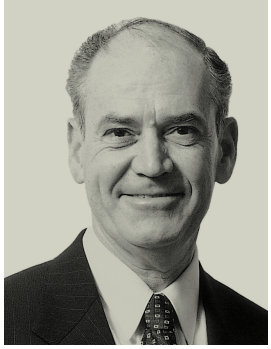
Delta Electricity Environment Report
1996-1999



Welcome

I am pleased to present the first Delta Electricity Environment Report. The Report covers the period March 1996, when Delta was established, to June 1999. The Environment Report will be prepared every three years, providing a comprehensive assessment of Delta's environmental management systems and performance. An Environment Review will also be published at the same time as the report. The review will be a condensed version of the Report but updated in the two intervening years between each report.

The decision to prepare an environment report came from the recognition of the growing interests at all levels within society for clear and accurate assessment of an organisation's environmental performance. Delta has operations that are located within a short distance of a number of townships. As a community member, the responsibilities of being a good corporate neighbour are recognised and Delta's commitment to best practice and innovative environmental practices recognise community expectations on participation, information and disclosure. The Community Access Regional Environment (CARE) Forums are a practical example of Delta's approach in meeting these community needs.

The 1996-1999 Environment Report demonstrates Delta's commitment to improving environmental performance in all of its operations. Improvements in environmental performance have been achieved through implementation of an effective Environmental Management Systems, which is aligned with the international environmental standard ISO 14001.

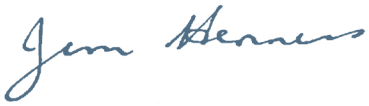
Additionally Delta's Environment Policy issued in 1996 established nine objectives and targets for which environmental performance is measured. Through the commitment and skills of Delta's people this policy is also used as a basis for improved environmental performance.

Greenhouse gas emissions have been consistently addressed in this three year period. In 1997, Delta Electricity signed a Greenhouse Challenge Co-Operative Agreement and subsequently developed short and long term strategies to reduce greenhouse emissions. These strategies will result in a one per cent reduction in greenhouse emissions over business as usual by 2000. Further significant reductions will be achieved over the next ten years with continuous improvement and the development of renewable energy sources.

Clearly environmental factors, particularly greenhouse gas emissions, will continue to provide electricity businesses with a need to continually address its activities. As yet, there are only limited market signals for development of lower greenhouse gas emitting technologies and more are required to provide incentives for their application.

The 2% new renewable generation target and possible development of a carbon emission trading scheme are both examples of Federal Government initiatives to encourage a reduced emphasis on coal fired electricity production. Delta's approach is to explore and enter into new technologies where these are sustainable and economically viable.

The report demonstrates a clear and unambiguous approach to managing Delta's operations in a responsible and pro-active way. It is intended to provide employees, local residents, community groups and regulatory bodies with reliable information against which Delta's environmental performance can be assessed.



Jim Henness Chief Executive

VISION, MISSION AND VALUES

Delta's Vision

Delta Electricity – the generator of innovation

Delta's Mission

To be the supplier of first choice in the electricity market, by ensuring that:

- **customers** receive competitive prices and innovative, customised services;
- **staff** work in a safe, challenging and creative workplace, receive a fair return for their contribution, and have opportunities to develop;
- **community** members welcome us as a valued, environmentally responsible organisation; and
- **stakeholders** are confident that we effectively manage the business and associated risks.

Shared Values

Delta values:

- maintaining productive relationships with customers, colleagues and suppliers;
- providing for the safety, health and welfare of our people, visitors and the community;
- demonstrating continuous improvement in all aspects of our business;
- supporting the learning and development of our people for business success;
- caring for the environment for future generations; and
- ensuring honesty, fairness and integrity in all that we do.

About Delta Electricity

Delta Electricity operates under the Energy Services Corporations Act (1995) and the State Owned Corporations Act (1989). Following the Federal Government's program of competition reform, Delta was formed on 1 March 1996 as part of the NSW Government's restructure of the State's electricity industry, in response to large scale changes in generation, transmission and supply of electricity in eastern Australia.

Delta's total available generating capacity is 3,940 MW. With its corporate office in Sydney, it operates four power stations in NSW: Mt Piper and Wallerawang near Lithgow, and Vales Point and Munmorah on the Central Coast.

These stations generate approximately 20 per cent of the electricity supply in the National Electricity Market (NEM).

Delta's total generating capacity

Station	Unit size (MW)	Total units	Capacity (MW)
Mt Piper	660	2	1,320
Vales Point	660	2	1,320
Wallerawang	500	2	1,000
Munmorah*	300	1	300

* Munmorah's operational role was changed in 1998 with Unit 3 placed on a stand-by role and Unit 4 taken out of service

Principal functions and objectives

Delta Electricity's principal functions are to:

(a) establish, maintain and operate facilities for the generation of electricity and other forms of energy; and

(b) supply electricity and other forms of energy.

The principal objectives that guide Delta in carrying out these functions are:

(a) to be a successful business by:

(i) operating at least as efficiently as other comparable businesses;

(ii) maximising the net worth of the State's investment in Delta; and

(iii) exhibiting a sense of social responsibility by having regard to the interests of the community in which it operates.

(b) to protect the environment by conducting its operations in compliance with the principles of ecologically sustainable development contained in section 6 (2) of the Protection of the Environment Administration Act 1991;

(c) to exhibit a sense of responsibility towards regional development and decentralisation in the way in which it operates;

(d) to operate efficient, safe and reliable facilities to generate electricity;

(e) to be an efficient and responsible supplier of electricity; and

(f) to be a successful participant in the wholesale market for electricity.

Delta Electricity Power Station Locations

Munmorah

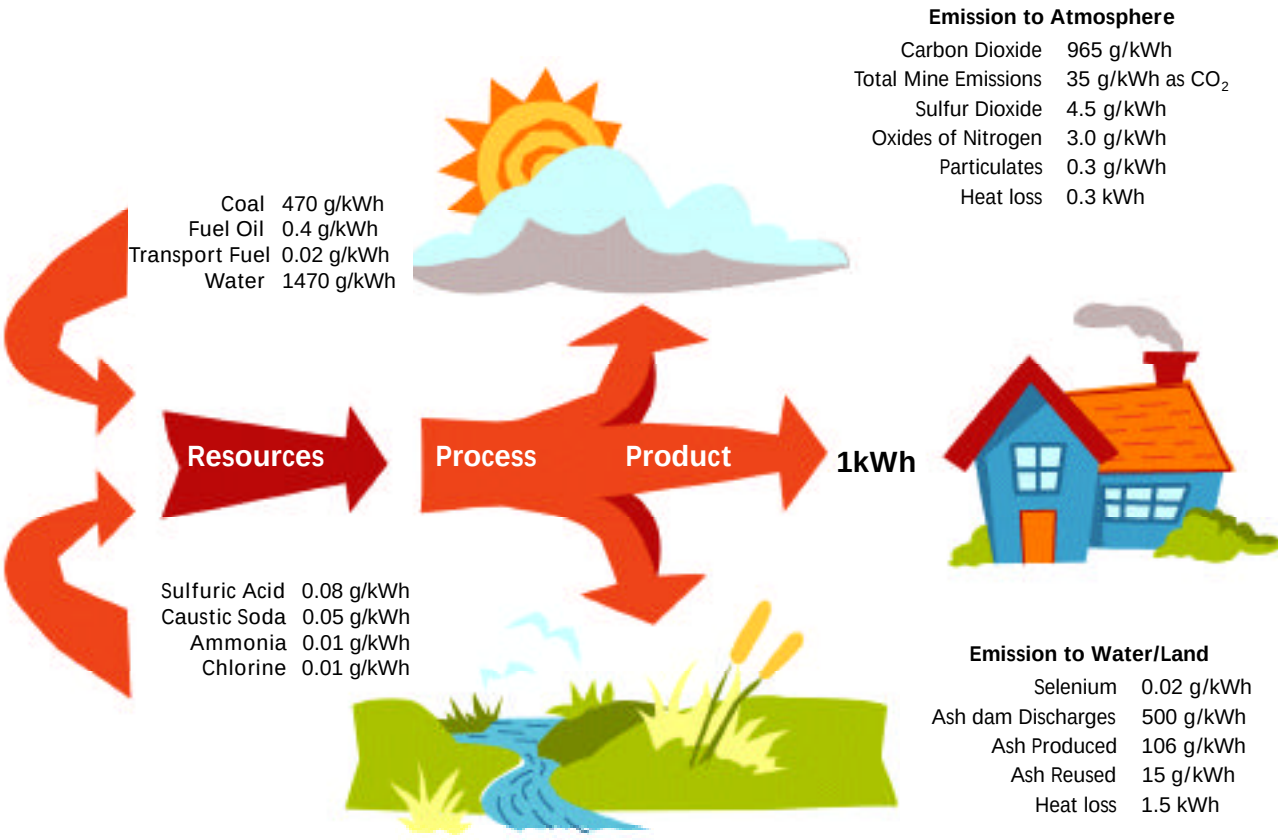
Mt Piper

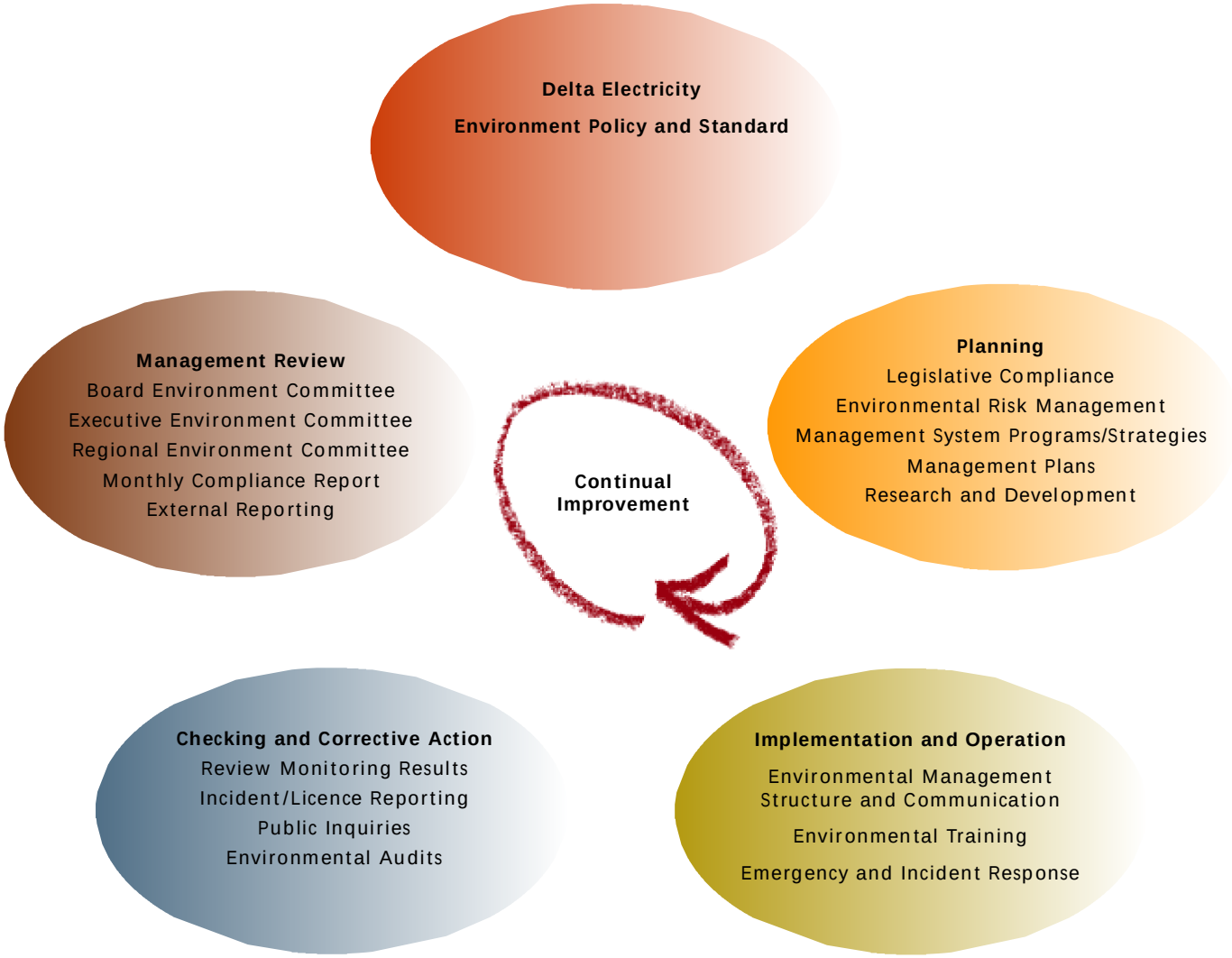
Wallerawang

Vales Point

Understanding Electricity Generation

The basis of Delta Electricity's environmental practices stem from the emissions generated from the processes involved in converting the energy in coal to electricity. The following Resource Utilisation Flow Diagram represents for every 1kWh of electricity produced by Delta Electricity the equivalent amount of resources utilised and the equivalent amount of emissions to land, waters and the atmosphere.





Environmental management system model for ISO 14001

CORPORATE ENVIRONMENT POLICY

Through the commitment and skills of our people, Delta will be a leader in caring for our environment to ensure its preservation for future generations.

Delta's objectives are to:

1 protect the environment by:

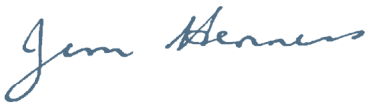
- conducting operations in compliance with the principles of ecologically sustainable development;
- operating the business in a safe, efficient and environmentally responsible manner;
- understanding the potential for environmental impacts and avoiding pollution;
- minimising the consumption of resources and the production of wastes;
- minimising the impact of our operations on the environment and surrounding communities; and
- continually measuring, reviewing and improving our environmental performance.

2 exhibit a sense of social responsibility by having regard to the interests of the communities in which we operate;

3 comply with all statutory environmental regulations; and

4 promote environmental responsibility among our people.

This policy is supported by standards and procedures consistent with the principles of ISO 14001 Environmental Management Systems.



Jim Henness

Chief Executive

Delta electricity

We will:

1. reduce or eliminate emissions or discharges where economically feasible;
2. comply with all statutory environmental regulations;
3. conduct operations in compliance with the principles of ecologically sustainable development;
4. implement, monitor and maintain programs to minimise emissions of greenhouse gases;
5. use material, fuel and energy efficiently. Minimise the production of wastes by reducing, reusing and recycling waste materials;
6. improve environmental performance by including environmental objectives and targets in our business plans and regularly review environmental performance;
7. implement effective land management by incorporating the principles of total catchment management for all landholdings and take into account natural, aboriginal, historical and industrial heritage issues;
8. eliminate environmentally harmful materials by using any suitable substitute; and
9. consider the interests of the community by giving prompt and courteous attention to all public environmental concerns and consulting with the community on significant environmental matters, conducting appropriate environmental research and supporting community-based environmental activities.

Objective	Target	Outcome
1. Reduce or eliminate emissions or discharges	Operate below NSW Clean Air Act Regulation Limit for plant built after 1997. Reduce particulate emissions on 1998/99 emissions. Minimise ash dam discharges and dust emissions.	Installing or augmenting NOx monitoring on all Delta boilers by start of the Load Based Licensing Scheme. Reduce flue gas O_2 at Mt Piper. Trialled precipitator sulphur trioxide injection at Vales Point and Wallerawang power stations. Ash dam management plan at Vales Point & Munmorah implemented in 1997. Wallerawang completed ash dam stormwater diversion works in 1997.
2. Comply with statutory requirements	Zero licence regulation breaches.	1996/97: 3 breaches 1997/98: 3 breaches 1998/99: 3 breaches Refer to Environment Incidents table on page 29 and Supporting Data – Licence Compliance July 1996/June 1999 on page 39.
3. Conduct operations in compliance with the principles of ecologically sustainable development	Fully utilise existing facilities by repowering existing plant. Develop renewable generation.	Feasibility study completed for upgrading Unit 3 & 4 at Munmorah. Construction of two mini-hydros with total capacity of 240kW at Chichester Dam and Dungog Water Treatment works by 2000. Installation of approximately 100MW bagasse biomass plant by 2005.
4. Reduce greenhouse emissions	Reduce greenhouse emission rate by 18% by 2008 on 1990 emission rate.	Joined greenhouse challenge program with 14 greenhouse reduction initiatives. Feasibilty study has commenced for installation of gas fired plant at Munmorah power station.
5. Use resources efficiently	100% reuse of ash. Reduce waste to landfill and establish recycling programs. Reduce energy usage by 5%.	1998-99: 21% ash reused Established waste tracking system and increased number of recycling streams. Initiated financial incentive in enterprise agreement for energy reduction .
6. Improve environmental performance	Establish the Environmental Management System (EMS) consistent with ISO 14001 by June 1999.	Upgraded the EMS in 1996. Computerised EMS installed in 1997.
7. Implement effective land management	Plant 100,000 trees by the year 2000.	Planted 72,800 trees from 1996 to 1998.
8. Eliminate environmentally harmful materials	Remove all PCB contaminated material by the year 2001.	Investigated treatment and reuse option. External facility treated and disposed of 110,000 litres of non-scheduled PCB contaminated oil in September 1999.
9. Consider the interests of the community	Establish community environment forums at Central Coast and Western regions.	Community forums commenced at Central Coast from 1997 and Western regions from 1998.

Legislative Compliance, Environmental Risk Assessment, Management System Programs/Strategies, Management Plans,

LEGISLATIVE COMPLIANCE

Our policy is to comply at all times with all regulatory requirements and to integrate environmental management into all aspects of our operations. In accordance with ISO 14001, we maintain a register of environmental legislation, which identifies key NSW and Commonwealth environmental legislation pertaining to our operations. It is available to power station personnel on a computerised environmental data management system.

Each power station site holds licences under the Pollution Control Act 1970. These licences specify terms under which we can carry out our activities as well as covering emissions to the atmosphere and to waters. Compliance with these licences and other environmental legislation is a high priority and a subject of regular auditing and management review.

ENVIRONMENTAL RISK ASSESSMENT

From 1998, we utilised our computerised Environmental Management System as a process to identify significant environmental aspects and impacts associated with power station operations.

Environmental aspects refer to specific power station operational activities which can interact with the environment, whilst an environmental impact refers to a potential change to the environment as a consequence of power station operations.

To date, all power station sites have completed identification of environmental aspects and impacts associated with their operations. Environmental officers at each site are now assigning a risk rating score to each impact. Having identified the significant environmental impacts, each site will establish and maintain documented environmental objectives and targets to address these risks.

ENVIRONMENTAL ISSUES

Significant environmental issues concerning Delta Electricity are:

Issue

Greenhouse gases

Action

Refer to Greenhouse Challenge Agreement – Action Plan and Research and Development Initiatives addressed later in this report.

Issue

National Pollution Inventory

The National Pollution Inventory (NPI) is a scheme designed to provide the community, industry and government with information about chemical substances emitted to air, land and water from industrial facilities.

Action

Delta power station sites will soon be responsible for annually monitoring, collating, calculating and reporting emission data to the NSW Environment Protection Authority for the NPI. An extensive testing regime has been undertaken by external consultants to ensure the Commonwealth receives accurate and meaningful emission data.

Issue

Load Based Licensing

From July 1999, we will be required as a licence holder under the NSW Protection of the Environment Operations Act 1997 to report and pay fees on a kilogram emitted basis for the following assessable air and water pollutants:

Air	Water
Benzo(a)pyrene	Salt
Coarse particles	Selenium
Fine particles	Suspended solids
Fluoride	
Nitrogen oxides	
Sulfur oxides	

The Load Based Licensing scheme was designed to provide industries with an incentive to reduce emissions by using the best available technology.

Action

We are committed to reducing emission levels by developing strategies to ensure adequate monitoring and operational control of emissions.

Issue

Coxs River environmental flows

Freshwater supplied from the upper catchment of the Coxs River is essential for the operation of the Mt Piper and Wallerawang power stations. The NSW government water reforms are aiming to maximise the environmental flows in rivers. The reforms have implications for the security of water supplies for our operations.

Action

We are working in cooperation with the NSW Department of Land and Water Conservation and local community representatives to assist and fund environmental, economic and social impact studies. Conducted by specialist consultants, these studies aim to understand and establish sustainable environmental flows without unduly affecting the security of our operations.

Early morning mist at Lake Lyell

Issue

NOx emission cap and trading scheme

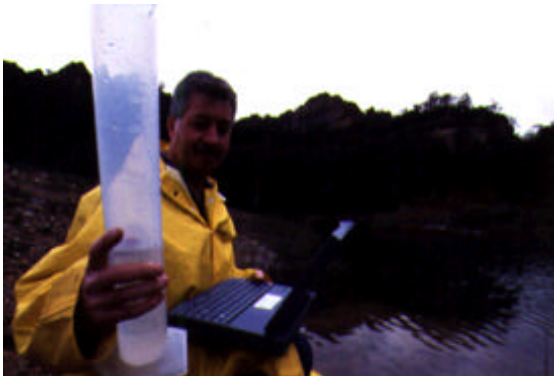
The NSW Environment Protection Authority (EPA) is developing a NOx trading scheme aimed at reducing photochemical smog in the metropolitan region, the vast majority of which is caused by motor vehicle emissions. The proposed scheme, however, only incorporates industrial emissions. Although no clear scientific link has been established between power station emissions located outside the metropolitan region and photochemical smog, the scheme may require reduction of the already low NOx emissions from power stations.

Action

In conjunction with other NSW electricity generators, we have:

- engaged the CSIRO to determine if and to what extent power station emissions impact on air quality in the metropolitan region;
- engaged economic consultants to determine if the proposed cap and trading scheme offers the best and only approach to addressing the photochemical smog problem; and
- engaged consultants to determine what practical methods exist to further reduce the NOx emissions from power stations.

Air monitoring



Monitoring Ash Dam water

Ash dam return water system, Vales Point

Issue

Selenium in Lake Macquarie and Lake Wallace

Selenium is a naturally occurring substance found in rocks, soil and coal. Studies of power station operations have shown 97 per cent of selenium in coal remains with ash and dust products. A very small proportion of this selenium does dissolve, thus reaching localised areas adjacent to the power station environment via ash dam water discharges.

Action

We have comprehensive ash dam management plans at both Central Coast and Western regions detailing operational aspects of ash dams to minimise or eliminate discharges. Ash dam projects and initiatives that have reduced selenium discharges into localised water bodies include:

- installing ash dam return water systems (to recycle water);
- stormwater diversion works;
- ash dam rehabilitation and revegetation
- ash and dust plant modifications; and
- trialing the use of wetlands at Wallerawang Power Station.

We will continue to work on selenium management initiatives to further reduce the level of selenium discharges. Current initiatives in place at both Central Coast and Western regions include:

- regular review of ash dam management plans;
- market developments for ash utilisation;
- investigation into selenium removal technologies;
- research by CSIRO into bio-reactors for selenium reduction;
- environmental investigations into selenium in marine life and sediments; and
- continued water quality monitoring and environmental licence compliance.

Issue

Noise

Noise from power station operations may impact or be of concern to local communities surrounding power station sites.

Action

We investigate all public enquiries about elevated noise levels and engage external consultants to conduct regular ambient noise surveys to identify the source, location and characteristics of noise. Where significant levels of noise have been identified from either operational procedures or plant failures, we have taken remedial action. For example, Munmorah power station identified higher than normal levels of noise during unit return to service from the operation of air ejectors and has modified the air ejector discharge silencers. We will continue to monitor noise levels in communities surrounding power station sites.

Issue

Particulate emissions – Vales Point and Wallerawang Power Stations

Public enquiries have identified particulate emissions from Vales Point and Wallerawang power stations – whilst below the Clean Air Act Limit for plants built after 1977 – to be a concern to surrounding communities.

Action

Plans are in place to rehabilitate Units 5 and 6 precipitators at Vales Point Power Station. New pollution abatement and control technologies are currently being trialed at both Vales Point and Wallerawang Power Stations. Wallerawang Power Station has recently succeeded in trialing the injection of sulfur trioxide into precipitators to reduce atmospheric particulate emissions and is currently installing permanent abatement equipment on Units 7 and 8.

Mt Piper Stack

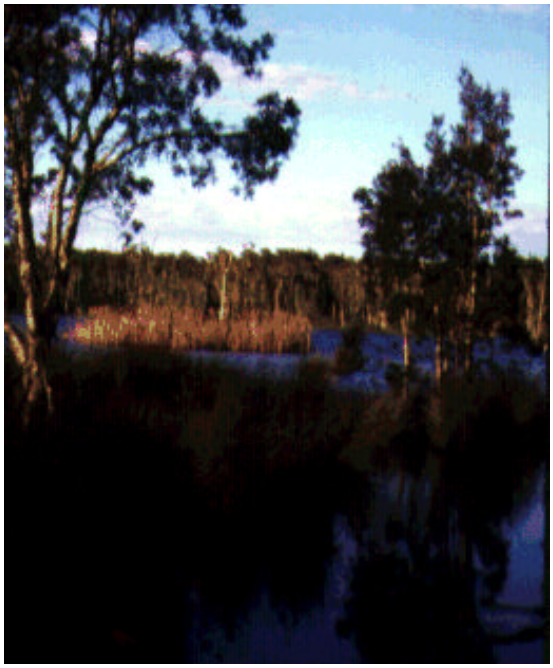
Issue

Colongra Wetland

Colongra Wetland is a freshwater wetland situated on the foreshores of Lake Munmorah and lies within the buffer zone of Munmorah Power Station. Its isolation and diverse range of vegetation has provided a unique wildlife habitat for waterbirds. Coal mining operations beneath the wetland since 1963 by Endeavour Colliery have resulted in subsidence of between 600 and 1000 millimetres. The effect of this subsidence will lead to loss of foreshore trees and vegetation, and could impact on the freshwater system with intrusion of saline water from the lake.

Action

Delta is a member of the Colongra Wetland Working Group, which is currently assessing rehabilitation and restoration options for the ongoing management of the wetland. We are planning to hand ownership and management of this wetland to the NSW National Parks and Wildlife Service.



Colongra Wetlands, Central Coast

Issue

Coal haulage

Coal deliveries to power station sites by trucks can be a concern to local communities due to noise, damage to road surfaces, coal spillage, dust emissions and risk to other road users.

Action

Delta is addressing the issue of coal haulage by road on the Central Coast, through the rehabilitating and recommissioning of the Wyee Rail unloader facility. Coal haulage by road in the Western region has been addressed through a feasibility study to evaluate all transport options for coal deliveries to Wallerawang and Mt Piper power stations. In addition, Delta has been liaising with a range of stakeholders including:

- NSW Department of Urban Affairs and Planning;
- Lithgow Council;
- Coal suppliers; and
- the local community.

MANAGEMENT SYSTEM PROGRAMS AND STRATEGIES

Management system programs have been established at each power station site to address air, water, land, noise and waste management issues. These programs ensure power stations comply with all regulatory requirements and specific licence conditions. In addition to these activities power stations:

- monitor significant air and water emissions;
- conduct studies to measure and mitigate impacts on the environment; and
- plan and instigate projects to rehabilitate land affected by power station operations.

Successful implementation of an environmental management system requires a process of communication. A comprehensive computerised environmental data management system has been acquired for environmental officers at Delta sites. The system manages the control of documentation and provides a communication link between our corporate office and regional sites.

Strategies developed at a corporate level address significant environmental issues for the whole organisation and include load based licensing, NOx and greenhouse emissions. Other management strategies to improve Delta's environmental performance include the integration of targets into the employee enterprise agreement. For example, small increases in salary are tied to the achievement of auxiliary energy use targets and the level of environmental incidents.

GREENHOUSE CHALLENGE AGREEMENT – ACTION PLAN

In November 1997, we signed a greenhouse challenge agreement and action plan with the Commonwealth Government to reduce greenhouse gas emissions. It identified 14 initiatives to reduce greenhouse emissions and concentrated on optimal use of available generating facilities, improvements in power generation efficiency and reducing energy use in the production process.

The objective is to achieve a targeted emission saving of 144,700 tonnes of CO_2 from 1999 to 2000. We are thus implementing the following:

optimal use of high efficiency generating units by:

- optimising generation – increasing the share of generation output for the most efficient units;
- reducing spinning reserve – reducing amount of reserved generating capacity.

Improvements to power generation efficiency by:

- upgrading the coal mill – relining and modifying Wallerawang Unit 8 coal mills with subsequent improvement to boiler back-end temperature;
- making the cooling tower more efficient – reducing wind induced performance losses from Mt Piper cooling towers;
- reducing excess combustion air – reducing excess combustion air in Mt Piper boilers;
- installed high efficiency Turbine Blade on one Vales Point Unit.

energy reductions in the production process by:

- reducing brine concentrator usage – operating Mt Piper cooling towers with maximum dissolved salt levels to reduce waste for brine concentrator treatment;
- auxiliary energy consumption – reducing energy consumption from compressed air leakage, lighting and air conditioning at Wallerawang Power Station;
- reducing cooling water pump usage – reducing the operation of cooling water pumps at Munmorah Power Station.

purchasing new plant and equipment such as the:

- Mt Piper hydro turbine – installing a 350 kW hydro generator on the cooling water supply pipeline between Thompsons Creek Dam and Mt Piper.

Other actions included:

- introducing waste management and recycling programs;
- using fly ash as a substitute in the cement industry;
- planting between 100,000 and 200,000 trees at Delta sites by 2000; and
- upgrading Wallerawang coal plant to increase dry coal storage.

Power stations themselves are major users of electricity, consuming about five per cent of the electricity generated in the production process. We have targeted a five per cent reduction in this figure and are encouraging employee participation in the program by including a 0.2 per cent salary increase in the enterprise agreement should the target be attained.

Mini hydro at Mt Piper

MANAGEMENT PLANS

To address specific environmental issues we use management plans for achieving defined outcomes within allocated timeframes. The range and scope of these plans depends on their purpose, that is, whether they relate to environmental issues specific to power station operations or matters concerning the whole corporation. Management plans are not rigid and are periodically reviewed to ensure they are aligned with Delta's environmental objectives and targets. Management plans developed to improve environmental performance are listed below.

Land Management Plans

Total Catchment Management (TCM) is the coordinated and sustainable use and management of land, water, vegetation and other natural resources on a water catchment basis so as to balance resource utilisation and conservation. We have incorporated into land management plans the principles of TCM for all our landholdings. Land management plans prepared for Western and Central Coast operations provide the foundation for sustainable land management. They implement management strategies for:

- erosion and sediment control;
- noxious plant and animal control;
- bushfire planning;
- protection and enhancement of biodiversity;
- habitat restoration;
- solid waste management;
- water management;
- heritage management;
- recreation planning;
- buffer land management; and
- grazing management.

We recognise that the management of our landholdings is a dynamic process requiring continual review to ensure sustainable use of land consistent with the principles of TCM. Land management plans are reviewed six monthly and revised five years from the date of approval.

Waste reduction and purchasing plans

Waste management committees have been in operation at Central Coast and Western regions since the formation of Delta Electricity in March 1996. They meet quarterly to:

- identify site waste management issues;
- review waste audit recommendations; and
- review and implement waste management action plans.

A waste reduction and purchasing plan prepared under the direction of the Executive Environment Committee was approved in 1998 to compliment existing regional management plans. The purpose is to establish practices throughout Delta that will result in the implementation of waste reduction strategies and the regular review of those strategies in line with the NSW Government's Waste Reduction and Purchasing Policy (1997).

PCB Management Plan

The PCB Management Plan aims to phase out all non-scheduled (material containing greater than two and less than 50 mg/kg) PCB material from all sites by the end of 2001. It includes a register of all items of plant, mainly transformers, containing non-scheduled levels of PCB contaminated oil, their quantity and location.

The first phase of the plan was to remove 110,000 litres of non-scheduled PCB contaminated oil stored in two bulk storage tanks at Wallerawang Power Station. Removal, treatment and disposal of this material was completed in September 1999. Further non-scheduled PCB contaminated oil contained in transformers at power stations in both Western and Central Coast regions will subsequently be transferred to tanks for removal by private contractors for safe treatment and/or disposal.

Ash Dam Management Plans

Ash dam management plans prepared at Central Coast and Western regions ensure that ongoing operation and maintenance of ash disposal systems are controlled in the most economically and environmentally responsible manner. These plans address the management of water, air quality and ash utilisation issues during the operating life of dams and capping and revegetation for final rehabilitation of filled dam areas. The content of these plans includes:

- civil works;
- ash marketing;
- ash dam storage capacity;
- water balance;
- air quality management;
- water treatment;
- environmental conditions;
- land management; and
- options for future disposal.

Bushfire Management Plans

Under the Bush Fires Act, Delta Electricity is required to ensure that adequate measures are undertaken on its behalf to protect neighbouring property from property damage caused by fire. The objective of these plans are to:

- maintain access for fire control vehicles;
- maintain fire trails;
- maintain fuel reduced zones;
- monitor and record fuel loadings;
- maintain habitat values; and
- develop an understanding of the bushfire regime.

Regional Environmental Management Plans

Regional Environmental Management Plans contain action plans assigning responsibilities, budgets and completion dates to address stated objectives and targets relating to power station operations. Action plans prepared by regions include:

- Environmental Strategic Action Plan;
- Environmental Action Plan;
- Environmental Asset Management Strategies;
- Land Management Action Plan;
- Bushfire Management Action Plan;
- Waste Management Action Plan, and
- Environmental Audit Action Plan

RESEARCH AND DEVELOPMENT INITIATIVES

The continual improvement of Delta's environmental performance depends on our ability to develop alternative methods of power generation. We are currently investigating opportunities to generate renewable energy, reduce greenhouse gas emissions, improve the efficiency of our existing plants and develop new generating technologies on our existing sites. We are focusing on developing energy alternatives which are both economically and environmentally sustainable.

Renewable energy developments

The production of renewable energy from sustainable sources is a long term goal for the electricity supply industry. Some technologies which create electricity directly from the sun, such as solar photo voltaics and solar thermal technologies, have the potential to provide sustainable supplies in the long term, but are currently still in the research stage so can only produce small quantities of very expensive electricity.

There are some technologies available now which are capable of producing cost effective renewable energy in reasonably large quantities. We are currently developing two of these technologies – 'run of river' small hydro and energy from biomass fuels.

Biomass fuels provide a method of converting energy from the sun indirectly into electricity. Plant matter, called biomass, can be used as a renewable fuel from crops which are harvested and replanted on a regular basis. The sun provides the energy to grow the plants and the plant matter can be turned into electricity. The process is renewed when the plants are grown again. This form of renewable energy is particularly efficient when combined with existing agricultural industries. Even the ash from the renewable fuel is returned to the field as a fertiliser for the new crop. Examples of projects being investigated include the use of renewable biomass fuels are sugar mill co-generation and co-firing with biomass.

Sugar mill co-generation

We are working with the NSW Sugar Milling Co-operative Limited to undertake a joint feasibility study to upgrade and extend three sugar mills in the Northern Rivers region. The planned expansion will allow additional generation capacity of approximately 100 MW of renewable energy using the crushed sugar cane fibre, called bagasse, as a renewable fuel. The plant could also use sawdust from local sawmills and forest thinnings from local forest plantations. The energy output of the project is expected to achieve 600 to 700 GWh per annum and will contribute significantly to Australia's renewable energy targets.

Co-firing with biomass

In a similar project, we are investigating the use of small quantities of renewable biomass fuels to supplement coal in our existing power plants Mt Piper and Wallerawang power stations which are located close to large forest plantations. Biomass materials are a bi-product of sustainable plantation management practices. Renewable biomass fuel can be converted to electricity more efficiently when used in a large modern coal fired power stations than when used in smaller biomass only power stations.

Run of river hydro

Run of river hydro involves installing hydro electric generators on existing rivers, dams, weirs or water supply pipelines. This is generally a very cost effective method of producing hydro energy because it does not require the construction of new dams. Delta has installed a 350 kW mini hydro at Mt Piper Power Station and is installing small hydro systems at Hunter Water's Chichester Dam (110 kW) and Dungog Water Treatment Plant (132 kW). The anticipated generated output from Mt Piper mini hydro is 1600 MWh per annum and between 1300 and 1500 MWh per annum from Chichester and Dungog dams. We are also investigating other hydro opportunities on existing weirs and dams throughout NSW.

Greenhouse gas reductions

Reducing greenhouse gas emissions is an important element of our environment planning. Renewable generating technologies are important to the greenhouse response, but there are other opportunities to make significant reductions that are presently more economically viable.

Coal mine methane

We are currently assessing the feasibility of using methane in coal mine ventilation as a source of fuel in power station boilers. Methane is a greenhouse gas and is around 21 times more potent than carbon dioxide. Capturing and using the coal mine ventilation methane as a fuel could reduce greenhouse gas emissions by approximately 500,000 tonnes per year.

Munmorah repowering

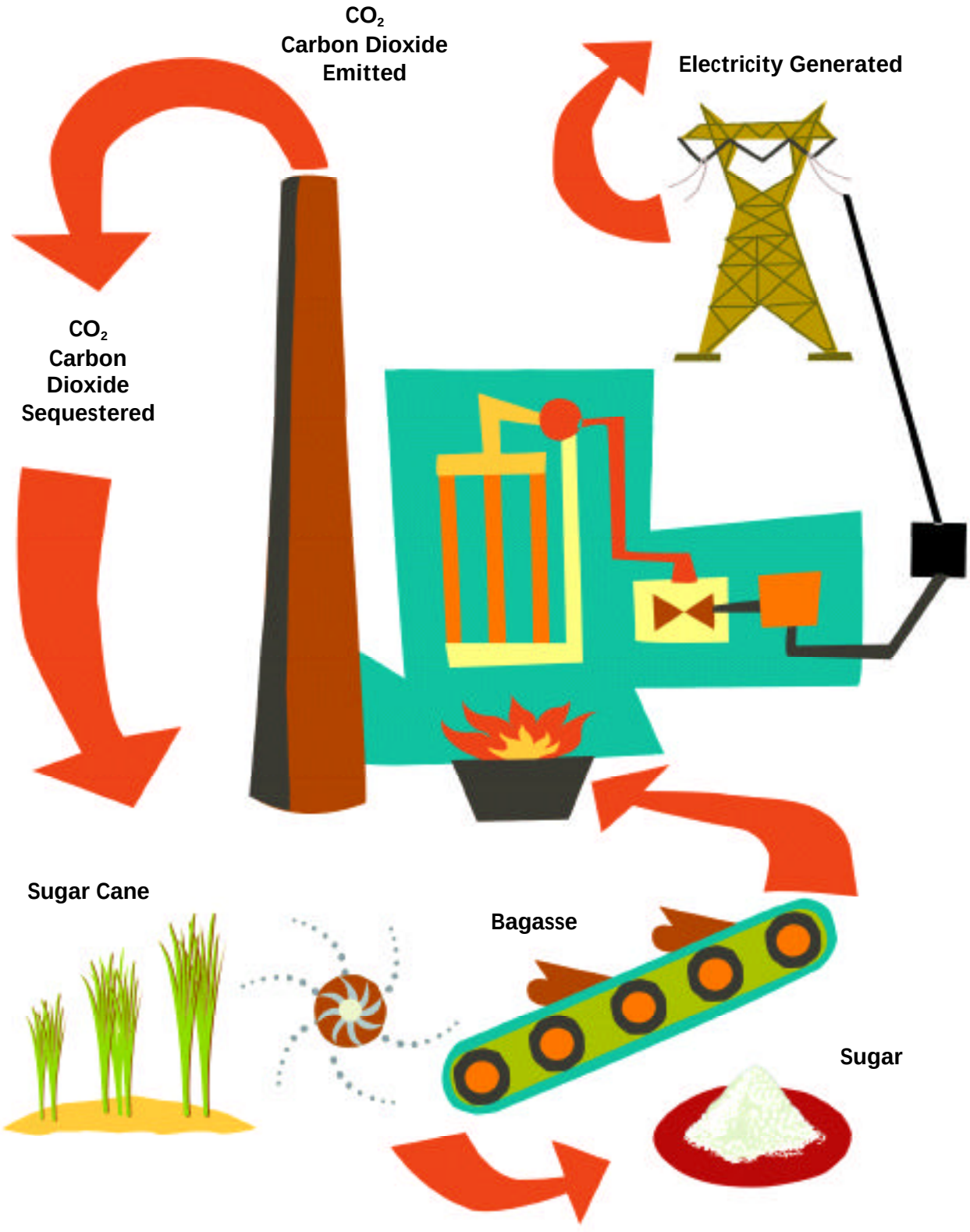
Delta has undertaken a feasibility study to consider options for refurbishing and upgrading Munmorah Power Station. The study included options to rehabilitate and upgrade the efficiency of existing coal fired generating units and install efficient natural gas combined cycle generation. The initiatives could save approximately 2 million tonnes of greenhouse emissions a year if the generation displaces other forms of coal fired generation.

Research projects

We are conducting research into ways of improving the environmental performance of our existing power stations and investigating new, clean coal technologies. Through our participation in the Black Coal Utilisation Co-operative Research Centre we are collaborating on research into the development of clean coal technologies such as integrated gasification. Integrated gasification converts coal into gas for the production of electricity in a more clean and efficient way.

To improve nitrous oxide emissions, efficiency of existing generating plant and better ways to manage and utilise coal ash, we are collaborating in research with universities and research organisations.

Renewable energy from sugar cane



Environmental Management Structure and Communication, Environmental Training, Emergency and Incident Response

ENVIRONMENT MANAGEMENT STRUCTURE

The following diagram illustrates the levels of environmental responsibilities that exist within Delta management structure.

Board of Directors and Chief Executive

Board Environment Committee

Two Directors and Chief Executive

Executive Environment Committee

Chief Executive, General Managers and Environment Managers

Regional Environment Committees

General Managers, Production Team Leaders, Environment Managers, Consultants and Contractor Representatives

Power Station Environment Committees

General Managers, Production Team Leaders, Environment Managers and Environment Officers

Jim Henness
Chief Executive
(Chairman Executive Environment Committee)

Gordon Deans
Manager Environment
(Secretary of Executive Environment Committee)

Peter Jackson
General Manager
Production Central Coast

Mal Gamble
Acting General Manager
Production Western

Mal Park
General Manager
Development

Rohan Hall
General Manager
Delta Maintenance

Glenn Sharrock
Manager Production and Environment
Central Coast

Wayne Milner
Environment Officer (Compliance)
Central Coast

Ian Cruikshank
Acting Manager Production and Environment/Western

Nino Di Falco
Environment Officer (Compliance)
Western

Andrew Vandervelde
Environment Officer
Central Coast

Kenneth Young
Environment Officer
Central Coast

Greg McMahon
Environment Officer
Western

Wolfgang Nothnagel
Environment Officer
Western

OPERATIONAL PROCEDURES AND STANDARDS

Operational procedures and standards have been developed for Delta personnel to provide detailed instructions on power station environmental procedures. The standards are readily available to personnel on local computer network systems and include:

- waste minimisation and management;
- handling of bulk hazardous substances;
- environmental licence compliance;
- environmental emergency response; and
- environmental management.

ENVIRONMENTAL EXPENDITURE

The allocation of environmental expenditure for power station operations is planned on a yearly basis by environment officers. The planning process includes a review of past budgets, asset management plans, environment management plans and forecast licence fees by regulatory authorities.

Proposals to undertake major investments, including environmental projects, form part of the annual budgeting and business planning processes. A financial evaluation is required for all projects for which the total value (including capital and operating expenditure) is in excess of $250,000 prior to their inclusion in a budget or business plan.

EMERGENCY RESPONSE

Environmental emergency response procedures have been developed for all power station sites as operating standards. They provide instructions on the control and management of environmental incidents relating to all aspects of power station operations, including oil spills, containment of hazardous substances, bushfires, gas leaks, subsidence and landslip, flooding and impacts from coal plant discharges. The instructions provide details including steps to assess and effectively respond to incidents, command structure overview listing positions and responsibilities, communication procedures, equipment resources and legislative and licence requirements.

All Delta personnel are required to undertake environmental awareness training which contains an overview of environmental emergency response procedures. Simulated emergency response training is provided at least twice per year at all power station sites for selected personnel including operators, maintenance and coal plant personnel. The training provides simulated emergency response exercises including boat deployment, boom deployment, use of oil and chemical spill absorbent materials and other equipment usage. Training is also provided for:

- environmental protection systems;
- plant incident reporting; and
- environmental compliance.

ENVIRONMENTAL AWARENESS TRAINING

We acknowledge that the success of our environmental performance depends on the performance of our people regardless of whether their role is operational, maintenance, planning or a support function. All personnel must undertake environmental awareness training within each three-year period. The training is delivered either as lectures or as a computer exercise incorporating:

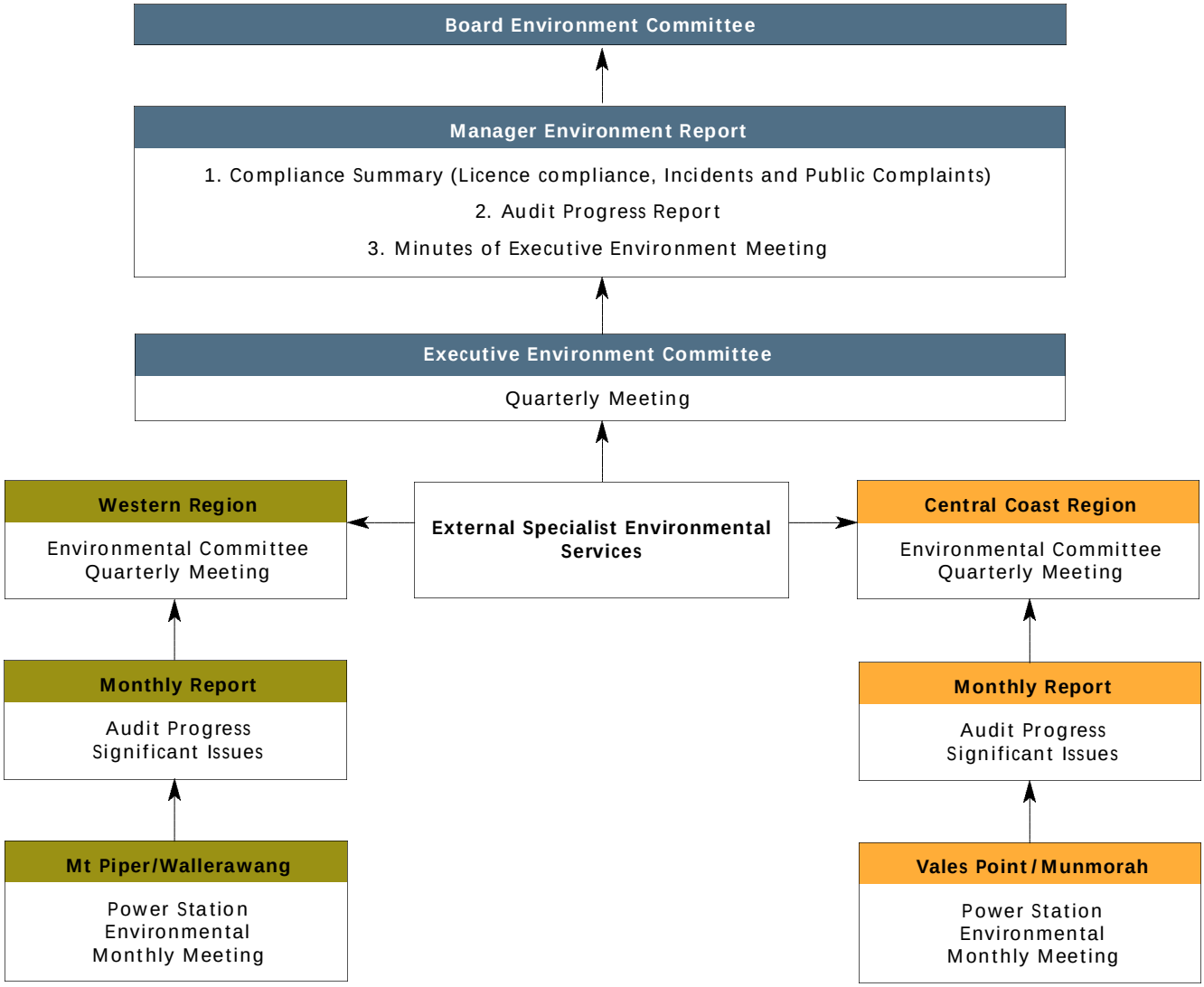
- Delta environment management system and policy;
- environmental impacts and initiatives;
- environmental incidents and controls;
- environmental legislation;
- land management; and
- waste management.

INCIDENT REPORTING

We developed a corporate standard for incident reporting as part of our environmental management system to ensure incidents are reported according to the level of regulatory, non-compliance or potential harm to human beings or eco-systems. The corporate standard categorises three incident types with Incident Category 1 having the highest priority and Incident Category 3 the lowest. Each category is defined in detail with appropriate immediate and follow-up actions. All incidents are reported from senior management through to Executive Management Committee and Board Environment Committee.

DELTA'S ENVIRONMENT INFORMATION FLOW

An essential component of our environmental management system is an effective process of communication.
The following information flow diagram illustrates the process for communicating environmental information throughout the organisation.



WATER MANAGEMENT

Water is an essential resource for Delta operations and is used to:

- produce high purity steam;
- supply domestic water; and
- supply miscellaneous operations including dust suppression.

The management of water is unique for each power station site. Water quality, usage requirements and operational impacts depend on the location of the power station. Munmorah and Vales Point Power Stations draw cooling water from estuarine lakes, while Wallerawang and Mt Piper draw from inland fresh water supplies. Inland power stations consume larger volumes of fresh water than coastal power stations.

We fund research programs and environmental studies of aquatic environments relating to our operations to increase our knowledge of associated impacts and improve environmental performance. Studies include groundwater monitoring, surface water quality monitoring, river flow studies, ash dam trace element discharge studies and aquatic flora and fauna studies.

Vales Point Power Station

Vales Point Power Station draws cooling water from Chain Valley Bay and discharges into Wyee Bay on Lake Macquarie. Sources of water quality impacts on Lake Macquarie include tidal interchange at lakes entrance, discharges from surrounding industries and catchment runoff.

Vales Point Power Station uses fresh water supplied by Wyong Shire Council from Mangrove Creek Dam for all uses other than condensate cooling.

Munmorah Power Station

Munmorah Power Station draws cooling water from Lake Munmorah and discharges to Lake Budgewoi. These estuarine lakes form the upper part of Tuggerah Lakes system. Water quality impacts on the three lakes is attributable to tidal interchange at the Entrance, runoff from the Wyong Shire Catchment and industry discharges.

Munmorah Power Station is supplied with fresh water supplied by Wyong Shire Council from Mangrove Creek Dam.

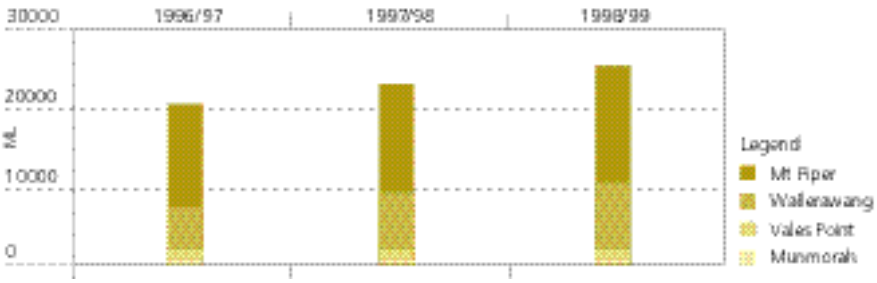
Mt Piper & Wallerawang Power Stations

Wallerawang and Mt Piper power stations draw cooling water from Fish River and Coxs River. The maximum draw from Fish River is 8,140 ML, and is reduced to 60 per cent in times of drought. The maximum draw from Coxs River is 21,000 ML.

Mt Piper Power Station has been designed to achieve zero discharge of process water from the site. Waste waters from site sources including cooling tower blowdown, plant wash down, water treatment plant effluent and sewage are recycled and reused by the power station.

A proportion of process water produced from Wallerawang Power Station's operations are discharged into Coxs River. Discharges from the ash storage system only occur during periods of heavy rainfall. This ash water discharged from Sawyers Swamp Creek ash dam is directed to settling ponds for pH correction before being discharged to Coxs River.

Fresh water consumption ML



LAND MANAGEMENT

Production Central Coast manage approximately 2500 hectares of land located within the Lake Macquarie and Wyong Council local government areas.

Western Operations manage approximately 3500 hectares of land located within the City of Greater Lithgow local government area.

Location Area (hectares)	
Vales Point Power Station	**1,750**
Munmorah Power Station	**838**
Wallerawang Power Station and Lake Wallace	**1,471**
Mount Piper Power Station	**677**
Thompsons Creek Dam	**339**
Lyell Dam	**991**

Vegetation restoration

We undertook extensive tree planting programs from 1996 to 1998 in the Central Coast and Western Regions, the objective of which was to improve visual amenity and wildlife habitats, whilst providing a sink for carbon dioxide emissions. Revegetation of selected areas is ongoing with a number of tree plantation projects currently being considered.

Delta Vegetation Planting Program

Weed management

Control of noxious weeds by Central Coast and Western regions is achieved by implementing appropriate monitoring and control programs. The following table lists weed types and methods of control at Delta from 1996 to 1998.

We have supported research programs by the Department of Agriculture for biological control of noxious plants including Pattersons Curse and Viper's Bugloss. In 1998, Western Operations commenced a program of willow removal along the Coxs River from Lidsdale to Lake Wallace.

Year of treatment	Noxious plant	Noxious plant location	Control method
1996 1997	Pattersons Curse St.Johns Wort Blackberry Cerrated tussock English broom Viper's Bugloss	Western Region	Biological and herbicide control
1998	Bitou bush Croften weed Pampas grass Blackberry	Central Coast Region	

Natural heritage

Delta's land holdings include Colongra Wetland, a fresh to brackish wetland located in the Buffer Zone of Munmorah Power Station, and an area of saltmarsh located at the mouth of Colongra Creek. These wetlands are listed as State Environmental Planning Policy SEPP 14 Wetlands No. 894 and 893.

The Colongra Wetland attracts a large number of birds including two species of recognised international conservation significance, the great egret and white-bellied sea-eagle. Plant species having regional conservation significance have also been identified including Xanthorrhoea fulva and Banksia paludosa.

We are committed to preserving and protecting the Colongra Wetland and Colongra Point in accordance with State Environment Planning Policy SEPP 14. Plans are in progress to hand ownership and management of this unique wetland to the NSW National Parks and Wildlife Service.

Cultural heritage

Archaeological investigations of Delta's Western region have identified both Aboriginal and European historic sites. A register in accordance with S.170 of the Heritage Act was prepared in 1996 to adequately manage and conserve heritage assets. Historic sites include a rare convict stockade on the banks of the Lyell Dam, a slab hut at Thompsons Creek, the Old Wallerawang Schoolhouse, Huon Mine, the Cottage Hospital, a stone barn and the Wallerawang Units 1 & 2 chimney stack.

Located within the 'buffer zone' of open lands created around Wallerawang Power Station, the Old Wallerawang Schoolhouse, dating from 1860, is the oldest remaining building in Wallerawang. To conserve this item of heritage significance for the future, we have sought professional advice in preparing a conservation plan, which includes details such as historical background, cultural significance, description and condition of the building. Restoration on the schoolhouse is currently proceeding under the supervision of Western Operations to repair damaged stonework, roofing and flooring.

Protection of biodiversity

Flora and fauna assessments of Delta land holdings ensure rare and endangered species are identified and protected. Specialist consultants are engaged to conduct surveys identifying the location and type of threatened or rare species of flora and fauna. Mapping information obtained from these surveys ensures future planning of civil and fire management activities do not adversely impact on the biodiversity of species within our land holdings.

Flora species identified on power station perimeter lands that are listed on the Threatened Species Conservation Act 1995

Old Wallerawang Schoolhouse

include Acacia bynoeana, Tetratheca juncea (Black-eyed Susan), and Cryptostylis hunteriana (Leafless Tongue Orchid). Protection of such species is managed by:

- prohibiting development of areas with known conservation significance;
- closing and rehabilitating non-essential tracks;
- establishing wildlife corridors; and
- restricting access of the public and their vehicles.

A substantial number of threatened fauna species were identified on Delta lands, some of which include Petaurus norfolcenis (Squirrel Glider), Calyptorhynchus lathami (Glossy black cockatoo), Crinia tinnula (Wallum Froglet), Miniopterus schreibersii (Common Bent-wing bat) and the Myotis adversus (Large-footed, mouse-eared fishing bat). We manage the protection of fauna species by:

- establishing inventories of fauna species;
- monitoring feral animal numbers and implementing control programs;
- prohibiting removal of bushrock or logs from bushland areas; and
- controlling access to significant wildlife habitats.

Hazardous materials

We are targeting the removal of all Polychlorinated Biphenyl (PCB) contaminated material by the year 2001. To achieve this goal a register of oil containing PCB has been established at all sites which provides information including the:

- location of contaminated oil;
- quantity of contaminated oil; and
- concentration of PCB contained in the oil.

An option of establishing a Base Catalysed De-chlorination (BCD) plant at one of Delta's sites to treat non-scheduled PCB contaminated oil was investigated. This option was not economically viable and we are in the process of having the oil removed off-site and treated by an external treatment facility.

Asbestos material has been safely removed from known areas of Delta power station plant and disposed of in licensed asbestos dumps. Asbestos disposal sites utilised during asbestos stripping operations have been closed except for one site located at Wallerawang Power Station.

Location of waste site	Waste type	Method of rehabilitation
Munmorah waste disposal site	General waste	Closed and capped with topsoil and revegetated with native grasses.
Vales Point ash dam pond 1	Ash	Progressively capped with topsoil and revegetated with native grasses.
Vales Point ash dam pond 2	Ash	Capped with topsoil and revegetated with native grasses.
Vales Point waste disposal site	General waste	Closed and capped with topsoil and revegetated with native grasses.
Old Wallerawang asbestos disposal site	Asbestos	Closed and capped with soil and revegetated with native trees.
Wallerawang waste disposal site	General waste	Closed and capped with soil and revegetated with native trees.
Kerosene Vale ash dam	Ash	Closed and capped with soil and drill seeded with native grasses and shrubs Planted 10,000 trees on old dam.
Mt Piper maturation ponds	Effluent	Decommissioned under the guidance of the EPA and State Forest.
Mt Piper waste disposal site	Construction	Closed and capped with soil and revegetated with native trees.

Land remediation

We are committed to the principles of ecologically sustainable development by ensuring land affected by power station operations are rehabilitated to a condition appropriate to its subsequent use. Sites requiring remediation are identified in regional land management plans and include old asbestos disposal sites, ash dams, general waste disposal sites and effluent disposal areas. The above table lists waste disposal sites which have been or are currently being rehabilitated.

Delta Electricity site	Number of waste categories currently recycled
Vales Point Power Station	**18**
Munmorah Power Station	**14**
Mt Piper Power Station	**9**
Wallerawang Power Station	**13**

WASTE MANAGEMENT

Waste management actions during the period of 1998/99 has resulted in 21 per cent ash utilisation (target 100 per cent). Recycling facilities have been located at all Delta sites to encourage recycling of paper, glass, aluminium cans and PET.

Mt Piper Power Station closed its landfill waste disposal areas in 1995 and has since only operated a small area for restricted waste. The disposal area has restricted access and waste types are controlled to minimise waste and ensure separation of material to be recycled.

Fly Ash Australia has a contract to sell fly ash from Mt Piper Power Station to the concrete industry. The remaining ash generated from the site is disposed at the Western Main open cut mine site in progressive stages as mining is completed.

Vales Point, Munmorah and Wallerawang Power Station's waste disposal areas closed in 1995-1997. All waste generated at these sites is sorted and collected by private contractors.

Ash generated from Wallerawang had in the past been disposed of in Kerosene Vale ash dam, which has since been filled, capped and rehabilitated. Ash generated from Wallerawang's present operations is now sent to Sawyers Swamp Creek ash dam for disposal.

Ash generated from Munmorah and Vales Point power stations is pumped by separate lean phase slurry systems to Vales Point ash dam located on Mannering Creek. At the end of the dam's operation, ash will be capped with appropriate material including topsoil and the site rehabilitated.

COMMUNITY RELATIONS

We value community support and interest in our operations. CARE (Community Access Regional Environment) forums have been established at Central Coast and Western regions for community consultation of issues relating to the environment and Delta operations.

Success in environmental reporting is achieved by providing relevant information to all stakeholders. This included distributing an environmental reporting survey to employees, local community representatives and local governments. Feedback received from the survey has assisted in determining the form and content of this environment report.

Topics scoring the highest response from participants are listed in the table and those of relevance to all participating groups include:

- emissions to air, land and water;
- environmental impacts and risk assessment;
- environmental objectives and targets; and
- waste generation, disposal and recycling.

COMMUNITY INQUIRIES

Community complaints and inquiries are managed in accordance with the Delta Environmental Standard. Environmental officers promptly and thoroughly investigate complaints received at operational sites with further follow-up action if required. Environment officers at operational sites ensure details of complaints are recorded and reported to regional environment managers. Corporate summary reports of complaints and inquiries are forwarded to the Executive Management Committee on a monthly basis and to the Board Environment Committee on a quarterly basis.

Investigation of the type and frequency of complaints provides us with valuable feedback for continuous improvement of operational environmental performance.

Environmental Reporting Survey

Topic	Delta Electricity employees	CARE Forum Representatives	Local Government	Topics found on following pages of Delta Environment Report 1996/99
Emissions to air, land and water	✓	✓	✓	**24, 26 & 36**
Environmental impacts and risk assessment	✓	✓	✓	**10**
Environmental objectives and targets	✓	✓	✓	**8 & 9**
Waste generation, disposal and recycling	✓	✓	✓	**24**
Environmental accountabilities and responsibilities	✓	✓		**18 & 31**
Environmental incidents and emergency response	✓	✓		**19 & 29**
Greenhouse gas production and reduction programs	✓	✓		**14**
Local community issues	✓	✓		**29**
Environmental research and development	✓	✓		**16**
Extent of land contamination and remediation		✓	✓	**3, 24**
Progress towards sustainable development		✓	✓	**16 & 24**
Environmental audits	✓			**30**
Community partnership events and stakeholder involvement	✓			**25 & 33**
Industry code of practice compliance	✓			**30**
Natural resource conservation		✓	✓	**23**
Description of process and operations				**3 & 5**
Environmental capital and operating expenditure				**37**
Environmental liabilities				**29**
Environmental policy and procedures				**7 & 14**
Land use and bio-diversity				**21 to 23**

ATMOSPHERIC EMISSIONS

Carbon dioxide (CO_2)

Carbon dioxide emissions from Delta's operations are produced from the combustion of black coal and boiler fuel oil. The emissions constitute more than 99 per cent of Delta's greenhouse gas emissions.

The amount of carbon dioxide emitted relates to the thermal efficiency of converting coal to electricity. Increasing the efficiency of a power station increases the production of electricity from a unit of coal, thus reducing the amount of carbon dioxide emissions. From the beginning of 1996 we have investigated and implemented initiatives to increase thermal efficiency at each power station to reduce carbon dioxide emissions.

Currently, Delta's carbon dioxide emission rate is 7.6 per cent less than the emission rate of 1990 and 38 per cent less than Victorian brown coal average emissions.

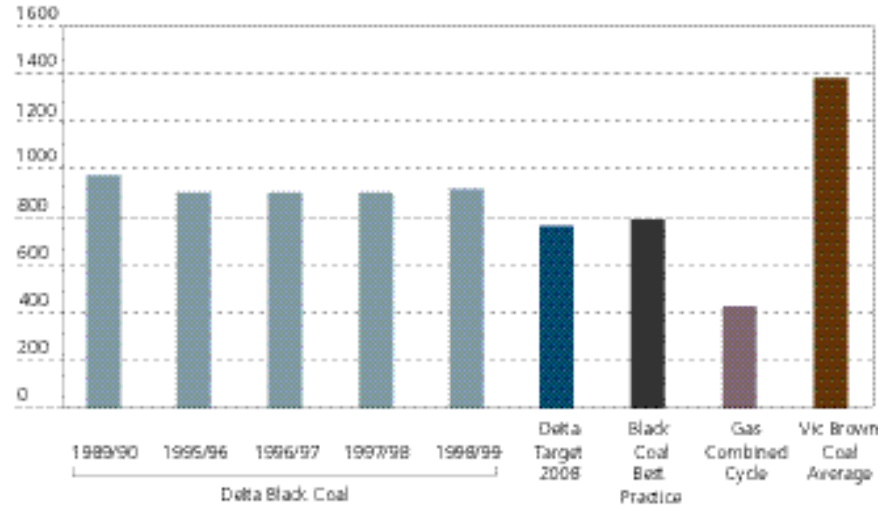
Oxides of sulfur (SOx)

Oxides of sulfur (SOx) are produced by the combustion of coal containing limited amounts of sulfur. The major component of SOx emitted is sulfur dioxide (SO_2) with the remaining proportion being sulfur trioxide (SO_3).

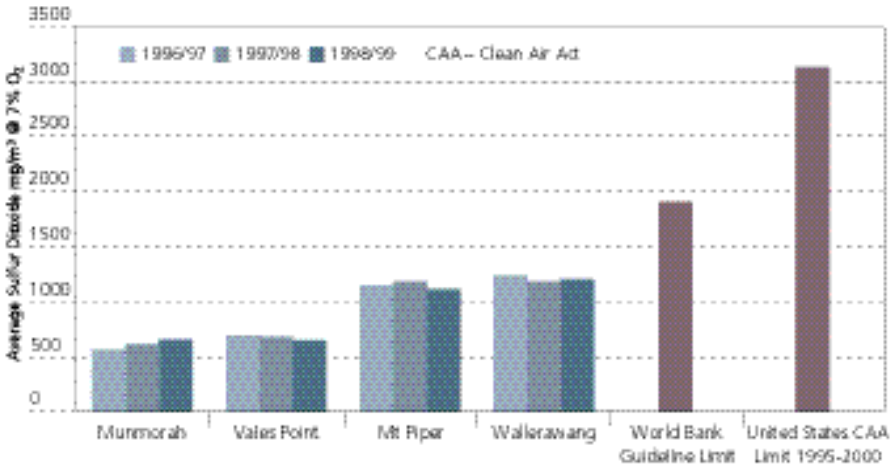
In Australia SOx emissions from coal-fired power plants are generally low due to the low content of sulfur in our coal. SOx emission limits in NSW have not been proposed by the EPA, however, licence limits do exist to limit the content of sulfur in coal that can be used at the power stations.

Emissions of sulfur dioxide from Delta sites during July 1996 to June 1999 are low when compared to the World Bank guideline. Low sulfur dioxide emission levels achieved during this period were due to the purchase of coals containing a low sulfur content.

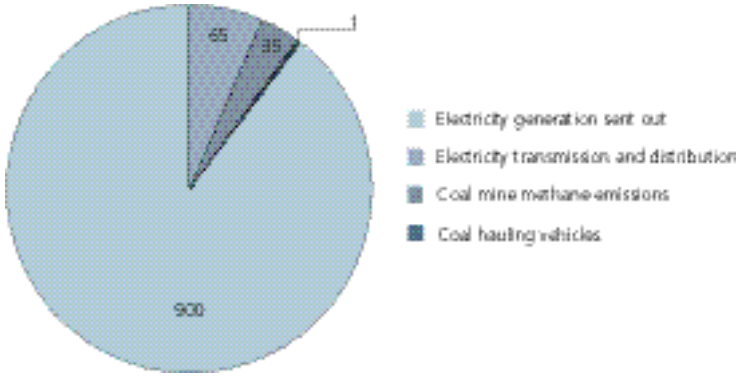
Carbon Dioxide Emissions tonnes/GWh



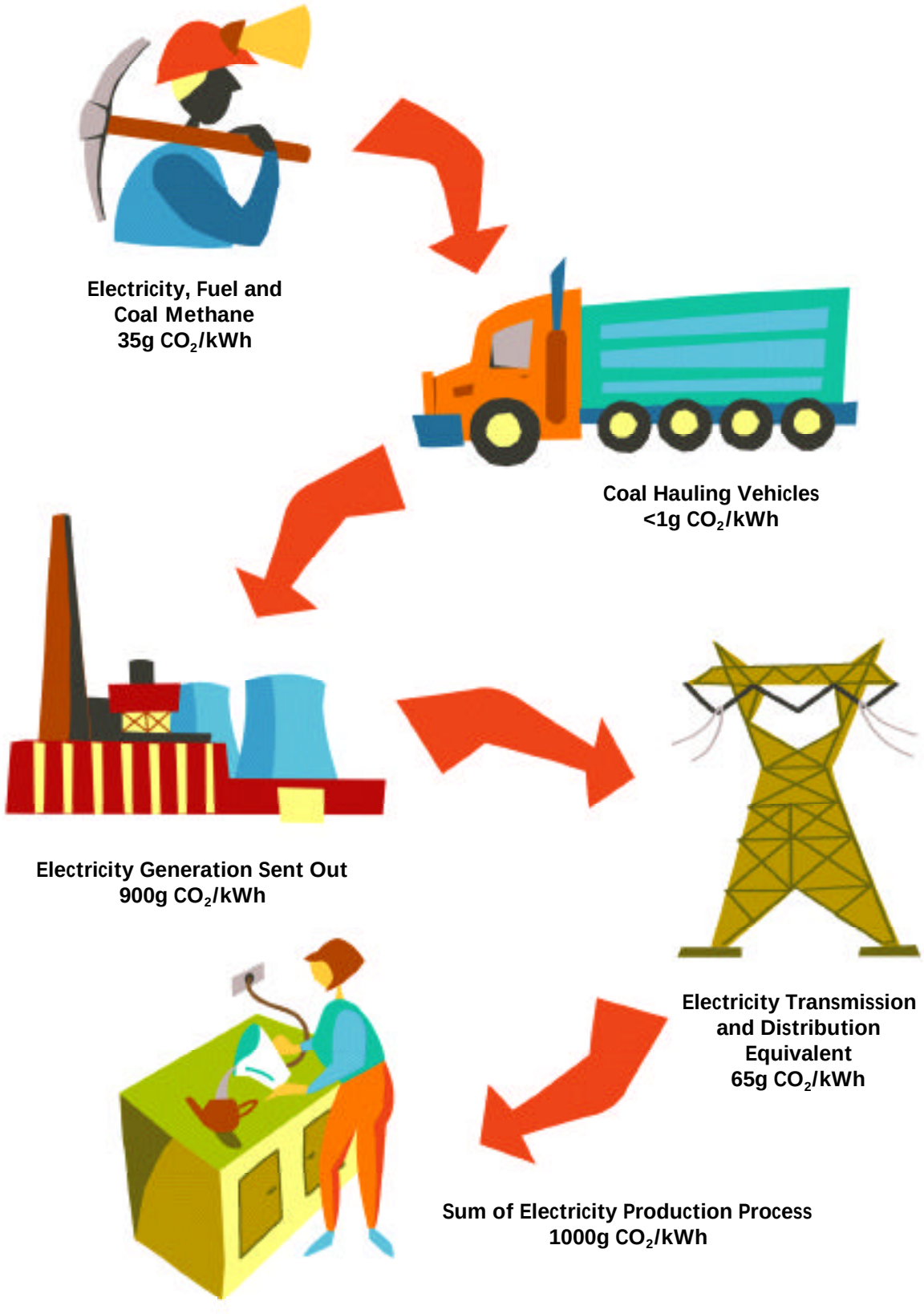
Average Sulfur Dioxide Emissions



Carbon Dioxide Emissions g CO_2/kWh



Carbon Dioxide Emissions Flow Diagram of Black Coal



Oxides of nitrogen (NOx)

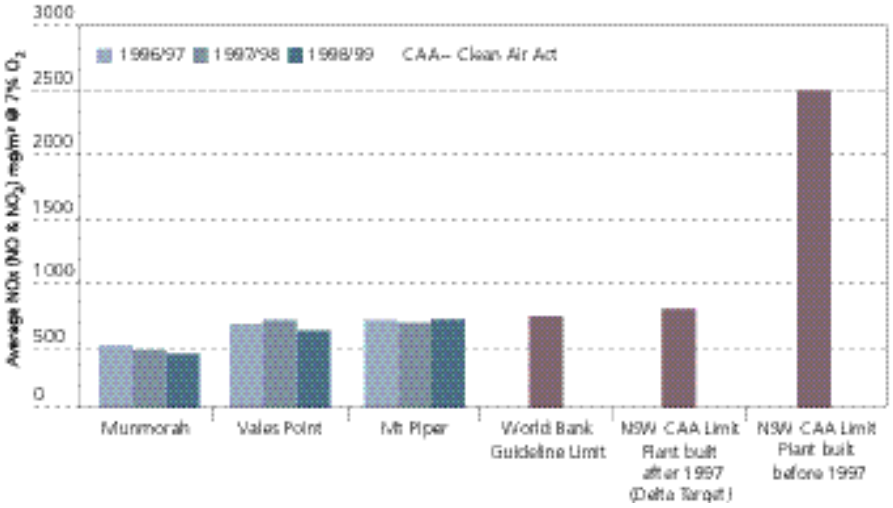
Oxides of nitrogen (NOx) produced during the combustion of fossil fuel at high temperatures consist predominantly of nitric oxide (NO) and nitrogen dioxide (NO_2). The amount of nitric oxide produced is generally in the range of 80 to 95 per cent with the remaining being nitrogen dioxide.

Boiler design, operating conditions and the nature of coal affect the concentration of NOx in flue gas. NOx emissions are generally higher at higher operating loads.

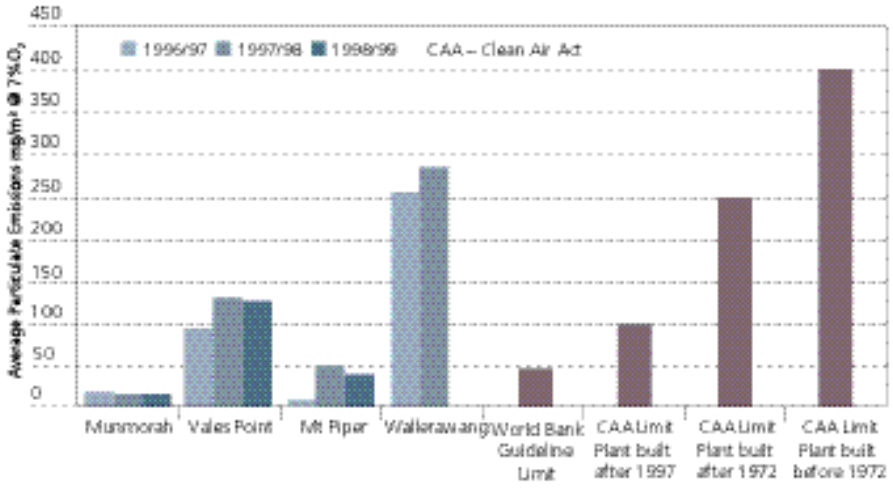
NOx emissions formed during combustion are reduced by using burner optimisation techniques and low NOx burners. Mt Piper Power Station was constructed with low NOx burners.

Average NOx emissions recorded from Delta sites during the period of July 1996 to June 1999 were well below the NSW Clean Air (Plant and Equipment) Regulation 1997 limit of 2500 mg/m³ and in fact below the limit of 800 mg/m³ for new plant built after 1997. Additionally, average NOx emissions reached levels below the World Bank guideline level of 700 mg/m³. Average NOx figures for Wallerawang Power Station were not available during the period of July 1996 to December 1998 as monitoring of nitrogen oxides only commenced from January 1999.

Average Oxides of Nitrogen Emissions



Average Particulate Emissions



Particulates

Particulate emissions are generated when mineral matter from the combustion of coal is converted to ash. Part of this ash is collected in the bottom of the furnace as bottom ash, whilst the remaining fly ash is suspended in flue gases. Delta Electricity uses both electrostatic precipitators and fabric filters to control particulate emissions from fly ash.

During July 1996 to June 1999 particulate emissions from Delta operations remained below the NSW Clean Air (Plant and Equipment) Regulation 1997 for premises approved after 1972, except for Wallerawang power station whose Unit 7 was approved prior to January 1972 and is subject to the particulate emission limit of 400 mg/m³. Munmorah and Mt Piper power stations achieved particulate emissions lower than the Clean Air (Plant and Equipment) Regulation 1997 for premises built after 1997 due to the operation of fabric filter collectors.

Wallerawang emission data for 1998/99 not available due to precipitator refurbishment and sulfur trioxide injection trials.

Fugitive dust

Fugitive dust emissions can be generated from coal stockpiles and ash dams under conditions of strong winds.

We control potential dust emissions from ash dams by using fabric fences to maintain slurry wetting zones and keep surface ash wet by maintaining high water levels in dams. Once sections of ash dams are filled the surface is capped and revegetated, preventing any wind borne emissions.

Dust emissions arising from coal stockpiles and coal-handling plant is controlled by watering with dust suppression sprays.

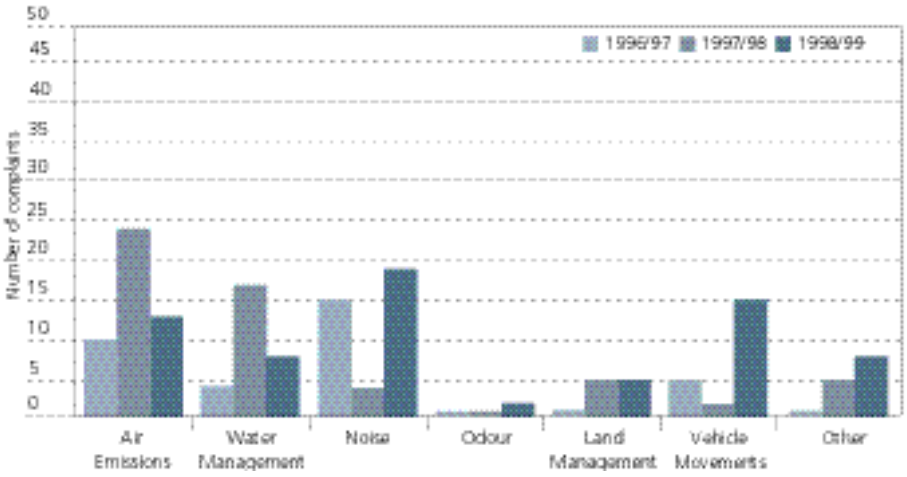
COMMUNITY CONSULTATION

We are committed to providing community consultation about environmental issues relating to our power station operations. This is achieved by:

- being represented on committees for estuary and coastal management and catchment management;
- distributing information sheets;
- providing funding to the Lake Macquarie Environment Research Grants Committee;
- being represented on the Lake Macquarie Task Force for review of urban and industrial impacts;
- working with the Department of Land and Water Conservation and the community towards sustainable river flow regimes; and
- participating and providing presentations to progress associations, community groups, local council meetings etc.

Delta employees are encouraged to support community environmental activities by participating in community projects such as Clean-up Australia Day.

Community Complaints or Inquiries



E-team provides students with valuable work experience.

PROSECUTIONS AND ENVIRONMENTAL LIABILITIES

From 1996 to 1998, Delta Electricity had no prosecutions relating to environmental incidents. There are no current environmental liabilities.

ENVIRONMENT INCIDENTS

The number of category 1 and 2 incidents for the years 1996 to 1998 is detailed in the following table. The number of category 3 incidents for this period was not available, but will be included in future environment reports.

YEAR	Central Coast Operations				Western Operations			
	Munmorah		Vales Point		Wallerawang		Mt Piper	
	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2
1996/97	0	2	0	9	3	8	0	4
1997/98	0	1	0	4	1	6	2	2
1998/99	0	0	1	2	2	1	0	2

Incident Category 1 A breach of EPA licence condition, environmental regulation or incidents requiring mandatory reporting to the EPA.

Incident Category 2 A potential, possible or suspected breach of EPA licence condition or other environmental regulation.
A non-trivial discharge that flows to but is contained within a final holding pond.

Incident Category 3 Trivial discharges to the environment or other on-site incidents contained locally and not included in any of the above categories.

ENVIRONMENTAL AUDITING

Environmental auditing of all operational sites is undertaken on a two yearly basis by external consultants to identify environmental risks, legislative non-compliance and impacts on the environment. Audit recommendations and progress on actions are reported quarterly to the Executive Environment Committee and Delta Electricity Board. The following table details all Delta audits undertaken during 1995 to 1998.

ELECTRICITY SUPPLY ASSOCIATION OF AUSTRALIA (ESAA)

Delta is a member of the Electricity Supply Association of Australia (ESAA) and is a signatory to ESAA's Code of Environmental Practice. The code establishes policy, principles and actions to address sustainable development, social responsibility, community participation, environmental management and resource management. As a signatory Delta is expected to audit its performance against the code.

Environmental Auditing

Location	1995	1996	1997	1998
Delta Electricity Corporate				
Vales Point Power Station	**1**(4) **2**(20) **3**(26)			**1**(1)
Vales Point 'A' Power Station demolition		**2**(7) **3**(13)		
Vales Point coal handling plant		**1**(1) **2**(20) **3**(16)		
Munmorah Power Station	**2**(16) **3**(26) **4**(6)			**1**(1)
Wallerawang Power Station		**1**(1) **2**(28) **3**(65) **4**(10)		
Wallerawang 'A & B' Power Station		**2**(7) **3**(7)		
Mt Piper Power Station		**1**(1) **2**(10) **3**(35)		**1**(1)
Lyell Dam upgrading project		**1**(2) **2**(18) **3**(14)		
Fuel and external services Western Operations		**1**(2) **2**(16) **3**(80) **4**(13)		

Audit type

- Environmental management and facilities and process **(Pacific Power International)**
- Environmental compliance and due diligence **(Golder and Associates)**
- Environmental legislative compliance **(Middletons Moore and Bevins)**
- Waste audit **(Pacific Power International)**
- Environmental risk assessment **(Pacific Power International)**

Category rating system

The numbers in brackets in the table refer to non-compliance items which have now all been addressed. The numbers with bold highlight in the table refer to ranking levels described as follows. (These are different to incident categories)

AUDIT RANK	DESCRIPTION
1	Significant issues requiring immediate action.
2	Significant issues requiring non-urgent action, or less significant issues requiring immediate action.
3	Less significant matters requiring non-urgent action.
4	Minor issues, not requiring urgent action.

In 1999 we engaged external consultants to conduct a number of audits including facilities and process, environmental management, compliance, due diligence and environmental management system ISO 14001 gap analysis.

Board Environment Committee, Executive Environment Committee, Regional Environment Committee, Compliance Reporting

BOARD ENVIRONMENT COMMITTEE

The Delta Board Environment Committee, convened by the Hon B Unsworth and also comprising the Chief Executive, one other director and Manager Environment, meets quarterly to review the Environmental Performance Quarterly report prepared by the Manager Environment. The report is submitted prior to Board meetings to provide an update on the corporate governance of Delta's environmental responsibilities. The report includes compliance issues, environmental incidents, public complaints and inquiries, environmental audit recommendations and significant issues arising from the Executive Environment Committee meeting.

The Board Environment Committee is responsible for:

- reviewing reports of any significant environmental incidents and management's response to such incidents;
- reporting on the status of all observations arising from environmental audits, and monitoring management's responses to implement remedial action; and
- evaluating the overall effectiveness of Delta Electricity's environment policy and procedures.

Matters arising from Board Environment Committee meetings requiring action are referred to the Manager Environment for subsequent communication to relevant environmental committees.

EXECUTIVE MANAGEMENT COMMITTEE

The Executive Management Committee prepares monthly compliance reports for the Board of Directors.

The committee comprising Senior Executives as designated by the Chief Executive and is responsible for:

- reviewing environmental compliance on a monthly basis; and
- ensuring appropriate corrective actions are taken in response to licence compliance, environmental incidents and public complaints or inquiries.

EXECUTIVE ENVIRONMENT COMMITTEE

The Executive Environment Committee meets on a quarterly basis with committee members including the Chief Executive, Manager Environment, General Managers and Regional Environment Managers. The Manager Environment reports to the committee on significant environmental issues arising from each region. The Executive Environment Committee is responsible for:

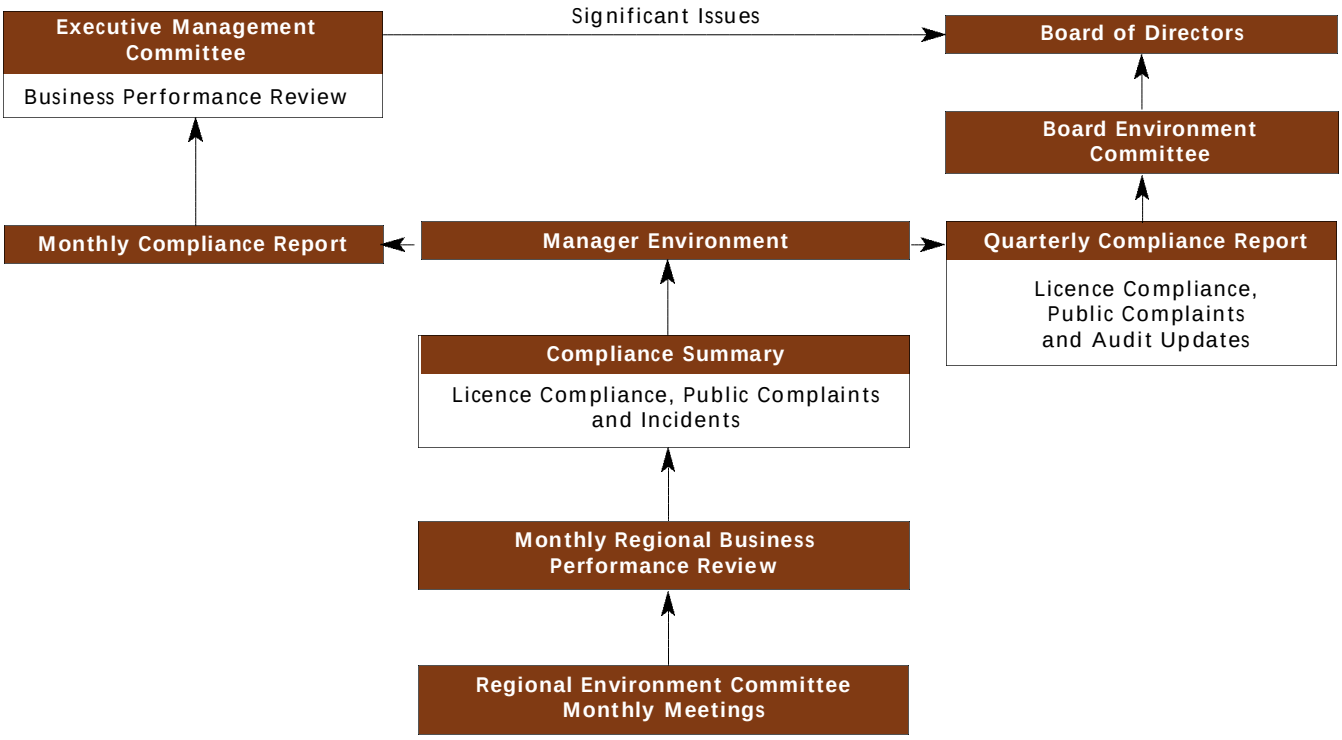
- setting and reviewing environmental policy and objectives;
- setting corporate environmental targets;
- allocating resources and responsibilities;
- reviewing environmental audits;
- developing new environmental initiatives;
- reviewing environmental performance targets; and
- responding to significant environmental issues.

REGIONAL ENVIRONMENT COMMITTEE

Quarterly Regional Environment Committee meetings chaired by General Managers are held to review environmental matters relating to operations within defined regions. The meetings are attended by Production and Environment Managers, Environmental Officers and power station personnel. Significant issues arising from these meetings are communicated to the Executive Environment Committee.

Regional Environment Committees are responsible for:

- setting and reviewing environmental targets consistent with corporate targets, policy and objectives;
- allocating resources and responsibilities;
- communicating and reviewing new environmental legislation;
- reviewing environmental management programs;
- responding to community related concerns; and
- reviewing environmental performance of operations.



COMPLIANCE REPORTING

Monthly compliance reports are prepared at both Central Coast and Western regions by Environment Officers for Business Performance Review Committees and Regional Environment Committees. These reports provide details and corrective actions on licence compliance, environmental incidents and public or EPA inquiries relating to power station operations. A tally of issues for each power station is provided on the reports including a year to date figure and the number of corrective action items outstanding.

The Manager Environment reviews both regional monthly compliance reports and prepares a Monthly Compliance Report for the Executive Management Committee and a Quarterly Compliance Report for the Board Environment Committee. Both reports provide the same detail of information as the regional monthly compliance reports but incorporate all Delta sites with year to date figures presented both numerically and graphically.

Significant environmental issues raised in the Monthly Compliance Report to the Executive Management Committee are reported to the Board through the Business Performance Review process.

EXTERNAL ENVIRONMENT REPORTING

Comprehensive environment reports detailing Delta's environment management system, policy objectives, environmental performance targets and measures and research and development programs will be prepared by the Corporate Strategy Group every three years. In addition, an Environment Review will be prepared every year as a performance measure. This review will provide details including:

- emissions to air and water;
- environmental incidents;
- licence compliance;
- management of waste;
- environment audit outcomes;
- management of water;
- tree planting programs; and
- public inquiries.

Schoolchildren visit the Mt Piper Expo.

Emergency response training

Energy Expo

The Energy Expo situated on the grounds of Mt Piper Power Station attracts up to 25,000 visitors a year. The majority of visitors are schoolchildren on organised school visits.

The Expo has been designed to inform and educate visitors with a range of media including interactive displays, illustrations, videos and information packs containing handouts on many different subjects relating to the generation, transmission and utilisation of electricity. An essential function of the Expo is to provide information on environmental issues including management of environmental impacts from Delta's operations (air/water/land), global environmental impacts (greenhouse emissions) and renewable technologies (wind/solar/biomass).

Occupational Health and Safety

The National Safety Council of Australia has rated all four Delta Electricity power stations 5-Star, with Mount Piper receiving the highest ever point score rating during 1999. We have achieved this through sound Occupational Health and Safety policies and procedures and a strong safety focus by Delta employees.

Occupational Health and Safety committees established at both Central Coast and Western Regions have been a driving force in the cultural change that has reduced our lost time frequency rate by 50 percent since 1997.

Community Sponsorship

The projects sponsored by Delta Electricity reflect the findings from community surveys. In both the Central Coast and Western regions residents have identified the environment as an area of concern and Delta's sponsorships have been targeted to assist in environmental care programs. These programs have included:

- Clean Up Australia (Delta Production Central Coast a major sponsor);
- Lithgow Tidy Towns (principal sponsor of judging competition);
- Central Coast Environment Council to assist with the removal of noxious weeds from Colongra wetlands;
- Rydal and District Bush Fire Brigade for bush fire control; and
- Birdie Budgewoi Dune Care to store and protect tools for sand dune stabilisation.

In addition, Delta also supports environmental education initiatives to help promote an understanding of environmental impacts and associated management activities. Examples include:

- Wyong Shire Council Schools Environment Program;
- Power House Museum's "Sparks and Currents"; and
- Streamwatch (Swansea and Northlakes High Schools).

MANAGEMENT
ENGINEERING
ENVIRONMENT

Scope of our assessment

GHD was commissioned by Delta Electricity to independently validate the data and content of the 1996-99 Environmental Report (referred to as the Report). The scope of our independent assessment was to:

1. Verify that data used in the Report was materially correct, based upon a random selection of data;
2. Track the selected data through an audit trail;
3. Review completeness of data, reasonableness of assumptions and calculation methods; and
4. Review supporting documentation to verify the statements made in the Report.

The site selected for verification (out of four operating power station sites) was the Vales Point power station.

General findings

We examined the content and context of the Report and interviewed relevant management staff. A detailed evaluation report was produced by GHD outlining any errors of fact, omissions and areas for further improvement. All errors of fact and a number of omissions were corrected prior to finalising the Report. In addition, a number of additional environmental issues were addressed in the final Report.

Based on our findings, the statements made in the report present a fair view of Delta Electricity's environmental management and performance over the past three years.

Reporting systems

We reviewed the controls and procedures in place for collecting the environmental information included in the report. The findings were:

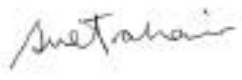
1. There are procedures in place for collecting, analysing, calculating and interpreting data for some environmental issues such as atmospheric emissions. However, Corporate procedures have not yet been established for collecting, reporting and aggregating most environmental data from the four power stations. Data collection procedures need to be established for future environmental reporting;
2. Detailed spreadsheets were used for data collation for a number of environmental issues. These enhanced the generation and review of data as well as allowing comparability between the sites; and
3. Different reporting formats and spreadsheets were used at the four power stations for some environmental issues, such as raw material usage, and quantities and types of wastes recycled. This made verification of aggregated data difficult. Standard environmental reporting reports/ spreadsheets need to be developed.

Data verification

Data for the Vales Point power station for 1998/99 was checked for each graph and table in the Report. In addition, other random samples of data from other power stations and years were checked. The findings were:

1. In general, the data collected and reported was complete and accurate, and assumptions were reasonable;
2. Data is presented in the report in an appropriate manner, including international emission guidelines for comparison;
3. The methodology for aggregating, calculating and deriving information such as atmospheric emission rates and raw material usage appears acceptable. However, the methodology is not documented in all cases. It is recommended that the conversion factors used and the methodology for all calculations and derived values be documented so that future environmental reports use the same basis for comparison;
4. Not all raw data was available, such as quantities of ash to landfill and quantities recycled. Consequently, some data reported was difficult to verify;
5. Not all data was correctly transcribed into the Report (eg: environmental expenditure data);
6. Some minor errors were noted in the selection of data that was tracked, such as rounding errors and/or mathematical errors; and
7. Raw data was not tabulated in all cases, so could not be readily checked. This has now been rectified with the preparation of data spreadsheets.

It is noted that items 5 and 6 have been corrected in the final version of the Report.



Sue Trahair
Senior Environmental Auditor
GHD, Sydney
November 1999

Delta Electricity (Delta) commissioned Snowy Mountains Engineering Corporation (SMEC) to undertake an external desktop review of its first Environment Report 1996-99.

Review Scope

The scope of the external review was to cover the following:

- desktop assessment of the report for any major anomalies or errata and to identify potential improvements in reporting;
- benchmarking of the report against the UNEP/SustainAbility 50 environmental reporting ingredients;
- assessing the report using the Annual Reporting Awards (1998) Corporate Environmental Reporting Award and Banksia Foundation Environmental Management Award criteria as review benchmarks; and
- identifying potential improvements to enhance the communication value of the report.

Two major outputs of the external review process are this review statement and a detailed review report on the findings.

Review Findings and Recommendations

- In general the report is an excellent well-balanced first report on Delta's environmental performance. It is easy to follow and clearly delineates the principle issues relevant to stakeholders.
- It is recognised that the level of data presented reflects the short performance measurement and reporting timeframe of three to four years, and the targets set are mostly new external targets given that the report is the organisation's first.
- The report can be classified as Stage 3 of SustainAbility Ltd's five stages of complexity increasing from basic to advanced level of public environmental reporting. This is a commendable outcome.
- The report contains some emerging best practice examples in public environmental reporting. These include a listing of Delta's significant environmental issues, information on stakeholder consultation in relation to external reporting and environmental cost accounting.
- The report scored well against the UNEP ingredients, which reflects its comprehensive nature. The score of 91 out of a total score of 194 points puts the report in the 'State-of-the-art' category and second in the list of reports considered by SMEC's benchmarking study Public Environmental Reporting: Where Does Australia Stand?

Recommendations

- Delta's approach of developing one comprehensive environmental report every three years supported by yearly environmental review reports is innovative, but requires further input from stakeholders to ensure they are satisfied with the level of environmental disclosure. This could form part of the ongoing consultation process with stakeholders.
- The level of information presented within the report reflects Delta's stakeholder needs and significant environmental issues. It is an Environmental report rather than an Environmental and Social, Sustainability or Triple Bottom Line report. Delta may wish to consider progressively moving towards a more holistic report in future years.
- Key outcomes of external reporting include transparency, multi-way stakeholder dialogue and accountability. The Delta report reflects these characteristics and is strong in accountability. Room exists for improvement to show more interactions with other non-traditional stakeholders in addition to local communities. The link between stakeholder dialogue and governance could also be strengthened.

Terence Jeyaretnam
Manager, Environment, SMEC Victoria
Accredited Environmental Auditor (EPA Victoria)
Senior Environmental Auditor, QSA
Date: 26 November 1999

Atmospheric emissions

	Delta Electricity atmospheric emissions (tonnes)					
	Delta Production Central Coast			Delta Production Western		
	1996/97	1997/98	1998/99	1996/97	1997/98	1998/99
Oxides of Sulfur	16,500	16,200	17,600	54,200	59,700	63,000
Oxides of Nitrogen	14,700	14,600	14,700			
Particulates	2,400	2,300	2,400			

Note – Monitoring of nitrogen oxides at Wallerawang power station commenced January 1999. Mass emission data at Mt Piper and Wallerawang power stations will be available in January 2000.

Emissions to waters

The figures in the following tables refer to concentrations of trace elements detected at the point of discharge. The concentrations detected downstream of these points of discharge are well below the NSW Clean Waters Regulation 1972 limits and the Australian and New Zealand Environment and Conservation Council 1992 guidelines.

Trace Element	Delta Electricity water emissions (mg/L average)					
	Munmorah Ash Dam Discharge Point 002			Vales Point Ash Dam Discharge Point 002		
	1996/97	1997/98	1998/99	1996/97	1997/98	1998/99
Zinc (mg/L)	<0.10	<0.10	<0.05	<0.10	0.05	<0.05
Copper (mg/L)	<0.01	<0.01	<0.01	0.05	0.04	0.01
Selenium (mg/L)	<0.01	<0.01	<0.01	0.03	0.02	0.02
Manganese (mg/L)	0.02	0.03	0.02	0.02	<0.01	0.02
Cadmium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Note – Trace elements denoted with a less than sign are below the practical quantitation limit of the sample result.

Parameter	Cooling Tower Discharge to Coxs River					
	1996/97		1997/98		1998/99	
	Unit 7	Unit 8	Unit 7	Unit 8	Unit 7	Unit 8
Sulfate (mg/L) Limit: 1200	150	300	300	700	340	560
Non-filterable Residue (mg/L)	9	4	10	4	18	8

Trace Element	Caustic Injection Plant Settling Ponds to Coxs River Discharge Point 003	
	1996/97	1998/99
Fluoride (mg/L)	7	9
Manganese (mg/L)	0.7	0.8
Iron (mg/L)	0.1	0.1
Boron (mg/L)	3	4
Selenium (mg/L)	0.1	0.2

Number of trees/shrubs Delta planted during 1996/98

Planting period	Region trees planted	Amount trees planted
1996	Western Region Central Coast Region	6,050 7,100
1997	Western Region Central Coast Region	27,800 270
1998	Western Region Central Coast Region	25,800 5,800

Note: Majority of trees planted by Western Region were pine, whilst the Central Coast Region planted native vegetation.

Environmental expenditure

Expenditure item	1995-96		1996-97		1998-99	
	Central Coast	Western	Central Coast	Western	Central Coast	Western
Protection of ambient air and climate	$2,406,000	$806,000	$730,000	$582,000	$475,000	$2,355,000
Waste water management/water pollution	$954,000	$1,486,000	$806,000	$2,048,000	$350,000	$589,000
Non-hazardous solid waste management	$753,000	$3,010,000	$246,000	$3,924,000	$60,000	$6,915,000
Hazardous solid waste management	$15,000	$45,000	–	$4,000	$39,000	–
Noise and vibration abatement	$31,000	$5,123,000	$41,000	–	–	–
Other environmental protection activities	$82,000	$426,000	$108,000	$28,000	–	$95,000
Capital expenditure on waste management and environmental protection	$5,850,000	$10,625,000	$1,398,000	$3,744,000	$2,340,000	$448,000
TOTAL	**$10,091,000**	**$21,521,000**	**$3,329,000**	**$10,330,000**	**$3,264,000**	**$10,402,000**

Note – Variations in capital expenditure between regions is due to differences in asset management strategies and business planning cycles. Waste management expenditure in the Western region is higher than that of the Central Coast region due to the high cost of dry ash disposal at Mt Piper Power Station.

Typical resource usage

Resource usage yearly consumption	Tonnes
Coal	8,000,000
Fuel Oil	6,000
Transport Fuel	400
Lubricating Oil	34
Water	25,000,000
Sulfuric Acid	1,300
Caustic Soda	900
Ammonia	150
Chlorine	120
Hydrazine	4
Alum	30
Bromide	15
Ferriclear	10
Hydrochloric Acid	4
Antifoam	4

Ash Recycled

YEAR	Delta Production Central Coast		Delta Production Western	
	Ash Produced (kilo tonnes)	Total Ash Sold (kilo tonnes)	Ash Produced (kilo tonnes)	Total Ash Sold (kilo tonnes)
1996/97	NA	NA	NA	NA
1997/98	652	101	1,106	137
1998/99	579	215	1,218	156

NA Not monitored, accounting system not established.

Waste to Landfill

YEAR	Waste to Landfill (Tonnes)			
	Munmorah	Vales Point	Wallerawang	Mt Piper
1996/97	NA	NA	NA	NA
1997/98	94	128	*53	*66
1998/99	41	92	146	156

NA Not monitored, accounting system not established.

* Accounting system was established in 1997 and figures may underestimate actual tonnes.

Greenhouse gas emissions

Year	Million tonnes of CO_2
1989/90	13.5
1994/95	13.5
1995/96	15.1
1996/97	16.6
1997/98	17.2
1998/99	18.1

Mt Piper Power Station July 1996/June 99 EPA licence compliance	
Licence condition	**100% compliance**
Any act or omission that results in the pollution of any water, within the meaning of the Clean Waters Act 1970.	No[1]
Final holding pond monitoring station to Neubecks Creek Volume of discharge not to exceed 3,500 kilolitres on any day.	Yes
Record combined volume of discharge and stormwater discharge daily in kilolitres.	Yes
Monitor approximate rainfall (millimetres)	Yes
Monitor discharge monthly for: • pH	Yes
• Conductivity (micro Siemens per centimetre)	Yes
Monitor discharge three monthly for:	
• Sulfate (mg/L)	Yes
• Chloride (mg/L)	Yes
• Non-filterable residue by scanning electron microscopy	Yes
Any act or omission that results in air pollution, within the meaning of the Clean Air Act 1961.	No[2]
SOURCE MONITORING **Particulate emissions** Continuous monitoring of particulate emissions in the flue gases of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Monitoring calibrated at least weekly and each six months a multipoint check.	Yes
Once each twelve months, a particulate emission test must be conducted on at least one boiler.	Yes
Report monthly date, 24 hour average value of particulate emissions as well as, mean, standard deviation, maximum hourly values, instrument multipoint calibration results and instrument availability.	Yes
Sulfur dioxide Continuous monitoring of sulfur dioxide of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Monitor instrument span at least monthly and multipoint calibration at least once each six months.	Yes
Report monthly date, 24 hour average value as well as, mean, standard deviation, maximum hourly values, instrument multipoint calibration results and instrument availability.	Yes
Oxides of nitrogen Continuous monitoring of oxides of nitrogen emissions in the flue gases of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Monitor instrument span at least monthly and multipoint calibration at least once each six months.	Yes
Report monthly date, 24 hour average value as well as, mean, standard deviation, maximum hourly values, instrument multipoint calibration results and instrument availability.	Yes
Total fluoride Determine the total fluoride concentration in the flue gases from at least one boiler, once each twelve months.	Yes
Report date, boiler tested and the concentration of the total fluoride obtained.	Yes
COMMUNITY AIR MONITORING Six ambient air monitoring stations must be maintained and operated at locations acceptable to the EPA.	Yes
A monitoring station must be maintained and operated at a location acceptable to the EPA to monitor sulfur dioxide and oxides of nitrogen. Valid data must be reported for 80% of each year.	Yes
Sulfur dioxide Ambient sulfur dioxide must be monitored continuously.	Yes
Valid data obtained 80% of each year.	Yes
Monitor instrument span at least monthly and multipoint calibration at least once each six months.	Yes
Report monthly average, standard deviation of the monthly data, the average and the maximum hourly average of each day. Instrument monthly span check results, multipoint calibration results and instrument availability.	Yes
Oxides of nitrogen Ambient oxides of nitrogen must be monitored continuously.	Yes
Valid data obtained 80% of each year.	Yes
Monitor instrument span at least monthly and multipoint calibration at least once each six months.	Yes
Report monthly average, standard deviation of the monthly data, the average and the maximum hourly average of each day. Instrument monthly span check results, multipoint calibration results and instrument availability.	Yes
METEOROLOGICAL DATA Wind velocity measured by a cup anemometer and wind vane.	Yes
Rainfall measured to SAA Standard.	Yes
Monthly reports prepared and submitted each calendar year.	Yes
Valid data reported for at least 80% of each calendar year.	Yes

1 Contractor discharged water with high total suspended solids from final holding pond to Neubecks Creek during desilting operation. Corrective action undertaken immediately with discoloured water transferred to station settling pond (May 1998).

2 Elevated stack gas opacity due to filter bag wear. Corrective action undertaken immediately with power station load reduced to lower particulate emissions. Replacement program undertaken to replace damaged filter bags with new filter bags (June 1998).

Wallerawang Power Station July 1996/June 99 EPA licence compliance	
Licence condition	**100% Compliance**
Any act or omission that results in the pollution of any water, within the meaning of the Clean Waters Act 1970.	No[1]
Cooling Tower Discharge to Coxs River Volume of discharge not to exceed 10,000 kilolitres on any day.	No[2]
Discharge must not contain more than 1200 mg/L of sulfate.	Yes
Discharge must not have a pH value below 6.5 or greater than 8.5.	No[3]
Discharge must not exceed Clean Waters Regulations 1972 excluding Mn and Fe.	Yes
Record total volume of discharge daily in kilolitres.	Yes
Monitor weekly cooling tower discharge for:	
• Sulfate (mg/L)	Yes
• pH	Yes
• Non-filterable residue (mg/L)	Yes
Oil and grit trap and settling lagoon overflow Volume of discharge must not exceed 10,000 kilolitres on any day	Yes
Discharge must not contain more than 30 mg/L of non-filterable residue.	Yes
Discharge must not contain visible grease or oil, nor 10 mg/L (in total) of grease and oil.	Yes
Discharge must not be of a pH less than 6.5 or greater than 8.5.	Yes
Discharge must not exceed Clean Waters Regulations 1972 excluding Mn and Fe.	Yes
Record total volume of discharge daily in kilolitres.	Yes
Monitor weekly oil and grit trap discharge for:	
• Non-filterable residue (mg/L)	Yes
• Grease and oil (mg/L)	Yes
• pH	Yes
Caustic injection plant settling ponds to Coxs River Volume of discharge must not exceed 10,000 kilolitres on any day.	Yes
Discharge must not contain more than 30 mg/L of non-filterable residue.	Yes
Discharge must not be of a pH less than 6.5 or greater than 8.5.	Yes
Discharge must not contain more than 1200 mg/L of sulfate.	Yes
Discharge must not exceed Clean Waters Regulations 1972 excluding Mn and Fe.	Yes
Record total volume of discharge daily in kilolitres.	Yes
Monitor weekly settling pond discharge to Coxs river for:	
• Non-filterable residue (mg/L)	Yes
• pH	Yes
• Sulfate (mg/L)	Yes
• Fluoride (mg/L)	Yes
Monitor monthly settling pond discharge to Coxs river for:	
• Manganese (mg/L)	Yes
• Iron filterable (mg/L)	Yes
• Boron (mg/L)	Yes
• Selenium (mg/L)	Yes
Monitor monthly 50 metres upstream and 100 metres downstream of discharge for:	
• Manganese (mg/L)	Yes
• Iron filterable (mg/L)	Yes
• Boron (mg/L)	Yes
• Selenium (mg/L)	Yes
• Fluoride (mg/L)	Yes
Discharge to Coxs River beneath Wallerawang dam wall Volume of discharge must not exceed 5,000 kilolitres on any day.	Yes
Discharge must not be of a pH less than 6.5 or greater than 8.5.	Yes
Discharge must not contain more than 1200 mg/L of sulfate.	Yes
Discharge must not exceed Clean Waters Regulations 1972 excluding Mn and Fe.	Yes
Record total volume of discharge daily in kilolitres.	Yes
Monitor weekly drain discharge for:	
• Non-filterable residue (mg/L)	Yes
• pH	Yes
• Sulfate (mg/L)	Yes
Overflow drain from southern retention basin to Coxs River Discharge must not be of a pH less than 6.5 or greater than 8.5.	Yes
Discharge must not contain more than 30 mg/L of non-filterable residue.	No[4]
Discharge must not contain any visible grease or oil.	Yes
Monitor weekly overflow drain discharge for:	
• Non-filterable residue (mg/L)	Yes
• pH	Yes
• Visible oil and grease	Yes

1 Water contaminated with silt from blowdown line repairs was discharged to Coxs River. Further discharges filtered with silt trap (March 1998).

2 Elevated discharge volume. Discharge reduced to within daily limit (September 1998).

3 Elevated pH due to use of incorrect sampling location. Sample location changed (June 1999).

4 Elevated non-filterable residue due to sediment runoff during heavy rainfall (July, August and October 1996). Condition subsequently removed from licence by EPA (Oct 1996).

Munmorah Power Station July 1996/June 99 EPA licence compliance	
Licence Condition	**100% Compliance**
Any act or omission that results in the pollution of any water, within the meaning of the Clean Waters Act 1970.	Yes
Cooling water outlet canal to Lake Budgewoi	
Volume of discharge not to exceed 4,750 megalitres on any day.	Yes
Discharge temperature not greater than 35^{O}C for more than 1.5% of time.	Yes
Discharge temperature not greater than 37.5^{O}C.	Yes
Continuously monitor inlet and outlet canal discharge temperature in ^{O}C with 80% data availability.	Yes
Provide backup temperature recording for inlet and outfall canal.	Yes
Provide 99% data availability on inlet and outlet canal temperature for months of Dec, Jan, Feb.	Yes
Continuously record skimmer pump operating hours (hours per day).	Yes
Continuously monitor volume of discharge (megalitres).	Yes
Monitor monthly cooling system dosing rates for:	
• amount of anti foaming agent use (kilograms per month)	Yes
• amount of iron used (kilograms per month)	Yes
• amount of biocides used (kilograms per month)	Yes
• amount of inhibitors used (mass per month)	Yes
• amount of sawdust used (mass per month)	Yes
Ash Dam discharge into inlet canal	
Volume of discharge must not exceed 10,000 kilolitres on any day.	Yes
Discharge must not be of a pH less than 6.5 or greater than 9.5.	Yes
Discharge must not contain more than 50 mg/L of non-filterable residue.	Yes
Monitor monthly outfall canal discharge for:	
• Non-filterable residue (mg/L)	Yes
• Nitrogen (nitrate & nitrite) (mg/L)	Yes
• Phosphorus Total (mg/L)	Yes
• Phosphorus Dissolved Reactive (mg/L)	Yes
• pH	Yes
Monitor quarterly discharge from the ash pond for:	
• Zinc (mg/L)	Yes
• Copper (mg/L)	Yes
• Selenium (mg/L)	Yes
• Manganese (mg/L)	Yes
• Cadmium (mg/L)	Yes
• Lead (mg/L)	Yes
Tuggerah Lakes monitoring	
Monitor not less than 10 water quality surveys at monitoring stations M1,B1 and T2 for:	
• Dissolved oxygen (mg/L)	Yes
• Temperature ^{O}C	Yes
• Salinity measured at 0.1 metres	Yes
• Water clarity using a secchi disk	Yes
• Zooplankton Total count	Yes
Operational conditions	
Skimmer pumps and ponds must be inspected daily or when oil alarm is activated.	Yes
Oil collected shall be recovered and disposed in a manner which does not cause water pollution.	Yes
Skimmer pumps system availability shall not be less than 95% during any calendar month.	Yes
Overflow from ash dam to inlet canal must be inspected if there is a possibility of discharge.	Yes

Munmorah Power Station July 1996/June 99 EPA licence compliance (continued)	
Licence condition	**100% compliance**
Any act or omission that results in air pollution, within the meaning or the Clean Air Act 1961.	Yes
SOURCE MONITORING	
Report monthly hours of operation, total mass of particulates, sulfur dioxide, carbon dioxide, oxides of nitrogen, fluoride emitted to atmosphere, total energy production and coal consumption.	Yes
Particulate emissions Continuous monitoring of particulate emissions in the flue gases of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Conduct a particulate emission test on one boiler each six months of boiler fan operation or after any boiler returns to service.	Yes
Report monthly the time, date and reason for any particulate emission exceeding 0.250 g/m^3.	Yes
Report monthly date, 24 hour average and maximum 1 hour average value of particulate emissions.	Yes
Report weekly span and zero check results, multipoint calibration results & instrument availability.	Yes
Sulfur dioxide Continuous monitoring of sulfur dioxide of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report monthly the time, date and reason for any sulfur dioxide emission exceeding 600 ppm.	Yes
Report monthly date, 24 hour average and maximum 1 hour average value of sulfur dioxide emissions.	Yes
Report weekly span & zero check results, multipoint calibration results & instrument availability.	Yes
Oxides of nitrogen Continuous monitoring of oxides of nitrogen emissions in the flue gases of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report monthly the time, date and reason for any oxides of nitrogen emissions exceeding 700 ppm.	Yes
Report monthly date, 24 hour average and maximum 1 hour average value of oxides of nitrogen emissions.	Yes
Report weekly span & zero check results, multipoint calibration results and instrument availability.	Yes
Total fluoride Determine the total fluoride concentration in the flue gases from at least one boiler, once each twelve months.	Yes
Report date, boiler tested and the concentration of the total fluoride obtained.	Yes
COMMUNITY AIR MONITORING **Sulfur dioxide** Ambient sulfur dioxide must be monitored continuously.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report weekly span & zero check results, multipoint calibration results and instrument availability.	Yes
Report monthly average, standard deviation of the monthly data, the average and the maximum hourly average of each day.	Yes
Oxides of nitrogen Ambient oxides of nitrogen must be monitored continuously.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report weekly span and zero check results, multipoint calibration results and instrument availability.	Yes
Report monthly average, standard deviation of the monthly data, the average and the maximum hourly average of each day.	Yes
Dust deposition Monitor monthly dust deposition at not less than 6 sites within 1 kilometre of coal handling operations.	Yes
METEOROLOGICAL DATA Measure wind velocity by a cup anemometer and wind vane.	Yes
Valid data reported for at least 80% of each calendar year.	Yes
Report monthly wind speed and direction data.	Yes

Vales Point Power Station July 1996/June 99 EPA licence compliance	
Licence condition	**100% compliance**
Any act or omission that results in the pollution of any water, within the meaning of the Clean Waters Act 1970.	Yes
Cooling water outlet canal to Lake Macquarie	
Volume of discharge not to exceed 6,500,000 kilolitres on any day.	Yes
Discharge temperature not greater than 35 ^{o}C for more than 1.5% of time.	Yes
Discharge temperature not greater than 37.5 ^{o}C.	Yes
Discharge not to contain more than 0.2 mg/L of free chlorine.	Yes
Continuously monitor inlet and outlet canal discharge temperature in ^{o}C.	Yes
Provide backup temperature recording for inlet and outfall canal.	Yes
Provide 99% data availability on inlet and outlet canal temperature for months of Dec, Jan, Feb.	Yes
Continuously record skimmer pump operating hours (hours per day).	Yes
Continuously monitor volume of discharge (megalitres).	Yes
Monitor monthly cooling system dosing rates for:	
• amount of anti foaming agent use (mass per month)	Yes
• amount of chlorine used (mass per month)	Yes
• amount of biocides used (mass per month)	Yes
• amount of inhibitors used (mass per month)	Yes
• amount of sawdust used (mass per month)	Yes
Ash dam discharge to outfall canal	
Volume of discharge must not exceed 120,000 kilolitres on any day.	Yes
Discharge must not be of a pH less than 6.5 or greater than 9.5.	Yes
Discharge must not contain more than 50 mg/L of non-filterable residue.	Yes
Monitor volume of daily discharge (megalitres) from pump running time.	Yes
Monitor monthly outfall canal discharge for:	
• Non-filterable residue (mg/L)	Yes
• Nitrogen (nitrate & nitrite) (mg/L)	Yes
• Phosphorus Total (mg/L)	Yes
• Phosphorus Dissolved Reactive (mg/L)	Yes
• pH	Yes
Monitor quarterly discharge from the ash pond for:	
• Zinc (mg/L)	Yes
• Copper (mg/L)	Yes
• Selenium (mg/L)	Yes
• Manganese (mg/L)	Yes
• Cadmium (mg/L)	Yes
• Lead (mg/L)	Yes
Ash dam spillway discharge from number 1 & 2 holding ponds	
Volume of discharge must not exceed 500 kilolitres on any day.	Yes
Discharge must not contain more than 50 mg/L of non-filterable residue.	Yes
Monitor volume of daily discharged (kilolitres).	Yes
Monitor monthly from number 1 holding pond discharge for:	
• pH	Yes
• Non-filterable residue (mg/L)	Yes
• Phosphorus Total (mg/L)	Yes
• Nitrogen (nitrate & nitrite) (mg/L)	Yes
Monitor not less than 90 day intervals from number 1 holding pond discharge for:	
• Zinc (mg/L)	Yes
• Copper (mg/L)	Yes
• Selenium (mg/L)	Yes
• Manganese (mg/L)	Yes
• Cadmium (mg/L)	Yes
• Lead (mg/L)	Yes
Lake Macquarie monitoring	
Monitor not less than 10 water quality surveys at monitoring stations LM15,LM14 & LM13 for:	
• Dissolved oxygen (mg/L)	Yes
• Temperature ^{o}C	Yes
• Salinity measured at 0.1 metres	Yes
• Water clarity using a secchi disk	Yes
• Zooplankton total count	Yes
Operational conditions	
Skimmer pumps and ponds must be inspected daily or when oil alarm is activated.	Yes
Oil collected shall be recovered and disposed of in a manner which does not cause water pollution.	Yes
Inspect overflow points from ash dam into Mannering Creek regularly for discharges.	Yes
No discharge of effluent to outlet canal or any area other than the ash dam catchment.	Yes
Stormwater run off must be diverted from holding ponds.	Yes
Effluent disposal storage capacity of the ponding system must be utilised during wet weather.	Yes

Vales Point Power Station July 1996/June 99 EPA licence compliance (continued)	
Licence condition	**100% compliance**
Any act or omission that results in air pollution, within the meaning or the Clean Air Act 1961.	Yes
SOURCE MONITORING Report monthly hours of operation, total mass of particulates, sulfur dioxide, carbon dioxide, oxides of nitrogen, fluoride emitted to atmosphere, total energy production and coal consumption.	Yes
Particulate emissions Continuous monitoring of particulate emissions in the flue gases of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	No[1]
Conduct a particulate emission test on one boiler each six months of boiler fan operation or after any boiler returns to service.	Yes
Report monthly the time, date and reason for any particulate emission exceeding 0.250 g/m^3.	Yes
Report monthly date, 24 hour average and maximum 1 hour average value of particulate emissions.	Yes
Report weekly span and zero check results, multipoint calibration results and instrument availability.	Yes
Sulfur dioxide Continuous monitoring of sulfur dioxide of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report monthly the time, date and reason for any sulfur dioxide emission exceeding 600 ppm.	Yes
Report monthly date, 24 hour average and maximum 1 hour average value of sulfur dioxide emissions.	Yes
Report weekly span and zero check results, multipoint calibration results and instrument availability.	Yes
Oxides of nitrogen Continuous monitoring of oxides of nitrogen emissions in the flue gases of at least one boiler.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report monthly the time, date and reason for any oxides of nitrogen emissions exceeding 700 ppm.	Yes
Report monthly date, 24 hour average and maximum 1 hour average value of oxides of nitrogen emissions.	Yes
Report weekly span and zero check results, multipoint calibration results and instrument availability.	Yes
Total fluoride Determine the total fluoride concentration in the flue gases from at least one boiler, once each twelve months.	Yes
Report date, boiler tested and the concentration of the total fluoride obtained.	Yes
COMMUNITY AIR MONITORING **Sulfur dioxide** Ambient sulfur dioxide must be monitored continuously.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report weekly span and zero check results, multipoint calibration results and instrument availability.	Yes
Report monthly average, standard deviation of the monthly data, the average and the maximum hourly average of each day.	Yes
Oxides of nitrogen Ambient oxides of nitrogen must be monitored continuously.	Yes
Valid data obtained 80% of each year.	Yes
Check instrument zero and span weekly and multipoint calibration once each six months.	Yes
Report weekly span and zero check results, multipoint calibration results and instrument availability.	Yes
Report monthly average, standard deviation of the monthly data, the average and the maximum hourly average of each day.	Yes
Total fluorides Ambient gases and particulate fluorides must be monitored continuously.	Yes
Valid data obtained 80% of each year.	Yes
Report particulate, gaseous, total fluoride results and instrument availability for the quarter.	Yes
Suspended particulates Monitor suspended particulates must be monitored by Australian Standard 2724.3 or continuously.	Yes
Valid data obtained 80% of each year.	Yes
Dust deposition Monitor monthly dust deposition at not less than 6 sites within 1 kilometre of coal handling operations.	Yes

1 Failed to conduct multipoint calibration for particulate emissions (January 1998). Calibration carried out the following month.