SUBMISSION BY QUEENSLAND RAIL

In response to

SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT COMMITTEE

Inquiry Into Australia's Future Oil Supply And Alternative Transport Fuels

Submission for Senate Rural and Regional Affairs and Transport Committee
Inquiry into Australia's future oil supply and alternative transport fuels

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Executive Summary

As concerns over Australia's future oil supply and the current emission levels escalate, there is an industry-wide need to implement greenhouse gas abatement strategies with a view to creating a more sustainable future.

Rail transport is a key to creating a sustainable transport industry and reducing fuel consumption. However rail in Australia is underdeveloped and still requires significant improvement in order to maximise efficiency.

Rail has many practical advantages over road transport:

- Reduction in land use and energy requirements
- Decreasing dependence on the unsustainable oil market
- Reduction in fuel usage (rail uses one third of the fuel used by road transport)
- Reducing greenhouse gas emissions and air pollution
- Minimising the incidence of road accidents as well as traffic congestion and noise

At present, inadequate public transport infrastructure is isolating urban fringe residents and forcing more people to use cars as a means of commuting. From a freight perspective, trucks continue to benefit from government subsidies and fuel tax regimes which create an uneven playing field.

In the long term, an integrated industry where rail is used for linehaul and road is used for freight pick up and delivery would be ideal to utilise the advantages of each mode.

In order to make rail an increasingly competitive and attractive option, QR has improved operational efficiencies, increased rollingstock and infrastructure capacity, enhanced service safety, timeliness and reliability and provided staff training and skills enhancement.

QR has reduced greenhouse gas emissions by 14% in its past six years of involvement in the AGO Greenhouse Challenge Co-operative Agreement. In the past two years QR has invested $850M in more efficient locomotives, increased containerisation, upgraded infrastructure, optimised train scheduling and increased driver training.

QR supports the future introduction of alternative fuels such as Diesohol, E10 and Biodiesel in order to further reduce greenhouse gas emissions.

QR's current air quality initiatives include engine emission quality standards, condition monitoring and maintenance programs, operational driver training and extensive pollutant emissions research.

In recent years QR has emphasised energy and emission performance criteria in locomotive purchasing decisions. QR has also embarked on a project which would see the trial and likely introduction of hybrid locomotives using a small diesel engine powered by a battery system. The hybrid would dramatically reduce fuel consumption, pollution and greenhouse gas emissions and could bring about a new era in efficient and sustainable locomotive design.

Submission for Senate Rural and Regional Affairs and Transport Committee Inquiry into Australia's future oil supply and alternative transport fuels

Introduction

This submission is being lodged by Queensland Rail (QR) in relation to the Senate Inquiry into Australia's future oil supply and alternative transport fuels. The paper will discuss the following relevant issues from a QR perspective:

- The comparative environmental and efficiency benefits of rail transport in comparison to road transport;
- Initiatives taken by QR to reduce greenhouse gas emissions and provide more efficient and environmentally friendly service delivery;
- Rail transport options to reduce dependence on oil supplies and minimise greenhouse gas emissions;
- The need to inspire modal change from road to rail across the transport industry - in the context of both freight and passenger services;
- The sustainability of the rail industry and recommendations for future strategic directions.

Rail – A Key to Reducing Environmental Impacts

Consumption of energy contributes over 68% of all greenhouse gas emissions in Australia, making it by far the most prevalent source of emissions. The transport sector consumes a significant amount of energy and in light of ever-increasing demand (particularly for motor vehicles), is one of the fastest growing emissions sectors in Australia. This highlights an industry-wide need to implement greenhouse gas abatement strategies and drive both social and corporate change with a view to creating a more sustainable future.

Rail transport is a key in the quest for sustainability as it moves people efficiently and reduces the amount of heavy vehicle traffic, thereby improving quality of life in terms of mobility, health and environmental impacts. Rail also offers greater fuel efficiency, reduced greenhouse gas emissions and reduced general pollution, as will be discussed later in this submission.

QR's annual freight task is roughly one third of the national rail freight task. QR's total energy profile is comprised primarily of non-renewable fossil fuel sources – namely diesel fuel and coal-generated electricity. Diesel fuel constitutes roughly 60% of QR's total energy source yet contributes only 28% of total annual greenhouse gas emissions. This is in direct contrast to electricity which accounts for 34.6% of the energy consumed by QR and a little over 70% of all the greenhouse gas emitted.

Rail transport in Australia still has significant room for improvement in order to maximise efficiency. As a consequence, QR is continually considering and introducing new strategies to improve operational efficiencies and thus contribute to significant greenhouse gas emission abatement and an overall reduction of local, national and global environmental and social impacts.

Modal Shift

Rail transport has many practical advantages over motor vehicles in both freight and passenger task efficiency, as illustrated by the following:

- A freeway lane carries around 1,200 cars (or 1,500 people) per hour. A railway line can carry at least 20,000 people (the equivalent of 16,000 cars) per hour;
- A peak hour suburban train carrying 1,000 people keeps 800 cars off the road. This is equivalent to a line of cars over 5km long;
- Each fully laden freight train travelling from Brisbane to Sydney replaces 150 semi-trailers, saves 45,000 litres of fuel and produces 130 tonnes less in greenhouse gas emissions compared to road transport including road pickup and delivery.

Rail provides safety and reduced environmental impact through:

- Reducing land use and energy requirements;
- Reducing dependence on the unpredictable and unsustainable oil import market;
- Reducing fuel usage to one third of road transport;
- Reducing greenhouse gas emissions and air pollution. Of the greenhouse gas emissions created by Australian transport, 90% are attributable to road transport, compared to only 2% by rail transport;[1]
- Reducing the incidence of road accidents, road congestion and noise costs of road transport as well as improving safety and reducing road damage. Various studies have revealed that rail is at least seven times and up to 29 times safer than road.[2]

QR's biggest contribution has been its work towards achieving an increase in rail's market share in both the passenger and freight sectors. QR actively promotes rail as a safe and an environmentally superior transport option in comparison to road and air transport.

Key initiatives undertaken by QR to increase rail's modal share by increasing competitiveness and service quality include:

- Improving operating efficiencies;
- Increasing the capacity of rollingstock and fixed infrastructure assets;
- Improving service safety, on-time performance and reliability;
- Marketing and pricing strategies to increase awareness and provide greater value for money; and
- Staff training and skills enhancement.

Urban rail is by far a more efficient form of mass transport to road. Rail is over twice as energy efficient as buses, five times as energy efficient as cars[3] and can move thousands of people quickly and safely using just 25% of the land of a freeway. Queenslanders make an estimated 49 million passenger journeys each year, with a daily average of 150,000 journeys.[4] This is achieved through operating 260,000 services per year – in comparison to the 3.92 million cars that would be required to transport the same amount of passengers by road.

Increased rail usage will provide improvements in the following areas:

- Greenhouse gas emissions (global warming effects)
- Air pollution (human health, flora and fauna, visibility and amenity effects)
- Visual amenity (visual obstruction and intrusion effects)
- Land use (ecological, amenity and recreational effects)
- Water pollution (aquatic flora, fauna, human health and amenity effects)
- Energy use (resource depletion)
- Safety impacts (fatalities and injuries)
- Traffic congestion (energy use, air pollution effects)
- Noise and vibration (communication and sleep disturbance, infrastructure damage)

From a freight perspective, rail transport is more energy efficient than road transport but provides less flexibility in terms of delivery locations and size limitations. Current congestion, emissions and road safety concerns have arisen largely due to the wide usage of trucks for mid to long distance freight

[1] North, P., 2005, 'Torpor in Utopia' [Online] http://www.isoconference.org.au/papers/North9.pdf, date accessed: 3 February 2006.
[2] RTBU submission on: Smart Travel Choices for South East Queensland – A Transport Green Paper, p2
[3] ARRB Transport Research, op cit, p 56
[4] QR Citytrain information [Online] http://www.citytrain.com.au/about/overview/overview.asp, date accessed: 6 February 2006.

transport. An integrated industry where rail is used for line haul and road is used predominantly for freight pick up and delivery would be ideal to utilise the advantages of each mode.

From a passenger perspective, public support for investment in urban rail instead of roads as a solution to traffic congestion, air pollution and greenhouse gas emissions has increased, despite 89% of respondents using the urban rail system less than three days per week.[5] Urban fringe residents are becoming isolated because of poor public transport infrastructure. An integrated public transport system where bus and rail complement each other without competing is more efficient and can transport far more people per hour than cars alone.

In the short-term, modal change from road to rail should be facilitated and encouraged. However, at present the rail system in Australia is extremely underdeveloped. In contrast, road transport continues to benefit from government subsidies and fuel tax regimes which account for a significant portion of its competitive advantage.

Integrated transport planning and increased funding using transparent and consistent investment criteria across all transport modes is required to further develop the public transport system. This vital planning and necessary funding will ensure that the nation can cope with the growing transport and assist in the reduction of emissions from transport.

Greenhouse Gas Reductions

Six years into its initiative to substantially reduce greenhouse gas emissions, QR has reached a significant milestone – a greenhouse gas emissions abatement of 1,047,486 tonnes CO_2-e (tCO_2-e) gas, representing a 14% reduction. This is equivalent to keeping 205,833 cars (or 34,305 cars per year) off the roads in the same period and is enough gas to fill almost 422 Melbourne Cricket Grounds. This significant abatement performance is also more than double the five year savings target of 477,300 tCO_2-e gas that QR initially aimed for as part of the AGO Greenhouse Challenge Cooperative Agreement signed in November 2000.

In 2004/05 QR recorded a record annual greenhouse gas abatement of 281,085 tCO_2-e gas. This is roughly equivalent to keeping over 55,200 cars off the road and the gas abated could fill the Melbourne Cricket Ground 113 times over. It is also important to note that this figure is approximately 27% of the cumulative abatement that QR has recorded over the last six years.

About 70% of QR's greenhouse gas emissions are generated from the consumption of electricity and the combustion of diesel fuel. By focusing on improving the efficiency of its train operations, QR has reduced energy consumption and thus greenhouse gas emissions substantially.

While a reduction in the rate of greenhouse gas emissions can be partly attributable to increased patronage of existing services and better utilisation of surplus asset capacity, the significant gains observed would not have been achieved without the implementation of a range of innovative actions and technologies. Over the past two financial years, QR has invested over $850 million on various initiatives including:

- The introduction of more efficient locomotives and wagons (higher gross to tare ratio) for freight traffic;
- Increased general freight containerisation;
- New and more fuel-efficient rollingstock on the Brisbane Citytrain network;
- Upgraded track permitting both more efficient rollingstock and operations;
- Optimised train scheduling and electronic control systems to reduce transit times and delays;
- Driver training in the dynamics and smooth running of trains to maximise fuel efficiency and minimise maintenance costs.

[5] ATRF Conference Paper, The role of rail, David Hill (Australasian Railway Association Inc)

As part of QR's commitment to continually investigate actions to further reduce greenhouse gas emissions, QR is in its 2nd year as a commercial participant in BP Australia's Global Choice™ program. As such, participation in the BP Global Choice program gives QR access to certified emission reduction credits via the Australian Greenhouse Office 'Greenhouse Friendly' scheme. QR's investment into BP Global Choice will entitle QR to certified emission reduction credits equivalent to approximately 2,980 tCO_2-e/annum. This equates to approximately 585 fewer cars on the road each year or a further reduction of 5,960 tCO_2-e over the two year period.

QR's commitment to environmental and social performance has seen it win the Australian Greenhouse Challenge Gold Award in 2002 and the Australian Greenhouse Challenge Plus Award (Government and Essential Services) in 2005.

In terms of future developments, QR supports the introduction and use of alternative fuels such as Diesohol and E10 for its road fleet and the possibility of Biodiesel being used for rail applications.

Air Quality

- **Fuel standards**

QR recognised the environmental and other advantages of Low Sulphur Fuel some years prior to general industry acknowledgment and commercial availability, and had traditionally specified low sulphur fuel content for its bulk fuel supply.

Ultra Low Sulphur Diesel Fuel has been available for commercial customers of BP who buy bulk fuel in some regions of Australia since early 2002. QR's diesel fuel is supplied under contract by BP and has been receiving Ultra Low Sulphur Diesel fuel since its earliest introduction. The perceived environmental benefits include reduced smoke/particulate emissions, exhaust odours and sulphur oxide emissions.

- **Locomotive pollutant emissions**

No emission standards exist or are currently proposed for the Australian rail industry. Although rail out-performs comparable road tasks in terms of air pollutant emissions, it is expected that there will be increased pressure from the road industry for government regulatory control over rail industry emissions.

The implications of enforced emission standards for the railway industry would be quantifiable increases in capital and operating costs, as evidenced by some rail operators in the USA.

QR is currently implementing a number of air quality initiatives focussed on improved environmental and business performance outcomes. These include:

- Engine emission quality – Specification of engine emission limits for new and upgraded diesel locomotives in line with overseas standards.
- Condition monitoring and maintenance programs - Comprehensive programs established for diesel locomotive fleet to ensure optimum performance and reduced emissions.
- Operational driver training – as mentioned previously in this document.
- Pollutant emissions research – With Griffith University, QR is currently undertaking a unique research project involving its locomotive fleet. Key aims of the study are to:
    - accurately determine pollutant emissions from various classes of locomotives under various operating conditions and monitor performance against specifications/standards over time

- determine the correlation between optimum energy/engine efficiency and pollutant emissions
- determine pollutant loads in various regions and contribute to air shed studies
- compare performance between rail and other transport tasks and benchmark performance nationally and internationally

The Future of Rail and Modal Change

- **Focus on energy-efficient, low-emission locomotives**

In recent years, QR has included energy and emission performance criterion in its locomotive specifications. Examples include the introduction of the 2800, 4000 and the new 5000 class locomotives. Specifications of these locomotives are included in Annexure A. These systems will improve safety, increase productivity and reduce maintenance costs.

Future locomotive purchasing decisions will continue to take into account energy and emissions performance based on research into low-emitting options. Further evidence of initiatives and innovative use of technologies in the rail task can be found in Annexure A.

- **Development of hybrid locomotives**

QR is currently embarking on a project which would see the trial and likely introduction of hybrid locomotives. Although still in its initial stages, the proposed hybrid locomotive is set to deliver the following advantages:

- Reduced fuel consumption by eliminating a large engine consuming fuel during long idle periods
- Significantly decreased pollution and greenhouse gas emissions
- Produce the same tractive effort as a normal locomotive while using a much smaller engine
- Considerable fuel savings – estimated to be at least 27% and potentially in excess of 50% from preliminary analysis
- Reduced noise output through use of a smaller, quieter engine

This project has added significance due to the fact that there are no hybrid locomotives currently in operation in Australia. In addition, regulatory control over emissions is minimal, meaning that the industry has been able to maintain the status quo instead of working to develop more efficient and environmentally friendly locomotives. If this project is successful, it will lead to increased exposure and confidence in the hybrid concept and could bring about a new era in efficient and sustainable locomotive design.

Some anticipated per locomotive savings and benefits are as follows:

Diesel fuel savings per locomotive: 80-270 KL / annum (22% - 73%)
Energy savings per locomotive: 3,400-10,500 GJ / annum (24% - 74%)
Pollutant savings per locomotive: 6,088-18,663 kg / annum (23% - 71%)
CO^2-e savings per locomotive: 240-740 tonnes / annum (24%-74%)

Other Issues of Interest

Other aspects of the rail transport industry requiring further investigation are:

- Upgrading of important rail corridors and rail infrastructure for the anticipated future growth of rail transport over road transport;

- Dedicated lines for passenger services and freight services to reduce time constraints;
- The possibility of new freight terminals to encourage rail transport for long haul and road transport to short haul. One example is in the proposed industrial area at Bromelton (south of Brisbane near Beaudesert) to service the south-west corner and interstate traffic;
- Further promotion of passenger rail as a safe, reliable, environmentally friendly alternative to travelling by car.

At a transport industry level, the Government should increase research into decreasing the environmental impact from the use of fossil fuels coupled with supporting long-term availability with increased development of renewable fuel sources for power generation or internal combustion engines.

Conclusions

Modal change from road to rail is the key to reducing dependence on oil supplies and consequently minimising greenhouse gas emissions. A stronger rail system can lure people out of their cars and give freight users increased incentive to transport their goods via rail.

To date, rail has not received the funding it requires to become an increasingly competitive mode of transport. It has been suggested that Australia's major centres are too dispersed to justify building railways – however since the cost of building a railway is half that of building a freeway of equal capacity, this argument lacks substance. In addition, roads consume three times as much physical space as rail per unit of carrying capacity.[6]

As an example of lack of sufficient rail development, rail currently has less than 20% freight market share along the North-South corridor compared to 80% market share along the East-West corridor to Perth.[7] This figure indicates that, with sufficient infrastructure in place, rail has the ability to command a large percentage of the national transport market – and therefore lessen the demand for Australia's scarce oil supply and reduce transport's environmental impact.

Rail transport has to be seen as an economic, safe, reliable, environmentally friendly and sustainable mode of transport for both passengers and freight so as to overcome public reliance on the road system. With Australia's freight task expected to double in the next 15-20 years[8], it appears unlikely that Australia's road system can support such a high volume of traffic. Rail presents a logical and efficient solution to this problem, and given adequate funding will help minimise environmental impact and reduce the strain on the world's oil supply.

[6] North, P., 2005, 'Torpor in Utopia' [Online] http://www.isoconference.org.au/papers/North9.pdf, date accessed: 3 February 2006.
[7] North-south rail corridor study, [Online] http://www.ministers.dotars.gov.au/ja/releases/2005/April/a49_2005.htm, date accessed: 7 February 2006.
[8] Government Plans for north-south rail link, [Online] http://www.abc.net.au/news/newsitems/200504/s1347255.htm, date accessed: 3 February 2006.

Annexure A
Innovative Use of New and Existing Technologies to Achieve Significant and Cost-Effective Emissions Abatement

Rollingstock Initiatives

Target Area	Initiative	Goal	Features
New Rollingstock – QRNational	Introduction of new 5000 class Locomotives	To introduce more efficient rollingstock to maintain competitive edge in a growing market	• At 180 tonnes, the 5000 Class locomotive is the largest and heaviest locomotive on the east coast of Australia. • It has a 4250 horsepower engine, which provides the same gross power as more than 10 road trains. • The new locomotives are technologically advanced, showcasing a range of sophisticated systems. • These systems will improve safety, increase productivity and reduce maintenance costs.
	Introduction of new 4000 class Locomotives	To introduce more efficient rollingstock to maintain competitive edge in a growing market	• Fitted with electronic fuel injection and a split cooling system, giving cooler engine inlet temperatures and therefore greater engine efficiency under normal operating systems. • Onboard computers aid in diagnosis and troubleshooting, which means a faster fix of problems and the engine is running at optimum efficiency for longer. • Bogies are radial steer units designed to keep all wheel sets more closely parallel to the rails. This reduces wayside noise, improves tractive performance, substantially improves rail and wheel life and improves fuel efficiency by about 2%. • These locomotives have increased mass and engine power. With increased adhesion significantly enhancing effective tractive effort capacity.
	Introduction of new 2800 Class Locomotives	To introduce more efficient rollingstock to maintain competitive edge in a growing market	• These locomotives have increased mass and engine power. With increased adhesion significantly enhancing effective tractive effort capacity by 40%. • Onboard computers on these high speed freight locomotives provide comprehensive engine performance monitoring for

Target Area	Initiative	Goal	Features
			better fuel efficiency and management. • The improved engine design and higher tractive effort capacity have resulted in improvements in fuel efficiency of the order of 1.5%.
	Higher Gross to Tare Wagons	To introduce more efficient rollingstock to maintain competitive edge in a growing market	• This allows QR to carry higher payloads more efficiently. • Coal Wagons, Bulk Material Wagons • Bulk Grain Wagons • Low friction pivot centres that reduce wear and the rolling resistance of the wagon with a consequential improvement in fuel efficiency.
	Container Wagons	To introduce more efficient rollingstock to maintain competitive edge in a growing market	• Construction of new container terminals and expansion of existing terminals • Improved volumetric efficiency and accommodate the rail industry's specially made containers with extended height requirements. • Productivity, loading and volumetric efficiency gains by increasing containerisation of general freight cargos.
Upgrade of Rollingstock – QRNational	Upgrade of 2600 Class Diesel Electric Locomotives	To upgrade existing rollingstock to enhance efficiency of maintenance and service operations	• Reliability, performance and cab upgrades incorporating major engine refurbishments and inclusion of direct train control, and result in 25% increase in tractive effort capacity, a 17% increase in hauling capacity, and improved reliability with resultant fuel efficiencies.
	Upgrade of 2300 Class Diesel Electric Locomotives	To upgrade existing rollingstock to enhance efficiency of maintenance and service operations	• Addition of a turbo charger to increase horsepower and fuel economy. • Bogies will also be overhauled • The result being that these locomotives will be able to haul more load at greater speeds.
New Rollingstock – CityTrain Services	Introduction of new 3-Car SMU Units	To introduce more efficient rollingstock to maintain competitive edge in a growing	• Purchase of new 3 car SMU units for the CityTrain network. • Provide additional capacity, replace old diesel locomotive hauled trains, increase the amount of fleet available for

Target Area	Initiative	Goal	Features
		market	maintenance • Allow more services to be provided using the most efficient rollingstock available with enhanced serviced reliability.
	Introduction of new SMU 220 Series	To introduce more efficient rollingstock to maintain competitive edge in a growing market	• Latest generation Electric Multiple Units for the CityTrain Fleet utilise regenerative braking which allows the energy available within the electric traction motors to be returned to the overhead supply system during the braking. If another train is on the same system as a braking train, that train can utilise the returned electricity supply. If the returned energy is not used by another train it is returned to the grid. • Less electricity waste than allowing electrical energy to dissipate as heat through resistors in the vehicles dynamic resister bank. • More energy efficient than other stock due to the nature of the AC Traction System that is designed to maintain a unity power factor. So the SMU 220s use less energy for the same task. • Utilise more electric braking energy than previous rollingstock and thus less friction on brake pads. • QR is introducing a new wheel profile to reduce wear and save energy and cost.
Upgrade of Rollingstock – CityTrain Services	Major Upgrade of 3 Car EMU Fleet	To upgrade existing rollingstock to enhance efficiency of maintenance and service operations	• Major overhaul of 3-car EMU fleet with a view of re-engineering and extending the lifespan of the fleet and improving the reliability and on-time performance. This will facilitate maximum utilisation of these units for passenger carrying purposes.

Improved Asset Utilisation

Target Area	Initiative	Goal	Features
Freight Task	Minimisation of Excess Freight Carrying Capacity	Increasing QRs freight efficiency by hauling more freight with existing rollingstock.	• Innovative marketing approaches (Customer/Supplier relationship development; provision of customer supply chain management services) • Improved timetabling of general freight services • Targeting freight rates to meet customer demands • Extending QR's core competencies as a full logistics business • Innovative infrastructure design, construction and maintenance practices • The development of an e-commerce strategy
	Increasing Coal Train Maximum Speed to 80kmh	Increase the throughput of bulk freight lines to increase efficiency and reduce greenhouse gas emissions	• Involves the upgrading of rail infrastructure designed to allow improvements in train handling, which means that the operating speeds of coal trains can be increased to a maximum of 80kmh compared to a past maximum of 60kmh. • Fuel savings have been associated with the development and use of special higher speed train driving methodologies. These fuel savings are estimated to in order of 5%.
Passenger Task	Minimisation of Excess Passenger Task Capacity - Urban	Increase QRs Passenger Carrying Efficiency by increasing the numbers of passengers within its urban passenger network.	• Introduction of integrated ticketing systems in conjunction with other public transport operators • Upgrading passenger information systems, eg. Display monitors at major stations, LED displays at selected stations with multiple platforms, automatic train announcements and help telephones at all stations, automatic announcements on all trains, and ticket vending machines at all stations. • The elimination of dieselised rollingstock from Citytrain network and the upgrading of carriage interiors • Enhanced passenger and network security with the rollout of closed circuit TV (CCTV) security monitoring of all stations and car parks, the progressive installation of CCTV on all train carriage, the upgrading of station lighting, increased personnel for the Police Rail Squad, the introduction of "Guardian Trains"

Target Area	Initiative	Goal	Features
			(specified night trains with two security guards on board for the full length of the journey) • Provision of disabled access to stations via lifts, ramps and new footbridges • Revised scheduling to better match customer demand • Innovative advertising campaigns • Promotion of season tickets with incentives for regular users • Targeted use of fare discounts, eg. Half fare return journeys on weekends and four for one tickets available on school holiday periods.
	Minimisation of Excess Passenger Task Capacity – Non-Urban	Increase QRs Passenger Carrying Efficiency by increasing the numbers of passengers using its non-urban passenger network.	• Comprehensive marketing surveys of existing customers • Direct mail outs to the growing database of existing and potential customers • Discount campaigns such as two for one on the western services from the period of November to March • Discount campaigns to encourage seniors card holders to bring a friend for 30% off.
	Upgrading CityTrain Network	To upgrade existing rollingstock to enhance efficiency of maintenance and service operations	• A series of infrastructure projects have been undertaken to increase track capacity and therefore leading to increased service provision on the CityTrain network. • The provision of additional intermodal facilities (car parks, bus interchanges)

Rail Infrastructure Development Initiatives

Target Area	Initiative	Goal	Features
Combined Tasks	Fewer Speed Restrictions throughout the QR Network	To reduce the impact that speed restrictions place on the effective and efficient running of rollingstock	• QR has an intensive program for reducing the length of track under speed restrictions across Queensland to facilitate smoother running of trains and resultant fuel efficiency gains.

Target Area	Initiative	Goal	Features
	Signalling Initiatives	To reduce the impact that signalling places on the effective and efficient running of rollingstock	• In conjunction with many infrastructure projects, a number of signalling improvements have been undertaken to facilitate smoother running trains. • Train queuing times and associated energy consumption will be reduced.
Railway Infrastructure	Track Upgrades to Increase Axle Loads	Increase the capacity of existing track infrastructure to allow for more competitive and effective rollingstock to operate.	• Conduct major track upgrades to facilitate increase operational efficiency by improving asset reliability, reducing future maintenance requirements and providing for increased rollingstock axle loads and train speeds. • These upgrades are essential to the introduction of new and more efficient stock such as the new 4000 & 5000 Class locomotives and the higher gross-tare wagons.
	Construction of Rail Extensions, Balloon Loops and Spur Lines	To upgrade existing rollingstock to enhance efficiency of maintenance and service operations	• For ease of operations and to reduce loading times, improve freight handling processes and reduce cycle times, QR is undertaking a number of track modifications. These will result in increased fuel efficiencies.

Operational Initiatives

Target Area	Initiative	Goal	Features
CityTrain Fleet Operations	Use of 3 Car Trains	To reduce excess passenger carrying capacity within the network.	• Operating 3Car trains in off peak times instead of 6 Car trains. Energy consumption reduced by 50%
All Operations	Reduced Dead Running	To reduce the amount of dead running occurring throughout the operation.	• The purpose of dead running is to reposition rollingstock to where it is required to commence service. • Development and implementation of a stabling strategy designed to reduce the amount of dead running required. • Construction of additional stabling infrastructure and application of improved security arrangements for stabilising rollingstock at various locations around the network. A net saving in operational

Target Area	Initiative	Goal	Features
			terms of approximately 1.4% in energy conservation has been realised and will continue to be realised.
Personnel	Train Dynamics	To improve the level of skill of personnel and thereby reduce the negative impact of human factors in efficiency of operations	• This project involves a collaborative research agreement between QR and the Central Queensland University. • This research will provide drivers with Intelligent Train Monitors to assist them to reduce the magnitude and frequency of excessive dynamic forces. • Interactive In-Service Driver Training will provide drivers with reports outlining their driving actions as well as the corresponding train dynamic forces. • Research has shown that a marked reduction in energy consumption (as much as 30%) has been achieved by utilising better train handling techniques. • This project is aimed at locking in these better techniques and continually improving on them.
	Train Driver Fatigue Management	To improve the level of skill of personnel and thereby reduce the negative impact of human factors in efficiency of operations	• Part of a major study conducted by the University of Adelaide into the effects of shiftwork on staff health and performance. • It is expected that the initiative will lead to the development of more effective rosters and as a result, improved train handling and reduced energy consumption.
	Fuels Savings Club	To improve the level of skill of personnel and thereby reduce the negative impact of human factors in efficiency of operations	• This initiative will concentrate on train handling, performance and resultant fuel usage. • Incentives will be offered for the best performance each month.

Target Area	Initiative	Goal	Features
Personnel	Train Management Course and Electric Locomotive Simulator Upgrade	To improve the level of skill of personnel and thereby reduce the negative impact of human factors in efficiency of operations	• A major factor in locomotive fuel efficiency is driver performance. • A comprehensive train management course has been developed for train crew which provides train crews with the means to improving their driving skills through the use of driving simulators. • Project objectives include reducing traction diesel fuel and electricity consumptions by a minimum of 1%/annum and reducing maintenance costs by 1%/annum.

Bulk Fuel Initiatives

Target Area	Initiative	Goal	Features
Bulk Fuel Storage Facilities	Bulk Fuel Storage Facilities Upgrade	To increase the efficiency of all QR bulk fuel storage facilities.	• Upgrading of existing bulk fuel storage facilities to current environmental, safety and building standards, including the replacement of all underground fuel lines and the upgrading of fuel dispensing and distribution equipment. • Will allow QR to adopt a comprehensive fuel management system and recoup current bulk fuel losses which may be as high a 2 million litres per annum. Projected CO_2-e savings from this project to 2004/5 is 17,500 tonnes.
	Proposed Fuel Management System	To effectively manage and trace the movement of all fuel supply throughout the QR network.	• A comprehensive electronic fuel management system will be introduced to allow QR to monitor and manage individual locomotive and trip fuel consumption patterns.
	Mainline Fuelling Strategy	To reduce the distance necessary to travel to appropriate refuelling stations	• Mainline locomotive refuelling points installed at strategic locations to eliminate dead running of locomotives to fuelling facilities located away from the mainline railway corridor. • Resulting in improved train transit times, reduced cycle times, elimination of shunting, reduced train crew hours and improved

Target Area	Initiative	Goal	Features
			train performance, reduced spillage and consequently reduced locomotive fuel usage.

Major Building Initiatives

Target Area	Initiative	Goal	Features
Office Infrastructure	Major Building Energy Management	To reduce the level of energy consumption from the office infrastructure sector of QR operations.	• A number of strategies have been put in place such as installing more efficient office lighting, lifts and chillers and conducting energy efficiency training with QR staff. • Estimated savings in energy consumption from two of QRs main buildings are in excess of 2.5million kWh/annum or 2600tonnes CO_2-e/annum.

Employee Initiatives

Target Area	Initiative	Goal	Features
Personnel	Workshops Group Energy Management Initiatives	To improve the level of energy conservation awareness within the QR workforce.	▪ Creation of Energy Task Teams as part of the Workshops Management Process that have the following objectives: ▪ To create an energy efficient workplace ▪ To create a way of maintaining energy efficient operations for manufacturing, maintenance, and component supplies to QR ▪ To provide a forum for discussion of new and innovative energy conservation ideas ▪ To ensure all recommendations from Energy Management Reports are reasonably practical to implement and provide cost effective measures for improvement.