



NARRABRI MINE
ENERGY SAVINGS ACTION PLAN



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EXECUTIVE SUMMARY

This updated Energy Savings Action Plan (ESAP) has been prepared by Narrabri Coal Operations Pty Ltd for the NSW Department of Planning and Infrastructure (DoPI).

The purpose of this document is to meet the planning consent requirements for Stage 2 of the project, issued on 26 July 2010 (Clause 30) as detailed below:

STAGE 2 Approval

Energy Savings Action Plan

30. The Proponent shall revise the Energy Savings Action Plan for the Stage 1 project to encompass all proposed mine activities and potential impacts associated with energy management for the site (Stages 1 and 2) and subsequently implement this revised version of the Energy Savings Action Plan to the satisfaction of the Director-General. This plan must:

- (a) be prepared in consultation with DECCW;*
- (b) be prepared in accordance with the Guidelines for Energy Savings Action Plans (DEUS, 2005), or **its latest version**;*
- (c) be submitted to the Director-General for approval prior to 30 June 2011;*
and
- (d) include a program to monitor the effectiveness of measures to reduce energy use on site.*

Furthermore this ESAP has been updated to be consistent with the requirements of Section 3 of the Federal Energy Efficiency Opportunities Act 2006, as detailed below.

3 Object

- (1) The object of this Act is to improve the identification and evaluation of energy efficiency opportunities by large energy using businesses and, as a result, to encourage implementation of cost effective energy efficiency opportunities.*
- (2) In order to achieve its object, this Act requires large energy using businesses:*
 - (a) to undertake an assessment of their energy efficiency opportunities to a minimum standard in order to improve the way in which those opportunities are identified and evaluated;*

and

 - (b) to report publicly on the outcomes of that assessment in order to demonstrate to the community that those businesses are effectively managing their energy.*



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This ESAP applies to the Narrabri Coal Project – Stage 2, approved on July 26 2010 and has been compiled with contributions from the following Narrabri Coal Operations staff members:

Mine Electrical Engineer, Mr Robert Gow
Mine Electrical Projects Officer, Mr Jonathan Pogson
Mine Technical Services Manager, Mr Shane Pegg
Other Senior Managers

The project comprises a coal mine with underground facilities currently consisting of development panels, continuous miners, ventilation fans, conveyors, water pumps and ancillary services as well as surface facilities consisting of administration offices, a bathhouse, workshops, coal stockpile areas, coal crushing, rail load out train loader, surface ventilation fans and surface water pumps. The site employs approximately 75 people on the Site Establishment phase and will employ 211 full time staff in normal steady state operational phase.

Opportunities to minimise energy consumption and greenhouse gas (GHG) emissions across the site have been a central consideration to the design and engineering of the mine development and wherever practicable energy efficiency measures have been implemented into the mine's infrastructure and operations philosophy.

This Action Plan is an update of the original site ESAP which was prepared in 2008. The revised plan has been prepared in accordance with the current [Guidelines](#) for Energy Savings Action Plans, produced by DEUS in October 2005, and with the associated Guide Notes, as well as in accord with the Federal Energy Efficiency Opportunities Act, 2006. The ESAP incorporates the following sections, as recommended in the Guide Notes:

- Business Overview and Introduction to the Plan
- Management Review;
- Baseline Energy Usage Data;
- Energy Management Actions
- Energy Usage
- Energy Savings Measures

The energy savings measures listed in this ESAP reflect actions taken as a result of the implementation of projects suggested by the Stage 1 ESAP, as well as identifying future energy savings initiatives to be considered for implementation as a result of this updated and revised ESAP. As with all cost reduction activities, this process is continuous and has become embedded in Narrabri Coal Operations' operating principles and procedures. New projects and energy saving opportunities will be identified on an ongoing basis and implemented wherever practical.

To ensure this is the case the site has committed to the establishment of an Energy Savings Steering Committee that will be responsible for the ongoing review of the ESAP at least half yearly, as well as overseeing the reporting and implementation of all energy saving initiatives undertaken as a result of the ESAP.



1. OVERVIEW AND INTRODUCTION TO THE BUSINESS

1.1. Brief Introduction to the Business

1.1.1. Site Description

Narrabri Mine is a new underground coal mining operation located on the western side of the Kamilaroi Highway, approximately 30km south-southeast of Narrabri. The mine site covers an area of about 5,210 ha with the majority of this area located on freehold agricultural land. A small area of the Project Mine Site is located within the Pilliga East State Forest. A 458 ha section of the lease is set aside for surface operations for the mine and is known as the Pit Top Area.

Figure 1 is a map of the area covered by the mine site with the project boundary shown in red.

Development of the mine is being undertaken in two stages.

Stage 1 commenced in 2007 and involved the establishment of surface facilities to support the proposed underground mine which comprises mining by continuous miners. Stage 2 commenced in 2010 to convert the mine to a longwall mining operation.

Project approval for Stage 1 was granted by the Minister for Planning on 13 November 2007 which approves the development and operation of the 2.5 million tonnes per annum (Mtpa) (Stage 1) underground mine as detailed below:

- Construction of a box cut, transport drift, conveyor drift and ventilation drift to provide access and ventilation to the underground workings;
- Construction of infrastructure within the Pit Top Area;
- Construction of a rail loop and site access road;
- Underground mining by continuous miner method;
- Transport of mined coal to the ROM coal stockpile area of the Pit Top Area via conveyor system within the conveyor drift;
- Crushing and sizing of ROM coal through the crushing/sizing plant and stockpiling on the product stockpile of the Pit Top Area;
- Loading of product coal into train wagons via the rail load-out bin for transportation to the Port of Newcastle; and
- Rehabilitation of areas of disturbance, including landscaping and progressive maintenance of the Pit Top Area.

The facilities associated with Stage 1 are:

Surface facilities:

- Administration Offices and Bathhouse;
- Workshops;
- Coal Stockpile areas - stackers, reclaimers;
- Coal crushing;
- Rail loadout - train loader;
- Mine site ventilation fans (surface located);



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- Water pumping systems;
- Incoming power line and main electrical substation.

Underground facilities:

- Development panels;
- Continuous miners;
- Ventilation fans;
- Drift conveyor;
- Main East West conveyors;
- Main Gate conveyor;
- Water pumping;
- Electrical Power and Ancillary Services.

Facilities associated with Stage 2 are:

- Underground – Longwall.

The functional areas on the mine site currently in the process of design are as follows:

Above Ground Facilities:

1. Administration Offices and Bathhouse;
2. Workshops;
3. Coal Stockpile areas - stackers, reclaimers;
4. Coal crushing/sizing;
5. Coal Handling and Preparation Plant (CHPP);
6. Rail loadout - train loader;
7. Mine site ventilation fans (surface located);
8. Gas Drainage System;
9. Water pumping systems.

Underground facilities:

10. Development panels;
11. Continuous miners;
12. Ventilation fans;
13. Drift conveyor;
14. Main East-West conveyors;
15. Main Gate conveyor;
16. Water pumping systems;
17. Ancillary Services.

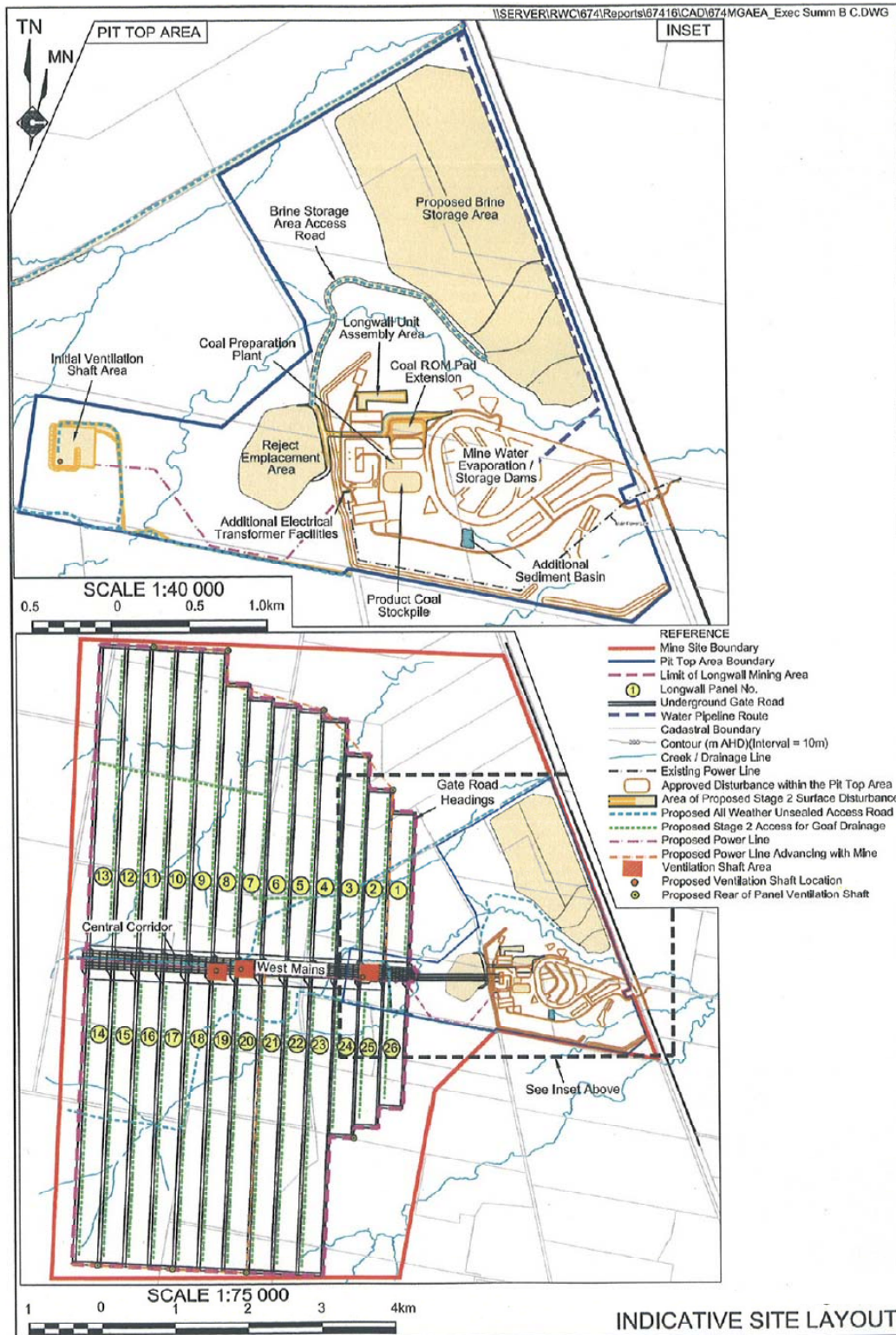


Figure 1: Indicative site layout Narrabri Coal Operations illustrating long walls and detailed pit top area.



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1.1.2. Key Statistics

Some key statistics for the mine consistent with the Stage 2 Approval are as listed below:

- Coal Seam: 110 m to 350 m below ground level (mined thickness is approximately 4.2 m)
- Coal Products: low ash, high quality thermal coal
- Expected annual production: 6 million tonnes per year (approved up to 8 million tonnes per year)
- Proposed Operating hours:
 - Stage 1: 24 hours per day, seven days per week.
 - Stage 2: 24 hours per day, seven days per week.
- Employment
 - Site Establishment: 75 people.
 - Operations: 211 people.
- Trains Despatched: 3 - 7 daily (any time).
- Surface Disturbance: 210 ha of native vegetation.
- Subsidence: maximum predicted subsidence of 2.44 m.



1.2. Background/History of Energy Savings with the Organisation

Since project inception Narrabri Coal has been conscious of the impact of its energy use, both on its operation and the broader impact of its energy use on the sustainable development of the Narrabri coal resource. Wherever practicable, energy efficient designs have been incorporated into the planning of the site infrastructure. Also ongoing energy management throughout mine production is a key consideration of all levels of management at the mine.

Narrabri Coal is committed to ensuring that its operations are as sustainable as possible and in particular that its use of energy is efficient. In 2008 the company prepared an initial Energy Savings Action Plan to identify general principles of behaviour and to nominate possible areas of energy savings opportunities associated with Narrabri coals construction and operations.

This current revision of the Narrabri Coal ESAP is a continuation of the commitment to energy efficiency and sustainable operations on site.

1.3. Introduction to Energy Savings within the Organisation

Having had an ESAP in place since late 2008 has increased the level of operational awareness to projects and initiatives that can be employed to reduce energy consumption. In addition, the plan by the Federal government to introduce a carbon tax from July 2012 has further demonstrated the need for Narrabri Coal Operations (NCO) to minimise its carbon footprint wherever possible. Certain design principles have been used in plant design and particularly in equipment selection to ensure that energy efficiency is a key design consideration for all items of plant.

NCO is establishing a standing committee with responsibility for the ongoing oversight of energy management and efficiency improvements at the mine over time. This committee will meet regularly and report on the annual progress of implementing this ESAP. The mine is committed to working with external agencies such as DoPI and OEHL in developing additional energy saving initiatives and wherever possible ensuring that best practice energy management is employed on site.

The objectives of this Action Plan are to:

- Comply with DECC (now OEHL) project approval requirements for the production of an Energy Savings Action Plan;
 - Identify actions that have the potential to help reduce the amount of energy used at the Narrabri Mine Site in the future;
 - Implement financially viable opportunities as they are identified;
- and
- Lower the greenhouse gas emissions intensity for our activities over time.



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This Action Plan was produced by Narrabri Coal Operations Pty Ltd, with contributions from the following staff members:

- Mine Electrical Engineer, Mr Robert Gow
- Mine Electrical Projects Officer, Mr Jonathan Pogson
- Mine Technical Services Manager, Mr Shane Pegg
- Other Senior Managers

also with assistance from external consultants:

- URS, Collin Macpherson Lead Auditor

1.4. Signoff of the Plan

I certify that this Energy Savings Action Plan has been prepared in accordance with the Guidelines issued by the Minister for Utilities. I am authorised to submit this Plan, on behalf of the designated user, to DoPI in accordance with the requirements of the Project Approval.

Signature and Date

Greig Duncan

Narrabri Mine – General Manager



2. Baseline Energy Use

The guidelines for ESAPs identify the baseline energy use as “*the energy you would expect to use on a regular and repeatable basis and the timing of the consumption. It is an important measure as it will form the basis from which energy saving opportunities will be assessed*”. Until Narrabri Coal reaches a steady state level of operations, predicted to occur in the 2012/13 financial year, it is only possible to:

- a) report on actual energy use since the start of construction;
- b) predict the baseline energy use targets from the energy modelling of site equipment and estimated duty cycles.

When this ESAP is next reviewed it will be possible to include a Baseline Energy Use summary based on normal operational information.

The modelling of the energy use for the mine has been used to develop the energy KPI of kWh/tonne, at least as an aspirational target, until steady state conditions have been achieved. The initial kWh/tonne values from 2008 to the present have been reported in Table 1. However these should not be interpreted as in any way representative of baseline conditions and are provided for information only purposes.

The table below summarises the actual site energy use for the first three years of the project commencing in July 2008.

Table 1: Energy Use Data for Financial Year 2009 to 2011

Year	1	2	3
Start Date	1 July 2008	1 July 2009	1 July 2010
End Date	30 June 2009	30 June 2010	30 June 2011
Energy use per annum (GWh)	28.429	22.733	27.245
Greenhouse Emissions (tCO ₂ e)	30,294	24,225	29,032
Is Baseline representative of normal energy use YES/NO	No	No	No
If NO, description of variation	Construction	Construction	Construction
Impact of variation on energy use (GWh)	N/A	N/A	N/A
Baseline energy use corrected for variation (GWh)			
Business activity indicators	tonnes	tonnes	tonnes
Quantity of site Business Activity Indicators	0	111	232,983
Baseline energy use KPI	-	204,800	1,169
Baseline KPI units	kWh/tonne	kWh/tonne	kWh/tonne
Baseline Summer Peak Electrical Use (kVA)			18 600
Baseline Winter Peak Electrical Use (kVA)			18 600



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The following table shows a projection of the expected energy baseline for the next three years as the mine settles into a steady state operational level. It is expected that the 2012/13 financial year will be representative of the baseline energy use year for the Narrabri Coal mine.

The projections for 2012/13 have resulted in an Energy Use KPI for the mine of 30.4 kWh/tonne.

Table 2: Projected Energy Use for Financial Year 2012 to 2014

Year	4	5	6
Start Date	1 July 2011	1 July 2012	1 July 2013
End Date	30 June 2012	30 June 2013	30 June 2014
Baseline energy use per annum (GWh)	162.53	163.59	176.17
Greenhouse Emissions (tCO₂e)	173,189	174,323	187,725
Is Baseline representative of normal energy use YES/NO	No	Yes	Yes
If NO, description of variation	Construction		
Impact of variation on energy use (GWh)			
Baseline energy use corrected for variation (GWh)	162.53	163.59	176.17
Business activity indicators	tonnes	tonnes	tonnes
Quantity of site Business Activity Indicators	1,863,705	5,381,605	5,417,511
Baseline energy use KPI	87.21	30.40	32.52
Baseline KPI units	kWh/tonne	kWh/tonne	kWh/tonne
Baseline Summer Peak Electrical Use (kVA)	18,600	18,730	20,170
Baseline Winter Peak Electrical Use (kVA)	18,600	18,730	20,170

Total energy use at the mine is predicted to rise slowly over time as total production is planned to increase each year up to 2020. Also, as new long walls are developed (further from the surface infrastructure) the costs of conveying coal will gradually increase year on year.



3. Energy Management Actions

3.1. Management Review

The table below summarises the findings from the Energy Management Review and is based on the template provided in the Department of Energy Utilities and Sustainability (DEUS) Guidelines (2005) for Energy Savings Action Plans. It represents the current position with these nominated areas of responsibility and provides a clear focus of areas for development and improvement.

Table 3: Management Review

Review Area	Rating				
	Low	Moderate	Minimum Sustainable	Industry Leader	Best Practice
Senior Management Commitment					
Understanding of energy savings potential					
Energy targets and key performance indicators					
Energy Metering and Monitoring					
Energy Management Reporting					
Energy Supply Management					
Operating and maintenance procedures					
Accountabilities for energy management					
Training and awareness procedures					
Compliance with legal and/or regulatory requirements					

****See Appendix 3 for a detailed description of the criteria for this Management Review****



3.2. Energy Management Review Process

The energy management review was initially undertaken on site at Narrabri and was discussed in a meeting with the following staff:

- Mine Electrical Engineer;
- Mine Technical Services Manager;
- Mine Electrical Projects Officer;
- External Consultant.

The purpose of the meeting was to inform all present about the ESAP process and to ensure that the proposed actions to improve energy use are supported by senior management.

A second review of the energy management processes in place on site was conducted in June 2011 with additional input from the following staff roles

- Mine Technical Services Manager;
- Mine Electrical Projects Officer;
- Whitehaven Environmental Officer;
- Electrical Engineering Manager.

3.3. Energy Management Actions

The following table summarises the energy saving actions for Narrabri Coal. It is important to note that a range of these measures will be implemented prior to commencement of longwall mining as the longwall unit and subsequent increases in production will be the main energy consuming activities onsite.

	Management Action	Planned Responsibility	Planned Completion Date	Actual Completion Date
1	Assign responsibilities for energy usage and management by functional areas across the site.	General Manager	30th June 2009	30 th June 2009
2	Add energy management to the agenda for site management meetings where progress and implementation of this Action Plan will be discussed.	Technical Services Manager	Prior to commencement of Longwall Operations	
3	Develop and report monthly site-based reports of electrical energy usage for the different areas across the site using On site SCADA / Energy Metering system. Report at monthly meetings.	Environmental Officer	Prior to commencement of Longwall Operations	
4	Develop and report on energy targets for the different areas across the site.	Environmental Officer	Prior to commencement of Longwall Operations	
5	Monitor and report on the Key Performance Indicator for energy use across the site operations.	Environmental Officer	Prior to commencement of Longwall Operations	
6	Develop comprehensive guidelines for energy	Environmental	Prior to	



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	Management Action	Planned Responsibility	Planned Completion Date	Actual Completion Date
	management and include as part of standard operating and maintenance procedures.	Officer	commencement of Longwall Operations	
7	Develop training modules for energy management.	To be developed		
8	Optimise pick length on long wall mining equipment to maximise energy efficiency and minimise coal fines.			1 st January 2011
9	Establish a Site Energy Management Committee to routinely review and report on energy management initiatives and ensure compliance to formal reporting conditions for both ESAP and EEO	Technical Services Manager	Prior to commencement of Longwall Operations	
10	Conduct an external Level 2 or Level 3 Energy audit to identify the next stage of energy efficiency actions following the start-up of near full scale production	Technical Services Manager	Prior to commencement of Longwall Operations	
11	Develop generic energy efficiency training modules for relevant site staff to ensure energy efficiency awareness is raised and ownership for energy efficiency improvements is devolved throughout the organisation	To be developed		
12	Establish an energy efficiency improvement suggestions scheme for mine personnel to capture and reward energy efficiency initiatives from staff	To be developed		

From time to time this table will be updated by the Site Energy Management Committee noting the completion dates of actions items and adding new items as they arise. This committee will conduct reviews of this plan at least once every 6 months.



4. Energy Usage

4.1. Major Electrical Energy Using Equipment

The Mine Site contains a wide range of machinery for the mining purposes, and this machinery in turn uses many electric motors and other electrical devices, including ventilation fans and compressors. There is also a small fleet of mobile equipment on the mine site. The tables below have been constructed to show major electricity consuming equipment and provide a broad indication of processes and proposed method of control of each major drive across the site. While the equipment lists are assumed to be complete there may be some small omissions of particular items of equipment.

Smaller energy use items such as lighting and office HVAC systems are not included in the tables but have been included in the total site electrical energy balance contained in Section 4.2.

Table 4: Major Electricity Using Equipment – Workshop

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures	Comments
Air Compressor #1	185	Automatic, operator oversight, demand matching	24 hours 7 days per week	Manual	Was listed as 160 kW. May be VVVF, but matches load.
Air Compressor #2	185	Automatic, operator oversight, demand matching	24 hours 7 days per week	Manual	Was listed as 160 kW. May be part of CMP004. May be VVVF, but matches load.



Table 5: Major Electricity Using Equipment – Water Pumping

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Fire Pump #1	75	Automatic, operator oversight	Required to be 100% available, but rarely runs	Auto start, Manual stop
Fire Pump #2	75	Automatic, operator oversight	Required to be 100% available, but rarely runs	Auto start, Manual stop
Dam A1 Pump #1	75	Automatic, operator oversight	24 hours 7 days per week	Manual
Dam A1 Pump #2	75	Automatic, operator oversight	24 hours 7 days per week	Manual
Box Cut Pump #1	75	Automatic, operator oversight	Operates for several hours per day to match needs	Manual
Box Cut Pump #2	75	Automatic, operator oversight	Operates for several hours per day to match needs	Manual
Dam B1 Filtered Water Pump 1	37	Automatic, VVVF, operator oversight	Operates for several hours per day to match needs	Manual
Dam B1 Filtered Water Pump 2	37	Automatic, VVVF, operator oversight	Operates for several hours per day to match needs	Manual
Dam D Transfer Pump	30	Automatic, VVVF, operator oversight	Operates for several hours per day to match needs	Manual

Table 6: Major Electricity Using Equipment – Water Treatment

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures	Comments
MF AP4 A Feed Pump	15	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	This pump may be duplicated in future as C Feed Pump
MF AP4 A Flush Pump	15	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	This pump may be duplicated in future as C Flush Pump
MF AP4 B Feed Pump	15	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	This pump may be duplicated in future as D Feed Pump
MF AP4 B Flush Pump	15	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	This pump may be duplicated in future as D Flush Pump
RO A LP Feed Pump	18.5	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	This pump may be duplicated in future as RO B LP Feed Pump
RO A Stage 1 Pump	45	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	This pump may be duplicated in future as RO B Stage 1 Pump
Feed Pump A (1)	15	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	
Feed Pump B (2)	15	Manual, DOL started, direct coupled, operator oversight	Likely to operate 24 hours 7 days per week	Semi-auto	



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Table 7: Major Electricity Using Equipment – Coal Preparation Plant

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Breaker 1/1 Drive (Breaker shaft)	150	Manual, Soft-start DOL direct drive, operator oversight	Infrequent operation to match early railing needs	Manual
Feeder 1/1 Drive (Feeder Chain)	150	Manual, VVVF, operator oversight	Infrequent operation to match early railing needs	Manual
Conveyor 1/1 Drive (Primary Belt)	150	Manual, VVVF, operator oversight	Infrequent operation to match early railing needs	Manual
Crusher 1/1 Drive (Tertiary Crusher)	220	Manual, Soft start direct coupled, operator oversight	Infrequent operation to match early railing needs	Manual
Conveyor 2 Drive 2A (Secondary Belt)	150	Manual, VVVF, operator oversight	Infrequent operation to match early railing needs	Manual
Conveyor 2 Drive 2B (Secondary Belt)	150	Manual, VVVF, operator oversight	Infrequent operation to match early railing needs	Manual
Reclaim Tunnel Fan	75	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week	Manual
Reclaim Tunnel 1 Sump Pump	22	Manual, DOL direct coupled, operator oversight	Intermittent operation over 24 hours 7 days per week	Manual
Reclaim Conveyor 1	110	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Reclaim Tunnel 2 Sump Pump	22	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Reclaim Conveyor 2	110	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Rotary Breaker	110	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Plant Feed Conveyor	110	Manual, VVVF, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Dry Sizing Screen	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Bath Feed Pump	185	Manual, VVVF, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Bath Correct Medium Pump	90	Manual, VVVF, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Dense Medium Bath	18.5	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Bath Product Screen	22	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Bath Reject Screen	22	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual



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Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Bath Product Sizer	185	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Bath Product Feed Feeder	15	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Product Screen	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
DMC Feed Pump	250	Manual, VVVF, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Correct Medium Pump	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Centrifuge Main Drive	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Centrifuge Main Drive	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Dilute Medium Pump	75	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Magnetite Addition Pump	30	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
CPP Area Sump Pump	30	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Fines Product Pump	75	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Filter Press Wash Water Pump	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Clarified Water Pump	90	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
CPP Air Compressor	45	Automatic, operator oversight, demand matching	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Rotary Breaker Reject Conveyor	15	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
CPP Rejects Conveyor	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Thermal Product Conveyor	185	Manual, VVVF, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Thermal Product Skyline Conveyor	110	Manual, VVVF, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
Thermal Product Skyline Tripper	30	Manual, VVVF, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual
PCI Product Conveyor	55	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, campaign operation for several days per week to match production	Manual



Table 8: Major Electricity Using Equipment – Train Loader

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Reclaim Conveyor Drive	500	Manual, VVVF, operator oversight	Several hours per week per rail schedule	Manual
Reclaim Tunnel Vent Fan	30	Manual, DOL started, direct coupled, operator oversight	24 hours 7 days per week	Manual
TLO No.1 Hydraulic Power Pack	55	Manual, DOL started, direct coupled, operator oversight	Several hours per week per rail schedule	Manual
TLO No.2 Hydraulic Power Pack	55	Manual, DOL started, direct coupled, operator oversight	Several hours per week per rail schedule	Manual

Table 9: Major Electricity Using Equipment – Conveyors

Functional Area for Electricity Usage	Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures	Comments
Drift Belt Conveyor	No 1 Motor	1000	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
	No 2 Motor	1000	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
	No 3 Motor	1000	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	Third drive presently being installed.
	Product Skyline	315	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	Was listed as 150kW.
	Tripper Supply	30	Manual, VVVF, operator oversight	24 hours 7 days per week, intermittent operation	Manual	Added item.
Main West Trunk B Belt Conveyor	No 1 Motor	630	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
	No 2 Motor	630	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
	No 3 Motor	630	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
LW Main Gate Belt Conveyor	No 1 Motor	630	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
	No 2 Motor	630	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
	No 3 Motor	630	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
Development Main Gate Belt Conveyors	No 1 Motor	630	Manual, VVVF, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	
Temporary Conveyors	Drive	250	Manual, DOL with Fluid Coupling, operator	24 hours 7 days per week, highly variable load due to production	Manual	Maximum motor size for Starter



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Functional Area for Electricity Usage	Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures	Comments
	Drive	250	Manual, DOL with Fluid Coupling, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	Maximum motor size for Starter
	Drive	250	Manual, DOL with Fluid Coupling, operator oversight	24 hours 7 days per week, highly variable load due to production	Manual	Maximum motor size for Starter



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Table 10: Major Electricity Using Equipment – Development Panels #1 (#2 and #3 are the same)

Functional Area for Electricity Usage	Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures	Comments
Development Panels 1 to 3 (& 4 and Contractor)		Note: 3 complete sets in the medium term (with 4 sets plus additional Contractor equipment from mid-late 2010 for a few years)				
12CM12-40D Continuous Miner	No 1 Cutter	170	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	No Scrubbers fitted, therefore deleted.
	No 2 Cutter	170	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	Both Cutter drives are fixed speed, not VVVF.
	No 1 Traction	60	Manual, VVVF, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	
	No 2 Traction	60	Manual, VVVF, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	
	No 1 Conveyor	45	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	Both Conveyor drives are fixed speed, not VVVF.
	No 2 Conveyor	45	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	Both Conveyor drives are fixed speed, not VVVF.
	Main Pump	45	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates for most of production time	Manual	Both Pump drives are fixed speed, not VVVF.
	Drill Pump	45	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates for most of production time	Manual	Both Pump drives are fixed speed, not VVVF.
10SC32BC Shuttle Car	No 1 Traction	85	Manual, VVVF, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	
	No 2 Traction	85	Manual, VVVF, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	
	No 1 Conveyor	23	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	Was 35kW. Both Conveyor drives are fixed speed, not VVVF.
	No 2 Conveyor	23	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates briefly but frequently	Manual	Was 35kW. Both Conveyor drives are fixed speed, not VVVF.



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Functional Area for Electricity Usage	Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures	Comments
	Pump	15	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, operates for most of production time	Manual	Pump was not listed. Pump drive is fixed speed, not VVVF.
BF14 Breaker Feeder	Breaker	90	Manual, DOL direct coupled, operator oversight	Runs intermittently to match coal inflow	Manual	This drive is fixed speed, not VVVF.
	Hydraulic Pump	90	Manual, DOL direct coupled, operator oversight	Runs intermittently to match coal inflow	Manual	This drive is fixed speed, not VVVF.
Panel Water Pump Pod	MB2337 Water Pump	110	Manual, DOL direct coupled, operator oversight	Runs intermittently to match water inflow	Manual	This drive is fixed speed, not VVVF.
Auxiliary Ventilation Fan	Motor	150	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week	Manual	This drive is fixed speed, not VVVF. Units are fitted with Variable Inlet Vanes (VIVs) to regulate capacity.

Table 11: Major Electricity Using Equipment – Main Ventilation Fans

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Fan Motor No 1	850	Manual, VVVF, operator oversight	24 hours 7 days per week, load matches mine requirements	Manual
Fan Motor No 2	850	Manual, VVVF, operator oversight	24 hours 7 days per week, load matches mine requirements	Manual
Fan Motor No 3	850	Manual, VVVF, operator oversight	24 hours 7 days per week, load matches mine requirements	Manual

Table 12: Major Electricity Using Equipment – Gas Drainage Plant

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures	Comments
Vacuum Pump Motor No 1	315	Manual, VVVF, operator oversight	24 hours 7 days per week, load matches mine requirements	Manual	Issue with VVVF drives rated at only 250kW that limits output.
Vacuum Pump Motor No 2	315	Manual, VVVF, operator oversight	24 hours 7 days per week, load matches mine requirements	Manual	Issue with VVVF drives rated at only 250kW that limits output.
Vacuum Pump Motor	315	Manual, VVVF, operator	24 hours 7 days per week, load matches mine	Manual	Issue with VVVF drives rated at only 250kW



No 3	oversight	requirements	that limits output.
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Table 13: Major Electricity Using Equipment – Longwall Mining System

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Tail-Gate Drive	1200	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Main-Gate Drive	1200	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Crusher	500	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
BSL	500	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Dust-Scrubber	37	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Main-Gate Ranging Arm/Cutter	860	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Tail-Gate Ranging Arm/Cutter	860	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Main-Gate Haulage	150	Manual, VVVF, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Tail-Gate Haulage	150	Manual, VVVF, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Hydraulic Pump	75	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Lump Breaker	200	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Main Emulsion Hydraulic Pump #1	250	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Main Emulsion Hydraulic Pump #2	250	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Main Emulsion Hydraulic Pump #3	250	Manual, VVVF, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Main Emulsion Hydraulic Pump #4	250	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Water Booster Pump & High-Pressure Emulsion Hydraulic Pump #1	250	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Water Booster Pump & High-Pressure Emulsion Hydraulic Pump #2	250	Manual, DOL direct coupled, operator oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual
Tail-Gate Drive	1200	Manual, DOL direct coupled, operator	24 hours 7 days per week, typically operates for 50	Manual



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			oversight	to 60% of week	
Main-Gate Drive	1200	Manual, DOL direct coupled, operator oversight	oversight	24 hours 7 days per week, typically operates for 50 to 60% of week	Manual

Table 14: Major Electricity Using Equipment – Fan Site Nitrogen Inertisation Plant

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Compressor #1	250	Automatic, operator oversight, demand matching	24 hours 7 days per week	Manual
Compressor #2	250	Automatic, operator oversight, demand matching	24 hours 7 days per week	Manual
Compressor #3	250	Automatic, operator oversight, demand matching	24 hours 7 days per week	Manual

Table 15: Major Electricity Using Equipment – Namoi River Pipeline Pumping Station

Electricity Usage Equipment	~ kW	Control Systems	Normal Working Hours	Start-up and Shut-down Procedures
Raw Water Pump NR1A	90	Manual, VVVF, direct coupled, remote operation	24 hours 7 days per week, campaign operation for several days at a time with lengthy breaks	Semi-auto
Namoi River Pump NR2	22	Manual, VVVF, direct coupled, remote operation	24 hours 7 days per week, campaign operation for several days at a time with lengthy breaks	Semi-auto
Namoi Alluvial Bore Pump NR3	37	Manual, VVVF, direct coupled, remote operation	24 hours 7 days per week, campaign operation for several days at a time with lengthy breaks	Semi-auto



4.2. Site Electrical Energy Balance

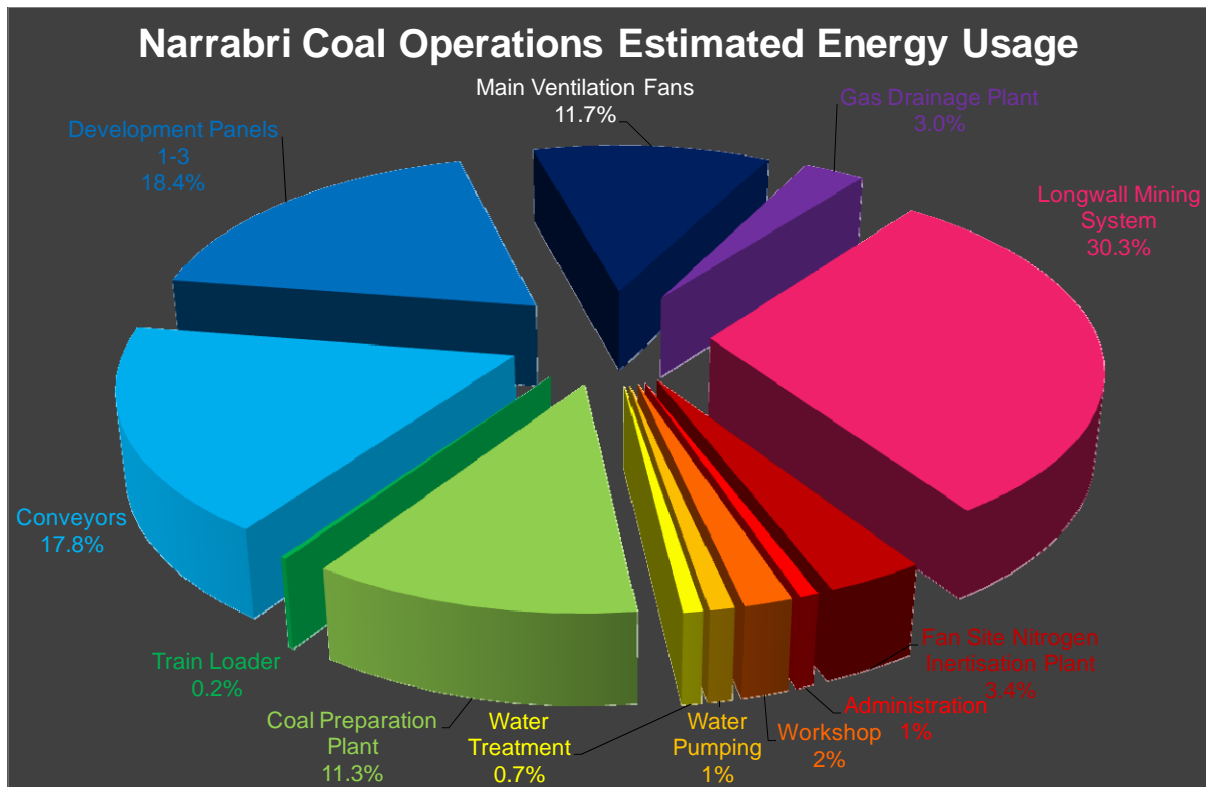
From the site design and construction drawings an inventory of the mine's energy use has been compiled and estimates of the expected duty cycles of each system have been prepared. As the site is still in the construction and ramping up phases, and is yet to reach normal operational levels, it has not been practical to complete an actual energy use audit across all aspects of the mine's operations. This is scheduled to be included in a Level 2 or Level 3 Energy Audit of the operations in the near future. However, based on documented motor ratings, expected duty cycles and hours of operation the breakdown below is currently the best estimate of the overall site energy balance.

Table 16: Estimated Annual Site Electrical Energy Balance

Stage 2 Loads	MWh
Administration	1,010.79
Workshop	2,592.96
Water Pumping	1,339.40
Water Treatment	1,075.73
Coal Preparation Plant	17,391.08
Train Loader	337.12
Conveyors	27,318.06
Development Panels 1-3	28,140.62
Main Ventilation Fans	17,870.40
Gas Drainage Plant	4,553.01
Longwall Mining System	46,406.98
Fan Site Nitrogen Inertisation Plant	5,256.00
Stage 2 Annual Totals	153,292.16

This electrical energy represents 163,348 tonnes of CO₂ per annum and the breakdown is expected to be representative of the predicted baseline year of 174,300 tonnes of CO₂.

Figure 2: Estimated Site Electrical Energy Usage



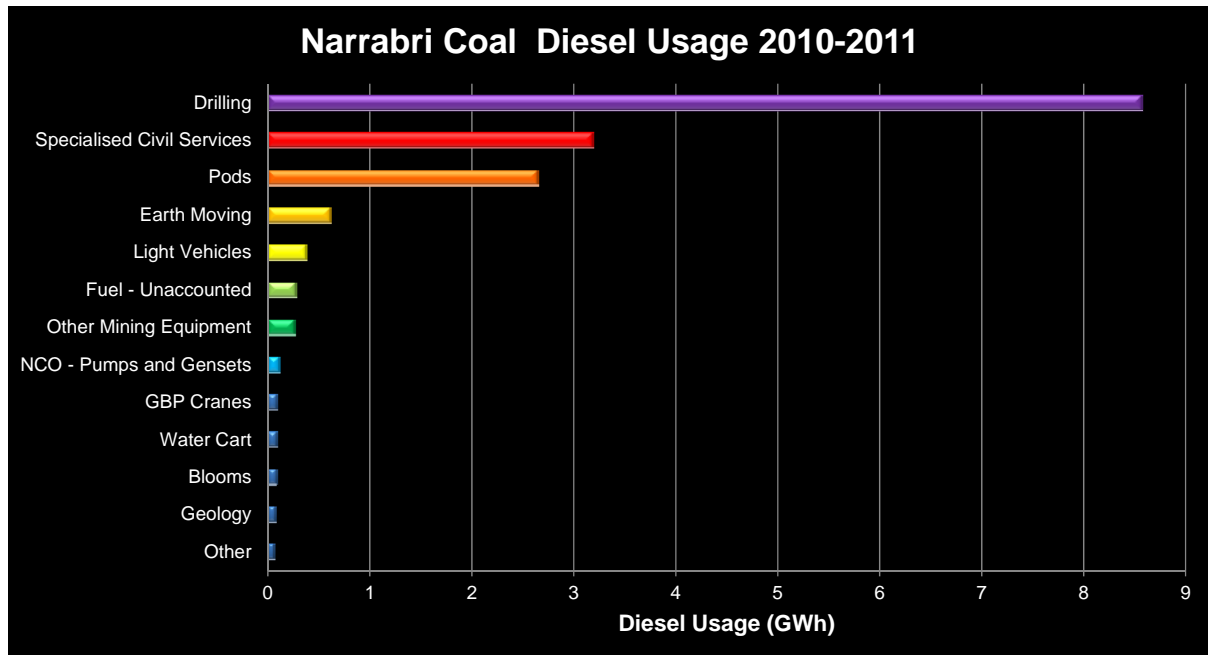
4.3. Diesel Energy Use

During the establishment and early construction of the mine there has been a relatively high use of diesel fuel for a number of non-routine activities such as earthmoving and drilling activities, as well as running diesel generators for site electrical supplies. As the mine site converts from establishment mode to operations mode it is expected that diesel use will fall significantly from its use to date. The ongoing use of diesel will be limited to surface and underground transport and some earthmoving equipment as well as drilling and generator operation.

The chart below shows the diesel energy use for the 2010/2011 financial year, converted from litres of diesel to kWh equivalents. The total diesel use for the year represents approximately 4,145 tonnes of CO₂, which is about 12.5% of the total 2010/11 GHG for that year. When the mine reaches base line levels of operation (in 2012/13) the proportion of diesel use is expected to remain at or near current levels. They will represent only about 2.5% of the total GHG emissions. As such it is not expected to figure significantly in any ongoing energy reduction projects.



Figure 3: Diesel Usage for 2010/11 Financial Year





5. Energy Saving Measures

5.1. Technical Review

Narrabri Coal has undertaken the task of updating the site ESAP to ensure that a clear focus on energy efficiency and sustainability are evident in all aspects of the site operation. To achieve this outcome external consultants have been engaged to review the current energy balance for the site and document those measures already undertaken to improve energy efficiency even before the mine has reached normal operating conditions. Additionally the ESAP has been updated to be consistent with the Stage 2 Approval for the expansion of the mine's original consent.

This has resulted in a new site energy balance model being prepared as well as determining when the site will be likely to reach a baseline level of operation from which future energy savings can be benchmarked.

As the mine has only been producing coal since late 2010 it has not been appropriate up to now to undertake a full Level 3 Energy Audit of the site's operations, as required by the ESAP Guidelines. Having said this there has been a lot of effort put in place to ensure that all the major energy using items of plant and equipment have been identified and their annual energy is estimated so that a clear understanding of the site energy use breakdown is available.

There have also already been some initiatives undertaken on site to both reduce specific energy consumption of key systems as well as improve operational stability. These have included the installation of Variable Voltage Variable Frequency (VVVF) drives for the large conveyor systems and some ventilation systems. This will facilitate future optimisation of the drive settings as the mine ramps up to full production rates over the next 2 years. It will be useful to monitor existing power usage of the key drives from time to time as the mine ramps up to full production.

The Site Energy Management Committee will have responsibility to ensure that the required energy audit for the site is undertaken in the near future. This audit will add to the list of energy efficiency initiatives already identified through this ESAP.

5.2. Brainstorming

In June 2011 a brainstorming session was held to review and update the current state of energy efficiency projects and opportunities at the Narrabri Coal operations. The following team participated in the brainstorming session;

Rob Gow	Electrical Engineering Manager
Shane Pegg	Technical Services Manager
Peter van de Ven	Construction Electrical Engineer
Jill Scealy	Environmental Officer
Siubhan Macpherson	Energy Consultant
Collin Macpherson	Energy Auditor

The team reviewed a number of projects that have already been implemented at Narrabri to improve energy efficiency. These projects are discussed briefly below.



5.2.1. Car Park Lighting

The external lighting for the site car park has been set up to operate on a photo voltaic cell so that lighting is only switched on when required. This avoids the issues of manual or timer controls which often are not well managed and lead to excessive lighting levels when it is not required.

5.2.2. VVVF Motor Drives

A large number of key drive motors and ventilation fans have been set up with VVVF drive controllers so the motor speeds and power can be tuned to actual process demands. When the mine ramps up to normal production a project will be initiated to determine the optimal speed for the conveyors and fans that meets safety and production requirements, but minimises the energy input required achieving that balance.

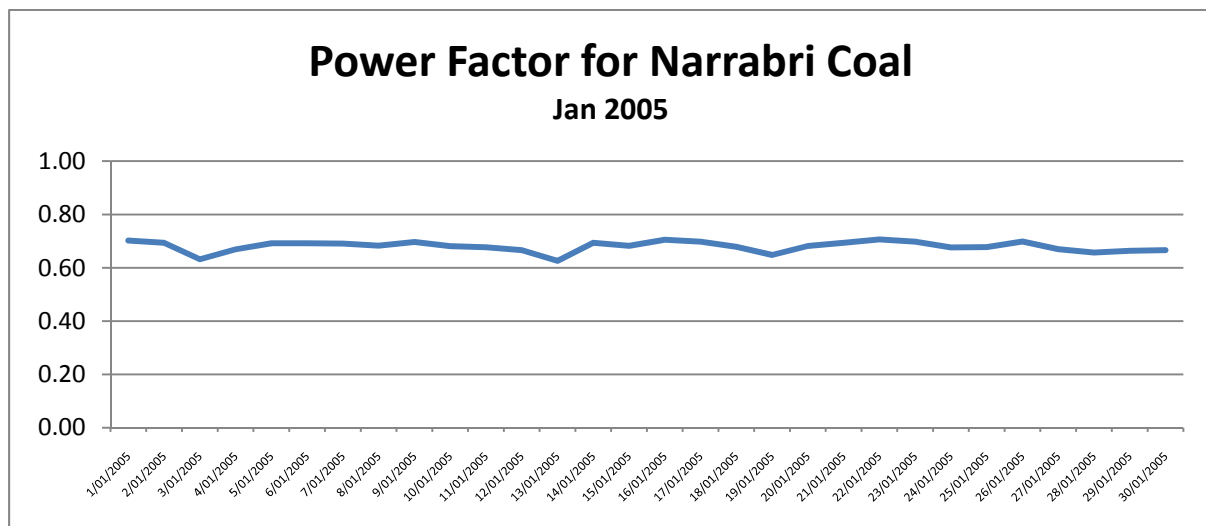
Also the new gas drainage plant will be designed with VVVF drives to again allow for the possibility of tuning the fans' speeds to process and safety requirements and thus reduce overall energy consumption of the drainage plant.

Soft start modes have been introduced to a number of larger drives to reduce the peak demand loading for the mine site as much as is practical.

5.2.3. Power Factor Correction

The chart below shows the power factor of the electricity supply to the main supply point for the mine site in January 2005. As can be seen the power factor average is very low, around 0.7. In order to improve the efficient use of incoming electrical energy Narrabri Coal has committed to installing a power factor correction system to boost the average power factor to greater than 0.90.

Figure 4: Power Factor of Incoming Electricity Supply



5.2.4. Optimisation of Development Continuous Miner Cutting Pick Length

As the mine commissioned the underground development equipment it was noticed that the energy consumption and productivity of the Continuous Miner cutting head was not meeting



specification. A detailed investigation determined that a less than optimal pick length was being used on the cutting head. This was causing inefficient cutting and excessive energy consumption. A project team identified the problem and changed the pick lengths. This resulted in a reduction in specific energy consumption for the Continuous Miner.

5.2.5. Proposed Energy Savings

The team identified a number of additional areas where new energy opportunities might exist. These included;

- Use of energy efficient lighting;
- Installation of sky lights and PV cells in workshops;
- Use of instantaneous hot water systems in bath houses;
- Conduction of a Level 3 energy audit;
- Placing all conveyors on VVVF drives except small ones underground – for softer start;
- Use of VVVF drives on all pumps;
- Convene Site Energy Management Committee meetings every 6 months to analyse site energy use and identify areas for savings;
- Conduct audits on:
 - Compressed air;
 - Ventilation system;
 - Water – pumping and what goes in;
 - Hydraulic bypass and leaks on Longwall face;
 - Gas drainage system
- Establish energy KPI's for each operational area over time;
- Establish an Energy Savings Suggestion scheme to capture all staff suggestions for efficiency improvements.

The team identified that the establishment of a Site Energy Management Committee would enhance the implementation of energy saving initiatives and that this committee should meet at least twice per year to assess the progress of implementing the ESAP and report the progress to senior management.

It was recognised that until the site was operating at approximately 5 to 6 million tonnes per year it would be difficult to set the baseline energy benchmark or even to accurately quantify the true magnitude of the improvement projects already implemented. The conduct of the Level 3 Energy Audit of the mine would be a major milestone in establishing both the benchmark position for energy consumption, additional detailed improvement opportunities and measurement methodologies to capture the quantitative impact of each energy efficiency project undertaken in the future.



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APPENDICES**



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Appendix 1: Model of Site Energy Use

Functional Area for Electricity Usage	Electricity Usage Equipment	~ kW	Number of Units	Duty	Hours per day	Days per year	Annual MWh
Workshop	Air Compressor #1	185	1	80%	24	365	1,296
Workshop	Air Compressor #2	185	1	80%	24	365	1,296
Water Pumping	Fire Pump #1	75	1	5%	24	365	33
Water Pumping	Fire Pump #2	75	1	5%	24	365	33
Water Pumping	Dam A1 Pump #1	75	1	80%	24	365	526
Water Pumping	Dam A1 Pump #2	75	1	80%	24	365	526
Water Pumping	Box Cut Pump #1	75	1	80%	3	365	66
Water Pumping	Box Cut Pump #2	75	1	80%	3	365	66
Water Pumping	Dam B1 Filtered Water Pump 1	37	1	80%	3	365	32
Water Pumping	Dam B1 Filtered Water Pump 2	37	1	80%	3	365	32
Water Pumping	Dam D Transfer Pump	30	1	80%	3	365	26
Water Treatment	MF AP4 A Feed Pump	15	1	80%	24	365	105
Water Treatment	MF AP4 A Flush Pump	15	1	80%	24	365	105
Water Treatment	MF AP4 B Feed Pump	15	1	80%	24	365	105
Water Treatment	MF AP4 B Flush Pump	15	1	80%	24	365	105
Water Treatment	RO A LP Feed Pump	18.5	1	80%	24	365	130
Water Treatment	RO A Stage 1 Pump	45	1	80%	24	365	315
Water Treatment	Feed Pump A (1)	15	1	80%	24	365	105
Water Treatment	Feed Pump B (2)	15	1	80%	24	365	105
Bypass Coal 1,200 tph Crushing Plant	Breaker 1/1 Drive (Breaker shaft)	150	1	10%	2	365	11
Bypass Coal 1,200 tph Crushing Plant	Feeder 1/1 Drive (Feeder Chain)	150	1	10%	2	365	11
Bypass Coal 1,200 tph Crushing Plant	Conveyor 1/1 Drive (Primary Belt)	150	1	10%	2	365	11
Bypass Coal 1,200 tph Crushing Plant	Crusher 1/1 Drive (Tertiary Crusher)	220	1	10%	2	365	16
Bypass Coal 1,200 tph Crushing Plant	Conveyor 2 Drive 2A (Secondary Belt)	150	1	10%	2	365	11
Bypass Coal 1,200 tph Crushing Plant	Conveyor 2 Drive 2B (Secondary Belt)	150	1	10%	2	365	11



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Crushing Plant							
Train Loadout System	Reclaim Conveyor Drive	500	1	80%	5	52	104
Train Loadout System	Reclaim Tunnel Vent Fan	30	1	80%	24	365	210
Train Loadout System	TLO No.1 Hydraulic Power Pack	55	1	80%	5	52	11
Train Loadout System	TLO No.2 Hydraulic Power Pack	55	1	80%	5	52	11
Drift Belt Conveyor	No 1 Motor	1000	1	30%	24	365	2,628
Drift Belt Conveyor	No 2 Motor	1000	1	30%	24	365	2,628
Drift Belt Conveyor	No 3 Motor	1000	1	30%	24	365	2,628
Drift Belt Conveyor	Product Skyline	315	1	30%	24	365	828
Drift Belt Conveyor	Tripper Supply	30	1	30%	24	365	79
Main West Trunk A Belt Conveyor	No 1 Motor	630	1	30%	24	365	1,656
Main West Trunk A Belt Conveyor	No 2 Motor	630	1	30%	24	365	1,656
Main West Trunk A Belt Conveyor	No 3 Motor	630	1	30%	24	365	1,656
Main West Trunk B Belt Conveyor	No 1 Motor	630	1	30%	24	365	1,656
Main West Trunk B Belt Conveyor	No 2 Motor	630	1	30%	24	365	1,656
Main West Trunk B Belt Conveyor	No 3 Motor	630	1	30%	24	365	1,656
LW Main Gate Belt Conveyor	No 1 Motor	630	1	30%	24	365	1,656
LW Main Gate Belt Conveyor	No 2 Motor	630	1	30%	24	365	1,656
LW Main Gate Belt Conveyor	No 3 Motor	630	1	30%	24	365	1,656
Development Main Gate Belt Conveyors	No 1 Motor	630	1	30%	24	365	1,656
Temporary Conveyors	Drive	250	1	30%	24	365	657
Temporary Conveyors	Drive	250	1	30%	24	365	657
Temporary Conveyors	Drive	250	1	30%	24	365	657



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Development Panels 1 to 3	No 1 Cutter	170	3	80%	24	365	3,574
Development Panels 1 to 3	No 2 Cutter	170	3	80%	24	365	3,574
Development Panels 1 to 3	No 1 Traction	60	3	80%	24	365	1,261
Development Panels 1 to 3	No 2 Traction	60	3	80%	24	365	1,261
Development Panels 1 to 3	No 1 Conveyor	45	3	80%	24	365	946
Development Panels 1 to 3	No 2 Conveyor	45	3	80%	24	365	946
Development Panels 1 to 3	Main Pump	45	3	80%	24	365	946
Development Panels 1 to 3	Drill Pump	45	3	80%	24	365	946
Development Panels 1 to 3	No 1 Traction	85	3	80%	24	365	1,787
Development Panels 1 to 3	No 2 Traction	85	3	80%	24	365	1,787
Development Panels 1 to 3	No 1 Conveyor	23	3	80%	24	365	484
Development Panels 1 to 3	No 2 Conveyor	23	3	80%	24	365	484
Development Panels 1 to 3	Pump	15	3	80%	24	365	315
Development Panels 1 to 3	Breaker	90	3	80%	3	365	237
Development Panels 1 to 3	Hydraulic Pump	90	3	80%	3	365	237
Development Panels 1 to 3	MB2337 Water Pump	110	3	80%	3	365	289
Development Panels 1 to 3	Motor	150	3	80%	24	365	3,154
Main Ventilation Fans	Fan Motor No 1	850	1	80%	24	365	5,957
Main Ventilation Fans	Fan Motor No 2	850	1	80%	24	365	5,957
Main Ventilation Fans	Fan Motor No 3	850	1	80%	24	365	5,957
Gas Drainage Plant	Vacuum Pump Motor No 1	315	1	55%	24	365	1,518
Gas Drainage Plant	Vacuum Pump Motor No 2	315	1	55%	24	365	1,518
Gas Drainage Plant	Vacuum Pump Motor No 3	315	1	55%	24	365	1,518
Coal Handling and Preparation	Reclaim Tunnel Fan	75	1	80%	24	365	526



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Plant Coal Handling and Preparation Plant	Reclaim Tunnel 1 Sump Pump	22	1	80%	24	365	154
Coal Handling and Preparation Plant	Reclaim Conveyor 1	110	1	80%	24	365	771
Coal Handling and Preparation Plant	Reclaim Tunnel 2 Sump Pump	22	1	80%	24	365	154
Coal Handling and Preparation Plant	Reclaim Conveyor 2	110	1	80%	24	365	771
Coal Handling and Preparation Plant	Rotary Breaker	110	1	80%	24	365	771
Coal Handling and Preparation Plant	Plant Feed Conveyor	110	1	80%	24	365	771
Coal Handling and Preparation Plant	Dry Sizing Screen	55	1	80%	24	365	385
Coal Handling and Preparation Plant	Bath Feed Pump	185	1	80%	24	365	1,296
Coal Handling and Preparation Plant	Bath Correct Medium Pump	90	1	80%	24	365	631
Coal Handling and Preparation Plant	Dense Medium Bath	18.5	1	80%	24	365	130
Coal Handling and Preparation Plant	Bath Product Screen	22	1	80%	24	365	154
Coal Handling and Preparation Plant	Bath Reject Screen	22	1	80%	24	365	154
Coal Handling and Preparation Plant	Bath Product Sizer	185	1	80%	24	365	1,296



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Plant Coal Handling and Preparation Plant	Bath Product Feed Feeder	15	1	80%	24	365	105
Coal Handling and Preparation Plant	Product Screen	55	1	80%	24	365	385
Coal Handling and Preparation Plant	DMC Feed Pump	250	1	80%	24	365	1,752
Coal Handling and Preparation Plant	Correct Medium Pump	55	1	80%	24	365	385
Coal Handling and Preparation Plant	Centrifuge Main Drive	55	1	80%	24	365	385
Coal Handling and Preparation Plant	Centrifuge Main Drive	55	1	80%	24	365	385
Coal Handling and Preparation Plant	Dilute Medium Pump	75	1	80%	24	365	526
Coal Handling and Preparation Plant	Magnetite Addition Pump	30	1	80%	24	365	210
Coal Handling and Preparation Plant	CPP Area Sump Pump	30	1	80%	24	365	210
Coal Handling and Preparation Plant	Fines Product Pump	75	1	80%	24	365	526
Coal Handling and Preparation Plant	Filter Press Wash Water Pump	55	1	80%	24	365	385
Coal Handling and Preparation Plant	Clarified Water Pump	90	1	80%	24	365	631
Coal Handling and Preparation	CPP Air Compressor	45	1	80%	24	365	315



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Plant Coal Handling and Preparation Plant	Rotary Breaker Reject Conveyor	15	1	80%	24	365	105
Coal Handling and Preparation Plant	CPP Rejects Conveyor	55	1	80%	24	365	385
Coal Handling and Preparation Plant	Thermal Product Conveyor	185	1	80%	24	365	1,296
Coal Handling and Preparation Plant	Thermal Product Skyline Conveyor	110	1	80%	24	365	771
Coal Handling and Preparation Plant	Thermal Product Skyline Tripper	30	1	80%	24	365	210
Coal Handling and Preparation Plant	PCI Product Conveyor	55	1	80%	24	365	385
Longwall Mining System	Tail-Gate Drive	1200	1	55%	24	365	5,782
Longwall Mining System	Main-Gate Drive	1200	1	55%	24	365	5,782
Longwall Mining System	Crusher	500	1	55%	24	365	2,409
Longwall Mining System	BSL	500	1	55%	24	365	2,409
Longwall Mining System	Dust-Scrubber	37	1	55%	24	365	178
Longwall Mining System	Main-Gate Ranging Arm/Cutter	860	1	55%	24	365	4,143
Longwall Mining System	Tail-Gate Ranging Arm/Cutter	860	1	55%	24	365	4,143
Longwall Mining System	Main-Gate Haulage	150	1	55%	24	365	723
Longwall Mining System	Tail-Gate Haulage	150	1	55%	24	365	723
Longwall Mining System	Hydraulic Pump	75	1	55%	24	365	361
Longwall Mining System	Lump Breaker	200	1	55%	24	365	964
Longwall Mining System	Main Emulsion Hydraulic Pump #1	250	1	55%	24	365	1,205
Longwall Mining System	Main Emulsion Hydraulic Pump #2	250	1	55%	24	365	1,205
Longwall	Main Emulsion Hydraulic	250	1	55%	24	365	1,205



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Mining System	Pump #3							
Longwall	Main Emulsion Hydraulic	250	1	55%	24	365	1,205	
Mining System	Pump #4							
Longwall	Water Booster Pump &							
Mining System	High-Pressure Emulsion	250	1	55%	24	365	1,205	
	Hydraulic Pump #1							
Longwall	Water Booster Pump &							
Mining System	High-Pressure Emulsion	250	1	55%	24	365	1,205	
	Hydraulic Pump #2							
Longwall	Tail-Gate Drive	1200	1	55%	24	365	5,782	
Mining System								
Longwall	Main-Gate Drive	1200	1	55%	24	365	5,782	
Mining System								
Fan Site	Compressor #1							
Nitrogen		250	1	80%	24	365	1,752	
Inertisation								
Plant								
Fan Site	Compressor #2							
Nitrogen		250	1	80%	24	365	1,752	
Inertisation								
Plant								
Fan Site	Compressor #3							
Nitrogen		250	1	80%	24	365	1,752	
Inertisation								
Plant								
Namoi River								
Pipeline	Raw Water Pump NR1A	90	1	80%	24	250	432	
Pumping								
Station								
Namoi River								
Pipeline	Namoi River Pump NR2	22	1	80%	24	250	106	
Pumping								
Station								
Namoi River								
Pipeline	Namoi Alluvial Bore	37	1	80%	24	250	178	
Pumping	Pump NR3							
Station								
Grand Total							147,084	



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Appendix 2: Trend of Energy Billing Chart

Month	Diesel use (L)	Diesel Use (kWh)	Electricity Use (kWh)	Total (kWh)
Jul-08	294889	3114278		3114278
Aug-08	270817	2860057		2860057
Sep-08	149152	1575171		1575171
Oct-08	222305	2347729		2347729
Nov-08	172199	1818567		1818567
Dec-08	147035	1552814		1552814
Jan-09	187105	1975987		1975987
Feb-09	190896	2016023		2016023
Mar-09	262037	2767333		2767333
Apr-09	236554	2498211		2498211
May-09	213787	2257772		2257772
Jun-09	237506	2508265		2508265
Jul-09	193426	2042742		2042742
Aug-09	237443	2507599		2507599
Sep-09	242390	2559844		2559844
Oct-09	166792	1761465		1761465
Nov-09	105423	1113357		1113357
Dec-09	68061	718782		718782
Jan-10	87275	921698	672255	1593953
Feb-10	96008	1013926	650214	1664140
Mar-10	108926	1150351	783533	1933884
Apr-10	124489	1314709	708334	2023043
May-10	140666	1485552	740858	2226410
Jun-10	115796	1222904	604825	1827729
Jul-10	128597	1358093	No Data Available	1358093
Aug-10	122413	1292785	922469	2215254
Sep-10	138386	1461477	928573	2390050
Oct-10	112088	1183744	866192	2049936
Nov-10	126751	1338598	806582	2145180
Dec-10	136277	1439200	840215	2279415
Jan-11	176652	1865594	986832	2852426
Feb-11	192943	2037642	1025447	3063088
Mar-11	156807	1656015	1157067	2813082
Apr-11	168500	1779503	1185050	2964553
May-11	91299	964196	1455098	2419293

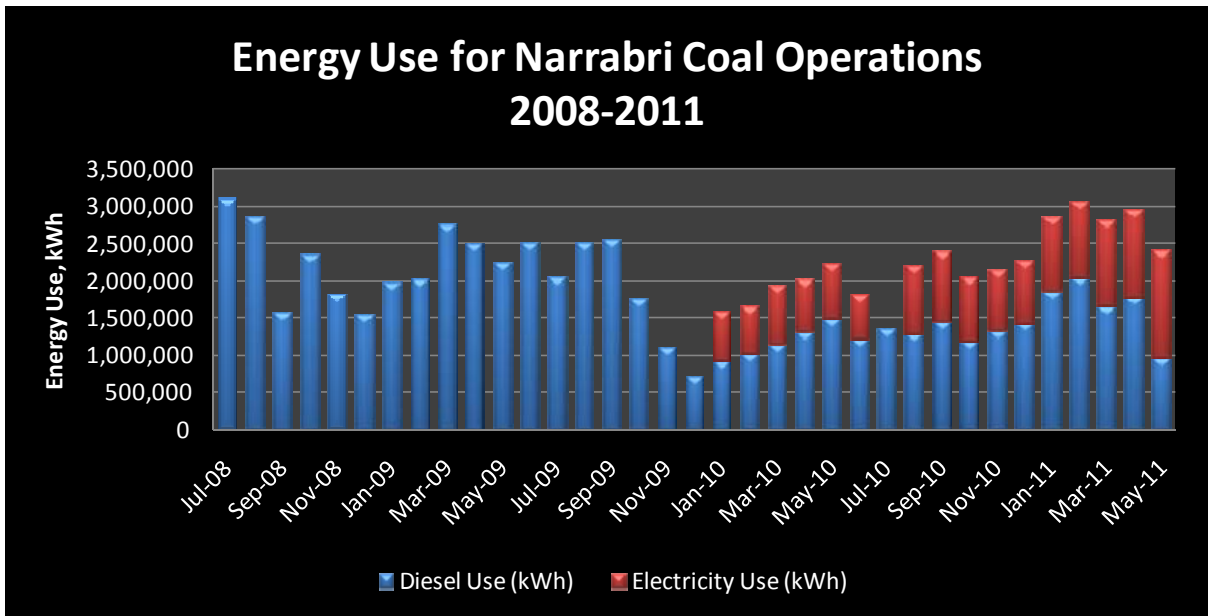
Notes:

1. Prior to January 2010, all electricity used on site was generated with diesel generators
2. No Electricity bill data was available for July 2010
3. Diesel litres have been converted to equivalent kWh for ease of comparison



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Appendix 3: [Detailed Description of Table 3](#)

Management Review Area	Ranking	Descriptor
Senior Management Commitment	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Executive-level management policy for improving energy efficiency or reducing energy costs that includes targets. This policy is reported on the organisation's website and in Annual Reports and communicated to all employees. Sub-targets are established for major facilities, and regularly updated.
	Industry Leader	In addition to minimum sustainable, business practices are routinely audited, and publicly reported.
	Best Practice	In addition to industry leader, organisations can demonstrate that energy management is ingrained into corporate culture.
Understanding of Energy Saving Potential	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Energy efficiency opportunities are based on a comprehensive review of energy use by major users, and of savings opportunities in each major operation covering operating procedures, maintenance procedures, and capital works.
	Industry Leader	Cost-effective measures are routinely implemented, energy operating and maintenance procedures for energy intensive plant, and documented internal communications strategy implemented.
	Best Practice	In addition to industry leader, all innovation measures implemented.
Energy Targets and Key Performance Indicators	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	KPIs established and tracked monthly for large sites, and grouped to allow for internal benchmarking of similar facilities where applicable. Sites have routine visibility of this data, and review thoroughly where they show large variance from target.
	Industry Leader	In addition to minimum sustainable, KPIs are included in job description.
	Best Practice	In addition to industry leader, KPIs are benchmarked against world best practice performance and facilities in top quartile.



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Management Review Area	Ranking	Descriptor
Energy Metering and Monitoring	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Organisations maintain a baseline database for all sites, and basic plant monitoring enables access to interval metering data for major energy streams.
	Industry Leader	In addition to minimum sustainable, sub-metering installed throughout plant and results reported and tracked at regular management meetings.
	Best Practice	Energy consumption metered as per industry leader, regular reporting of consumption at board level.
Energy Management Reporting	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Organisations report savings opportunities with extended payback periods (>5 years) and whether they plan to implement these measures and over what time-frame.
	Industry Leader	In addition to minimum sustainable, business practices are routinely audited, and publicly reported.
	Best Practice	In addition to industry leader, organisations can demonstrate that energy management is ingrained into corporate culture.
Energy supply management	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Organisations have formal processes for energy procurement, and assess opportunities for alternative energy supply options based on capital and operating costs.
	Industry Leader	In addition to minimum sustainable, product life cycles studies are carried out.
	Best Practice	In addition to industry leader, organisation acts on product life cycle measures to reduce cradle to grave impacts.



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Management Review Area	Ranking	Descriptor
Operating and maintenance procedures	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Opportunities assessment includes potential improvements to operating and maintenance procedures, and planned projects to improve energy efficiency incorporate formal operating procedures and training to ensure sustainability.
	Industry Leader	In addition to minimum sustainable, product life cycles studies are carried out.
	Best Practice	In addition to industry leader, organisation acts on product life cycle measures to reduce cradle to grave impacts.
Accountabilities for energy management	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Organisations have an executive-level manager who is accountable for energy management, together with at least one person at each site and an energy management group that coordinates energy management activities at major sites.
	Industry Leader	In addition to minimum sustainable, KPIs are included in job description.
	Best Practice	In addition to industry leader, KPIs are benchmarked against world best practice performance and in top quartile.
Training and Awareness Procedures	Low	No activity/absent
	Moderate	Informal Management Practices
	Minimum Sustainable	Basic energy-awareness activities are in place at each major facility, and energy management training is provided to operations and maintenance teams in energy intensive areas.
	Industry Leader	In addition to minimum sustainable, business practices are routinely audited, and publicly reported.
	Best Practice	In addition to industry leader, organisations can demonstrate that energy management is ingrained into corporate culture.
Compliance with legal and other regulatory requirements	Low	Regularly fails compliance requirements.
	Moderate	Occasionally fails compliance requirements.
	Minimum Sustainable	Limited compliance failures.
	Industry Leader	Compliance within allowable limits.
	Best Practice	Consistently above compliance requirements.



Appendix 4: Energy Efficiency Project Template

NARRABRI COAL OPERATIONS ENERGY SAVING OPPORTUNITY EVALUATION		
PROJECT:		DATE:
PROJECT DESCRIPTION		VALUE
Description:		\$
Related project(s)		\$
START DATE:	COMPLETION DATE:	EXPECTED LIFE:
JUSTIFICATION/EVALUTAION: 4. CURRENT STATUS: 5. EVALUATION: 6. PROJECTED OUTCOMES:		



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	Annual	Life Cycle		
Cost Savings				
Energy Savings				
GHG Savings				
Payback Period, NPV, IRR				
1. ATTACHED DOCUMENTATION, QUOTES AND ANALYSIS:				
PROJECT SUMMARY:				
Economic	Low Cost/cost effective measure	1-2 year payback, seek business plan funding	3-4 year payback, apply for ESF funding	>4 year payback,
Project type	Sustaining		Enhancing	
Other benefits/Factors	Productivity	Safety	Other	
JUSTIFICATION SUFFICIENT TO ENABLE BUSINESS DECISION:				
FURTHER ACTIONS REQUIRED:				



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Appendix 5: Annual Progress Reporting Template

All Projects Implemented	Yes / No
Estimated energy savings kWh/annum	
Baseline energy use	
Baseline KPI	
Current Report Start Date	
Current Report End Date	
Site Energy Use for Report Period	
Actual KPI	
Is current energy use representative of normal use?	Yes / No
If No, explain why	
Total Energy Saving/Increase relative to Baseline	
Explanation of Variation	



Appendix 6: Office of Environment and Heritage Comments on this ESAP

The following correspondence was received by Whitehaven Coal on 29th September 2011.

As just discussed, thank you for forwarding the following Management Plans for our records:

Narrabri Mine Stage 2 Energy Savings Action Plan

...

The Office of Environment and Heritage (OEH) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/conservation management, not to be directly involved in the development of strategies to achieve those objectives.

Should you have any further enquiries please do not hesitate to contact me.

*Regards
Kharl Turnbull*

*Regional Programs Officer
Environment Protection and Regulation Group
Office of Environment and Heritage
Department of Premier and Cabinet
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It is clear that OEH does not have any further comments regarding this ESAP as they do not approve these plans.