Proposal Description

3

3. Proposal Description

This chapter of the Environmental Assessment provides a detailed description of the works associated with the construction and operation phases of the Munmorah Power Station rehabilitation.

3.1 Overview of Proposal objectives

The objectives of the Munmorah Power Station refurbishment Proposal are to:

- maintain 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
- restore the output of Units 3 and 4 to 350 MW
- replace outmoded and worn components with the currently available technology
- reduce the greenhouse gas emissions (GGE) per unit of electricity generated
- provide for the rehabilitated boilers to be readily converted to accept co-firing with coal and up to 75% gas according to fuel availability and competitive constraints as the CPRS evolves.
- include modifications or provisions required to enable Munmorah Power Station to be carbon capture ready
- identify, minimise and manage environmental and social impacts that might arise as a result of the rehabilitation

3.2 Overview of Proposal details

The proposed rehabilitation programme would not involve any significant changes to the current layout of the site and would not alter the general electricity generation process.

The majority of the works would occur within the existing plant layout of the power station. The components of the Proposal considered by this assessment include:

- rehabilitation of Units 3 and 4 steam turbine and generator components
- refurbishment of major boiler components
- provision for coal and gas firing options
- replace, upgrade, modify and/or maintain auxiliary equipment which includes condenser, circulating water system components, air heater , pulverised fuel mills, fans
- replacement of instrumentation and control system
- make Munmorah Power Station carbon capture ready
- fuel delivery – coal conveyor capacity increase
- removal of obsolete plant.

One of the main aims of the rehabilitation works is to restore the output of Units 3 and 4 to 350 MW. The resulting 700 MW baseload generation would provide around 4,800 GWh of electricity per annum, equivalent to the electricity generated in the 1986/87 period (see Figure 3.1)

Proposed activities were recommended by Worley Parsons in 2007. These activities were further reviewed by Delta Electricity staff during 2007-2008 and reviewed by SKM in July 2009. These are identified in the tables below.

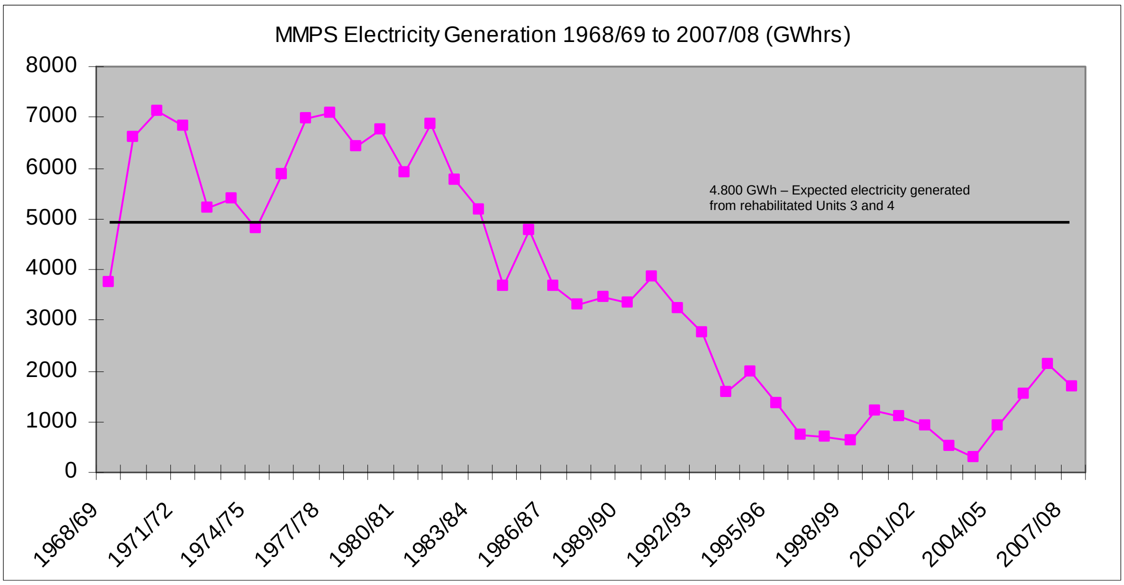


Figure 3.1 – Munmorah Power Station annual total electricity generation from 1968/69 to 2007/08

3.3 Property details

The rehabilitation of Munmorah Power Station and the Munmorah Vales Point Conveyor would encompass the following list of properties:

DP1091396	Lot 12	DP240685	Lot 8
DP1120393	Lot 1	DP518575	Lot 1
DP1134580	Lot 21	DP562635	Lot 1
DP212277	Lot 1	DP578194	Lot 421
DP229395	Lot 4	DP755266	Lot 159
DP240685	Lot 10	DP755266	Lot 161
DP240685	Lot 2	DP755266	Lot 464
DP240685	Lot 4	DP755266	Lot 479
DP240685	Lot 5	DP825212	Lot 2
DP240685	Lot 6		

The locations of these properties are shown on Figure 4.2.

3.4 Construction activities

The general activities associated with the Proposal would include:

- transport of new equipment to site. The larger turbine and generator components would be transported by oversize trucks (See Section 12.1)
- units would be taken out of service to replace the steam turbine components. Only one unit would be taken out of service at a time to allow the other unit to continue generating electricity
- replacement, upgrade, modification and/or maintenance of components on site. Major and auxiliary component replacements are described in more detail in Tables 3.1 – 3.3
- disposal off-site of replaced and maintained components by specialist waste contractors
- commissioning of the rehabilitated plant
- operation of the rehabilitated plant.

Demolition of the plant and major earthworks for construction activities would not be required for any of the rehabilitation works. The major components of the rehabilitation are discussed below.

3.4.1 Construction hours

Construction activities would occur during standard hours of operation. These are as follows:

- Monday to Friday: 7.00am to 6.00pm
- Saturdays: 8.00 am to 1.00pm

No work would be conducted on Sundays or public holidays.

3.4.2 Turbine and auxiliaries

The turbines at Munmorah power station are four cylinder, tandem impulse reaction type, using reheat, and with high-pressure (HP), intermediate-pressure (IP) and twin double-flow low-pressure (LP) cylinders arranged in line. The operating speed is 3,000 rpm. Each turbo-generator is approximately 41 m long and weighs 1,200 t.

The turbines have not achieved the design performance of 8,109 kJ/kWh and performance testing carried out in December 2006 estimated the turbine heat rate to be approximately 14% above design heat rate compared to 6% above heat rate when commissioned in 1969. This poor turbine performance has impacts throughout the plant including:

- increased steam demand with increased feedwater, steam, air and flue gas flows and higher firing rates, fuel usage and ash production
- higher feed pump and condensate pump duty
- increased heat load to the condenser with increased potential for summer load limitations due to outfall canal temperature limits and auxiliary cooling limits with higher condensate temperatures
- reduced operating margins.

(Worley Parsons 2007)

It is anticipated that original plant design capacity and steam cycle heat rate could be achieved if the following works are carried out on the turbines and auxiliary equipment.

Main turbine component replacement

Replacement of components of Units 3 and 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 improve performance and to match steam conditions delivered by the boiler to enable the steam turbine plant to deliver the necessary output. The works would include:

- replacement of the HP and IP turbine rotors
- replacement of HP and IP inner and possibly outer casings
- replacement of blades/diaphragms in the LP turbines

Plate 3.1 – IP turbine blades

- steam valves/chests replacement (including loop pipes).

The construction works to replace the steam turbine components would be staged to allow one unit to continue generating electricity at all times. In parallel additional works would be carried out on turbine auxiliary plant. Table 3.1 provides a breakdown and the objectives of the required additional works.

Table 3.1 – Additional works required for the turbine and auxiliaries

Plant	Proposed works	Objective
Condenser	Complete replacement of Unit 4 condenser tube bundles within the exiting shell	Required for increased capacity and reliability targets.
	Install condensate polishing and associated regeneration plant	Maintain condensate quality to the boiler
	Repair or replace debris filter and ball cleaning system	Prevent deterioration of the condenser
	Replace Unit 4 cast iron waterbox, pipework and valves	Required for increased capacity and reliability targets.

Plant	Proposed works	Objective
	Replace circulating water (CW) pumps	Required for increased capacity and reliability targets. SKM recommends impeller refurbishment, rather than CW pump replacement
	Install attemperation pumps with high flow but low heads	To reduce outfall canal temperatures and prevent summer capacity restrictions. Currently Unit 1 circulating water pumps are used for attemperation
Circulating water system	Upgrade condensate pumps	To increase capacity and improve efficiency
	Retube LP Heaters:	To achieve the reliability targets
	Replace condensate pumps and LP heaters	Required for increased output and/or high reliability targets
Feed pumps	Pump and turbine upgrade required	Contribute to the recovery of steam cycle efficiency. A recommendation is that this whole feed heating system is reviewed and tested before major changes are implemented.
	Upgrade feed pump controls	Improve automatic operation
Feedwater and HP heaters	Retube or replace HP heater	Replacement may be necessary to match steam feed pump turbine performance
Auxiliary cooling (ACW) (3 options)	Upgrade existing arrangement	Retains the existing system configuration but replaces the majority of components, duty of system unchanged Recommendation is to review the ACW/SCW to optimise performance
	Closed loop system with lake cooling water	Closed loop system (demineralised water), cooled by water from the circulating water system or pumped from the intake canal. Increased cooling capacity, less deterioration and maintenance and addresses the environmental risk of oil discharge – expensive
	Closed loop system with cooling tower	Arrangement with a closed loop system (fresh water) cooled by a mechanical draft cooling tower
salt water cooling systems	Upgrade cooler	Replacing particular coolers identified by operation at high load during summer periods to have inadequate capacity and to achieve the reliability targets Recommendation is to review the ACW/SCW to optimise performance

Source: Worley Parsons (2007) and SKM (June 2009)

3.4.3 Boiler plant

The boilers were designed by International Combustion UK and detailed, manufactured and installed by International Combustion Australia Limited. The drums were manufactured in the UK by B&W and the mills supplied by International Combustion UK. The boilers are tangentially fired, down draught, radiant reheat, single-furnace, single-drum with control assisted circulation. Boiler steam pressure is 16,550 kPa at 565°C, and steam flow rate is 309 kg/sec. Figure 3.2 shows a cross section of Munmorah Units 3 and 4 boilers.

Although the units were down rated in 1984 from 350 MW to 300 MW, the current plant is generally limited to 290 MW under normal operating conditions or 320 MW with abnormal operating conditions, with fuel quality and ambient conditions also factors (Worley Parsons, 2007). Table 3.2 provides a breakdown and the components and objectives of the recommended works.

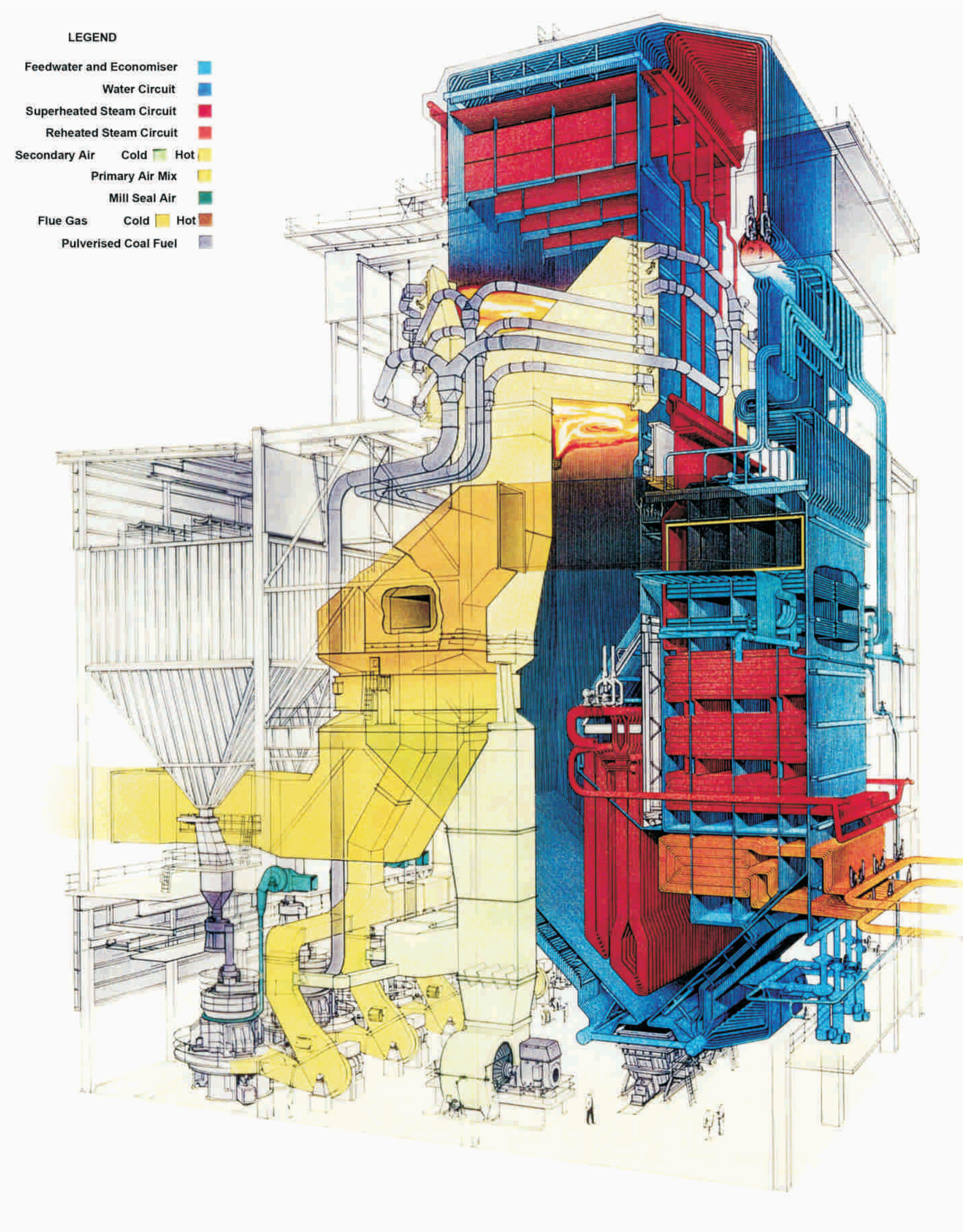


FIGURE 3.2: Munmorah Power Station Schematic

Table 3.2 – Works recommended for the boiler plant and auxiliaries

Plant	Proposed works	Objective
Mills and PA fans	Automate the pyrites system	Would detect when poor quality coal is encountered and automatically clears the pyrites hoppers
	Replace mills, motors	Air flow indication and coal weigher feeders would enable improved plant monitoring by the operator
PA fans	Replace PA fans	Variable speed fans is recommended to operate efficiently, currently fixed speed operation
PF system	Replace PF pipework on Unit 4	Reduce the risk of unscheduled outages.
FD fans	Replace FD fans	Required to achieve 350 MW with sufficient margin to cater for varying coal
Air heater	Replace air-heater baskets and seals on Unit 4	To ensure proper operation of the air-heater
	Upgrade soot-blower system	To ensure proper operation of the air-heater
Economiser	Installation of soot-blowers and lance blowers	To return the units to their design efficiency and recommended due to design and up-flow configuration
	Allowance of two additional rows of tubes in lower bank required on Unit 4	To return the units to their design efficiency
	Boiler pressure parts	
Furnace	Major repairs required include the following:	Bring the unit up to a reasonable new condition for high reliability
	• Replace furnace tubes	Replace hydrogen embrittlement areas
	• Repair cladding	Prevent casing corrosion in various areas
	• Refurbish burnt out front wall support of scallop	
	• Remove and repair various casing	To repair where ash build up caused corrosion, distortion etc.
	• Replace bifurcations on Unit 4	Design improvement.
Superheater	Replace superheater header	Extension of life
	Replace 6th and/or 7th stage elements	Extension of life and remove presence of sigma phase embrittlement
Reheater	Redesign the reheater	Achieve final steam under revised operating conditions and extension of life
Integral piping	Reinstate primary de-superheater	Limit the steam temperature leaving 5th stage superheater (preventing creep) – primary de-superheater is currently not operational

Source: Worley Parsons (2007) and SKM (June 2009)

3.4.4 Electrical plant

The works listed in Table 3.3 were recommended by Worley Parsons to ensure compatibility with other equipment upgrades and to replace deteriorated outmoded equipment.

Table 3.3 – Works recommended for the electrical plant

Plant	Proposed works	Objective
Generators	Replace brushgear	Reduce failures
	Replace hydrogen driers	Reduce failures
	Install multiple brush housing brushgear / installation of brushless static excitation system	OH&S - existing brushes cannot be safely changed on line.
	Replace exciter water-cooled heat exchangers	Life extension and reliability
	Replace rectifier capacitors	Need to be replaced in 2011/12
	Generator stator winding and core overhaul	Life extension and reliability
	Upgrade seal oil system to conventional design	Life extension and reliability
Transformers	Modify LV bushings	Eleven bushings on Units 3 and 4 need to be modified, Prevent oil leaks
	Replace tap changer control boxes	Life extension
	Replace single tube salt water coolers on Unit 4	Higher reliability
	Replace cooling water strainer	Life extension and reliability
	Recondition Unit 3 coolers	Life extension and reliability
	Maintain Units 1 and 2 transformers	Spare parts for emergency replacement
Switchboards	Replace 415V Screens Switchboard	Outdated (contains asbestos)
DC System Batteries	Replace No 2 110V Battery with Plante cells	Life extension and higher reliability. These were replaced in 2009
	Replace No 2 50V Battery with Plante cells	Need replacement for 20 year life. Life extension and higher reliability
Motors	Rewind HV and DC motors	Life extension and higher reliability – rewinding would occur as required and forms part of maintenance program
Cabling	Replace MV Conveyor 3.3kV cables	Life extension and higher reliability - forms part of maintenance program Spare cable procured 2009
PIB	Replace phase isolated busbars with improved design. Preferable to avoid salt water in the cooling system	Life extension and higher reliability.
Protection	Replace AVR of the Emergency Diesel Generator	Life extension and higher reliability Diesel Gen set replaced 2009

Plant	Proposed works	Objective
Miscellaneous Power and Lighting	General replacement of lamps, wiring of turbine and boiler halls, upgrade air conditioning units	Outmoded and deteriorated equipment. Some of the work has already been completed
Network studies	State and dynamic network studies required in accordance with NER	
Control systems	Install burner management system	Life extension and higher reliability
	Install boiler Protection System	Life extension and higher reliability
	Install water ingress protection	Life extension and higher reliability
	Install integrated unit distributed control system	Life extension and higher reliability, NEM compliance

Source: Worley Parsons (2007) and SKM (June 2009)

3.4.5 MV Coal Conveyor

The MV Coal Conveyor runs approximately 6.4 km between the RV7 conveyor at Vales Point Power Station across four transfer stations to the Munmorah Power Station conveyor S1 and main receival bin. The conveyer crosses Rutleys Road via an overpass, crosses the Pacific Highway and existing ash line via underpass tunnels. It then crosses the Munmorah Power Station entry road via another overpass (See Figure 3.3). The conveyor transformers are not bunded but located above a gravel base. The conveyor corridor has been cleared to a width of approximately 10 m and it is secured by a man-proof fence (See Plate 3.2).

This conveyor would be the sole source of coal supply to Munmorah, and truck deliveries which have been employed in the past would be discontinued. The MV conveyor is not operated at night and consequently has a maximum throughput of ~5,600 t/day.

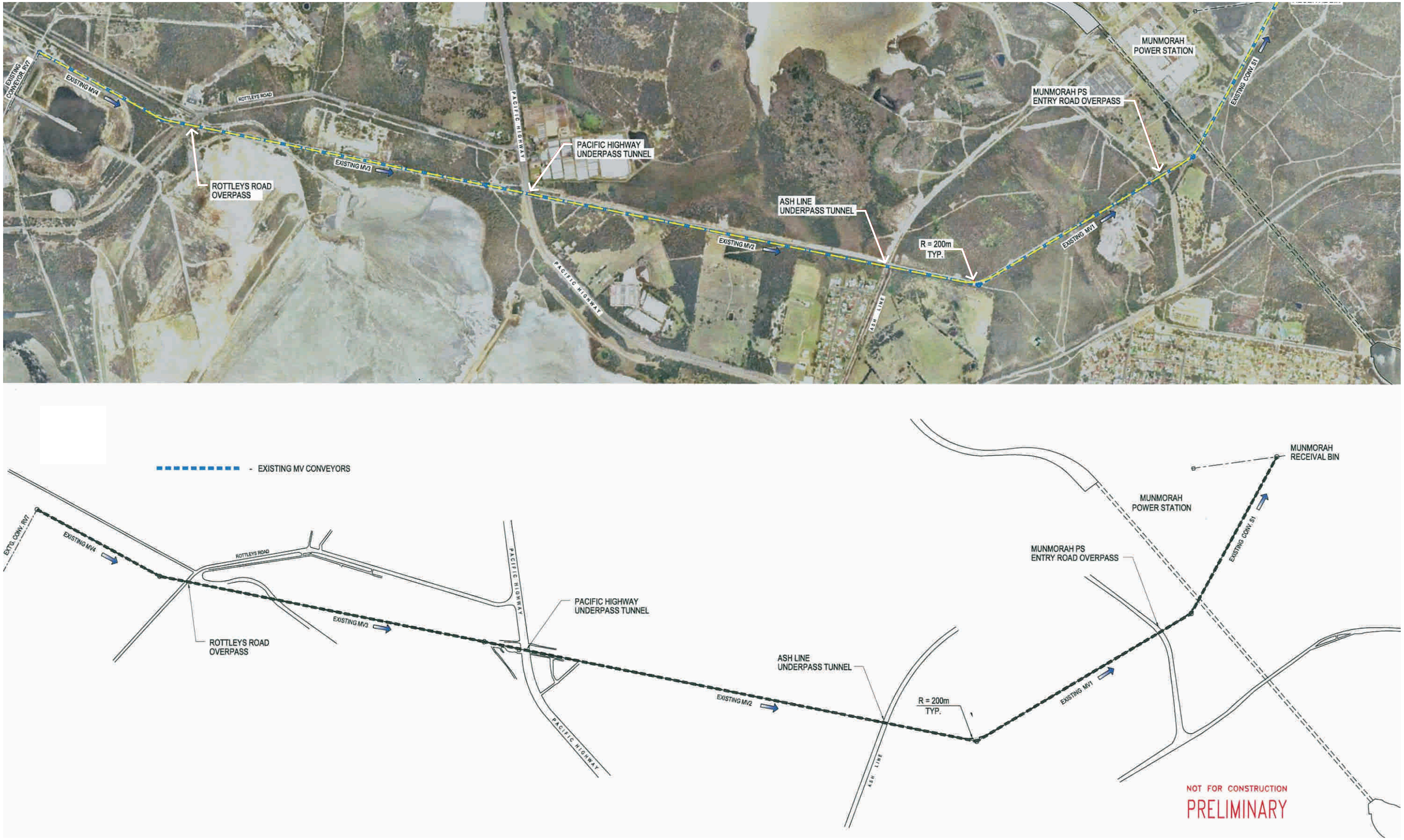
Currently the fuel consumption at Munmorah Power Station is ~3,020 t/day per unit for a unit operating at 300 MW. Based on this, the MV coal conveyor has insufficient capacity to supply coal for two units at 350 MW and 80% capacity factor and would require an upgrade above its current 350 t/h rating (Worley Parsons, 2007)

Laing O'Rourke Australia Pty Ltd was engaged by Delta Electricity to investigate the concept engineering and cost estimates for replacing the existing overland conveyor system. The upgraded conveyor would be designed assuming the transport of unwashed raw coal, with a bulk material density of 850 kg/m^3, maximum lump size of 50 mm and an overall capacity of 1,600 t/hour.

Plate 3.2 – Section of the MV conveyor and conveyor easement

Two concept design options for the upgrade were identified in the review. One option involves the construction of a new conveyor within the existing 10 m fenced corridor. The other option involves a single flight conveyor which would require two minor deviations from the existing 10 m corridor onto Delta Electricity property. This Proposal considers the option within the existing corridor only. Any decision at the detailed design stage to pursue options outside the existing cleared corridor would require separate assessment and approval.

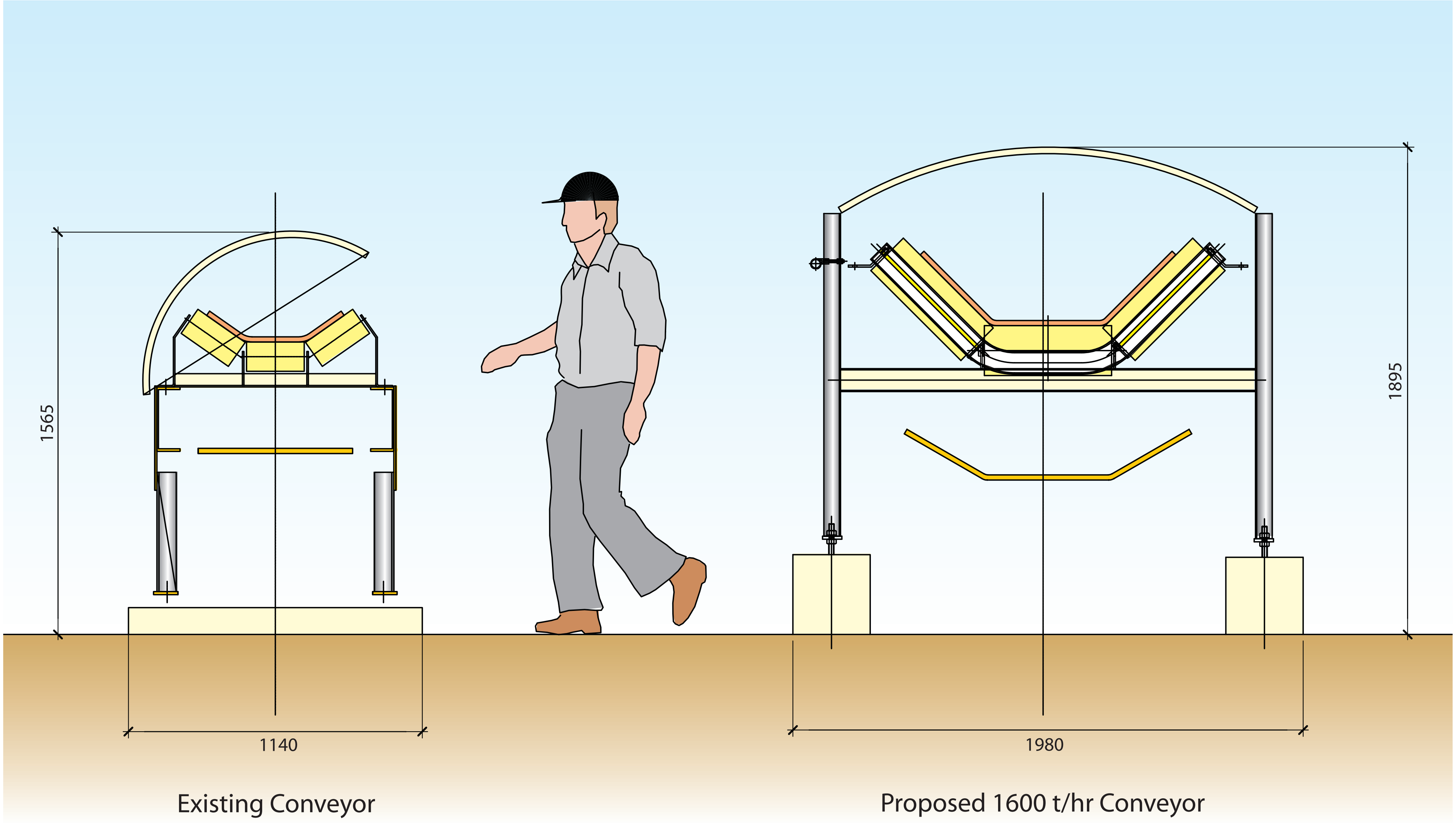
Figure 3.4 shows a cross section of the existing conveyor and the proposed conveyor (Laing O'Rourke, December 2008)



Source: Laing O'Rourke 2009 report

Munmorah Power Station **Rehabilitation Environmental Assessment**

FIGURE 3.3: Route for MV Conveyor



Source: Laing O'Rourke 2009 Report

FIGURE 3.4: Cross Section of Existing MV Conveyor and Proposed Upgrade

Should access be required to neighbouring properties for construction access, this would be undertaken in consultation with the relevant landholders. Where possible, access would be obtained through existing access points.

The upgraded conveyor would continue to cross Rutleys Road, the existing ash line, and Munmorah Power Station entry road (See Plate 3.3). The conveyor also passes under the Pacific Highway through a purpose built culvert, There may be some minor interruptions to traffic on Rutleys Road and the Pacific Highway while the conveyor sections at these crossings are replaced however such impacts would be temporary and appropriately managed through traffic control.

It is anticipated that the replacement overland conveyor would operate in day time hours, similar to the existing arrangement.

Plate 3.3 – Section of the MV conveyor passing through a culvert

3.4.6 Modifications required for co-firing

As the proposed Munmorah rehabilitation would allow for potential gas firing, an investigation was undertaken by Aurecon into the technical feasibility of co-firing varying proportions of natural gas with coal into the existing boilers (Appendix C). The study looked at co firing with 25%, 50%, 75% and 100% gas. The study indicated that 100% gas firing is not considered to be viable as the extensive modifications required would result in the Munmorah boilers no longer being suitable for coal firing. Based on this, only co-firing up to 75% gas would be considered as part of the rehabilitation project.

For either 100% coal or co-firing, reheater performance requires improvement to regain the shortfall in hot reheat temperature. Reheater works are included in the rehabilitation program (See Table 3.2).

For the purpose of this high level study, it has been assumed that natural gas would be available at the boundary of Munmorah at mains pressure. The pressure would be let down through a pressure reducing station after being heated in a bath. The system requires the following components for gas co-firing:

- gas burners would need to be installed together with their detection and monitoring systems and equipment required for integration into the integrated control and monitoring system (ICMS) if co-firing with gas is adopted. The initial proposal is to replace the existing eight oil igniters (per boiler) with gas burners
- gas reticulation piping would be required from the boundary to the Water Bath Heater and the pressure Reducing Station and thereafter to reticulate gas to individual burners on the boiler.
- natural gas fired water bath heater is required to heat the gas prior to expansion to counteract the Joule-Thompson effect
- pressure reducing station is required to regulate the delivery pressure to the power station so that the system components are protected from overpressure and pressure fluctuation.

3.4.7 Other plant and processes

The Proposal would not involve any significant changes to the current layout of the site and would not alter the general electricity generation process.

Fuel supply

It is expected that restoring the units to the original 350 MW would result in an overall increase in the amount of coal combusted, but due to the improved efficiency the coal consumption per MW generated would decrease. Transport of coal via the MV coal conveyor has been addressed in Section 3.4.5. Transport options for gas are addressed in Section 3.5.

Ash disposal

Currently flyash from Munmorah Power Station is disposed of at Vales Point Ash Dam, while furnace ash is disposed of at Munmorah Ash Dam. It is expected that the rehabilitation of Munmorah Power Station would shorten the life of the Vales Point Ash Dam by anything between two and eight years,

A preliminary investigation of viable options for the future disposal of flyash from Munmorah Power Station, beyond the current projected life of the Vales Point ash dam, was undertaken by Aurecon. Several options for flyash disposal technologies have been identified and considered feasible at a conceptual level. The current storage capacities, processes and possible future disposal options are discussed in more detail in Chapter 9.

Water management

The delivery of potable water to the site and the on-site management options for clean and dirty water remain largely unchanged. Water cycle management is described in detail in Chapter 8. The Proposal would continue to use lake water for cooling, however due to the increased efficiency of the turbines and condenser resulting from the rehabilitation works, the reject heat would be reduced, thus reducing the expected average temperature increase at the cooling water outlet. Plume modelling for the Proposal is included in Chapter 8. The proposed refurbishment of the plant is not expected to increase the overall freshwater consumption compared to the 'as built' power station's water use in the 1960s. In addition, a number of water saving measures have been implemented at Delta Electricity's Central Coast power stations since the severe water restrictions experienced in 2006.

3.5 Fuel sources and options

This section provides an overview of the options available to supply either natural gas, including coal seam gas and coal.

3.5.1 Fuel Demand for Munmorah

The upgraded Munmorah Units 3 and 4 operating at 700 MW output would require a fuel input of approximately 7000 GJ/hr (based on 36% efficiency). This is equivalent to 168 TJ/day or 61 PJ/annum if the units were to operate at 100% capacity factor. This energy demand may differ slightly depending on whether natural gas or coal is used but for the purpose of this study it would be assumed that the energy input from either coal or natural gas fuel is essentially the same. Over a year however the total energy delivered would be determined by the actual capacity factor. For an 80% capacity factor this would be approximately 49 PJ/annum.

3.5.2 Natural Gas

The location of the gas resources and pipelines in Australia are indicated in Figure 3.4. It can be seen from the relative location of the gas resources and pipelines that NSW currently has to import natural gas from other states.

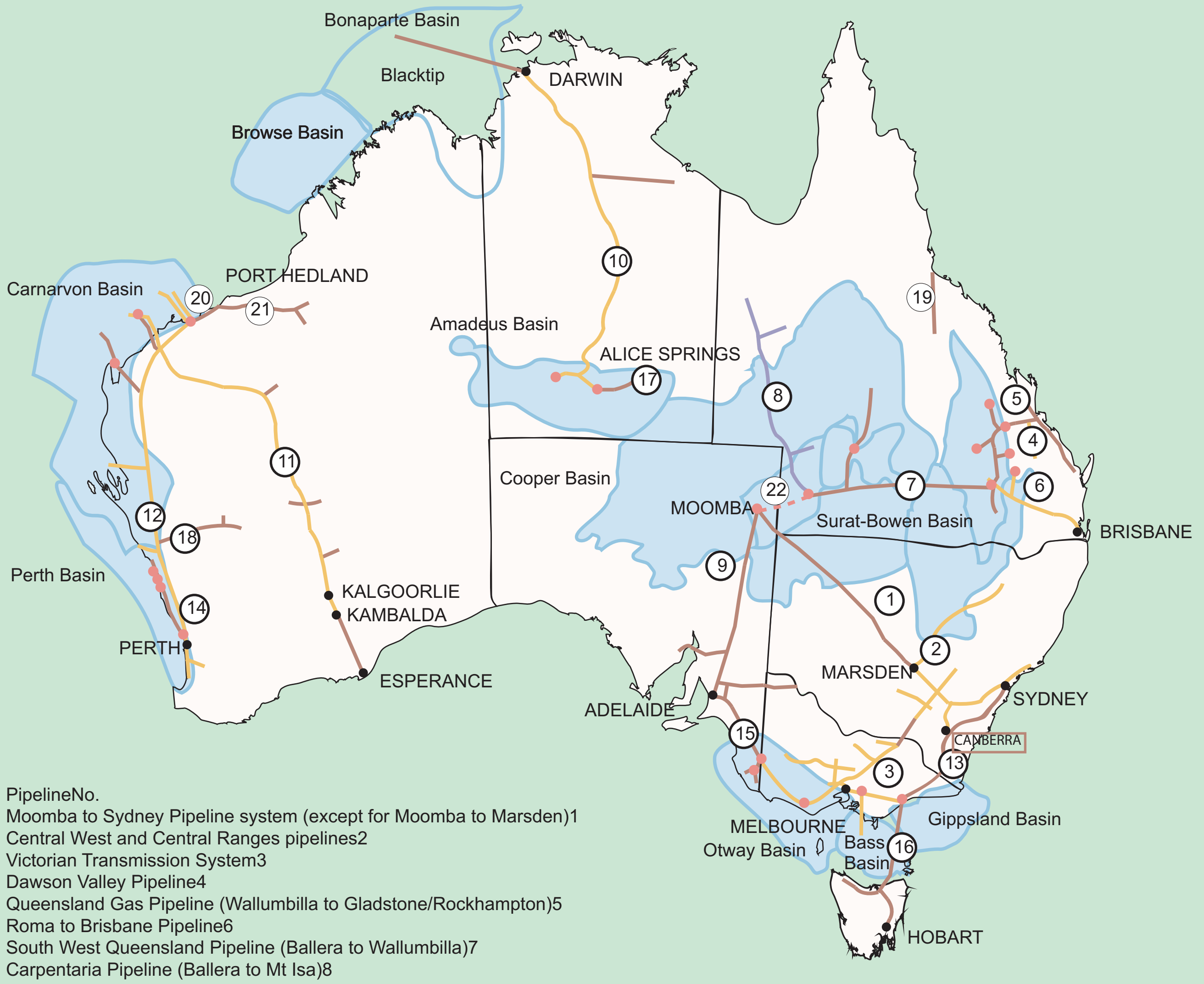
Investigations indicate that ample gas resources exist in south-east Australia to support a gas-fired base load station at Munmorah. Evidence from publicly available reports and papers to support this conclusion is included in the fuel options study (Aurecon, 2009) and presented briefly below.

3.5.3 Gas demand for Munmorah

Gas resources need to be able to supply the estimated amount of gas over the life of a project while the processing and pipeline system must deliver at the rate of consumption.

The upgraded Munmorah Units 3 and 4 would require the following:

- a rate of supply would of 7000 GJ/hr, 168 TJ/day or 61 PJ/annum
- an annual quantity of 49 PJ.



PipelineNo.
Moomba to Sydney Pipeline system (except for Moomba to Marsden)1
Central West and Central Ranges pipelines2
Victorian Transmission System3
Dawson Valley Pipeline4
Queensland Gas Pipeline (Wallumbilla to Gladstone/Rockhampton)5
Roma to Brisbane Pipeline6
South West Queensland Pipeline (Ballera to Wallumbilla)7
Carpentaria Pipeline (Ballera to Mt Isa)8
Moomba to Adelaide Pipeline system9
Amadeus Basin to Darwin Pipeline10
Goldfields Gas Pipeline11
Dampier to Bunbury Natural Gas Pipeline12
Eastern Gas Pipeline (Longford to Horsley Park)13
Parmelia Pipeline14
SEA Gas Pipeline15
Tasmanian Gas Pipeline16
Palm Valley to Alice Springs Pipeline17
Midwest Pipeline18
North Queensland Gas Pipeline19
Pilbara Pipeline20
Telfer Pipeline21
QSN Link22

Gas basins
Gas processing

Existing uncovered natural gas pipelines
Existing covered natural gas pipelines
Light regulation pipelines
Under construction

Acknowledgement:

Principal sources: ABARE, Energy in Australia 2008, Canberra, 2007; EnergyQuest, Energy Quarterly Report, February 2008, 2008; NERA, The Gas Supply Chain in Eastern Australia —A report to Australian Energy Market Commission, 2007. Reproduced under licence from the Australian Energy Regulator, figure 9.1, page 256 of the State of the energy market 2008.

J:\JOBS\ENERGY\TMUNMORAH\41442.001.01\09.04.09\RC\Rec 0

FIGURE 3.5: Gas pipelines and gas basins

3.5.4 Gas resources

Natural gas resources occur naturally and must be established to be available for sale to support a project. Natural gas reserves are described using the conventional 1P and 2P classifications where 1P (Proven) Reserves can be borrowed against, 2P (Proven and Probable) Reserves can be contracted and 3P (Proven, Probable and Possible) Reserves are an indicator of future potential. There is little incentive for gas producers to prove up reserves of gas if there is no ready market, unlike oil reserves which can be easily transported and sold on the world market. Consequently, the 2P reserves tend to be the indicator of potential for future sales, albeit this may cover a time period of many years.

An overview of the gas resources in eastern Australia was undertaken (Aurecon, 2009a).This review indicates that the 2P resource base is increasing significantly due to the potential demand and the very large resources of coal seam methane that has been shown to exist in Queensland. The proven reserves of this resource have increased significantly in the past few years in response to expected demand from LNG facilities. In NSW, there are also large gas resources that have not yet been developed, and these resources are in the order of potentially thousands of PJs.

It may be concluded from the discussion on gas resources the fuel options report that there is likely to be more than sufficient gas to supply 49 PJ/annum to Munmorah from the existing and potential reserves. However the price of gas needs to be addressed as that determines which resources would be developed and how much gas is available. Prediction of price is beyond the scope of the report but the main price driver is likely to be from the potential to export gas as liquefied natural gas (LNG) which would tend to drive natural gas to world prices when export markets are available.

3.5.5 Gas pipelines

Table 3.4 summarises the capacity of the pipeline system in NSW to deliver gas to Munmorah and as can be seen the system has no available capacity. Delivery of significant quantities of gas, as required for Munmorah, would necessitate the upgrade of the existing system or additional pipelines. Upgrades of pipelines may involve additional compression on the line and/or looping of the line to achieve the flow rate necessary to meet the demand for gas. The addition of compression would initially deliver cost effective upgrades to the capacity but due to the nature of compression increasing the number of compression stations on a line would not deliver proportional returns in capacity and eventually looping would be more cost effective. It would be necessary for enquiry to be made to the pipeline owners/operators to assess at any time capacity availability and potential for upgrades.

New pipelines could also be constructed to provide the necessary gas supply with two proposals for such pipelines in the public domain. The proposed 831 km Hunter Gas Pipeline would, if constructed, transmit conventional and coal seam gas from the Wallumbilla gas hub in Queensland to Newcastle. The APA Group, owner of the MSP system, has proposed a pipeline link between the Wallumbilla hub and the Bulla Park compressor station which is located west of Cobar on its Moomba to Sydney Pipeline. This would represent an alternative route to the Queensland Hunter Pipeline (QHP) for transporting CSG into NSW.

The above noted pipeline could provide the necessary connection to the Queensland gas resources to facilitate delivery of that gas to NSW and consequently to Munmorah with some additional pipeline infrastructure. Where new or upgraded pipelines are required they could, in general, be constructed using the existing easements thus avoiding disturbance of additional native vegetation. The environmental impacts of new pipelines or the upgrading of existing pipelines would be covered in the projects associated with those pipelines. In order to deliver gas from the Wilton Newcastle pipeline to Munmorah the existing easement for the Colongra pipeline could potentially be utilised also avoiding additional impacts.

3.5.6 Conclusions for gas supply options

On the issue of adequacy of the gas resource it is concluded that there would be access to sufficient gas resources to supply a gas-fired power station at Munmorah. The principal options to be considered for the supply of gas are:

- conventional natural gas from the Gippsland or Otway Basins in Victoria
- conventional natural gas from the Cooper-Eromanga Basin in Queensland or South Australia
- coal seam gas from the Bowen or Surat Basins in Queensland
- coal seam gas from the Clarence-Moreton Basin in southern Queensland or northern NSW

- coal seam gas from the Gunnedah Basin in northern NSW
- coal seam gas from the Gloucester Basin in NSW.

Gas exploration in these basins is at widely varying levels of maturity. The Cooper-Eromanga Basin is a mature province and its production is now in decline. However, significant reserves of tight gas are known to exist there. It is possible that the general upward price pressure evident in the market may mean that gas can be sources competitively from there.

The Gippsland Basin is also a mature producing province but gas discovered there some years ago is only now being developed because there has been adequate gas available previously. New gas field developments in the Otway Basin are now providing additional gas for the south-east Australian market.

Coal Seam Gas (CSG) development in NSW is less mature and reserve levels are lower, than in Queensland. However, the Gunnedah and Gloucester Basins in particular are undergoing exploration which could prove fruitful for Delta Electricity. The relative proximity of these potential sources is of note.

CSG development in the Bowen and Surat Basins has boomed in very recent times. With a massive increase in 2P reserves, this region probably offers the greatest promise in the short term as a possible source of gas for Munmorah.

Depending upon the source of the gas which might supply Munmorah, the Moomba Sydney Pipeline, the Eastern Gas Pipeline or the proposed Queensland Hunter Pipeline (QHP) could be the means of gas haulage to the station. If supply were to be via the MSP or the EGP, capacity could be provided via additional compression, possibly in combination with looping. It is expected that the existing pipeline easements to facilitate the construction of new pipelines to Munmorah and irrespective of this new pipelines would be subject to their own environmental impact assessment.

3.5.7 Coal in NSW

The major coal resources of NSW are located in the 500 km long, 150 km wide, Sydney-Gunnedah Basin. The Basin extends from south of Wollongong to north of Newcastle and north-westerly through Narrabri into Queensland.

Minor coal resources are located in the Gloucester and Oaklands Basins. The coal measures in the Sydney-Gunnedah Basin are bituminous in rank and Permian in age and consist of a large variety of coal types ranging from low-volatile, hard coking coals to high quality thermal coals. There are five major coalfields within the basin: Hunter, Newcastle, Southern, Western and Gunnedah.

A major factor in the economic development of NSW has been easy access to coal as an energy resource for the State’s main industrial centres. Continued development of these resources needs to take into account competing land uses and various environmental issues.

Table 3.4 – Natural gas pipelines serving Munmorah

Pipeline	Owner	Significant Available Capacity in current configuration	Reported Potential Capacity Increase
Moomba to Wilton	APA Group	None	300 to 400 TJ/day (see Sect 4.4.1 for Ref)
Wilton to Newcastle	Jemena	None	Not Reported
Longford to Horsley Park	Jemena	None	32TJ/day [2] in 2011

[2] http://www.jemena.com.au/operations/transmission/egp/assetDetails/transServices/default.aspx

A map[3] (2007) of the NSW coalfields is shown in Figure 3.5.

In regard to the source of coal for coal fired power plants in NSW, the NSW Government has announced[4] that it has secured future coal supply for the State owned power generators by extending an invitation to them to apply for a coal exploration licence in the Dunedoo area. The identification of this resource, in the Cobbora area, near Dunedoo, is based on exploration by the Department of Mineral Resources. The resource is a large unallocated domestic grade deposit in the Western coalfield, which is expected to be amenable to low cost mining. The resource is also said to be substantial and suitable for domestic power generation.

3.5.8 Coal supply to Munmorah Power Station

The Mandalong coal mine supplies coal to the Vales Point /Munmorah Power Station's and also to Eraring Power Station under long-term contracts and also targets export sales. It is located near Morisset in the Newcastle Coalfield of NSW and has recoverable reserves estimated to be 102 million tonnes[5]. Longwall mining commenced in January 2005.

Munmorah would require a new coal contract for an upgraded plant as the current Munmorah/Vales Point contract would not provide the necessary quantity. The new coal resources that are being assessed for use in NSW power stations are expected to provide fuel at a cost suitable for the purpose, as noted above. Investigation of rail transport options are being pursued by Delta Electricity for delivery of coal to the station using the existing rail system.

Currently coal for Vales Point from the Mandalong mine goes to the Wyee coal unloader and can be diverted to Munmorah without going to the Vales Point stockpile. The coal is delivered from the coal unloader by the RV (Rail to Vales) conveyor that is rated at 1600t/h. To deliver coal to Munmorah it is transferred to the MV conveyor which delivers it to the station, this conveyor is rated at 350t/h. The MV conveyor needs upgrading to separate coal supplies from Vales Point to the upgraded Munmorah as each station can potentially use different types of coal. Upgrading of the MV conveyor is also required as the lower rating makes train unloading is too long resulting in constrained coal delivery to Vales Point.

[3] http://www.dpi.nsw.gov.au/minerals/resources/coal/coalfields
[4] Minister for Mineral Resources, Ian MacDonald, Press Release,15 May 2009
[5] http://www.centennialcoal.com.au/ssl/axs/1/2.asp?recID=155

3.6 Decommissioning Munmorah

The extent of the decommissioning process for Munmorah Power Station is highly dependent on the future use decided for the site at the time. For example, it may be determined that the cooling water system should be left in place as it could be utilised by a future site use. At this juncture this is impossible to predict. Therefore the description below revolves around the total removal option to ground level only. Ground slabs and foundations below ground level would not be removed unless a new use for the site requiring these to be removed had previously been identified.

The discussion also reflects today's statutory environment which may well have changed by the time the decommissioning process begins.

If development approval were required for the process it would be sought prior to works commencing.

The decommissioning of Munmorah Power Station would involve the following processes.

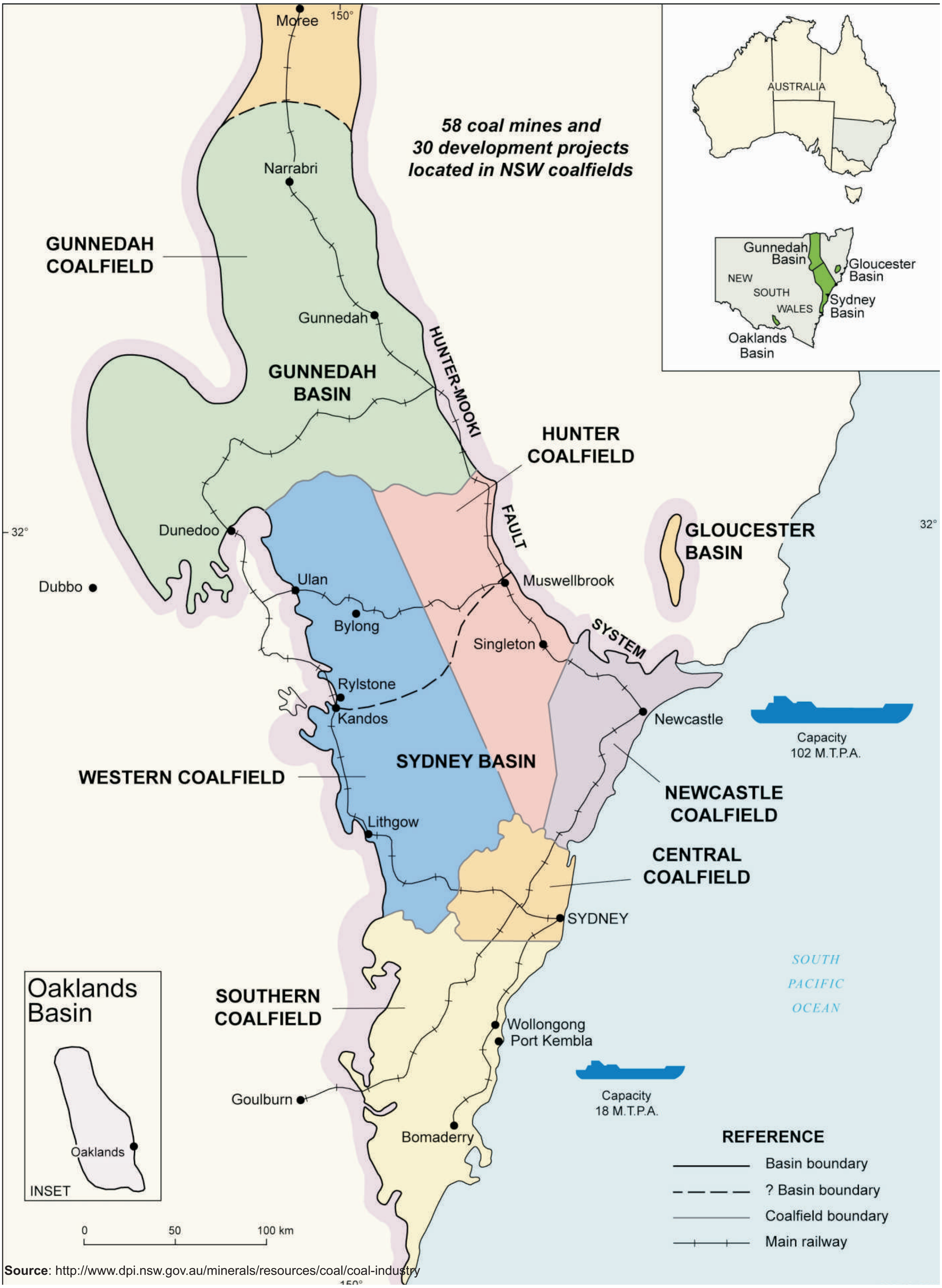
3.6.1 Identification and compilation of relevant information

All available drawings of the power station's plant, equipment, structures and subsurface systems should be identified and compiled for the decommissioning process.

All relevant information such as plant manuals and photographs should also be compiled for assistance during the decommissioning process. Photographic records should include all photographs available in the station's history.

3.6.2 Heritage issues

Statutory heritage requirements should be followed as part of the decommissioning process.



Source: http://www.dpi.nsw.gov.au/minerals/resources/coal/coal-industry

J:\JOBS\ENERGY\TMUNMORAH\41442.001.01\09.04.09\RC\Rec 0

3.6.3 Identification and removal of hazardous materials from the site

A contamination study for the entire site would be conducted. This would identify hazardous materials present on the site. An initial subsoil survey for contamination would be conducted as part of this process.

All remaining fuels including coal, fuel oil and gas would be removed from the site.

All materials with hazardous potential, such as oils, grease, industrial gases and chemicals would be removed from the site in accordance with statutory requirements.

Traceability of the disposal process would be a key component of these activities.

3.6.4 Plant and system isolations

All equipment and plant systems would be isolated, disconnected and made safe. The electrical connection to the grid would be removed and a supply from the local distribution authority would be installed. Where possible, new electrical supplies would be run as required to maximise safety of the decommissioning workforce. Electrical supplies would be maintained to lighting, essential pumping systems (drainage and sewage) and elevators where required.

Essential fire protection systems (water based) would be identified and left in place to assist during the decommissioning process.

The transmission network equipment on the site may be removed at the discretion of the network operator. This would include the switchyard and its equipment and any redundant transmission lines.

3.6.5 Plant decommissioning

Plant decommissioning would involve the following:

Initial works

Removal of any lubricants and fluids from plant and equipment and disposal would be undertaken in accordance with statutory requirements.

Insulation and asbestos removal

All insulation materials from plant and equipment would be removed. The vast majority of asbestos insulating materials have already been removed from the site. The replacement synthetic mineral insulation material would be removed and disposed of in accordance with statutory requirements. It is noted that limited asbestos bearing materials would be present in the form of high temperature gaskets and building materials (eg fibre cement). The site asbestos register would however list all these items. By the time the plant is decommissioned these may all have been removed.

Removal of plant and equipment

Plant and equipment would be dismantled and removed from the site. The process for elevated items of plant would vary depending on the nature of the equipment being removed. Large items would normally be lowered by cranes. The controlled collapse/dropping of some items would occur also. Such processes would be covered by the relevant statutory requirements.

Demolition of buildings and structures

Buildings and structures would be demolished once the removal of internal plant and equipment from each building or structure was completed. Prior to demolition, the building or structure would require certification that all hazardous substances had been removed.

The demolition process would be machinery based with the use of excavators and cranes as required. Demolition by explosives would be highly unusual. The turbo-generator foundations are large mass concrete structures filled with structural steel and large reinforcing elements. These foundations would likely be split chemically prior to demolition by machinery.

The chimneys would most likely be demolished by the use of explosive charges if statutory approvals could be obtained. This method would generally be utilised due to the unconfined nature of the site and the buffer zones that exist to neighbours.

Recycling

Recycling of dismantled plant and demolished structures would be a high priority in the decommissioning process. All scrap metal (eg steel, copper, lead etc) would be recycled. Masonry and concrete would be crushed to useable sizes and sold as road base and fill. Minor amounts of timber would be liberated during the decommissioning process and, depending on the condition of the timber; it would be either sold as second hand timber or chipped.

Truck movements

Truck movements would peak during the dismantling and demolition part of the process moving scrap steel and demolition waste. It is estimated that truck movements could peak at up to 30 per day but this would be highly conditional on the dismantling and demolition philosophy adopted by the demolition subcontractor. The vast majority of these truck movements would head straight to the Pacific Highway and then to Newcastle or Sydney.

It is anticipated that scrap steel would be processed by excavators with shears on site into sizes suitable for direct entry into furnaces. The advantage of this approach is that the number of truck movements would be optimised as the mass of individual loads leaving the site would be brought to the legal capacity of the track, ie space use would be maximised.

Equipment

Hand work would be minimised wherever possible for both OH&S and economic reasons. Machinery to be used during the process could include:

- excavators ranging from 3 t to 80 t in capacity
- skid steer loaders
- small bulldozers for spreading material, if necessary
- wheeled loaders
- trucks ranging from double axle tip trucks to semi-trailer tippers
- cranes ranging in capacity form 16 t articulated mobile cranes to 500 t jib cranes.

Disposal of waste

As discussed earlier, the majority of materials liberated during the decommissioning process would be recycled. All remaining waste from the decommissioning process would be disposed of in approved landfills. Any asbestos waste would be disposed of in appropriately licensed landfills.

Monitoring of emissions during the work

During the decommissioning process the following potential emissions from the site would be monitored:

- asbestos, if asbestos removal works were in progress
- dust, at points on the boundary of the site as agreed with local authorities
- noise, at points on the boundary of the site as agreed with local authorities.

Final condition of site

Power station site proper

As discussed earlier the power station proper would be left with ground slabs in situ and any pits filled with demolition rubble unless a future identified use for the site required otherwise. Cable tunnels would be left in-situ (unfilled) unless specifically required otherwise. Wherever possible drainage systems would be left in situ or put in place to deal with future rainwater run off.

Ash dams

The ash dam would be capped with an approved material to prevent fugitive dust from leaving the site and limit infiltration of rain and surface water into the ash deposits. A monitoring program for dam condition and leachate would be put in place and continued as necessary.

Coal stockpile

As discussed earlier, any remaining coal would be removed from the site. The coal stockpile area would then be rehabilitated and probably grassed, depending upon the future use identified for the site.

Contamination survey

At the completion of the plant removal and demolition process a further site contamination survey would be conducted to check on the final status of contamination at the site. Any remediation works necessary would entirely depend on the results of the study.

3.7 Schedule

Demolition of the entire power station site could take up to 2.5 years. Much of the work would not be apparent to the surrounding community with minimal truck movements. The peak demolition process would be expected to take approximately 18 months.