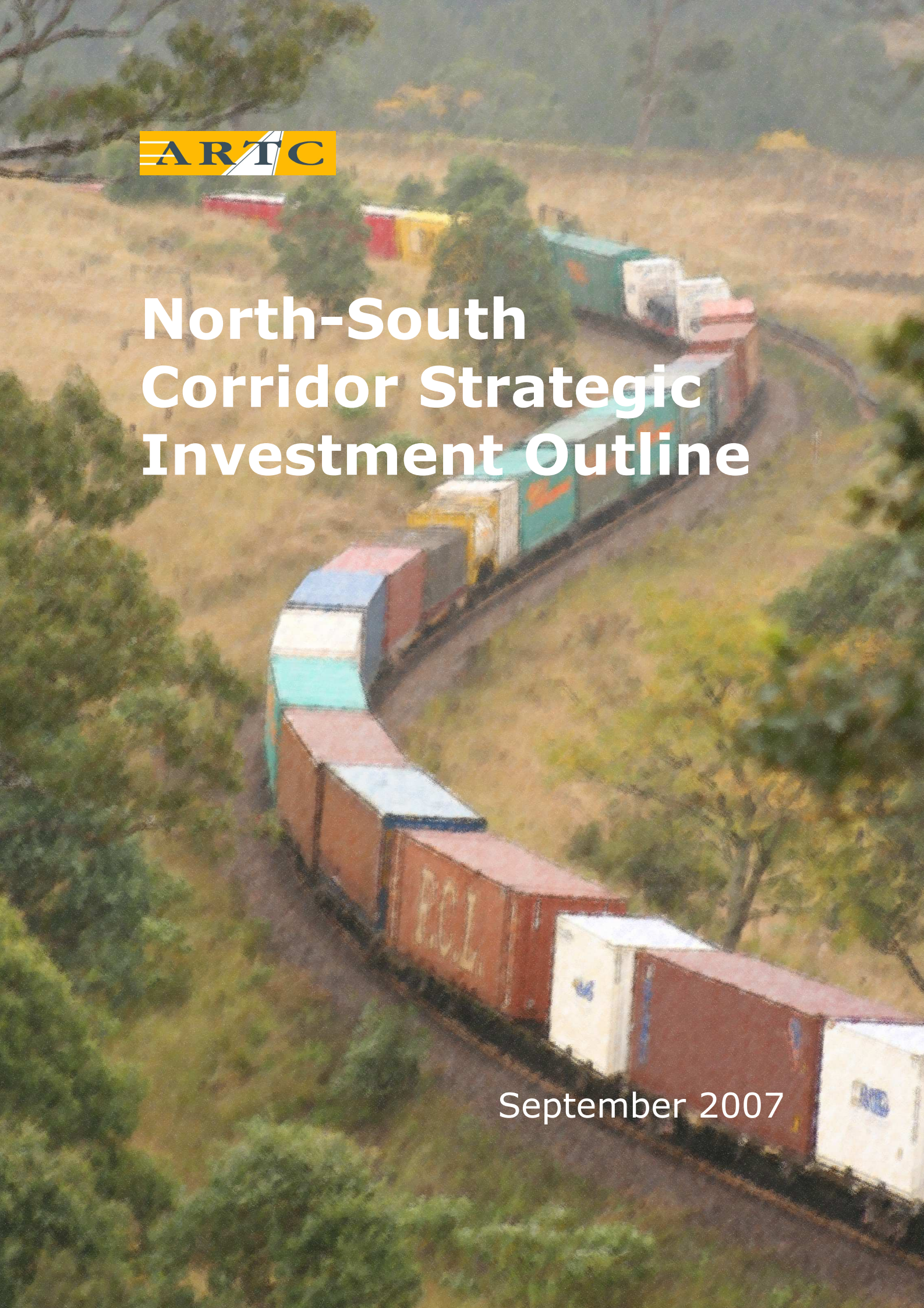


North-South Corridor Strategic Investment Outline

September 2007

1. Introduction

Background

On 5 September 2004, the Australian Rail Track Corporation (ARTC) commenced a 60 year lease of the NSW interstate and Hunter Valley rail lines. ARTC previously controlled the interstate rail network within the area bounded by Albury on the NSW / Victoria border, Kalgoorlie in Western Australia and Broken Hill in western NSW. The commencement of the NSW lease consolidated the management of the majority of the interstate rail network under ARTC and created an opportunity to deliver an integrated investment strategy to enhance rail competitiveness on the North-South Corridor.

In the 2003/04, 2004/05 and 2005/06 financial years the Australian Government gifted a total of $820 million to ARTC. ARTC has added this investment to its previously announced investment program for NSW.

This document outlines the basis of ARTC's North-South Investment Strategy and details the expected outcomes from the investment.

ARTC's Business Strategy

ARTC is investing to pursue growth for the rail industry on the North-South Corridor to assist in improving the role of rail in the Australian land transport task. ARTC believes that its success in growing the rail volume will flow through to increased revenues that will underpin the long-term sustainability of the business.

This has already proved a successful strategy on the East-West corridor where rates of volume growth have greatly exceeded expectations, leading to very strong and sustainable revenue growth.

To achieve a growth led business model means that the strategies for investment in the network must be driven by market need, not by what might be engineeringly elegant. This means that the focus of the company is very much on identifying what the market will respond to and developing the infrastructure to suit.

ARTC is also addressing the significant maintenance deficit inherited in the NSW rail infrastructure.

The focus of this paper is the general freight market between the three east coast capital cities. These markets represent the largest non-bulk movement of freight in Australia, are projected to grow at a rate above GDP growth, and offer the opportunity for rail to regain volume and market share.

After a long period of continuous decline from the 1950s, rail's share of the east coast transport task has stabilised over the last few years.

The revitalisation process includes integration of the rail network across State borders, and integrated investment in that infrastructure to deliver an efficient and competitive network.

For the North-South corridor (Melbourne – Sydney – Brisbane) what ARTC is seeking to deliver is a step change in performance.

North-South Strategy Development Methodology

There are two key elements to ARTC's market driven approach to investing in rail infrastructure. These are:

- The objective is to achieve the largest possible increase in rail gtk for the available investment dollars.
- Investment must be grounded in an understanding of the factors that drive market movements between modes.

The following sections set out the key factors that drive the market and describes how those factors translate into infrastructure projects. It then summarises the scope of work in the North-South Strategy and details the expected outcomes.

2. The North-South Interstate General Freight Market

The North – South Corridor services three distinct interstate general freight markets.

Melbourne - Brisbane

The Melbourne – Brisbane corridor has the smallest tonnage of the three markets at around 5 million tonnes.

However, it is the market where rail is most competitive. Both road and rail offer second morning availability for freight leaving in the late afternoon, despite road being significantly faster than rail.

Melbourne - Sydney

The Melbourne - Sydney market is estimated at approximately 11 million tonnes, making it by far the largest general freight market in Australia.

Rail currently has a negligible share of this market. The market has an expectation of late afternoon dispatch with early next morning delivery. Road achieves this where rail has fallen short of these expectations.

With such a large market available, relatively small changes in market share translate into significant volume growth, making this an important market for rail to improve its competitiveness in.

Sydney - Brisbane

Rail enjoys a greater share of the Sydney – Brisbane market than it does Melbourne – Sydney.

Constraints to road operations on the Pacific Highway have tended to allow rail to remain competitive for a small segment of the market despite rail offering poor departure and arrival times.

At 7 million tonnes, the market is smaller than the Melbourne – Sydney market.

3. The Economics of Rail Market Share

Introduction

The critical factors effecting road/rail market share outcomes are:

- Transit time / Availability – This refers to the ability of freight to be dispatched and received at times that meet the needs of the market.
- Reliability – Poor reliability results in additional costs due to disruption to local pick-up and delivery and to the efficient operation of warehousing.
- Price – Price is considered to be the dominant consideration in decisions about mode choice for the majority of freight. However, availability and reliability both have large indirect cost effects and as a result can have an effect on mode choice greater than that of direct price alone.

Background

During the late 1990's, Booz Allan and Hamilton (BAH) to undertake a series of studies to develop an understanding of the mode share outcomes in the Australian interstate intermodal market.

The initial work involved qualitative and quantative research to determine the factors that effected mode share choice and their relative importance.

Through revealed preference surveys this was translated into a set of demand elasticities. BAH further refined the elasticity analysis for the purposes of the Interstate Audit undertaken by ARTC in 2001.

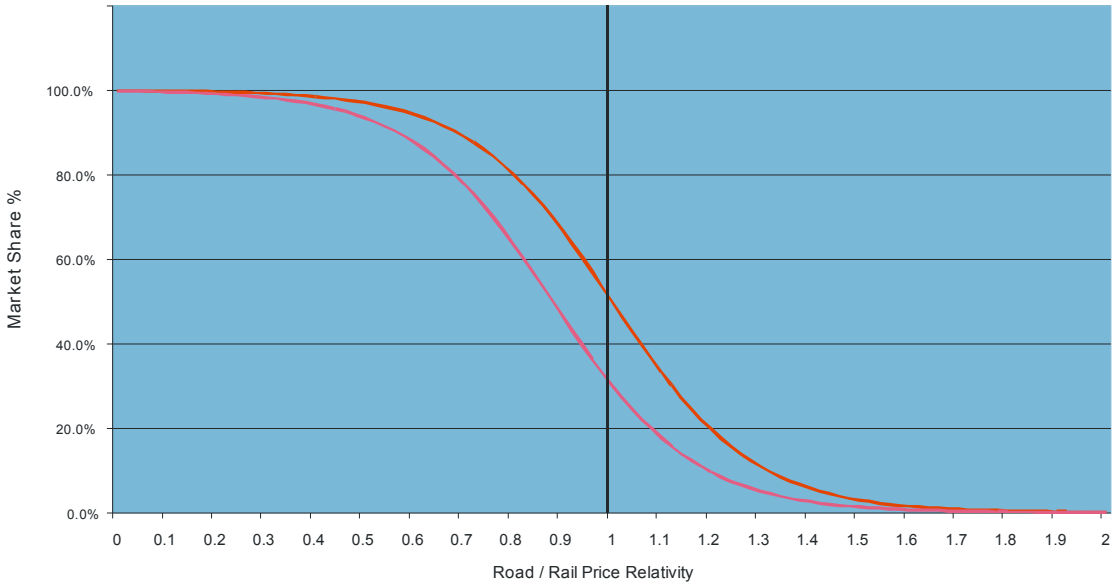
ARTC has utilised and refined this formula and further calibrated it to reflect the most recent data on performance and market shares to produce a model that predicts market outcomes. The formula reflects the views of ARTC on the relative importance of factors, based on ARTC's experience of the market.

Consultancy ACIL Tasman undertook further extensive research on elasticities in the context of the Australian Government's North-South Rail Corridor Study. The model that it developed has a similar structure and gives similar market share outcomes to the ARTC model, although ARTC's model has a number of technical differences and adopts different demand elasticities.

Model Description

The model is reflected in a logit curve. The effect of a change in an input value varies depending on the point you are at when you started. This is in contrast to a linear relationship which would mean that the percentage market share change from a given change in an input is the same irrespective of the starting point. The logit function is explained in more detail in the following section.

The basic form of the relationship is shown in the diagram below:



The red line (logit curve) in the chart gives the predicted market share outcomes if road and rail had identical quality of service. The thick black vertical line shows the point at which road and rail door-to-door prices are the same. The point at which the red line intersects the black line gives a 50% market share to each mode. The logic of this outcome is that if both average price and service quality are identical, customers will be indifferent between road and rail.

In practice there will be a spread of actual price and service quality levels around the average. Each individual freight movement will be more or less suited to road or rail depending on issues like freight density, distance from terminals and movement specific service requirements. However, on average there will be an equal split.

A change in average road/rail price relativity causes a shift along the red line and hence a change in market share. A change in relative service quality causes the logit curve to shift left or right.

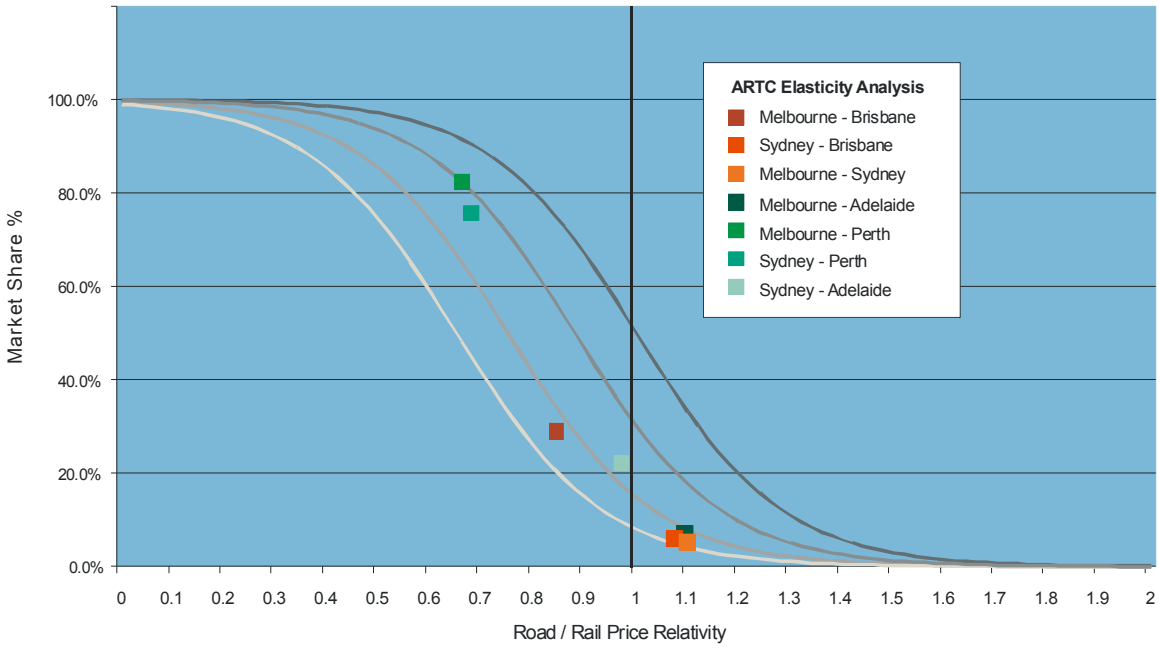
Booz Allan and Hamilton's research determined that the important non-price issues are:

- Reliability (that is, the percentage frequency at which goods are available at their advertised availability time at the destination terminal),
- Availability (that is, the ability for freight to be dispatched and received at times that meet supply chain needs), and
- Transit time.

The chart below illustrates the logit model applied to current performance for the major intercity intermodal markets.

The Melbourne – Perth and Sydney – Perth corridors, which have historically enjoyed high levels of reliability and availability, sit on a curve close to the maximum practical service quality performance of rail. The other markets sit on curves representing lower service quality outcome.

Road-rail price relativities are based on annual research undertaken for ARTC on actual road and rail door-to-door prices.



This analysis provides a context for quantifying the effect of different infrastructure options.

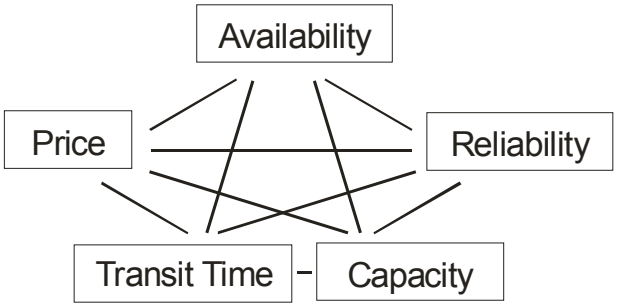
An analysis of the current performance is that rail can achieve a significant increase in its market share by improving its service quality. Improving the infrastructure contribution to service quality has therefore been a primary focus of ARTC's strategy development.

4. From Strategy to Projects

Introduction

The process from strategy to projects that deliver the market outcomes has a complex inter-relatedness of market characteristics.

The strategy revolves around five characteristics – Price (above and below rail yield), Availability, Reliability, Capacity and Transit time. These characteristics are highly interdependent.



ARTC has adopted as its corporate goals: transit time; reliability; capacity; and, above & below rail yield.

Transit Time

Reducing transit time is a critical input to a range of other important market outcomes. Reductions in transit time:

- Improve availability, that is, the ability of rail to offer cut-off and delivery times that meet the needs of the market.
- Increase capacity, as shorter track occupancy allows more trains for a given level of delay.
- Reduces costs, directly for crew and indirectly where shorter transit time increases asset utilisation.

Transit time is a function of two things:

- Raw transit time, which is the time a train would take if it did not encounter any other trains, and
- Crossing delay, which is the amount of time that a train is delayed crossing oncoming trains (and to a much lesser extent where it is delayed by a train in front, or held to allow another train to overtake).

Reliability

The end-market for rail freight consistently identifies reliability as the key non-price consideration in decisions on modal choice. Poor reliability results in significant additional costs where, for instance, trucks are left to wait at a terminal for hours awaiting the arrival of a late running train. As unreliability is unpredictable, this further compounds the impact on cost and generally induces inefficiencies through the supply chain.

The North-South Strategy objective is to provide a more flexible infrastructure, so that delays caused by train operators are not compounded by constraints on the network.

The North-South Strategy aims to ensure that sufficient track capacity is provided to allow operations, and hence transit time, to be more robust and predictable even in an environment of disrupted operations.

Additionally, the track owner can make a contribution to reliability by providing a high quality track structure that minimises both planned and unplanned maintenance and speed restrictions. Moving to an all concrete sleepered track will substantially reduce the likelihood of speed restrictions and service disruptions. A quality track structure will also greatly reduce the frequency and severity of planned closures for track maintenance, which as rail volumes grow will increasingly be at a premium.

Capacity

Capacity does not feed directly into the factors that influence market share. Rather, it is an enabler of rail volume growth.

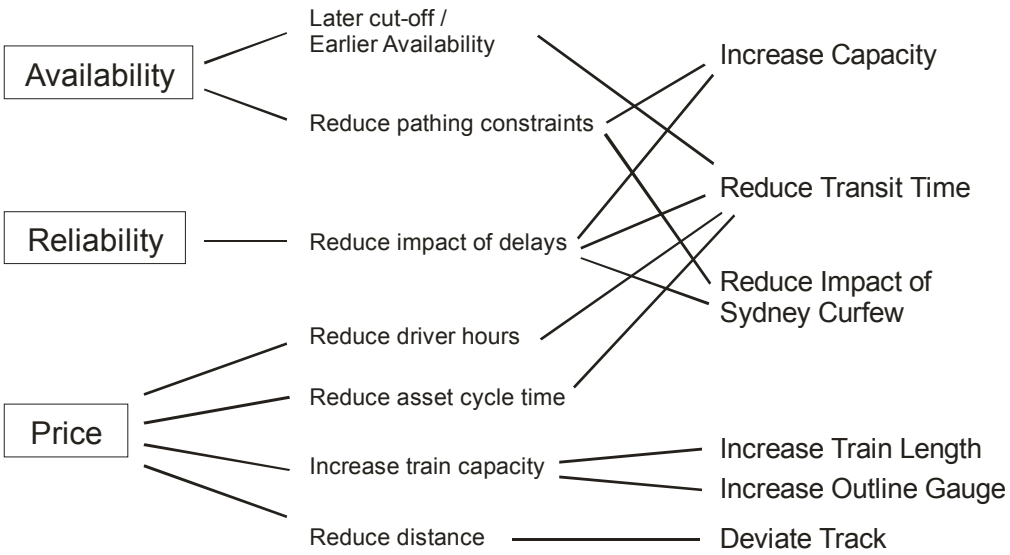
Provision of capacity is a major contributor to the achievement of high levels of reliability, by offering flexibility to deal with late running trains.

Capacity also has the ability to reduce transit time, by helping reduce crossing delay. Reduced transit time in turn feeds into reducing above rail costs and increasing availability.

ARTC's strategy is to use capacity to underpin the achievement of other market objectives (reliability, transit time and service availability). The passing lane and loop extension initiatives to reduce transit time will ensure that there are higher levels of capacity available on the network.

Linking Strategy to Projects

To move from the strategy framework described above to specific projects is a complex and iterative process. The following diagram provides a simplified "map" for moving through the three key parameters that drive market share to specific actionable goals.



ARTC's North-South strategy objectives are best achieved through projects that can be grouped together as projects that both reduce transit time and increase capacity.

5. North-South Program

Introduction

The proceeding sections set out the rationale for the selection of projects to optimise rail's ability to grow. This section describes the key projects in the North-South Strategy and describes how they relate to the performance objectives.

Sydney - Brisbane

- **Concrete sleepering** of the entire ARTC track between Sydney and the Queensland border. This will allow increased train speeds, reduce the incidence of temporary speed restrictions and delays due to track work, and eliminate speed restrictions imposed on high temperature days.

- An approximate doubling of 1500 metre **passing loops** on the North Coast. This creates significant additional capacity, reduces transit time and increases reliability.

- Installation of **CTC signalling between Casino and Acacia Ridge**. This will eliminate a 19th century signalling system that requires every train to stop at passing loops to exchange a metal token that gives it permission to be on a section of track. This will save over 45 minutes of transit time and reduce costs from repeated train stopping.
- **Loop upgrades** on the North Coast. The upgrade program will eliminate a number of track and signalling configuration issues that cause unnecessary delays when trains enter and leave existing long passing loops.

Melbourne – Sydney

- **Concrete sleepering** of the entire ARTC track between Melbourne and Sydney. This will allow increased train speeds, reduce the incidence of temporary speed restrictions and delays due to track work, and eliminate speed restrictions imposed on high temperature days.

- **Southern Sydney Freight Line**. This will provide a freight track independent of the Sydney commuter lines between Chullora and Macarthur. This will remove the current 'curfew' on freight trains operating in the metropolitan area during the morning and afternoon peak periods.
- **Automatic block signalling**. This program will eliminate line sections that use a 19th century signalling system that requires signallers to manually admit trains to a section of track. The project will significantly raise capacity and reduce costs.

- **Overtaking loop on double track at Harden**. This loop, which will be installed in conjunction with the signalling upgrade, will allow fast trains to overtake slower trains, increasing capacity and reliability.
- **Passing lanes Junee – Melbourne**. Passing lanes are sections of double track approximately 6.8 km long that allow trains to pass each other without stopping. 16 are proposed to be constructed by ARTC.
- **Tottenham triangle**. The Tottenham triangle will provide a direct connection between the North-South and East-West corridors, eliminating the need for trains to reverse at Tottenham. This will reduce costs for through traffic, open-up options to use terminals other than the main Dynon terminal in Melbourne, and improve network capacity.
- **Tottenham – Dynon Upgrade**. This Auslink funded project will significantly enhance capacity through this complex and congested dual gauge section that is the throat to Melbourne's Port area and the main rail freight terminal. This project will provide two standard gauge tracks into Melbourne.
- Replacement of **Murrumbidgee River Bridge**, Wagga Wagga. This project will replace a life expired bridge with severe speed and axle load limits, thereby reducing transit time.

6. Business Outcomes from the Investment Strategy

The following table outlines the outcomes from the strategy. Below rail yield is not shown as its market impact will depend on decisions about future track access charges. Transit time, while recorded below, does not feed directly into the model – rather, it acts as a key input to the other three parameters.

	Melbourne - Sydney	Sydney - Brisbane	Melbourne - Brisbane
Transit Time	**Hours**	**Hours**	**Hours**
2005	13.5	19.4	32.9
2010 (1500 m)	10.5	15.1	25.6
2010 (1800 m)	11.6	15.1	26.7
Reliability	**%**	**%**	**%**
2005	55	55	45
2010	75	75	75
Availability	**%**	**%**	**%**
2005	50	35	60
2010	75	60	85

Reliability is estimated based on the likely period of time between a train arriving and the freight being advertised for collection. The 75% figure is highly conservative, particularly for the Melbourne – Brisbane corridor.

Availability is based on the observed number of trucks leaving Melbourne over the course of the day and rail's ability to offer a departure time equal to or later than those truck departures with an early morning arrival.

Scenarios

While ARTC has a detailed strategy for achieving its market share objectives, it can only accurately predict those factors within its control. In projecting future market shares the relative performance of the road transport industry is a key factor.

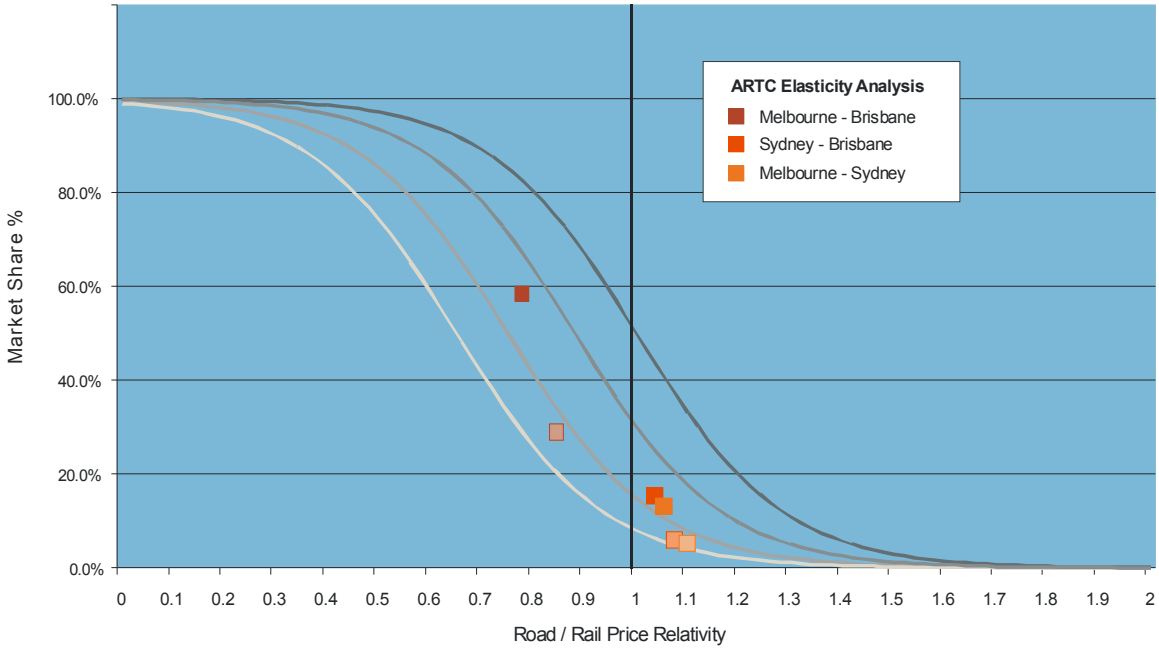
A number of factors will influence the road market:

- Oil prices. Fuel makes up a significantly smaller share of rail transport costs than it does for road. Increasing oil prices favour rail.
- Heavy vehicle charges.
- The effect of a tightening employment market and the aging of the road driver industry. This is likely to hit the long-distance, time sensitive haulage market the most and may have significant cost effects.
- The effect of "chain or responsibility" legislation, random drug testing and other initiatives that aim to ensure compliance with safety regulations.
- The effect of major road improvements and the extent to which these will be funded by tolls.
- Future heavy vehicle productivity improvement.

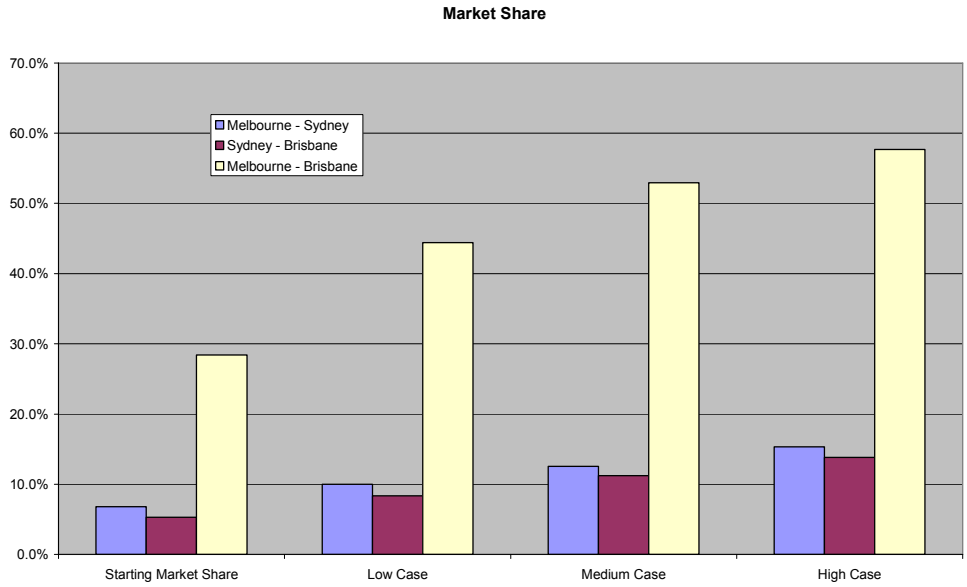
To provide a range of outcomes in terms of market share, three scenarios have been modelled. These scenarios are highly conservative in that they assume that, at best, road costs are constant notwithstanding the considerable road cost pressures described above.

- High - All of the benefits of the rail investment program flow through to rail without any significant change in road's competitive position.
- Medium - Road freight achieves a 4% reduction in cost, and road improvements to the Pacific Highway result in some of rail's availability gains being eroded.
- Low – Road achieves an 8% reduction in cost and, road improvements to the Hume and Pacific Highways result in some of rail's availability gains being eroded.

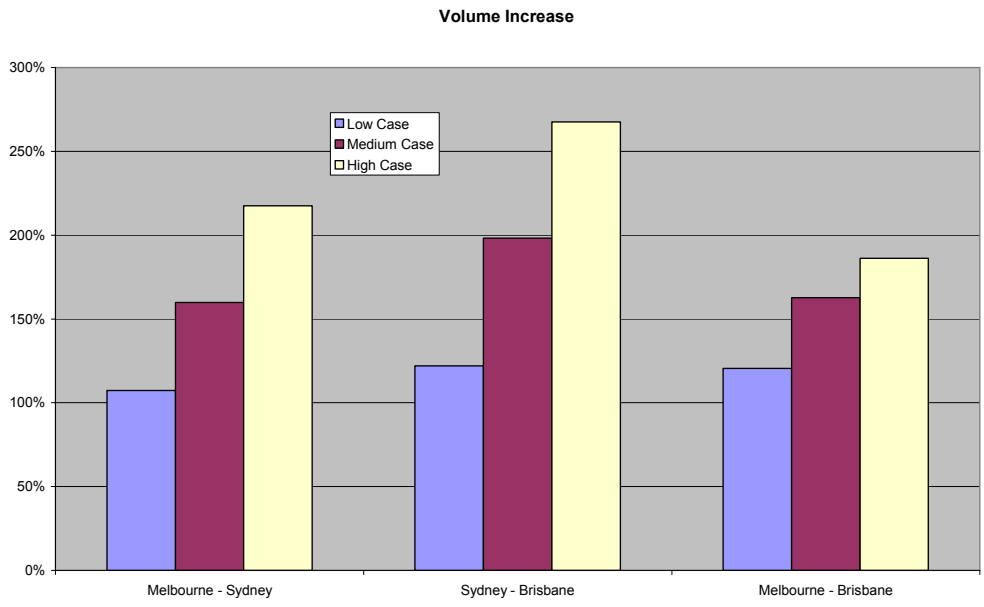
The following chart shows the effect of the North-South Strategy on estimated rail market share under the medium scenario. The shaded boxes are the current market shares while the solid coloured boxes are the projected future market shares.



The following chart compares predicted 2015 rail market share under the high, medium and low cases.



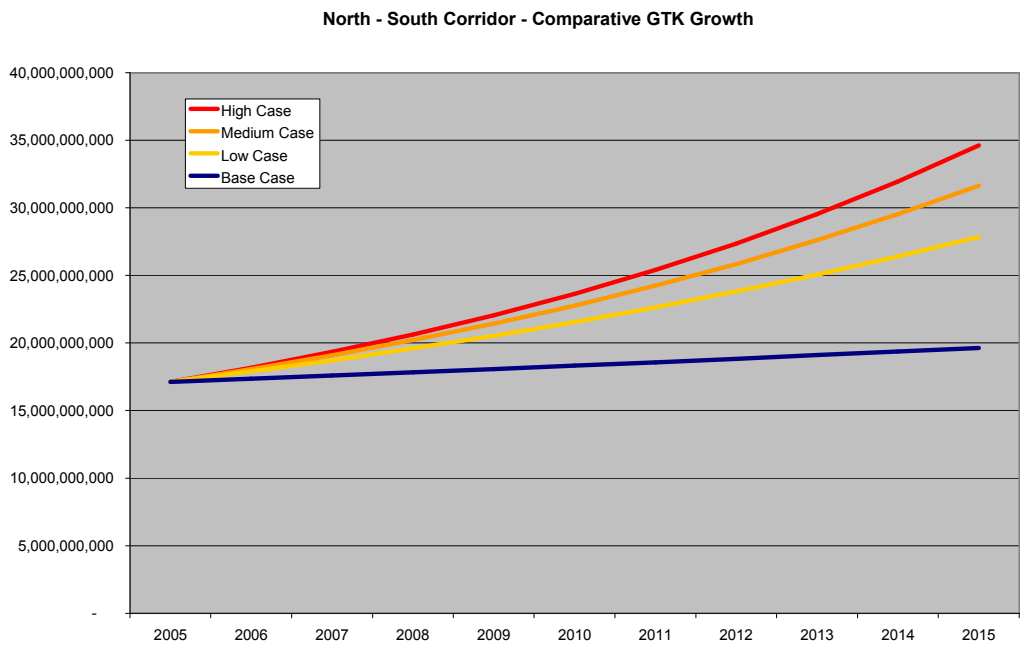
The following chart compares volume growth from 2005 to 2015 under the high, medium and low scenarios.



The following table provides the actual values shown in the charts above, along with a conversion of the growth into an annual compound growth rate assuming a constant compounding rate of growth over the 10 year period. In practice this rate of growth will slightly overstate growth in the first few years, understate it between around 2009 and 2012 and overstate it in the last few years.

	Melbourne - Sydney	Sydney - Brisbane	Melbourne - Brisbane
Starting Market Share	6.8%	5.3%	28.4%
2015 Market Share			
Low Case	10.0%	8.4%	44.4%
Medium Case	12.5%	11.2%	52.9%
High Case	15.3%	13.8%	57.7%
Market Share Increase			
Low Case	47%	57%	56%
Medium Case	84%	111%	86%
High Case	125%	161%	103%
Market Growth (10 Years)	41%	41%	41%
Volume Increase			
Low Case	107%	122%	121%
Medium Case	160%	198%	163%
High Case	218%	267%	186%
Annual Compound Growth Rate			
Low	7.6%	8.3%	8.2%
Medium	10.0%	11.5%	10.1%
High	12.2%	13.9%	11.1%

The following chart compares future rail volumes on the North-South Corridor under the high, medium and low scenarios. These are compared to a base case of "do nothing", which assumes rail market share is constant for Melbourne – Sydney and slowly declining on Melbourne – Brisbane and Sydney – Brisbane due to constrained capacity on the North Coast. GTK represents all freight on the corridor including grain, coal, steel and passenger.


North - South Corridor - Comparative GTK Growth
40,000,000,000
35,000,000,000
30,000,000,000
25,000,000,000
20,000,000,000
15,000,000,000
10,000,000,000
5,000,000,000
-
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
High Case
Medium Case
Low Case
Base Case

7. Investment Outline

The following table outlines the North-South Strategy expenditure within the context of ARTC's total 5-year capital works program.

ARTC 5-Year Capital Investment Program	Budget ($m)	
North-South Strategy	$	972.2
Southern Sydney Freight Line	$	245.1
Hunter Valley Strategy	$	369.8
Train Control Consolidation	$	88.3
Network-wide Train Communications System	$	69.6
MPM and Minor Capital Works	$	622.3
Miscellaneous*	$	88.8
Total	**$**	**2,456.1**

* Miscellaneous includes enhancement projects on the east-west network, communications system upgrades, plant & equipment and wayside.