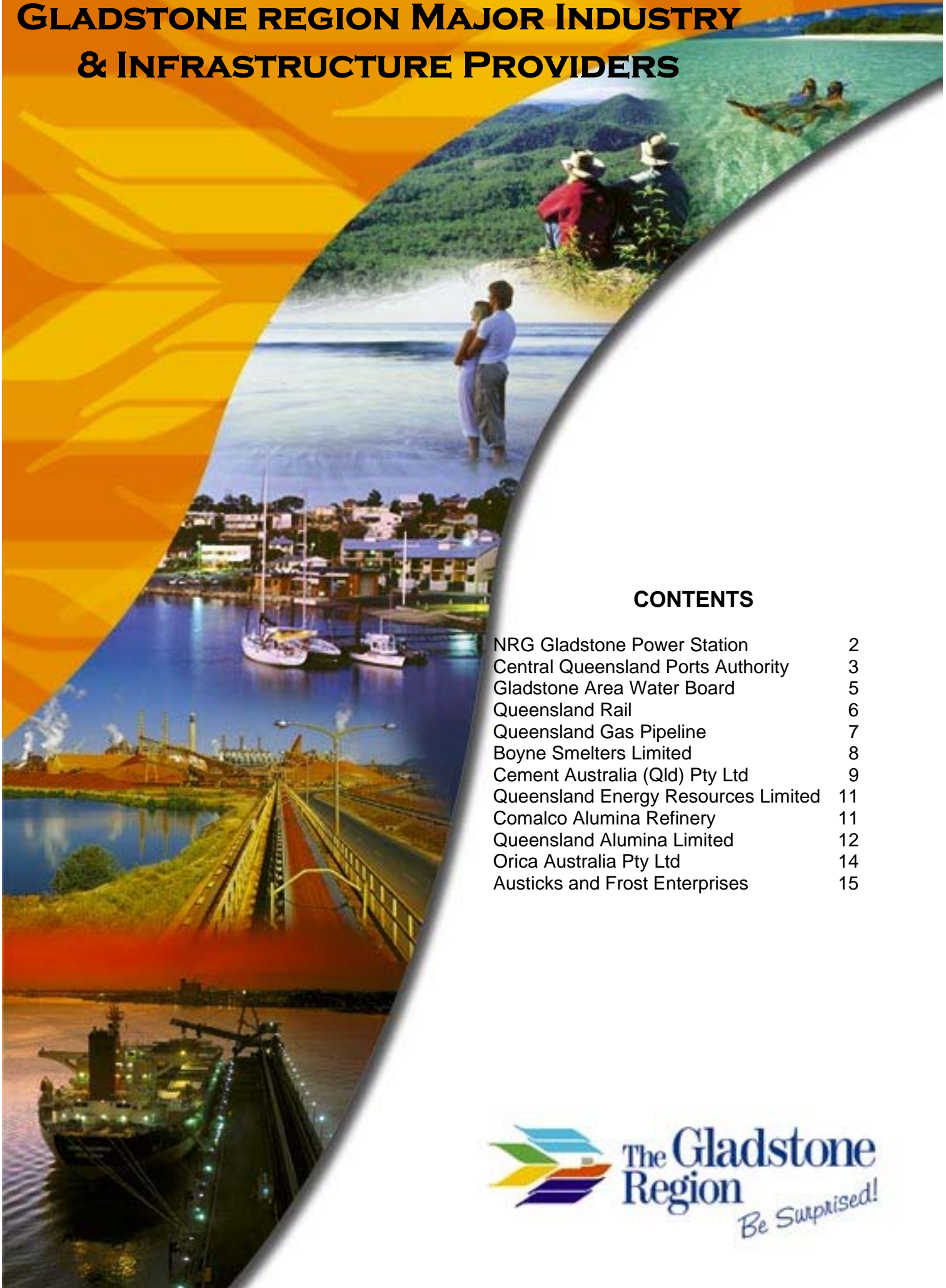


# GLADSTONE REGION MAJOR INDUSTRY & INFRASTRUCTURE PROVIDERS



## CONTENTS

NRG Gladstone Power Station	2
Central Queensland Ports Authority	3
Gladstone Area Water Board	5
Queensland Rail	6
Queensland Gas Pipeline	7
Boyne Smelters Limited	8
Cement Australia (Qld) Pty Ltd	9
Queensland Energy Resources Limited	11
Comalco Alumina Refinery	11
Queensland Alumina Limited	12
Orica Australia Pty Ltd	14
Austicks and Frost Enterprises	15

## NRG GLADSTONE POWER STATION



### OWNERSHIP AND OPERATION

The Gladstone Power Station is a world class power station providing safe, reliable low cost electricity to customers. Since 1994 the station has been operated by NRG Gladstone Operating Services on behalf of the joint venture participants, Comalco Ltd (42.125%) and NRG Energy Inc (37.5%), as well as SLMA GPS Pty Ltd (8.50%), Ryowa II GPS Pty Ltd (7.125%) and YKK GPS (Queensland) Pty Ltd (4.75%).

NRG Energy Inc was established in 1989 to invest in unregulated energy projects and is today one of the world's leading independent power producers. Today NRG has ownership in over 140 power facilities around the world and is involved in over 23,000 megawatts of projects in the USA, Europe, Latin America and the Asia-Pacific region.

NRG is also the largest independent power producer in Australia, with ownership interests in the Gladstone and Collinsville power stations in Queensland, Loy Yang A power station in Victoria, Flinders Power Station in South Australia and in Energy Developments Limited, an Australian company that pioneered the development of smaller scale power projects across Australia. These ownership interests reflect NRG's high level of commitment to Australia.

### HISTORY

Construction of the power station began in March 1971 and was completed in February 1982.

### Plant Description

Gladstone Power Station is Queensland's largest with a generating capacity of 1,680 megawatts.

The station was sited to take advantage of seawater for cooling and to be near to Central Queensland's vast coal reserves.

The station's six-megawatt turbogenerators each output 16,200 volts to transformers that convert the power to a level suitable for transmission at 132,000 or 275,000 volts.

### CUSTOMERS

The Gladstone Power Station sells most of its electricity to Boyne Smelters under a long-term contract. The station remains inter-connected with the Queensland Electricity grid and the remainder of the power generated is committed to the state.

### COAL SUPPLY

More than four million tonnes of coal each year are railed to the station from coalfields in Central Queensland.

Coal is stockpiled after unloading, then reclaimed from the stockpiles by either of two stacker reclaimers at a rate of 800 tonnes an hour, or via a covered slot bunker system that provides dry coal storage for extended operation in wet weather. Sufficient coal is stockpiled on site to run the station at maximum output for several weeks.

### COOLING WATER SUPPLY

The station requires 245 million litres of cooling water an hour, sufficient to fill nearby Awoonga Dam in six weeks. Saltwater pumped from Auckland Inlet passes through the Station's condensers to condense spent water for repeated use in the boilers. The cooling water is discharged into Calliope River.

### STACKS

The 153 metre high chimneystacks provide a natural draught that assist in the removal of the boiler flue gas. Two boilers are connected to each of the three stacks. Water reservoirs, for emergency fire fighting, are located in the base of the stacks.

### CONTROL SYSTEM

Gladstone Power Station's complex operations are controlled by modern computer systems, allowing all operations to be monitored in a single control room.

## BOILERS

Coal is burned in the boilers to generate steam from water at high pressure and temperatures. Each of Gladstone's six boilers has been designed with high dynamic response and is capable of increasing output at a rate of 100 thermal megawatts in 10 seconds.

## TURBOGENERATORS

Each of the six 280 megawatts turbogenerators weigh about 700 tonnes and are comprised of three steam turbines directly coupled to a generator. Hydrogen is used to cool the generators that spin at 3,000 revolutions a minute.

## ENVIRONMENT

NRG Gladstone Operating Services and the Joint Venture participants are committed to protecting the environment. Since 1994, NRG and the Joint Venture participants have completed in excess of \$90 million of environmental improvements to the plant. New fabric filters to remove dust from flue gases, equipment to maintain clean water standards, and a tree planting program are part of the upgrade. All waste products from the station are properly treated, monitored and controlled to avoid harmful effects on the environment.

## WORKFORCE

290 employees

## REPLACEMENT COST

Approximately \$2.2 billion.

## WEBSITE

[www.nrgasiapacific.com.au](http://www.nrgasiapacific.com.au)

## CENTRAL QUEENSLAND PORTS AUTHORITY – PORT OF GLADSTONE



Gladstone's bustling world-class port is Queensland's largest multi-commodity port. The port handles more than 59 million tonnes (Mt) of cargo a year and the region it serves is tipped to be Australia's major industrial centre for the 21st century.

The port is controlled and managed by the Central Queensland Ports Authority (CQPA), a State Government Owned Corporation. CQPA is unique among Australian port authorities as it not only conducts the functions of a "landlord" port authority but also owns and operates cargo handling facilities in the port. CQPA is a well recognised member of the Gladstone community and employs more than 420 people.

The port boasts many strategic advantages including:

- a naturally deepwater harbour
- protected waters sheltered by harbour islands
- stable weather patterns
- an abundance of nearby available land for industrial development
- a nearby hinterland rich with natural resources linked by an efficient transport network
- abundant energy sources, including coal, natural gas and water
- a short sailing time of 10 to 12 days to the Asia Pacific region

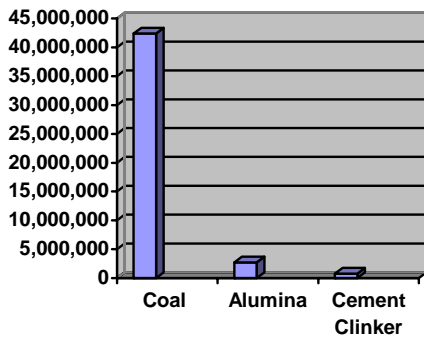
The port can cater for vessels of 220,000+ dead weight tonnes (dwt) and has a minimum sailing draft of 17 metres any day of the year.

## PORT TRADE

The Port of Gladstone handles a variety of cargoes associated with industries within the Central Queensland region.

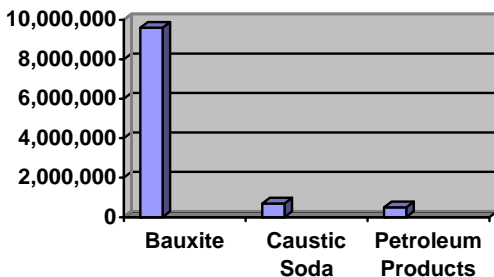
The major export commodity is coal, and during 2003/04, coal exports reached 42.4Mt, accounting for approximately 71% of total port trade. Other major export cargoes included alumina (2.7Mt); cement clinker (0.8Mt); and cement (0.4Mt). In total, the port exported 21 cargoes in 811 vessels to 36 countries.

Major Exports



The Port of Gladstone imports a variety of cargoes with the three major cargoes being bauxite (9.6Mt); caustic soda (0.7Mt); and petroleum products (0.5Mt). During 2003/04 305 vessels carrying imports from 15 countries berthed at the port.

Major Imports



**FACILITIES**

The port is home to six wharf centres comprising 14 berths. The wharves stretch over 30 kilometres of coastline from Boyne Wharf in the east to Fisherman's Landing in the west.

**RG Tanna Coal Terminal (RGCT)** - The terminal comprises two train unloading stations, 15 coal stockpiles, two mobile gantry shiploaders and three berths. RGCT services 11 mines and has a current throughput capacity of 40 million

tonnes per annum (Mtpa). Expansion works commencing late 2004 will increase the capacity of RGCT to 54Mtpa.

**Auckland Point Wharves** - The four wharves at Auckland Point handle a variety of cargoes. Among the imports are petroleum products, caustic soda, copper slag, cement gypsum, general cargo, magnetite, LP Gas, and containerised cargo. Cargoes exported from these wharves include woodchip, calcite, magnesia, grain, containerised and general cargo.

**Fisherman's Landing** - This facility boasts three berths, including CQPA's Bulk Liquids Wharf. Liquid ammonia, bauxite, and caustic soda are imported through Fisherman's Landing, with exports including cement clinker, cement, fly ash and limestone.

**Barney Point Terminal** - This terminal comprises one wharf and caters for the export of coal and other dry bulk products. Barney Point has a current throughput capacity of 5Mtpa.

**South Trees Wharf** - This facility boasts two wharves (East and West) and services the world's largest alumina refinery, Queensland Alumina Limited. The wharves handle the import of bauxite, caustic soda, and bunker fuel oil and the export of alumina.

**Boyne Wharf** - This wharf services Boyne Smelters Limited, Australia's largest aluminium smelter. Imports of petroleum coke and liquid pitch cross the wharf and the sole export cargo is aluminium.

**WORKFORCE**

420 employees  
150 employees during the construction and expansion phase of the port

**WEBSITE**

For further information, visit CQPA's website at [www.gpa.org.au](http://www.gpa.org.au)

For information on the RG Tanna Coal Terminal Expansion Project refer to the CQPA Publications section of this website.

## GLADSTONE AREA WATER BOARD



The Gladstone Area Water Board is a Queensland Government Commercialised Statutory Authority which supplies bulk raw and treated water to the Gladstone Region. The Board owns and operates the Awoonga Dam on the Boyne River, which is the only water storage in the region, as well as the associated infrastructure and delivery network.

The mission of the Board is 'To supply customers water requirements through commercially responsive and environmentally sustainable business practices'.

### THE FUTURE

The Board has a long history of meeting the developing needs of the region and is currently investing in major capital works to ensure an adequate water supply to meet the needs of the region for at least the next two decades.

The Gladstone Region Water Supply Development involves planning for future population growth and the industrial needs of the region. The Board is progressively upgrading and extending the pipeline network to ensure the water supply continues to supply enough water to satisfy the growth in the region.

The Board has developed a Water Management Plan on behalf of the Department of Natural resources for the Boyne River and is the process of developing a plan for the Calliope River. In addition, the Board has undertaken an Environmental Impact Statement for raising the Awoonga Dam, in two stages, which will more than double the capacity of the Dam. Construction commenced in November 2000 with construction now complete.

### SAFETY AND ENVIRONMENT

The Board runs a Fish Hatchery operation in partnership with the Gladstone Port Authority. Two Fisheries staff are employed by the Board to implement fisheries breeding, restocking, and research. Since 1996, the Hatchery has bred and released into Lake Awoonga over 1.5 million Barramundi fingerlings and 220,000 Sea Mullet that were released in Upper Boyne River. This was the first successful commercial scale spawning and release of Sea Mullet in Australia. The hatchery also plans to breed and release Mangrove Jack.

The Board employs an Environmental Manager who oversees ongoing monitoring environmental programs at Lake Awoonga and, in conjunction with the Quality Manager, implementation of ISO14001 accreditation for the Board's environmental programs.

### EXISTING WATER DEMANDS BY CONSUMER TYPE

Customer Type	Demand (ML)
Major Industry	21,200
Power Generation	23,600
Local Authorities	12,200
<b>TOTAL</b>	<b>56,000</b>

### WORKFORCE

*Goondoon St Office:*

23 employees and 1 trainee

*Hatchery:*

3 Fisheries employees

*Awoonga Dam:*

4 Rangers and 2 Trainees

### WEBSITE

[www.gawb.qld.gov.au](http://www.gawb.qld.gov.au)

## QUEENSLAND RAIL



Queensland Rail (QR) provides the transport link in Queensland's coal and minerals supply chain from mine to port or domestic coal consumer. QR transports virtually all of Queensland's coal and mineral exports to port. Our coal and minerals rail network connects over 30 mines with 6 separate ports as well as to domestic coal users, promoting flexibility and security of supply. Gladstone is the centre of two of QR's coal systems:

The **Blackwater Rail System** comprises a network of lines which connects the coal mines in the southern Bowen Basin to the R.G. Tanna and Barney Point export coal terminals at Gladstone, and to domestic coal users. The system is fully electrified and trains operated typically consist of 4 electric locomotives with 104x78 gross tonne wagons (ie nominally 6,450 net tonne trains). The Blackwater fleet is progressively being upgraded with the introduction of 104 gross tonne wagons.

The **Moura Rail System** is a non electrified line that connects the Moura, Callide and Boundary Hill coal mines to the R.G. Tanna and Barney Point export coal terminals at Gladstone and to domestic coal users. By late 2000, trains operating in this system will consist of two 4000 class diesel-electric locomotives with 58x104 gross tonne wagons (nominally 4,800 tonne payload).

To better coordinate and gain efficiencies through integration of mine, rail and port systems, QR works closely with mines and ports. They have established internet based systems, which provide mines and ports, access to train schedule and arrival time information. They have also developed computer simulation models of the mine-rail-port systems to optimise resources employed in the transportation and distribution of customer's products.

QR's industrial products and freight services comprise the transportation of containerised international products to and from the Gladstone Port between intra and interstate destinations. Domestically, containerised aluminium is handled both intra and interstate from Boyne Smelter to various destinations. QR transports on behalf of Queensland Cement Limited inputs such as coal and limestone and conveys both cement products ex plant and fly ash from the Gladstone Power Stations as far as Cairns, Mt Isa and Melbourne. Bulk woodchip from Owanyilla (near Maryborough) is also railed to the port of Gladstone for export.

Products from chemical industries, Orica and Tigor, ie - ammonia nitrate, cyanides, chlorine and acids are transported as far a field as the Northern Territory, Western Australia and various export ports servicing all major mining and industrial centres throughout Australia.

QR has also established a dangerous cargo spur line and direct access links to the Port of Gladstone and the containerisation facility.

Regular freight and passenger rail services are available within Queensland, from Cairns to Brisbane and interstate, linking with the major ports of Sydney and Melbourne.

The Tilt Train service from Brisbane to Rockhampton provides fast and efficient passenger travel, with the journey from Brisbane to Gladstone taking less than 6 hours.

### THE FUTURE

QR is continually investigating and evaluating strategic rail links to develop a more flexible rail network to connect new and potential mine projects with various ports. For example, the rail link between Oaky Creek and Gregory mines already provides opportunities for Blackwater system coal mines to rail to the Dalrymple Bay/Hay Point coal terminals and for Goonyella system coal mines to rail to Gladstone. This allows some flexibility for customers to send coal to alternative ports for blending purposes or to avoid the necessity for ships to undertake multiple port loading.

QR is confident it provides a reliable, flexible and quality transport service - to meet the needs of its rail haulage customers and international buyers of Queensland coal and minerals. QR is developing a partnering approach to building competitively stronger coal and mineral industries.

## SAFETY AND THE ENVIRONMENT

QR has introduced a corporate Safety Management System to administer the overall loss control function within the organisation. The Safety Management System comprises of policies, standards, specifications and business instructions.

This system is regularly audited using an audit tool known as the International Safety Rating System. This audit tool is owned by an external company (Det Norske Veritas) and is used by QR under licence. Corporate goals have been defined under this criteria. The majority of QR's operations achieved Level 1 accreditation at the end of 1999. Current corporate goals are set to achieve Level 4 by the end of 2003.

## MAIN STAKEHOLDERS/CUSTOMERS

The following table lists QR's major customers and stakeholders associated with rail in the Gladstone Area:

Blackwater Area Mines	Moura Area Mines	Other
Curragh Ensham/Yongal a Kestral Blackwater Gregory Jellinbah South Blackwater Yarrabee Cook Colliery Oaky Creek	Moura Callide Boundary Hill	NRG Australia (Gladstone Power Station) Gladstone Port Authority: ➤ RG Tanna Terminal ➤ Barney Point Queensland Cement Ltd (QCL) Queensland Alumina Ltd (QAL) Stanwell Corporation Ltd Orica Australia Pty Ltd Tigor Chemical Company Pty Ltd Canterwood Pty Ltd

## WORKFORCE

QR employs more than 14,000 staff statewide.

## WEBSITE

[www.qr.com.au/](http://www.qr.com.au/)

## QUEENSLAND GAS PIPELINE

### OWNERSHIP AND OPERATION

Alinta Limited, owner and operator of the Queensland Gas Pipeline, is a wholly owned subsidiary of the Duke Energy Corporation.

The company is one of the world's leading international energy companies offering energy trading and marketing, risk management, natural gas and power development expertise and operations services across Latin America, Europe and the Asia Pacific. DEI's Asia Pacific portfolio is located across Australia, New Zealand and Indonesia and includes 2300km of natural gas pipelines in operation; 800 gross megawatts of thermal power generation; and also energy trading and marketing operations.

DEI's 627km Queensland Gas Pipeline transports natural gas from the south-west Queensland gasfields to Gladstone and Rockhampton near the Central Queensland coast.

The pipeline supplies natural gas to industrial and domestic markets and is part of a pipeline network servicing Australia's fastest growing State, Queensland.

The Queensland Gas Pipeline connects most gas sources in Queensland directly to markets in Gladstone and Rockhampton. Supply sources include the conventional gas fields of Northern and Southern Denison Trough and Surat Basin. Coal seam methane is supplied from the Bowen Basin coalfields. It is also downstream of the remaining supply source in Queensland, the Cooper/Eromanga Basin. Coal seam methane has risen to make up approximately 25% of the gas supply since initial flow in 1995.

## CUSTOMERS

The Queensland Gas Pipeline transports gas to major industrial facilities operated by:

- Queensland Alumina Ltd;
- Orica;
- Queensland Magnesia (Operations) Pty Ltd;
- Tigor;
- Suncor;
- AMC;
- Boyne Smelters Ltd; and
- Queensland Nitrates Pty Ltd

It also supplies gas to the Gladstone and Rockhampton domestic markets through Origin Energy.

The maximum free flow delivery capacity of the QCP mainline is 27 PJ per year, while the

capacity of the Rockhampton lateral is 14 PJ per year. The pipeline's design also provides for the development of significant additional capacity to suit the requirements of facility users.

## ENVIRONMENT

Natural gas is the cleanest burning and most environmentally acceptable fossil fuel. It produces fewer polluting emissions and contributes to the reduction of greenhouse gas emissions.

The environmental, economic and societal benefits of introducing natural gas to communities are proven at commercial, industrial and domestic levels. From supply of energy for domestic cooking, heating and natural gas vehicles through to gas-firing of hospitals, mills, power stations and mining operations, natural gas is universally preferred.

## WORKFORCE

The Queensland Gas Pipeline employs about 25 personnel throughout Gladstone, Moura, Roma and Brisbane in the Pipeline Control Centre.

Employees have recorded more than 570,000 hours without lost time to injury, testimony to the success of safety programs and training on the pipeline.

## COST

The Queensland Gas Pipeline was built by the Queensland Government in 1989 at a cost of \$130 million.

## WEBSITE

[www.duke-energy.com.au/](http://www.duke-energy.com.au/)

## BOYNE SMELTERS LIMITED



Boyne Smelters Limited (BSL) is Australia's largest aluminium smelter. In late 1997 a \$1 billion expansion, involving the addition of a third reduction line, was completed. This expansion increased production at the smelter from 260,000 tonnes to 530,000 tonnes a year.

BSL converts alumina to primary aluminium in an electrolytic reduction process, consuming approx. 17.5% of Queensland's power.

Situated on a 60 hectare site, BSL consists of three main production areas: the Carbon Plant, where carbon anodes, which become the positive electrode in the smelting process are manufactured; the Reduction Lines where the aluminium is smelted in large carbon lined electrolytic reduction cells; and Metal Products - the metal casting facility.

Boyne Smelters is a joint venture managed by Comalco Smelting. Comalco Ltd has a holding of more than 50% with the balance owned by Sumitomo Light Metal Industries, Sumitomo Corporation, Mitsubishi Corporation, Mitsubishi Materials, Marubeni, YKK, Kobe Steel and Sumitomo Chemical Corporation.

## PRODUCTION

The original two reduction lines produce 260,000 tpa while the third reduction line produces a further 250,000 tpa. This brings Boyne Smelters' production from 18% of Australia's total production to around 30%. This is Australia's largest aluminium smelter, and one of the largest in the world.



## RAW MATERIALS

Alumina	981756 tpa
Petroleum Coke	180,000 tpa
Electricity	870 MW
Gas	1506700 giga joules

## PROCESS

Alumina, the raw material for aluminium production, is transported from Queensland Alumina Limited along a ten kilometre conveyor system. Aluminium is produced in large electrolytic reduction cells. The original two reduction lines contain 480 reduction cells in two 850 metre long buildings. The third reduction line contains an additional 264 reduction cells in two 1km long buildings.

Alumina ( $Al_2O_3$ ) is fed into the cells at regular intervals where it dissolves in a bath of molten cryolite (sodium aluminium fluoride). An electric current of 220,000 DC amperes for lines one and two and 334,000 DC amperes for line three flows through carbon anodes which are suspended in the bath material to the carbon lined base of the cell. The current passing through the alumina/bath solution causes the oxygen in the alumina to separate and combine with the carbon of the anodes. The aluminium settles to the bottom of the reduction cell. Molten aluminium is siphoned off daily and transferred to the metal casting facility. Exhaust gases from the process are drawn from the cells and cleaned through fluoride scrubbing equipment before being expelled to the atmosphere.

## SAFETY AND ENVIRONMENT

At Boyne Smelters Limited, staff believe that all injuries are preventable. In 1999 Boyne Smelters embarked on a Du Pont Safety Programme. This programme, together with many other safety initiatives, has resulted in continued improvement in safety performance. 2001 saw a 54% improvement in recordable injury performance from 2000. The target for 2002 is at least another 50% reduction in injuries from 2001.

The largest solid waste from the process, spent cell lining, is processed using the COMTOR™ Process into non-toxic recyclable product that can be used in the road construction industry.

Boyne Smelters Limited, through Rio Tinto, is part of the Greenhouse Challenge Programme, aimed at reducing greenhouse gas emissions. BSL's commitment to continuous improvement has

reduced its direct greenhouse emissions per tonne of aluminium produced over the last 11 years by 45% since 1990 to 2001.

Greenhouse gas emissions per tonne of aluminium have been reduced by reducing the number of anode effects. (An anode effect occurs when alumina concentration in a cell falls below a certain level, causing gas bubbles to form under the anode and a resultant rise in cell voltage and emission of PFCS - perfluorinated carbons.)

## WORKFORCE

BSL employs approximately 1350 staff in a variety of roles including operation, maintenance, technical and administration based roles. There are an additional 150-200 contractors employed at BSL, in a variety of roles.

## REPLACEMENT COST

\$2.8 billion

## WEBSITE

[www.comalco.com.au](http://www.comalco.com.au)

## CEMENT AUSTRALIA (QUEENSLAND) LTD



Cement Australia Gladstone is a member of the Cement Australia Group, Cement Australia is the largest manufacturer and distributor of cement and one of Australia's major marketers of cementitious materials.

The Gladstone plant is set at two sites, the limestone mine is situated at East End, just south of Mt. Larcom while the processing plant is located 12 kilometres north of Gladstone.

Cement Australia Gladstone processes limestone, clay, silica sand and ironstone to produce cement

clinker as well as cement in bulk or bags at its cement-making facility. With a production capacity of 1.6 million tonnes a year, the plant supplies cement and clinker mainly to domestic but also international markets including the USA East Coast, Hawaii, Nicaragua and Costa Rica.

With the completion of its expansion in 1998, Cement Australia Gladstone boasts the largest cement kiln in Australia, paving the way for lucrative business opportunities in the Asia Pacific area.

Operating state-of-the-art technology, the plant is Australia's best, most efficient and leading environmental performer in the industry.

### PRODUCTION

Cement Australia's Fisherman's Landing kiln is Australia's largest, with a production capacity of 1.6 million tpa.

### RAW MATERIALS

Limestone	2.4 mtpa
Sand	160,000 tpa
Clay	96,000 tpa
Gypsum	80,000 tpa
Iron Oxides	30,400 tpa
Coal	200,000 tpa
Water	240 ML

### PROCESS

The first stage of the cement manufacturing process is the production of 'clinker'. The main raw materials used in clinker are limestone and overburden (a mixture of clays containing silica, iron oxide and alumina). All the ingredients are then placed into a 5 stage dual string-in-line pre-calciner kiln.

Pulverised coal and air blasted into the lower end of the kiln is burned at 1650C. This extreme heat drives carbon dioxide from the raw materials. The fine solids that are left join together because of the heat and, when cooled, form different sized dark grey pebbles call clinker.

The clinker falls into a grate cooler where it is air cooled before being taken by conveyor to storage sheds or silos.

To make cement, clinker is mixed with gypsum and fed into a ball mill, which grinds it to form the fine, light grey powder, called Portland Cement.

### WORKFORCE

150 employees

### MAIN CUSTOMERS

Australia (Eastern States)  
USA East Coast  
Pacific Islands

### ENVIRONMENTAL STATISTICS

Advances in QCL Gladstone's plant technology include hydraulic friction-drive equipment for the kiln, being only the third of its kind in the world. The clinker cooler is also considered the most energy efficient in the industry because of its heat recuperation capabilities.

Due to these and other innovations, including a reduction in water consumption at the plant of 40 million litres per month, the Group's specific fuel consumption has fallen by 36% resulting in a considerable reduction in greenhouse gas emissions.

Following the latest in world trends, Cement Australia Gladstone also introduced to Australia the first bag filters used in the dedusting of kiln and cooler exhaust gases in a single installation. As a result the level of dust emission on the main stack has reduced by greater than 80% compared to previous operation, and meets the most stringent world class specifications.

Resulting from the commissioning of this world class equipment, Cement Australia Gladstone recently began trialing the use of waste materials through its kiln line to reduce its reliance on non-renewable resources and to provide a solution to the environmental problem of dumping certain wastes.

In addition to representing an opportunity to recycle the waste of other processes and industries through the cement kiln, the company sees this program as an opportunity to improve its scope to stay world competitive on costs.

### REPLACEMENT COST

\$550 million

### WEBSITE

[www.qcl.com.au](http://www.qcl.com.au)

## THE STUART PROJECT



Queensland Energy Resources Limited (QERL) is progressing the development of a world first technology to extract oil from shale rock. The Stuart deposit contains 2.6 billion barrels of oil shale resource and is one of nine deposits in which QERL has an interest. QERL's resource base in Queensland amounts to 14.7 billion barrels of oil shale resources.

The Stuart plant and open-cut mine, located 15 kilometres north of Gladstone, is the company's first development utilising the Alberta Taciuk Processor (ATP). The currently operational demonstration plant is designed to produce 4,500 barrels per day of high quality oil products from 6,000 tonnes per day of mined oil shale. The products being produced, ultra-low sulphur naphtha (ULSN) and light fuel oil (LFO) have been successfully marketed since May 2001. ULSN, used to produce petrol, diesel and jet fuel, is being sold to Australian refiners, while LFO, a premium blending stock, is being sold into the Singapore fuel oil market.

The Stuart demonstration plant and mine operation presently employs 150 fulltime personnel. QERL maintains a policy of sourcing a large majority of its goods and services from providers within the Gladstone region. By doing so, the current economic input to the local region is in the vicinity of \$40 million per year.

In progressing Stuart from a demonstration operation to a commercial operation, QERL is dedicated to establishing a culture of openness and accountability, with awareness of its duties of care to employees, outside stakeholders and the environment. QERL's priorities are to understand the technical challenges that must be resolved in the demonstration plant, take measured steps to improve the demonstration plant, and to design a commercial facility that supports the long-term viability of an Australian oil shale industry.

QERL has the long-term vision, patience and capital needed to build a shale oil industry in

Australia. If proved technically viable and environmentally sound, the industry would bring significant benefit to the economy of Queensland and the Gladstone region.

#### WEBSITE

[Currently under construction](#)

### COMALCO ALUMINA REFINERY



#### INTRODUCTION

Comalco, wholly owned by Rio Tinto, has been part of the Gladstone community for more than three decades. It maintains a significant shareholding in Queensland Alumina Ltd, the Gladstone Power Station and a shareholding and management of Boyne Smelters Limited.

Comalco wholly owns the Comalco Alumina Refinery (CAR) in Gladstone Queensland. CAR was announced in October 2001. The Refinery was commissioned during the later half of 2004 and is currently operational moving toward full production rates.

The Refinery uses bauxite mined at its Weipa mine on Cape York Peninsula in Queensland to produce alumina for Comalco aluminium smelters at Bell Bay in Tasmania, Tiwai Point in New Zealand and for world markets.

Stage One of the Refinery consumes three million tonnes of Weipa Bauxite a year to produce 1.4 million tonne per annum of alumina. Proposed stages two and three will result in an increase to 4.2 mtpa to meet future production needs.

Part of state government infrastructure, new wharf facilities are used to unload bauxite and caustic soda and for outloading alumina product. The wharf is linked to the Refinery by conveyors and pipelines along the designated transport corridor.

#### **SAFETY**

The Refinery is designed, constructed and operated with the aim that no one gets hurt reflecting Comalco's *"If it's not safe don't do it that way"* safety principal. World-class performance is achieved through a strong safety culture coupled with excellent safety systems.

#### **ENERGY**

Coal-fired boilers are used to produce the Refinery's steam requirements and consume 400,000 tpa of coal railed from Central Queensland. The calcination process uses coal seam methane gas from the region. Power for the refinery is supplied from the Queensland electricity grid.

#### **WATER**

About 3,500 megalitres of water a year are sourced from the Awoonga Dam, near Gladstone.

#### **RESIDUE STORAGE**

Bauxite residue from the Refinery is neutralised by sea water and transported by slurry pipeline to a storage area 10km to the west of the Refinery.

#### **COMMUNITY RELATIONS**

The Comalco Alumina Refinery is committed to working with the community to ensure long term benefits to the region. It aims to work in partnership with the local community and to be the employer of choice. The traditional owners relationship with the land is recognised and their assistance with cultural awareness training and heritage management valued.

#### **ENVIRONMENT**

The Environmental Impact Statement for the Refinery was approved by the Queensland and Federal Governments in June 2000. The Refinery uses world class technology to provide high energy efficiency and low levels of emissions and operates well within environmental standards to ensure minimal impact on the region.

The Comalco Alumina Refinery team achieved ISO14001 certification of their environmental

management system before operations began in September 2004. ISO14001 is a world recognised system and the accepted Rio Tinto standard for environmental performance.

#### **EMPLOYMENT**

The refinery employs 400 people including 100 full time equivalent contractors.

#### **PROCESS**

The Refinery uses the Bayer process. Grinding mills prepare the bauxite for the high temperature digestion process where aluminium hydroxide is dissolved from the bauxite into a solution of caustic liquor. The resultant liquor and solids are separated in clarifiers. The liquor is sent to precipitation and the solids are washed and pumped to residue storage. Open top precipitator tanks allow hydroxide crystals to form from the super saturated liquor. These crystals are heated in calciners to drive off water and produce alumina powder that is stored for shipment.

#### **WEBSITE**

[www.comalco.com.au/car](http://www.comalco.com.au/car)

## **QUEENSLAND ALUMINA LIMITED**



Queensland Alumina Limited (QAL) is recognised as the world's largest alumina refinery, supplying approximately 10% of the Western world's alumina. Since commissioning in 1967, the refinery has continued to grow from its original production rate of 600 000 tonnes of smelter quality alumina a year to its current production of 3.7 million tonnes a year. QAL has achieved ISO 9001 accreditation to ensure product quality is of the highest standard.

The four owners, Comalco (Australia) 38.6%, Kaiser (US) 20%, Alcan (Canada) 21.4%, and Pechiney (France) 20.0% transport the alumina product to their smelters primarily in Australia, New Zealand, and the West Coast of the United States and Canada.

A tolling charge per tonne of alumina is applied to recover the costs of processing, including operating, maintenance, raw materials, energy and administration. Each of the partners consigns alumina from Gladstone to aluminium smelters for metal production in proportion to their interest in the company.

The refinery plant itself covers 80 hectares of a 1200 hectare site. Adjacent to the plant is South Trees Island where QAL's wharf and storage facilities are based. The island is connected to the mainland via a causeway and bridge.

## PRODUCTION

Current rated capacity of 3.65 million tpa.

### Raw Materials

Bauxite	9.4 million tpa
Coal	1.55 million tpa
Caustic Soda	860,000 tpa
Natural Gas	12 PJ pa
Limestone	140,000 tpa
Water	34 ML / day
Electricity	86 MW

## PROCESS

The Bayer process is used by Queensland Alumina Limited to refine alumina from bauxite. The process was discovered and patented by Austrian chemist Karl Bayer in 1887 and involves the four core activities of:

Digestion	Dissolving bauxite's alumina content
Clarification	Settling out undissolved impurities
Precipitation	Forming alumina crystals
Calcination	High-temperature drying of alumina

The process is a continuous one with more than 550 megalitres of process solution circulating through tanks, pressure vessels, and pipes to achieve the scale of production required.

## WORKFORCE

Queensland Alumina Limited employs approximately 1000 people in a wide variety of

operative, technical, trade, and administrative roles. As well, the workforce is bolstered by around 300 to 350 contractors daily.

## ENVIRONMENT

Given its close proximity to the township of Gladstone, Queensland Alumina Limited has a very strong focus on its environment, being only the second alumina refinery in the world to achieve the stringent Lloyds of London ISO14001 standard for its Integrated Environmental Management System. Other alumina refineries are now progressively achieving certification.

Environmental audits are regularly scheduled using accredited auditors to check environmental compliance.

Continuous dust monitors have been installed to monitor the effects of dust reduction programs across the 80ha plant and these are audited annually to ensure their accuracy. Water emissions from the plant are also subject to continuous monitoring.

Dust reduction programs at QAL include the installation of Electrostatic Precipitators and Baghouses on stacks, revegetation of the ash ponds and red mud dams, and damping down of coal stockpiles and unpaved work areas.

Recycling and segregation are important components of QAL's waste minimisation program, with chipped timber used for revegetation, and paper, cardboard and scrap steel being recycled. Materials segregated for secure handling, such as fluorescent tubes, nickel cadmium batteries and heavy grease are sent to approved handling facilities.

QAL is also responsible for one of Australia's largest recycling programs, using almost all of Gladstone city's treated effluent for use in the process circuit.

## DISPOSAL

Bauxite residue is mixed with salt water and pumped to large contained disposal dams on Boyne Island where the red mud is allowed to settle. The neutralising effect of mixing sea water with the red mud helps conserve fresh water and also ensures any excess water discharged into marine environments from the red mud dam outfall has a negligible environmental impact. The whole area is the subject of continuing rehabilitation.

**REPLACEMENT COST**

Over US\$3 billion.

**WEBSITE**

[www.gal.com.au](http://www.gal.com.au)

**ORICA AUSTRALIA PTY LTD**

Orica Australia commenced operations in Gladstone in June 1990. Since commencing in the Gladstone Region, they have undergone several expansions, and are considering further expansions. Orica produce various chemicals, principally sodium cyanide (which is used to leach gold from ore) and ammonium nitrate (principally used to manufacture explosives). Chlorine is also produced which is used to purify water.

**PRODUCTION**

Sodium Cyanide	42,000 tpa
Chlorine	9,000 tpa
Ammonium Nitrate	240,000 tpa

In addition, Orica also produces its own caustic soda (which is used to produce sodium cyanide) and nitric acid (which is used to produce ammonium nitrate). Hydrochloric acid and sodium hypochlorite (used for pool chlorine, disinfectant, and bleach) are also manufactured.

**Raw Materials****For ammonium nitrate production**

Ammonia

**For chlorine production**

Salt  
Electricity

**For cyanide production**

Ammonia  
Caustic soda  
Natural gas

**PROCESS****Sodium Cyanide**

Methane gas is burnt in a mixture of ammonia and air over a platinum catalyst. This produces hydrogen cyanide gas. The gas is passed through a caustic soda solution, where it is absorbed and converted into sodium cyanide liquid. The liquid is evaporated, dried and compacted.

**Chlorine**

Salt from Port Alma is dissolved in water and the resultant brine solution is passed through an electrolytic process. The chlorine is dried, compressed and cooled to -35°C.

**Ammonium Nitrate**

Ammonia is converted to nitric acid by high temperature oxidation using air over a platinum catalyst. Ammonium nitrate liquid is then manufactured by adding more ammonia to the nitric acid. This liquid is then converted to prill (dry spherical beads), or emulsion phase product.

Prill is produced by spraying hot ammonium nitrate liquid down a 50-metre tower against a conditioned air stream. This product is dried and cooled, screened and coated before it is sold.

Emulsion Phase product is produced by spraying liquid oxidiser solution into a special chamber where a gelatinous paste results.

**ENVIRONMENTAL / SAFETY**

Orica's safety, health and environment objective is simply not to harm people or the environment. Our vision of "No Injuries to Anyone Ever" expresses our commitment to eliminate all injuries. Orica has a similar commitment to eliminate all work-related illnesses and all releases that could damage the environment.

**WORKFORCE**

150 employees

**OTHER**

Orica is the largest producer of sodium cyanide in Australia and is the third largest in the world. Orica is also the world's leading manufacturer and supplier of commercial explosives.

**REPLACEMENT COST**

\$280 million

**WEBSITE**

[www.orica.com.au/](http://www.orica.com.au/)

approved Environmental Management Overview Strategy.

**AUSTICKS**

Austicks Pty Ltd produces high quality ice cream sticks from plantation timber – Australia's renewable resource. The factory at Gladstone produces for both the Australian and export markets.

The hoop wood used is free of resin and has no taste or odour making it naturally safe and ideal for use with ice cream and iced water.

Austicks also produces timber veneer used in plywood and decorative panelling.

Austicks employs a quality management system to ISO 9002 standard to ensure a high standard is maintained.

**FROST ENTERPRISES**

Frost Enterprises is a family owned company established in Gladstone in 1966 to supply Queensland Alumina Limited with raw limestone.

The company owns and operates a large limestone operation at Taragoola, supplying varying grades of crushed limestone to state and local government departments and the construction, industrial and agricultural industries. Limestone is an extremely versatile product with a wide range of applications, from road building materials through to flux in the aluminium and steel industries.

Limestone is extracted by opencut method and transported by off-highway 50 tonne dump trucks to a 350 tonne per hour crushing plant. The finished product is dispatched by road and rail to customers from Proserpine to Brisbane.

The operation employs 20 permanent people and up to 25 sub contractors mainly delivery trucks.

Safety and environmental issues are stringently controlled by adherence to the Department of Mines and Energy Act and Regulations and an



**For additional information on the organizations presented in this document please contact:**

**Economic Development Manager  
Gladstone Area Promotion and Development Ltd**

**PO Box 5186**

**Gladstone Qld 4680**

**Ph: 61 7 4972 4000**

**Fax: 61 7 4972 5006**

**Email:**

[gapdl@gladstoneregion.org.au](mailto:gapdl@gladstoneregion.org.au)

**Website:**

[www.gladstoneregion.org.au](http://www.gladstoneregion.org.au)

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