via the MV coal conveyor (between Munmorah and Vales Point Power Stations). Gas supply infrastructure exists up to nearby Colongra power station.

The additional fuel requirements could be supplied by either upgrading the conveyor or through alternative fuel supply arrangements (coal or gas). This would be addressed in the EA and be subject to further evaluation at the detailed design stage of the project.

## 3.4 Workforce and Hours of Operation

The workforce required and hours of operation of the power station would not change.

It is expected that a construction workforce of around 150 would be required for the rehabilitation. This is similar to the workforce that has been on site for the recent construction of the Colongra Gas Turbine Facility.

## 3.5 Project Construction Phase

The program for the implementation of the rehabilitation project will depend on the final strategy adopted by the Proponent.

While the earliest completion date can be achieved by extensive outages on both units, it is expected that an approach which maintains at least one of the two units available for service at all times will be adopted. A progressive implementation program where both units are available for the peak demand periods of winter and summer as far as possible is also desirable.

With these objectives in mind the following indicative program is provided:

- Specification, Tendering & Contract Award by mid 2010
- 18 months lead time for new steam turbine manufacture to end 2011
- Major outage work on boiler & ancillary plant in Autumn & Spring 2011
- Turbine replacement & boiler work in Autumn & Spring 2012

To meet this program it will be necessary to ensure that all approvals for the work have been obtained and that any required environmental management plans have been prepared prior to the relevant works being undertaken.

# 4. Planning and Approvals

## 4.1 Introduction

The following sections discuss planning and approval requirements associated with the proposal.

## 4.2 Commonwealth Legislation

### 4.2.1 Environment Protection and Biodiversity Conservation Act 1999

As the proposal falls within the currently existing Munmorah Power Station site, the rehabilitation will not be expected to impact on matters of National Environmental Significance (NES) and referral to the Department of Environment, Water, Heritage and the Arts (DEWHA) is not proposed. This would be discussed in detail in the EA.

### 4.2.2 Australian Greenhouse Office

Delta Electricity participates in the Greenhouse Challenge program. Greenhouse Challenge Plus enables Australian companies to form working partnerships with the Australian Government to improve energy efficiency and reduce GGEs.

## 4.3 Environmental Planning and Assessment Act 1979

Based on the project description Delta Electricity is seeking the confirmation of the NSW Director-General of Planning as to whether, pursuant to Section 75B of the EP&A Act, the project is a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979.

The following information is provided in support of this view.

- Section 75B 1(a) states that Part 3A of the EP&A Act "applies to the carrying out of development that is declared under this section to be a project to which this Part applies: (a) by a State environmental planning policy".
- State Environmental Planning Policy (Major Projects) 2005 in Section 6 (1)(a) "Identification of Part 3A projects" states that development that, in the opinion of the Minister, is development of a kind: described in Schedule 1of the SEPP may be declared a Major Project.
- Section 24 of Schedule 1 "Generation of electricity or heat or co-generation" states that: "Development for the purpose of a facility for the generation of electricity or heat or their co-generation (using any energy source, including gas, coal, bio-fuel, distillate and waste and hydro, wave, solar or wind power), being development that: (a) has a capital investment value of more than $30 million. The capital investment for the rehabilitation of Munmorah Power Station significantly exceeds this threshold.

Delta is also seeking to have the Munmorah project, declared by the Minister to be a critical infrastructure project under section 75C of the Act. Additional provisions in Part 3A would apply should this occur.

The following information is provided in support of this view.

- On the 26 February 2008, the then Premier of NSW announced the need for additional energy supplies in NSW by 2014 when it is predicted that NSW will need an extra 10,500 GWh per year.
- Rehabilitation of Munmorah Power Station will increase the electricity generation capacity in NSW, improve the efficiency of power generation at the site and reduce the greenhouse gas

intensity per unit of electricity generated across the State. The project is also likely to extend the life of Munmorah Power Station in a more carbon constrained environment by reducing the intensity of GGEs produced, consistent with the power generation objectives of the NSW government.

- Recognising the need for additional power supplies in NSW, the then Premier of NSW announced in 2008 that all power station proposals between 2008 and 2013 with a capacity greater than 250 megawatts are to be declared 'critical infrastructure' regardless of fuel source, to help secure the State's future energy needs (Government Gazette February 2008). The project is essential for the State for economic, social and environmental reasons and appears appropriate that the project be classed as 'critical infrastructure'.

## 4.4 Environmental Planning Instruments

State Environmental Planning Policies (SEPP) are prepared under the EP&A Act and complement the Act and its Regulation. Other planning instruments that may need to be considered include Regional Environmental Plans (REPs), Local Environmental Plans (LEPs) and Development Control Plans (DCPs). Subject to a determination regarding the "Critical Infrastructure" status of the project, relevant planning instruments include

- SEPP (Major Projects) 2005 – Discussed in Section 4.3.
- SEPP (Infrastructure) 2007 – Introduced in 2007, this SEPP aims to facilitate infrastructure planning and amongst other things, addresses issues identified from the Owen Report 2007.
- Draft Sydney Regional Environmental Plan – Wyong Development Areas and Coal Mining
- Wyong LEP 1991 - sets out planning controls for development within the Wyong Shire LGA. This includes details of zoning and provisions of the zoning. Munmorah Power Station is located on land classified as '*Zone 5(a) Special Uses (Power station),* for which the proposed rehabilitation is permitted with consent.

A comprehensive discussion of the relevant planning instruments would be provided in the EA.

## 4.5 NSW Environmental Approvals

Potentially relevant legislation is identified in the following sections.

### 4.5.1 Protection of the Environment Operations Act 1997

The aim of POEO Act is to constitute the Environment Protection Authority (EPA), to provide integrated administration for environment protection. The POEO Act 1997 sets outs offences in relation to emissions to air and control of pollution caused by activity on a site, such as plant construction and operation. Generating plant is subject to EPL under the Act.

The station operates under Environment Protection Licence no. 759. The proposed rehabilitation will replace components of the station's mechanical plant within the existing power station building.

**Environment Protection Licence**

Munmorah Power Station is currently classified as a Group 2 facility under the POEO (Clean Air) Regulation. EPL No. 759 has been issued under POEO Act for Munmorah Power Station which is classed as generating plant 1,000 to 4,000 GWh per annum. The license sets operational and emissions limits and monitoring requirements for the power station. Once rehabilitated, a modification to the existing licence conditions may be required.

Other activities permitted under the Licence include aircraft (helicopter) facilities, chemical storage, waste activities and waste facilities.

Delta Electricity has commenced discussions with the DECC concerning the implications of the proposed rehabilitation for the current EPA licence.

## 4.6 Conclusion

The proposal would not be expected to impact on matters of National Environmental Significance (NES). Accordingly, referral to the Department of Environment, Water, Heritage and the Arts (DEWHA) would not be required.

Based on the capital investment value involved and the Major Projects SEPP the project appears to be a Major Project subject to Part 3A. The project would also seem to satisfy requirements for declaration as Critical Infrastructure.

The proposal is permitted, with development consent, under both the Wyong LEP and Infrastructure SEPP 2007. The proposal also appears to be consistent with the aims and objectives of relevant planning instruments.

Subject to the outcome of negotiations between Delta Electricity and DECC, a modification to the DECC EPA licence for the facility (Licence No 759) may be required to reinstate the generating capability of the rehabilitated power station.

# 5. Preliminary Environmental Assessment

## 5.1 Overview

Munmorah Power Station is located on the Central Coast of NSW within about 3 to 4 km from the coast and is surrounded by a largely bushland buffer zone and the lakes. Residential and commercial development, transport routes and various mining and industrial developments are located within the surrounding areas.

Much of the land is low lying coastal land with a number of lakes surrounding the site as follows:

- Lake Munmorah is about 1.5 km to the east of the station and has an extent of about 7.5 $km^2$
- Colongra Ash Dam about 600 m to the north has an extent of about 1.5 $km^2$
- Lake Budgewoi about 1.5 km to the south west being the northern part of the Tuggerah Lakes system.

The key environmental issues arising from the rehabilitation and operation of the power station are discussed in the following sections.

## 5.2 Assessment of Key Issues

### 5.2.1 Energy Use and Greenhouse Gas Emissions

The proposed rehabilitation of Units 3&4 would deliver a significant improvement to Station efficiency and deliver increased energy per unit of coal consumed thereby resulting in lower GGEs per unit of electricity generated.

Under the NSW Greenhouse Gas Abatement Scheme (GGAS) benchmarks are set for GGE levels expressed in tons of carbon dioxide equivalent ($tCO_{2\text{-}e}$) per unit of energy output. While the Scheme is likely to be phased out with the introduction of a NETS from about 2010 the NSW 'pool coefficient' currently provides a useful indicator of the average emission intensity of electricity sourced from a selected set of the major power stations ("pool") serving the NSW Electricity Grid.

Based on Units 3&4 being returned to their original design capacity and operating at 80% capacity factor, the greenhouse emissions are estimated to drop appreciably below the 2009 pool coefficient. These emissions would reduce even further when coal-gas mixture is used as a fuel.

**Conclusions and Need for Further Assessment**
It is expected that the rehabilitated units will be positioned higher in the merit order for scheduled operation by the NEM and may generate for longer periods. The generation could increase from current levels of about 2,000 GWh to 2,600 GWh per year to greater than 4,000 GWh per year.

The increased emissions due to the increase in generation above recent levels will be in part offset by the increased unit efficiency due to the rehabilitation works. This would be confirmed in the EA.

### 5.2.2 Air Quality

The Munmorah Power Station Licence no. 759 identifies assessable pollutants in respect of emissions to air along with monitoring and reporting required for the Station. The emission characteristics of the rehabilitated plant would depend on the detailed design for the rehabilitation and any change in fuel characteristics resulting from fuel supply arrangements. The outcome of EPA licence negotiations, discussed in Section 4.5 may also be relevant.

The following sections discuss issues associated with potential air quality impacts during both the construction and operational stages of the project.

**Construction air quality impacts and their management**

Fugitive particulate emissions from earthworks etc. are the most common air impacts of large construction activities. In this instance, the rehabilitation work is not expected to require earthworks.

As the majority of the steam turbine replacement work will be completed within the turbine hall building, dust emissions from the construction activities are likely to be minor. A construction dust management plan would be developed by Delta / site contractor and be included as part of the Construction Environmental Management Plan (CEMP).

**Operational air quality impacts**

The project involves replacement of the existing steam turbines with more efficient plant, thereby increasing the combined electrical output for the two units from 600 MW back to the original design level of 700 MW. Emissions to the atmosphere would be expected to be the same or less than the original two units when they operated at similar capacity factors.

As the existing boilers would be retained, rehabilitation is not expected to alter the concentrations of particulates and gaseous emissions, when the plant is fuelled by coal. Replacement of some or all of the coal with gas would be expected to result in some further improvement in the emission characteristics of the facility.

As a result of the efficiency improvements the units could be required to operate more regularly in the NEM. While there may be an increase in the total annual emissions when compared with recent operating levels, the operation of the boilers would be within their design specifications. Also, due to the improved thermal efficiency of the plant, emissions per MWh of electricity would decrease. Annual emissions based on gas substitution scenarios would need to be evaluated in the EA.

The station's normal air quality management procedures including monitoring, data review and reporting would continue under its certified Environmental Management System (EMS).

**Conclusions and Need for Further Assessment**

The EA will confirm any changes to emissions to the air based on the improved design in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2005).*

### 5.2.3 Water Management

Munmorah Power Station is located between Lake Munmorah and Lake Budgewoi, which are part of the Tuggerah Lakes System. Cooling water is drawn from Lake Munmorah and discharged to Lake Budgewoi after passage through the power station cooling water condensers. Water discharged to Lake Budgewoi is able to return to Lake Munmorah via a connection channel at the southern end of Lake Munmorah.

Temperature limits for cooling water discharges to Lake Budgewoi provide a basis for managing thermal impacts on sensitive aquatic ecosystems in Lake Budgewoi and Lake Munmorah.
The Environmental Protection Licence (EPL) no. 759 sets limits for discharge temperatures to Lake Budgewoi. These will not change because the power station efficiency is being restored to the original state as part of the rehabilitation.

The key considerations for water quality and thermal impacts on the Tuggerah Lakes are:

- return the efficiency of the steam turbines and waste heat to the condensers to the original design

- maintenance of the condensers to improve the flow through them
- improvements to the station control system that facilitates better monitoring and control of the units
- no change to the cooling water screening system
- rehabilitation of the attemperation pumping system

As the power station is near the end of its life, replacement of the existing steam turbines with new steam turbine plant will achieve the original design efficiency for two units, and the maximum condenser temperature rise would achieve the original design temperature rise of 10.4$^{o}$C or better when operating at 350 MW per unit. The steam turbine plant replacement would therefore mean:

- No changes from the original "as built" plant (assuming two unit operation)
- discharge temperatures continue to meet the EPL conditions
- the extent of the cooling water plume in Lake Budgewoi would be returned to the same size as originally designed for two unit operation
- cooling water flow rates are the same

Since the early 1980s cooling water pumps from the out of service units 1&2 have been used for attemperation to meet the EPL limits as required. This level of attemperation flows will continue.

**Cooling Water Discharge Impacts**

No change in the extent of cooling water plumes with the rehabilitated power station is expected. Accordingly cooling water plumes from the power station following the rehabilitation would have no additional impact on the lake.

Due to reduced reject heat, discharge temperatures may even be less than those from the existing inefficient plant. The existing cooling water discharge flow rate will not change as a result of the rehabilitation because it is proposed to replace the pumps rather than change their capacity (Worley Parsons, 2007).

The Munmorah units originally operated as base load plant. The proposed rehabilitation will return the units to this mode of operation. With no increase in the maximum cooling water flow rate, impacts on the lake would not change from those that have occurred from the operation of the original two units. The rate of entrainment of aquatic life will also not change from the original conditions.

The total volume of aquatic life entrained in any given year is a function of the number of units in operation and hours of operation of the power station. The number of pumps used depends on the number of units operating and whether or not the attemperation pumps are operating. This has varied throughout the operational life of the power station.

**Conclusions and Need for Further Assessment**

The detailed design would ensure that the discharge temperatures and cooling water flow rates are equivalent to or better than the design specifications of the current units. Following a comparison of expected annual flows through the power station cooling water system following rehabilitation, with historic flows, the EA will assess any potential increase in the impacts identified.

There will be no change in impacts of the rehabilitated power station compared to the original (two unit) operations of the power station and significantly less than those experienced when all four units operated at the power station. This being the case, rehabilitation of Munmorah Power Station will not have any additional impact in the lake. The EA will compare the proposed operation following rehabilitation with the original operation of the plant.

### 5.2.4 Hazard, Risk and Incident Management

Munmorah Power Station currently stores and handles a number of Dangerous Goods that are listed in the Australian Dangerous Goods Code, mainly used for water treatment and for conditioning in the water/steam circuit. SEPP 33 lists threshold levels that must be exceeded before the Policy applies.

Facilitating gas firing would require additional considerations for hazard, risk and incident management. This is likely to require additional design modifications to plant items.

**Conclusions and Need for Further Assessment**

The proposed rehabilitation of Munmorah Power Station Units 3&4 may result in the storage of Dangerous Goods above relevant thresholds and therefore a preliminary hazard assessment (PHA) would be undertaken as part of the EA. The PHA would outline the hazard associated with the operation of the rehabilitated facility, identify and assess risk impacts to surrounding land uses, and outline measures to reduce risks, where required. An emergency response and incident management plan would also be required and would be addressed in the EA.

### 5.2.5 Traffic and transport

**Staff movements**

During the construction phase there will be movements of construction staff to and from the site in addition to the normal Delta Electricity staff movements. There is a relatively small staff establishment maintained at Munmorah Power Station and the issue of movements of staff is considered to be within the capacity of the locality to absorb this traffic. Staff movements are expected to be similar to normal station outages or the construction of the gas turbine station that is currently in progress.

**Large and heavy items**

The main traffic issue for the steam turbine replacement project will be the transport of the large and weighty items of the new steam turbine equipment to the site and the removal of sections of the old steam turbine plant.

The details of the new turbine replacement are yet to be confirmed but could involve full replacement of the complete steam turbine including rotor, turbine blades, and inner and outer casings for each steam turbine. The details of the equipment to be transported can be confirmed once contracts have been awarded for specific plant and a suitable Traffic Management Plan developed by the contractor.

**Transport routes**

It is likely that the steam turbine components will be imported via the Port of Newcastle and will need to be transported to the power station by road. It will be necessary to develop and implement a suitable Traffic Management Plan that sets out the measures to be incorporated in the project to ensure safety of all road users and to minimise disruption to local traffic. Measures in the Plan are likely to specify the routes to be used and timing for deliveries.

**Conclusions and Need for Further Assessment**
There will be a need to transport large heavy items to the site. There is also the potential for construction traffic. Traffic associated with the operation of the rehabilitated plant would not be expected to be significantly different from current operational traffic.

It will be necessary to develop a Traffic Management Plan that sets out the measures to be incorporated in the project to ensure safety of all road users and to minimise disruption to local traffic. This would be developed as part of the CEMP for the project.

### 5.2.6 Waste management

Delta Electricity has implemented and fully complies with the NSW Government's Waste Reduction and Purchasing Policy (WRAPP) for existing operations. This policy advocates avoiding waste, reusing materials, recycling and reprocessing and finally disposal if all other options are not possible.

The construction works will be associated with various types and quantities of wastes. As the original steam turbine plant and some other fittings and equipment will be replaced and not reused, their removal from the station will be required. It is expected that they will be directed to materials recovery facilities where the metal can be recycled. Waste oil management is part of existing site operations. It may be also required to confirm the presence of asbestos, and if present necessary methodologies implemented for the safe removal and disposal.

The management of ash is already part of the Central Coast Power Stations operations. No changes to the ash management system would be proposed as a result of this project. The ash produced by Munmorah Power Station would be expected to be within the range of operating scenarios already included within Central Coast power stations planning.

**Conclusions and Need for Further Assessment**
A waste management plan would be developed and incorporated in to the CEMP for the project. This would incorporate the principles of avoid, re-use and recycle to minimise wastes.

Waste management requirements during operation would be expected to be similar to current operational requirements, and any modifications would be incorporated in to the site Operational Environmental Management Plan.

Ash management is an existing operation. As the rehabilitated power station will operate within the range of operating scenarios for the Central Coast power stations ash management does not need to be assessed as part of the proposal to rehabilitate Munmorah Power Station.

## 5.3 Socio-economic Issues

The proposed turbine replacements will result in little perceivable change from the existing situation for the local community. It does offer extension of employment opportunities for the staff of Munmorah Power Station and some Delta Maintenance staff based at Vales Point Power Station. This is regarded as an important contribution to the local economy and one that if removed could cause some disruption to the local community through either unemployment or relocation of existing local residents.

**Conclusions and Need for Further Assessment**
It is anticipated that a portion of the workers required for the rehabilitation would be sourced from the Wyong/Lake Macquarie/Newcastle area. However, due to the specialist nature of many trades required for the rehabilitation, many of the skilled workers will be sourced from outside the local area. During construction the potential for adverse impacts would primarily be associated with increases numbers of workers in the area placing increased demands on services within the area.

As any short term increase in the local population would be minor, it is expected that the area is well suited to provide any services required during construction. There is the potential for construction traffic and activities that generate noise and dust during rehabilitation. These impacts would be managed in accordance with mitigation measures presented in the EA and the CEMP.

An assessment of socio economic impacts would be undertaken as part of the EA. This would describe the characteristics of the communities in the area affected by the proposed rehabilitation and review the types of issues and concerns expressed by residents and businesses in those areas, as well as the likely impacts and benefits associated with those activities.

## 5.4 Stakeholder Consultation

Delta Electricity has developed a community relations program to inform the community of Delta's operational activities and obtain community feedback. The following consultation activities are undertaken to provide a link between Delta and the community:

- Independent community surveys
- Consultation with key community stakeholders such a local councils
- Quarterly community reference group forum
- Sponsorship of local organisations
- Interaction with media to provide information about operational and community activities
- Publication of reports; annual reports and sustainability reports, and
- Provision of work experience opportunities.

A community consultation plan will be developed for the project, which will depend on the outcomes of any Planning Focus Meeting and specific requirements issued by the DoP and may include:

- Establishment of a database , including all private stakeholders and potentially affected land holders
- Establishment of an information hotline and project email address
- Preparation of material for distribution informing stakeholders about the project and newspaper advertisements to advertise the project.

Meetings would be held with stakeholders/concerned landholders and residents as required. The consultation plan would aim to ensure there is effective, ongoing liaison with the community. The feedback from the consultation activities would be evaluated as part of the social impact assessment.

Measures to reduce adverse impacts and promote positive impacts would be identified in the EA and appropriate management plans developed for the project.

In addition, agency consultation would be undertaken in accordance with the requirements of the Part 3A assessment and approval process.

## 5.5 Other Environmental Issues

There are a range of environmental issues that are not considered to be key issues for this project. It is proposed that these issues will be considered in the EA to assess their level of significance. It is anticipated that any impacts identified would be able to be managed through appropriate mitigation measures and management plans.

### 5.5.1 Noise and Vibration

#### Operation noise level criteria

The existing Munmorah Power Station site was developed before noise control legislation was introduced. Ambient noise monitoring data was obtained at four residential receivers which are representative of the noise catchment surrounding Munmorah Power Station as part of the Munmorah (Colongra) Gas Turbine Facility Environmental Assessment (Parsons Brinckerhoff, December 2005). The survey noted that existing industrial noise was either inaudible or barely audible at night time along with the results it shows no excessive noise emissions from the site.

To ensure amenity of the area is maintained, additional spot noise measurements are required at closer proximity to determine the noise emission from the operation of the existing Unit 3 & 4 as well as of any other significant noise emitting plant equipment that is to be replaced as part of the rehabilitation. This is to ensure that the new equipment will not exceed the existing noise emissions from the site. The collected existing noise levels will then act as project specific noise levels for the new equipment however they should not be applied as mandatory noise limits. This is in accordance with Section 10 of the NSW Industrial Noise Policy which relates to applying the policy to existing industrial premises.

#### Construction noise level criteria

Noise emissions from construction activities associated with the rehabilitation will have to comply with guidelines for assessment of construction noise as specified in Environmental Noise Control Manual, Chapter 171, NSW Environmental Protection Authority (1994) which are shown in Table 5.1 below.

The data collected as part of the is Munmorah (Colongra) Gas Turbine Facility Environmental Assessment is considered sufficient for the purpose of the construction noise assessment, with the determined Rated Background Levels (RBL) representing the background noise $L_{A90}$ at the sensitive receivers.

**Table 5. 1: Periods and criteria when the average maximum noise level ($L_{A10}$) should not exceed the background noise level ($L_{A90}$)**

| Construction time frame | $L_{A10}$ should not exceed $L_{A90}$ by |
|---|---|
| About four weeks | 20 dBA |
| Between 4 weeks and 26 weeks | 10 dBA |
| More than 26 weeks (1) | 5 dBA |

NOTE: (1) - Not specified by the DECC, but used as a criteria

#### Potential operation and construction noise impacts

There will be variable noise levels depending on the stage of the works, however potential construction noise impact is considered to be minimal as the main construction activities will be conducted inside the enclosed turbine hall. The turbine hall building is expected to provide sufficient attenuation for most of the construction noise generated during the works.

The new installed steam turbines should have similar noise levels to the existing plant, but could also have lower noise emission due to technology advancement. However the plant's operational schedule is likely to change as it will change from a standby operation to intermediate or base load status which will signify more frequent and longer periods of noise emissions.

In undertaking the project Delta Electricity will commit to ensuring that the noise arising from the new plant is no greater than for the existing plant and where practicable some reduction in noise levels is achieved.

**Conclusions and Need for Further Assessment**
A noise assessment would need to be undertaken to ensure the impacts of the project do not exceed the noise emissions from the existing power station. This would include monitoring of existing noise levels, construction noise and post rehabilitation operational noise.

A noise assessment would need to be undertaken to ensure the impacts of the project do not exceed the noise emissions from the existing power station. This would encompass:

- Spot measurements of existing noise levels from plant at close proximity
- Prediction of noise emissions due to the new equipment and design on attenuation measures (if required)
- Assessment of construction noise based on construction schedule, methodology and equipment used
- Compliance spot measurements post rehabilitation to ensure noise emissions form the site have not increased.

In the event that the Vales Point - Munmorah coal conveyor is upgraded to allow increased rates of coal transfer, the potential noise impacts would need to be assessed.

The criteria used to assess noise would be in accordance with the NSW Industrial Noise Policy.

### 5.5.2 Flora and Fauna

The proposed rehabilitation will be restricted to existing operational areas of the power station and will not impact terrestrial flora or fauna.

Section 5.2.3 discussed the expected effects of temperature and extent of the cooling water thermal plume in Lake Budgewoi.

**Conclusions and Need for Further Assessment**
As the project would be located within existing operational areas of the site, no impacts on flora or fauna are predicted and no further assessment would be required.

### 5.5.3 Visual Landscape

The replacement of the Unit 3&4 steam turbines will not result any external change to the power station that would be visible from surrounding lands. Some surrounding residential areas will have distant views of the station while other areas will have no views of the station due to either topographic or vegetation screening or due to the aspect of the particular residential area.

**Conclusions and Need for Further Assessment**
The proposed rehabilitation of Munmorah Power Station would not significantly change the appearance of the power station. This would be confirmed in the EA through a review of form and location of project elements. There would be no need for a further detailed visual impact assessment.

### 5.5.4 Cultural Heritage

The proposed rehabilitation will be restricted to existing operational areas of the power station and no impacts on cultural heritage are anticipated. No further assessment would be required.

# 6. Conclusion

This PEA identifies the proposed modifications, involving rehabilitation of Units 3&4 of Munmorah Power Station and the construction activities required for the replacement of the various items of plant and modifications for availability for gas firing and carbon capture readiness.

Based on the available project description an assessment has been made of the potential environmental impacts of the required construction works and the impacts of operating the new plant. The findings of this PEA are summarised below.

- Rehabilitation of Munmorah Power Station forms part of a program of work to restore the capacity and reliability of Units 3&4. The rehabilitation will increase the current capacity of the station from 600 MW to 700 MW.
- Due to the improved station efficiency following the rehabilitation it is likely that the station operation will be more cost competitive and that it may be called upon by the NEM to generate more frequently and for longer periods essentially changing it from intermediate to base load status. Generation would be likely to increase from the current 2,600 GWh/year to in excess of 4,000 GWh/year.
- GGEs per unit of electricity generated will decrease.
- As a consequence of the increased generation, coal consumption is likely to increase from recent levels but the tonnes consumed per unit of electrical output will decrease.
- The station would continue to meet the current EPA licence requirements in relation to air emissions. While the station's stack emissions to air could increase in absolute terms the emission per unit of energy generated are expected to fall. The total generation output will be less than for the originally installed station that had 1,400 MW generation capacity.
- Improvement in the performance of the steam turbine plant will mean that the station will continue to meet current EPA licence requirements in relation to water management, with increased production. Less heat would rejected to the condensers and to the cooling water for the same electrical output using existing plant, resulting in a lower temperature at the condenser outlet and a maximum temperature the same or less than is currently achieved.
- Impacts on the lake systems would not change from the currently permitted operations.
- The steam turbine replacements will require unit shutdown while the necessary works are undertaken. They would be staged so that one unit remains operational and would be undertaken in accordance with the normal outage procedures for the station. Outages also include the relevant environmental management controls to address the potential impacts.
- Transport of the steam turbine plant to the site and removal of the existing steam turbine plant from the site will involve the movement of large and heavy vehicles to and from the site. These movements will need to be undertaken in accordance with a Traffic Management Plan that includes consideration of a least impact route, timing of vehicle movements and road safety for all users.
- No higher noise
- No visual, heritage F&F impacts

Overall the project has merit in terms of improved station performance and life extension of existing infrastructure. Its impacts will be within the permitted impacts of the approved and licensed power station and construction impacts can be readily managed.

Subject to the opinion of the Director-General of Planning NSW it is proposed that pursuant to Section 75B of the EP&A Act, the project is a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979.

Under section 75C of the Act, projects to which Part 3A apply may also be declared by the Minister to be critical infrastructure projects if they are essential for the State for economic, social and environmental reasons.

# 7. References

Commonwealth Government White Paper on *Carbon Pollution Reduction Scheme - Australia's low pollution future,* December 2008 (ISBN 978-1-921298-30-1)

Delta Electricity Corporate Standard (May 2007): Waste Reduction and Purchasing Plan Version 3 (DES EN 001-04)

Delta Electricity Sustainability Report – 2007

Delta Electricity Sustainability Report – 2006

Delta Electricity Sustainability Report – 2003/2004

Delta Electricity Sustainability Report – 2002/2003

Delta Electricity Sustainability Report – 2001/2002

Delta Electricity 2008 Annual Report

IEA 2007: $CO_2$ Capture Ready Plants Technical Study Report Number: 2007/4

NSW Environmental Protection Authority (1994): Environmental Noise Control Manual, Chapter 171.

Parsons Brinckerhoff (December 2005): Munmorah Gas Turbine Facility Environmental Assessment

Prof. Anthony D Owen (September 2007): Inquiry into Electricity Supply in NSW.

Ross Garnaut (August 2008): The Garnaut Climate Change Review – Final Report.

Worley Parson (April 2007): Delta Electricity - Munmorah units 3&4 upgrade studies stage 2 report.