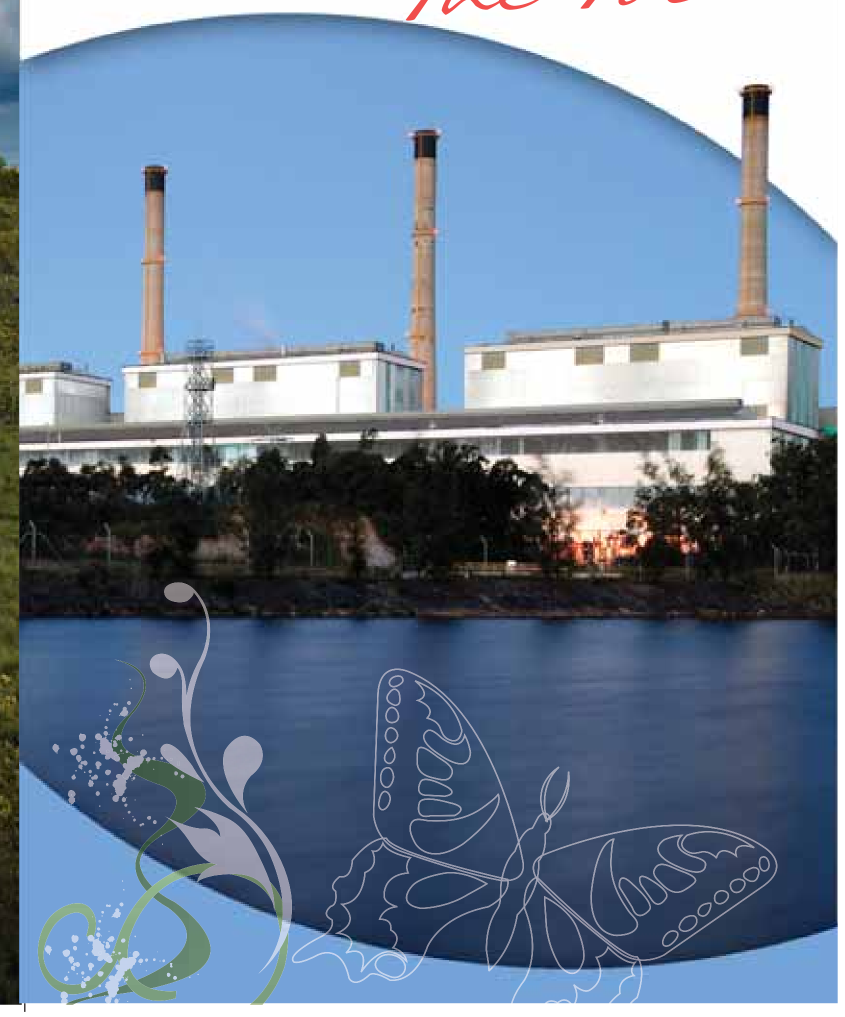
NRG AIR EMISSIONS *The Facts*



During our 30 years of operation, Gladstone Power Station has been subjected to rigorous internal and external monitoring and no community health issues have ever been identified.

As a major employer in the Gladstone region, we have a vested interest in ensuring that the region where our people work and live is a healthy one, now and into the future.

We hope that the factual overview in this brochure will provide the community with the knowledge to satisfy their own minds about the health of our workplace and Gladstone Power Station's efforts to minimise our environmental footprint.

Fast Facts

NRG Gladstone has the lowest emissions of particulate matter of all comparable Queensland coal-fired power stations.

In order to reduce our emissions, we:

- Installed 46,020 fabric filter bags across the six boiler gas outlets to reduce particulate emissions.
- Continuously measure particulate emissions to meet our environmental license obligations.
- Disperse gas emissions through our three 153 metre tall chimneys to minimise ground level concentrations.
- Blend coal types to reduce the production of nitrogen and sulphur gases.
- Utilise Burner out of Service (BOOS) technology to reduce the production of nitrogen oxide gases.
- Use advanced computer technology and operational controls to optimise air to fuel ratios in the combustion processes.
- Conduct comprehensive studies to ensure coals meet air quality specifications before entering coal purchase agreements.

The Queensland Government recently announced that they would undertake a comprehensive two year investigation into Gladstone's air quality to identify any potential health risks for the community.

Many people in the Gladstone area remain concerned about the impact of air pollution on their health, so NRG Gladstone welcomes the investigation that will give us a complete picture about the quality of air in Gladstone and any impact it is likely to have on community health.

Employees who would like further information can contact Community Relations Officer, Gary Macnamara on (07) 4976 5504.

NRG

Biting the Dust

Our close proximity to the coast and community, together with our large coal stockpile capacity, provides NRG with some environmental challenges.

Over the years we have implemented a range of environmental management techniques to reduce dust emissions around the site, including:

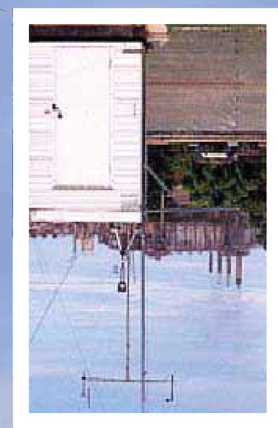
- Minimising drop heights of coal;
- Watering areas where mobile equipment is used;
- Installing dust suppression equipment that sprays two tonnes of reclaimed water for every 100 tonnes of coal fed along the conveyor systems;
- An upgrade of the coal conveying system to reduce dust emissions when moving greater quantities of coal;
- Using fallout gauges to determine the effectiveness of dust minimisation practices;
- Continuous improvement in operating procedures;
- Revegetation programs to create natural wind breaks and reduce levels of dust released from stockpile areas;
- Fabric filters to reduce particulate emissions.

In 2007, NRG purchased 60 hectares of land surrounding the station to further increase the buffer zone between us and our closest neighbours.

Monitoring – Validating the Figures

The Environmental Protection Agency's (EPA) air quality monitoring network in Gladstone includes a number of permanent stations around the area, including:

SOUTH GLADSTONE



Located in the grounds of South Gladstone State Primary School, this residential station was established in 1992. The station measures nitrogen oxides, SO_2, PM_{10}, visibility and meteorological parameters.

CLINTON

Established in 1993 in an open area at the Gladstone Airport. This station monitors PM_{10}, nitrogen oxides, sulphur dioxide, wind speed and direction. NRG contributed to the establishment of this station and to its ongoing operational costs.

TARGINNIE

There are currently two stations measuring the impact of industry emissions in Targinnie. NRG contributes to the operational costs of both stations.

The original station at Swans Road was established in 1991 in a rural area north of the Targinnie township. It measures nitrogen oxides, sulphur dioxide and meteorological parameters.

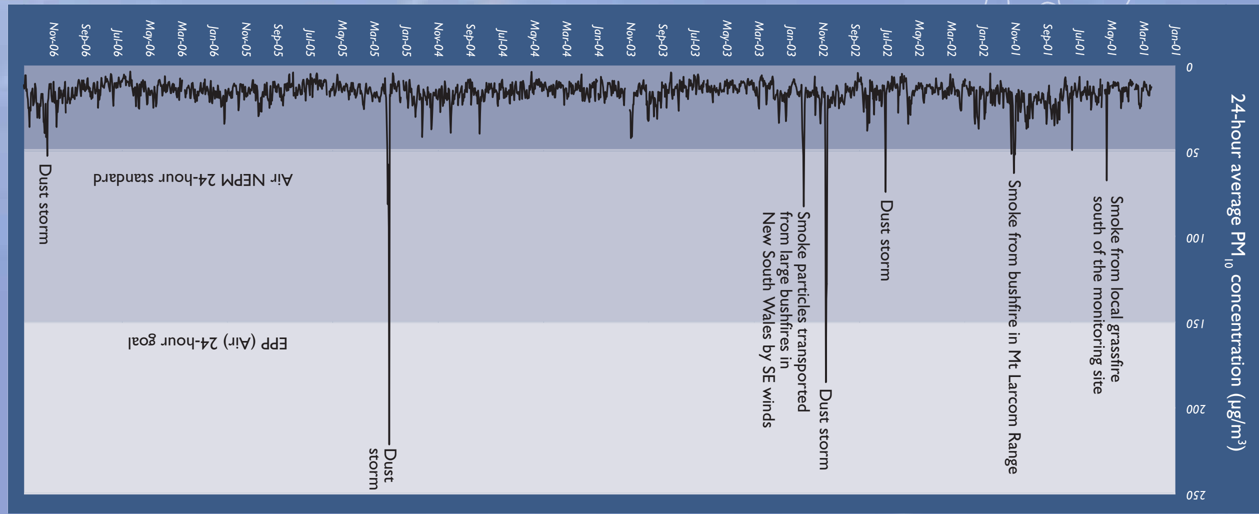
The second station in Stupkin Lane is currently being moved to the vicinity of the Rio Tinto Refinery at Yarwun.

As part of the Clean and Healthy Air for Gladstone project three new air monitoring locations and one mobile station will be set up. Air monitoring stations will be installed in the Gladstone CBD and Boyne Island in the near future.

An EPA review of air monitoring data in Gladstone between 2001 and 2006 states that:

> *"industrial particle emissions, as measured at the EPA monitoring site locations, did not result in exceedences of PM_{10} and visibility-reducing particle air quality goals and standards. Exceedences of 24-hour average PM_{10} air quality goals and standards only occurred during atypical particle episodes such as dust storms and smoke from grass fires and bushfires. Annual average PM_{10} concentrations were less than 34 percent of the EPP (Air) goal."*

Right: This graph, taken from the 2001 - 2006 EPA Review of Fine particle levels in Gladstone, shows the daily 24-hour average PM_{10} concentrations at South Gladstone over the period 2001 to 2006.



Name	Oxides of Nitrogen (NO_x)	Sulphur Dioxide (SO_2)	PM_{10}	PAH
What is it?	The term NO_x is used to denote oxides of nitrogen. The 'x' indicates the combination of nitrogen and oxygen in the compound. Of the numerous forms of NO_x possible, Nitric Oxide (NO) and nitrogen dioxide (NO_2) are the most significant air contaminants.	A colourless, irritating and reactive gas with a pungent odour, it is produced naturally in volcanoes and geothermal activity and bushfires. Fossil fuel combustion accounts for the majority of the world's sulphur dioxide emissions.	Particulate matter is a term used to describe airborne particles existing in the atmosphere. These particles, including all organic and inorganic compounds, can range in size from microscopic to visible. They occur from either natural activities such as erosion, evaporative sea salt, forest fires or man-induced processes such as combustion, manufacturing activities and automobile exhaust. The terminology commonly refers to particulate matter as PM_x where 'x' denotes the particle diameter in microns (1 millionth of a metre). PM_{10} indicates all particulate matter of diameter 10 microns or less.	Polycyclic Aromatic Hydrocarbons (PAH) are a group of over 100 different compounds that are formed during the incomplete combustion of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. In the atmosphere PAH exist mostly in solid form, absorbed to particulate matter.
How may I be exposed to it?	The primary source of NO_x is the combustion of fossil fuels such as coal, oil and gas. The main culprits are motor vehicles and the refining of petrol and metals, but gas stoves, gas and wood heaters and cigarette smoke are also significant sources oxides of nitrogen. The harmful effects of these indoor sources are increased where ventilation is poor.	Various industrial activities such as petroleum processing, base metal smelter operations and wood processing produce significant amounts of sulphur dioxide. People living in the vicinity of these industries may be exposed to sulphur dioxide in the atmosphere. Sulphur dioxide may also be produced naturally from the decay of vegetation on land, marshlands and the ocean.	Particulate matter can originate from a wide variety of sources, which differ markedly from one location to another depending on the problems of industry and dominant land use. Some natural sources of particulates are bushfires, oceans (sea salt particles), pollens and windblown dust. Various sources result from human activities including fuel combustion, vehicle engines, and dust from stockpiles and land clearing. In most urban areas PM_{10} exposure would be predominantly from motor vehicle emissions. In rural areas, agricultural operations can generate airborne particulate matter, especially during the dry seasons.	The greatest exposure to PAH is likely to take place in the workplace. People, who work in coal tar production, coking plants, asphalt production, smoke houses and facilities that burn wood, coal, or oil may be exposed to PAH in the workplace air. Exposure to PAH can occur through skin contact with products that contain PAH such as creosote-treated wood, asphalt, roads and coal tar. Cooking food at high temperatures, as occurs during charcoal grilling or charring, can increase the amount of PAH in the food.
How it is released from Power Stations?	Oxides of nitrogen are emitted during high-temperature combustion processes. At the point of release into the atmosphere approximately 95% of the release will be nitric oxide (NO) with about 5% nitrogen dioxide (NO_2). Trace amounts of other forms of nitrogen oxides are also released from combustion processes, such as nitrous oxide (N_2O).	Sulphur is present as a contaminant in fossil fuels including the coal that is burnt in power stations. Generally, Australian fuels including oil and coal are low in sulphur relative to global levels. During combustion the sulphur reacts with oxygen to form oxides (principally sulphur dioxide), which are released with the flue gases.	During the combustion process the coal is burnt producing energy for power generation, emissions and residual ash. Some of the ash becomes entrained in the hot combustion gases and is referred to as fly ash. The combustion emissions, a mixture of gaseous, liquid and solid matter are sent to the fabric filters to minimise the particulate emissions before the combustion gases are released to the atmosphere. Captured fly ash particles are reused in the production of cement.	PAH can be formed during the combustion of coal and oil. These products are then dispersed into the atmosphere from the power station stack, along with other combustion products. PAH are formed after the initial combustion as the hot gases react and cool in the boiler and stack. However, PAH in the ambient atmosphere are in the form of particulate matter.
What happens after release?	In the presence of sunlight and oxidation compounds, nitric oxide combines with oxygen to form nitrogen dioxide (NO_2). Nitrogen dioxide can create a brown haze, which may reduce visibility and can result in acid rain.	After release, the highly reactive Sulphur dioxide tends to form acid gases and sulphate aerosols. It is soluble in water and is associated with acid rain. Removal from the atmosphere occurs through rainfall and direct deposition as sulphur dioxide.	The environmental fate of particulate matter depends on the way the particle is formed. Particulate matter can be formed from combustion material that has been condensed in the atmosphere. Gases in the atmosphere can also react with combustion products to form particulate matter, which are removed from the atmosphere by rain.	PAH emitted as primary pollutants present on particulate matter can be subject to further chemical transformation either in stacks, emission plumes, or during atmospheric transport. PAH dispersed in the air can be carried long distances and will attach to fly ash or dust. Larger particles settle close to the stack while smaller particles may travel downwind before settling. Particles are eventually removed from the atmosphere by deposition.
What levels of exposure are likely around Gladstone Power Station? (The emissions are modeled using 'The Air Pollution Model' (TAPM) to predict maximum ground level concentrations.)	As a major industrial source of NO_x in the Gladstone region, NRG's emissions are minimised at ground level because they are released from tall chimneys. NO_x emissions produced by motor vehicles often accounts for the majority of NO_x emitted to an air shed, and as a low level source, it has a higher impact on the receiving environment.	NRG is a major emitter of Sulphur Dioxide (SO_2) due to the large quantities of coal which contains sulphur burned to generate electricity. NRG's contribution to the ground level concentrations is minor as the SO_2 emissions are emitted and dispersed above the inversion layer.	According to the National Pollutant Inventory database for the 2005/2006 period, NRG produces around 25% of the total PM10 released in the Gladstone Air Shed. PM10 are the fine particles released from coal combustion processes. The majority of this is released above the inversion layer and readily dispersed.	According to estimates submitted to the NPI for the 2005/2006 reporting period, NRG contributes less than 1% of the reported emissions. There are no guidelines for concentrations of PAHs in ambient air. The PAH emissions from the power station could be considered to result in very low levels in the surrounding area
What does exposure at these levels mean?	Adverse health effects are related to both the concentration of the nitrogen dioxide and duration of exposure. The maximum predicted ambient NO_2 concentrations due to Gladstone Power Station are well below the referenced guideline and standard levels. Consequently, adverse effects on health are extremely unlikely to occur.	The Queensland EPP (Air), Air NEPM and WHO Guidelines for Air Quality contain guideline levels for sulphur dioxide. It could be expected that there would be no adverse health effects from exposure to sulphur dioxide at the predicted levels surrounding the Gladstone Power Station. The concentration at the nearest receptors is well below the referenced guideline and standard levels.	Gladstone Power Station contribution to local PM_{10} levels is lower than guideline values on both a daily and annual basis. These GLCs are within levels proposed by the National Environment Protection Council in the Air NEPM and the Qld Environmental Protection Agency's EPP (Air). There are no adverse effects expected from PM_{10} emissions from the power station.	The concentration of PAH emissions from the power station would be considered to be extremely low and it is highly unlikely that adverse health effects will result from exposure to emissions of PAH.
How does it affect humans?	Legislated ambient air standards and guidelines are set for nitrogen dioxide (NO_2) concentrations because it is considered to be potentially the most harmful compound of the oxides of nitrogen to human health. Oxides of nitrogen are not recognised as cancer causing.	Dome effects, such as respiratory tract irritation or respiratory tract infections, may occasionally be noted in severely susceptible individuals who have existing respiratory conditions.	Particulate matter with an aerodynamic diameter less than 10 μm is considered to be small enough to be respirable. Adverse health effects identified with short term increases in ambient respirable particles (PM_{10}) include increases in the daily prevalence of respiratory symptoms and asthma. PM_{10} are of a health concern because they can penetrate into the sensitive regions of the respiratory tract. On inhalation, larger particles are usually deposited in the nose and throat. Smaller particles are deposited mainly in the larger airways, which lead to the lungs. The body has many ways of removing these particulates from the body, including coughing, sneezing, swallowing and via the lymph system.	There is a limited body of evidence available for determining the effects of PAH on humans. Most health effect data in relation to PAH are from animal studies and limited occupational studies. The exposure concentrations in these studies are significantly higher than expected from the ambient air near an industrial facility. The available evidence indicates that PAH are fat-soluble and are metabolised quite rapidly and would normally be excreted in faeces or urine after a few days. Exposure to some PAH can irritate the eyes, nose, throat and bronchial tubes. These effects would not be expected from Gladstone Power Station related exposures.
Does exposure from it increase the risk from other compounds?	Some synergistic effects are reported between NO_2 and other compounds. It should be noted that the combined effects of NO_2 with these compounds at the levels predicted by the modelling would not be expected to cause adverse health effects in the vicinity of the station.	Some synergistic effects are reported between sulphur dioxide and other compounds. However, it should be noted that the combined effects of sulphur dioxide with these compounds at the low levels would not be expected to cause adverse health effects in the vicinity of the station.	Some synergistic effects are reported between PM_{10} and other compounds. However, it should be noted that the combined effects of PM_{10} with these compounds at the low levels predicted by the modelling would not be expected to cause adverse health effects in the vicinity of the station.	Some synergistic effects are reported between PAH and other compounds. It should be noted that the combined effects of PAH with these compounds at the low levels would not be expected to cause adverse health effects in the vicinity of the station.