Aspects of the NSW Rail Access Regime

Issues Paper

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

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Issues Paper

Discussion Paper DP-28 October 1998

Submissions

Public involvement is an important element of the Tribunal's processes. The Tribunal therefore invites submissions from interested parties to all of its investigations.

Submissions should have regard to the specific issues that have been raised. There is no standard format for preparation of submissions but reference should be made to relevant issues papers and interim reports. Submissions should be made in writing and, if they exceed 15 pages in length, should also be provided on computer disk in word processor, PDF or spreadsheet format.

Confidentiality

Special reference must be made to any issues in submissions for which confidential treatment is sought and all confidential parts of submissions must be clearly marked. *However, it is important to note that confidentiality cannot be guaranteed as the Freedom of Information Act and section 22A of the Independent Pricing and Regulatory Tribunal Act provide measures for possible public access to certain documents.*

Public access to submissions

All submissions that are not subject to confidentiality will be made available for public inspection at the Tribunal's offices immediately after registration by the Tribunal and also via the Tribunal's website. Transcriptions of public hearings will also be available.

Public information about the Tribunal's activities

A range of information about the role and current activities of the Tribunal, including copies of latest reports and submissions can be found on the Tribunal's website at *www.ipart.nsw.gov.au*

Submissions on the issues raised in this paper should be received no later than 27 November 1998.
Comments or inquiries regarding this review should be directed to:
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1 INTRODUCTION

The Tribunal has been asked to examine specific elements of the NSW Rail Access Regime (the Regime). This investigation has been referred to the Tribunal by the Premier under Section 12A of the *Independent Pricing and Regulatory Tribunal Act 1992*. The final terms of reference of the review are shown in Appendix A. The NSW Rail Access Regime enables rail operators[1] to make use of rail infrastructure[2]. The Rail Access Corporation (RAC), a state owned corporation, owns the rail infrastructure in NSW.

The NSW Rail Access Regime sets down principles which are designed to facilitate the process of negotiation between RAC and rail operators seeking access to the rail infrastructure (ie the track). The terms of reference restrict this investigation to matters included in Schedule 3 of the Regime. Schedule 3 refers to the Pricing Principles that are to be applied under the Regime in the derivation of prices for access to rail infrastructure. When setting prices for rail operators the RAC is guided by the Pricing Principles contained in the Regime. A key issue is whether specific aspects of the Pricing Principles inhibit the entrance of new rail operators and thereby place limits on the benefits achievable through competition.

In this investigation, the Tribunal will examine certain economic terms contained in Schedule 3 in order to provide more robust definitions of these terms. Greater certainty in the meaning and application of these economic terms should give participants more confidence to negotiate outcomes.

The terms of reference for this investigation also focus on asset valuation and depreciation methodologies used for assessing the value of assets held by RAC. The allowable rate of return on assets for pricing purposes will be based on this underlying asset value. The Tribunal has also been requested to determine the appropriate maximum rate of return on assets. In doing so the Tribunal will recommend an appropriate methodology for determining the same.

The Rail Access Regime was introduced by the NSW Government in August 1996. In June 1997 it was submitted to the National Competition Council (NCC) for a recommendation to the Commonwealth Treasurer on whether the Regime was 'effective', meaning that it satisfies the terms of the National Competition Principles Agreement. The NCC released a Draft Recommendation[3] in April 1998, seeking various amendments and clarification of certain terms used in the Regime.

The NSW Government is to release a modified regime shortly in compliance with the request from the NCC. At the same time the Premier has requested the Tribunal to undertake this inquiry to clarify aspects of the Regime as sought by the NCC.

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1 According to the Regime a 'Rail Operator' means a person who is responsible for the operation or moving, by any means, of any rolling stock on the NSW Network.

2 The rail infrastructure is the monopoly component of the railways, that is the rail track, signals etc.

3 *Application for Certification of the NSW Rail Access Regime, Draft Recommendation*, National Competition Council, April 1998.

Access Regimes

An access regime is a set of procedures which allows a third party entity to use an essential monopoly infrastructure facility owned by another party on fair terms, thereby promoting competition in other markets. Common types of monopoly infrastructure include electricity transmission lines, gas pipelines, telecommunication networks and railway lines. These facilities display monopoly characteristics because it would be uneconomic to expend the large amounts of capital required to duplicate them.

Allowing new rail operators access to rail infrastructure will encourage competition in the provision of rail services. The benefits of competition come through lower prices, choice of service provider, development of innovative and high quality services and the efficient utilisation of the rail network.

Competition should also improve productive efficiency as rail operators try to minimise their operating costs in order to provide services at the lowest possible price. In turn this will increase the competitiveness of the downstream goods and services markets that use rail services. Examples of such markets may include the carriage of agricultural products, minerals, manufactured goods and passenger transport.

The prices at which rail operators can offer services depend heavily on the level of charges applied to them by the owner of the infrastructure. There is no competitive market for railway infrastructure. However, the benefits of competition in the operation of rail services may be achievable to a considerable extent through an appropriate access regime.

1.1 Investigation process

The terms of reference for this review, which are included as Appendix A, require the Tribunal to report on,

- appropriate definitions for a series of economic terms used in the Regime, the relevant terms being:
  (a) direct costs
  (b) fixed costs
  (c) full incremental costs
  (d) incremental fixed costs
  (e) full economic costs
  (f) stand alone economic costs.
- appropriate asset valuation and depreciation methodologies
- an appropriate maximum return on assets.

The terms of Reference require the Tribunal to “consider the assets used for the carriage of coal" in its investigation and report.

In conducting a public investigation, the Tribunal is required to follow the process set out in Part 4 of the *Independent Pricing and Regulatory Tribunal Act*. The current timetable for the review is shown below:

Table 1 Timetable for review

Action	Time frame
Submissions due	27 November 1998
Public hearing	14 December 1998 IPART Offices Level 2, 44 Market Street, Sydney, NSW 2000
Release Final Report	28 February 1999

1.2 Purpose of this issues paper

This issues paper explains how the review will be undertaken, provides background to the industry, highlights the issues that will be covered in the review and calls for submissions from interested persons. It identifies areas where the Tribunal seeks input and public comment. However, the Tribunal welcomes submissions on other issues that interested persons feel should be considered in addressing the terms of reference.

This paper canvasses a range of issues which need to be considered as part of this Investigation. The aim of raising these issues is to promote discussion and elicit informed stakeholders' submissions to the Tribunal.

The Tribunal actively seeks public input and values the processes of consultation and transparency. The Tribunal encourages submissions from all interested parties to enable as much information as possible to be filed on the public record and to assist the Tribunal in its deliberations.

Submissions should be sent to:

Independent Pricing and Regulatory Tribunal
PO Box Q290
QVB Post Office NSW 1230

All submissions must reach the Tribunal by 27 November 1998.

2 THE NSW RAIL SYSTEM

The rail network forms an integral part of the State's transport system. In many cases it competes with services provided by other modes of transport (eg road transport and air services). Rail services provide a vital link for the movement of passengers and goods between States and Territories. However, for the delivery of some goods such as coal, rail services are often the only practical means of long distance transportation.

2.1 Structure and ownership

Until July 1996 rail services in NSW were owned and operated by the Government through the State Rail Authority (SRA).[4] The SRA was the provider of passenger and freight services. The SRA also carried out the maintenance of rail track, overhead wires, signals and rolling stock (ie locomotives and carriages).[5]

Some of SRA's businesses operated under separate divisions such as:

- CityRail - metropolitan passenger services in Sydney, Newcastle and Wollongong.
- Countrylink – long distance passenger services.
- Freight Rail - transportation of goods such as wheat, coal and manufactured goods.

The SRA operated as an integrated monopoly and was not subject to competition.

In July 1996, the New South Wales Government established the NSW Rail Access Regime under the *Transport Administration Amendment (Rail Corporatisation and Restructuring) Act 1996* and created the Rail Access Corporation (RAC). RAC became the owner of the rail infrastructure and provides existing and prospective rail operators with access to the rail network. At the same time, FreightCorp was corporatised and rail maintenance services were transferred to a new entity, Rail Services Authority, which was subsequently corporatised in July 1998. CityRail and CountryLink continue to operate as separate business units of the SRA.

2.2 Rail network

The RAC network consists of over 12,000 km of track. It covers a route length of 8,500 km. The network is covered by a total of approximately 2,500 train services per day. About 2,300 of these are metropolitan passenger services.

The table below shows the breakdown of network usage on a gross tonne kilometre basis (GTK). GTK is the product of the tonnage carried (gross tonnes) multiplied by the distance travelled (kilometres).

Table 2 Network usage 1996/97

Purpose	Usage(%)
Long Distance Passenger	4
Urban Passenger	21
Intrastate Freight	20
Interstate Freight	26
Coal	29

Note: relative usage assessed on a gross tonne kilometre basis.
Source: RAC Annual Report, 1996-97, p33.

[4] Some services, even then, were operated by others such as National Rail Corporation (NRC) which is jointly owned by the NSW, Victorian and Commonwealth governments. Also, BHP owns track and runs its own trains.

[5] Privately provided maintenance was also available and utilised by SRA and NRC. The SRA also contracted-out part of these functions.

In 1997/98 a total of approximately 80 million tonnes of freight was carried on the network. About 61.5 million tonnes of this consisted of Hunter Valley coal.

While the total rail network of the State is owned by one organisation, RAC, the above table indicates the widely different nature of the provision of rail services. On the one hand, there are two relatively dense sub-networks - the Sydney CityRail passenger network and the Hunter Valley coal network - and three thinner transport networks - non-coal intrastate freight (which in tonnage terms is dominated by grain), interstate freight and long distance passenger services. Traffic densities and market conditions applying to each segment differ as do the associated requirements for the extent of access to and use of the rail network.

In short, the NSW rail network could be seen as a conglomerate of disparate but connected networks in the same way as the rail networks in Victorian, Queensland and South Australian are different from NSW while still being connected to NSW. This has implications for pricing decisions and cost definitions and the ways that these are derived.

3 THE NSW RAIL ACCESS REGIME

In 1995, Commonwealth and State Governments agreed to implement a package of reforms designed to open domestic markets to the free flow of goods and services by removing unnecessary barriers to trade and competition. The Competition Principles Agreement (CPA) requires all Governments to implement third party access regimes for the use of significant infrastructure facilities to permit effective competition in downstream markets.

The most notable third party access arrangements are for gas, electricity and rail. In the National Electricity Market, third party access allows an electricity retailer to sell electricity to customers connected to the networks of other distributors. For example, energyAustralia can sell electricity to a customer who is located in the distribution area owned by Integral Energy. Similarly, in rail this means allowing public and privately owned rail operators to provide services over track they do not own.

The aim of separating rail track infrastructure from service provision was to promote competition in the potentially contestable markets of freight and passenger transport. New rail operators seeking access to the rail network would be able to negotiate with RAC on the same basis as the existing rail operators.

The rail network is a natural monopoly since replication of the bulk of the network would be uneconomic given the current level of demand for rail services. But competition from road which parallels the rail line in many instances limits the market power that rail actually enjoys. Coal haulage in the Hunter Valley is an exception to this as in most cases mining approval is granted on the proviso that coal is transported by rail only.

RAC was established as a separate legal entity with the objective of ensuring its continuing commercial viability. However, since RAC is the only provider of rail infrastructure facilities the Regime seeks to constrain RAC from earning excessive profits whilst allowing it to cover costs and promote the usage of the community's rail assets.

The way in which access prices are established is set out in RAC's *Access Pricing Policy (RAC, September 1996).* According to the Pricing Guidelines in the policy "Prices will be negotiated between RAC and rail operators, subject to Schedule 3 of the Regime". Prices will be set such that they are consistent with the so called 'Floor Test' and 'Ceiling Test' in the Regime.

The terms of reference for this review require the Tribunal to report on definitions of the following economic terms referred to in the Floor Test and Ceiling Test.

(a) direct costs
(b) fixed costs
(c) full incremental costs
(d) incremental fixed costs
(e) full economic costs
(f) stand alone economic costs.

Section 4 of this issues paper discusses possible definitions that may be applied to these terms. The discussion of the pricing principles in the Regime, which follows, is aimed at placing these economic terms in their appropriate context. A more detailed discussion of the economic theory underlying the approach to the pricing principles adopted in the Regime may be found in Appendix B[6].

The description of the 'floor and ceiling' approach to pricing, in the box below, is quoted from the NCC's Draft Recommendation[7].

Description of Baumol band approach

The 'floor / ceiling' approach to pricing regulation is associated with the work of Professor William Baumol. It sets a band within which prices can be negotiated. Prices cannot fall below or rise above this band. This approach has two overarching purposes:

- The ceiling is based on stand alone costs and aims to prevent the regulated firm from extracting monopoly profits; and
- The floor is based on avoidable costs[8] and aims to ensure that prices are not set so low that some rail operators do not pay for the costs of the services they use.

The floor/ceiling approach reflects the boundaries of pricing which would exist if the market was open to competition and so provides an economically defensible method of regulation.

The stand alone cost test encompasses the situation where a single service is provided to a rail operator or rail operators and also the situation where a group of services are provided. In this case, the 'combinatorial' stand alone cost test is that the revenue from a group of operators cannot exceed the economic cost of the services provided to them if they were provided on a stand alone basis. Therefore, where there are multiple users of a line section or group of line sections, it will be impossible to charge all operators the stand-alone costs of their individual operations and still pass the combinatorial test.

Source: Dr D Cousins, Report on the pricing principles contained in the NSW Rail Access Regime, September, 1997, p 32.

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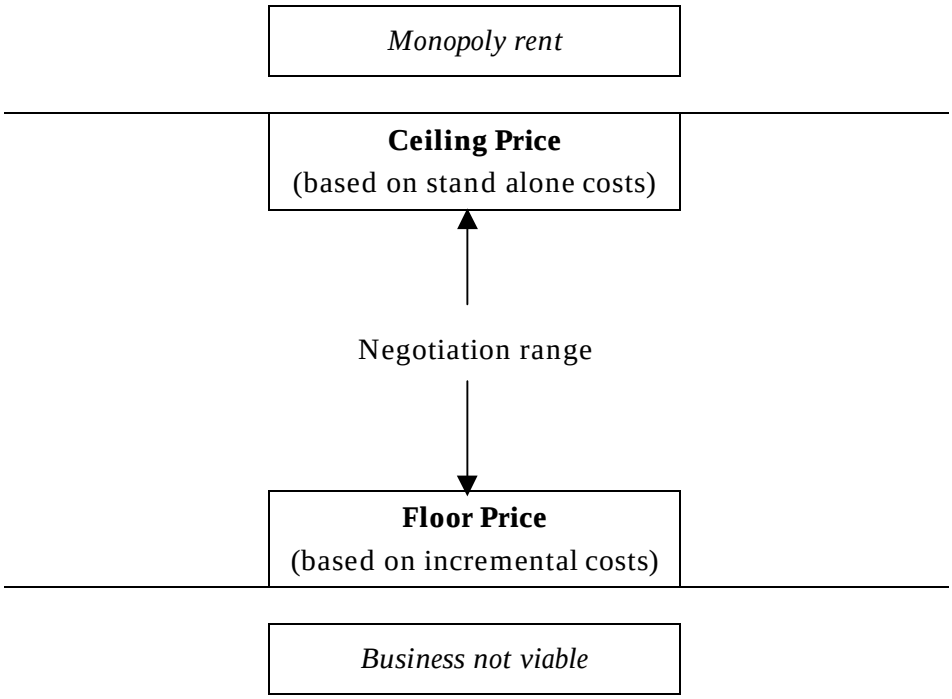
6 see *Ramsey Pricing.*

7 *Application for Certification of the NSW Rail Access Regime, Draft Recommendation*, National Competition Council, April 1998, p12.

8 It should be noted that the Floor Test in the Regime is actually based on full incremental costs.

This 'floor and ceiling' approach to pricing in the Regime may be represented diagrammatically by the figure below.

Figure 3 Baumol price band



3.1 Floor Test

In the Regime the floor test is defined as

(a) revenue from every Rail Operator or group of Rail Operators must at least meet the direct cost imposed by that Rail Operator or group of Rail Operators; and for any line section or group of line sections, the full incremental costs, including incremental fixed costs, must at least be met by revenue from the Rail Operators of those sections (**"floor test"**);

The floor test can be interpreted as requiring that,

1. RAC's revenue from operators should be no less than the ***direct costs*** of servicing each operator or group of operators
2. revenue from any line section or group of line sections should be no less than the ***full incremental costs*** (including ***incremental fixed costs***) of operating these sections.

The NCC has expressed concerns regarding the deterrent effect to demand of the second limb of the floor test. The NCC suggested that the problem would be removed if the wording of the second limb was changed to ensure that line fixed cost recovery was an RAC objective rather than a requirement. In response, the NSW Government has proposed an alternative wording of the second limb of the floor test that also allows for line by line subsidies it pays to RAC.

The NSW Government has proposed that (i)(a) of Schedule 3 of the Regime should read,

> Revenue from every Rail Operator must at least meet the Direct Cost imposed by that Rail Operator. In addition, for any line section or group of line sections, the full incremental costs, including Incremental Fixed Costs, but excluding that portion of Full Incremental Costs met by line section CSO's should, as an objective, at least be met by revenue from the Rail Operators of those sections ('floor test').[9]

Example 1 Floor test

Assume there are two line sections and three operators. The operators use the line sections as follows:

Operator	Line Section A	Line Section B
1	Yes	Yes
2	Yes	Yes
3	Yes	No

Then, revenue from Section A must be not less than,

First limb		Second limb
Direct costs of servicing operators 1+2+3 over Section A	and	Full incremental costs for Line Section A

and, revenue from Section B must not be less than,

First limb		Second limb
Direct costs of servicing operators 1+2 over Section B	and	Full incremental costs for Line Section B

This example indicates some of the difficulties associated with the floor test. While it may be possible to make reasonable estimates of an individual operator's direct costs, there is no necessarily 'right' way to allocate the full incremental costs between the different operators.

One of the features of the floor test may be the extent to which RAC is no worse off in terms of revenue if an individual operator ceases to be an operator, ie that the revenue loss from the operator's removal from the network is no greater than the reduction in costs sustained by the operator's cessation of operations. RAC may be worse off if the operator is contributing to fixed costs.

[9] *Application for Certification of the NSW Rail Access Regime, Draft Recommendation*, National Competition Council, April 1998, p14.

3.2 Ceiling Test

In the Regime the ceiling test is defined as:

(b) for any Rail Operator or group of rail operators, revenue must not exceed the full economic costs of the infrastructure (including reasonable costs of capital, overheads etc) which is required by that Rail Operator or group of Rail Operators on a stand alone basis (**"ceiling test"**);

RAC revenue from a group of operators is not to exceed ***full economic costs*** on a stand alone basis. Methods for calculating stand alone costs are not specified within the Regime but could be interpreted as the cost to an operator of constructing a replacement track to service the needs of that operator alone. The track that is constructed could be an optimised design, and quite different from the existing system.

3.3 Combinatorial Test

In the Regime the combinatorial test is defined as,

(c) total Corporation revenues must not exceed the stand alone economic costs of the entire NSW Rail Network

Baumol and Sidak[10] summarise the combinatorial test in general terms thus:

> … the combinatorial stand alone price ceiling means that the prices of every combination of the firms products must yield combined revenues not exceeding the corresponding stand-alone cost of the combination of products in question. Applied to the full set of products supplied by the firm, this rule dictates that the firm's total revenue must not exceed the competitive earnings level.

The terms of reference for this review require the Tribunal to report on "an appropriate maximum rate of return on assets under the Regime for the purposes of applying the ceiling test under Schedule 3, clause (i) (b), particularly taking account of the combinatorial nature of the ceiling test." The Tribunal wishes to ensure that in assessing the ceiling test it fully takes into account the implications of the combinatorial nature of the test based on ***stand alone economic costs***.

There is a question as to the practicality of calculating the possible combinations[11]. Baumol and Sidak's observations in this regard are:[12]

> … full execution of the combinatorial requirements of the stand-alone cost ceiling can be a mind-boggling task that threatens to make the entire procedure impractical. … But experience in railroad regulation has shown that such calculations are feasible, and the determination of such cost figures has become a fairly routine activity, with firms specialising in the requisite calculations.

The Tribunal seeks comment on the practical applicability of the Combinatorial Test, in a multi-operator environment.

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10 *Toward Competition in Local Telephony*, Baumol, W.J., and Sidak, G.J., AEI Studies in Telecommunications, MIT Press, 1994, p78.

11 KPMG's *Report on the pricing principles in the NSW Rail Access Regime* for the National Competition Council, September 1997, p49.

12 *Toward Competition in Local Telephony*, Baumol, W.J., and Sidak, G.J., AEI Studies in Telecommunications, MIT Press, 1994, p78.

3.4 Carriage of coal

The Terms of Reference require the Tribunal to "consider the assets used for the carriage of coal" in its investigation and report.

Access prices for the carriage of coal differ from other rail access prices in that they are not negotiated and are instead established by RAC. The current version of the Regime utilises the moratorium period applying to coal transportation granted under the *Competition Policy Reform Act 1995* (Commonwealth) .

For pricing purposes the Regime classifies coal mines into 3 categories based on whether 1996/97 rail freight revenue exceeded full above rail and below rail costs[13].

Category 1 applies where a coal mine previously paid to FreightCorp an amount greater than, the new ceiling test cost for access to the infrastructure and full costs of operating a train on the infrastructure. Full train operational costs comprise all costs associated with above rail assets and operations; eg locomotives, train crew, fuel, train operator overheads and return on assets.

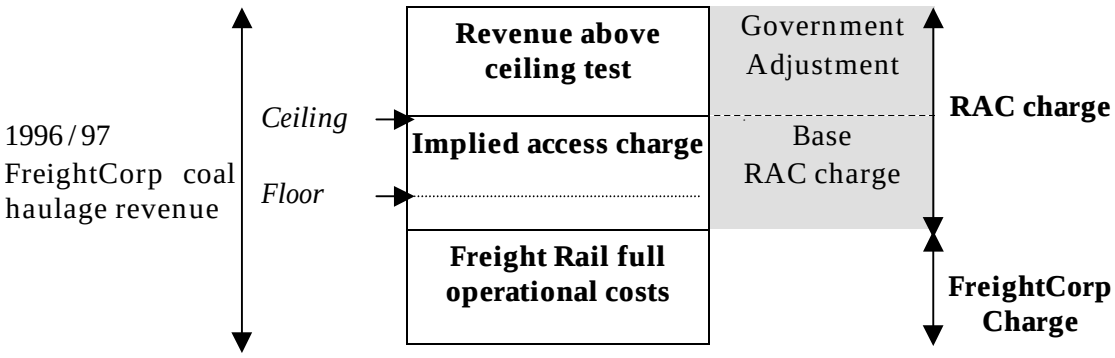
Category 1 mines will pay to the RAC, the ceiling test level plus an adjustment, for access to the infrastructure, (and will separately pay to FreightCorp a charge for the full operational costs for the carrying of coal). The adjustment represents an amount equal to the difference between, the ceiling test level plus full operational costs for rail operators, and their 1996/97 freight rate. The use of the adjustment gives transparency to the level of excess profits in coal rail haulage. The setting of the adjustment level will be annual and it is expected that the adjustment will fall progressively to zero before the year 2000/01.

Category 2 applies to mines that paid a 1996/97 freight charge to FreightCorp, equal to or greater than the sum of, full operational costs and an amount for access above the new floor test, but below the new ceiling test. Category 2 mines will pay to RAC the same implied access fee as for 1996/97 (and will separately pay to FreightCorp, a charge for the full operational costs for carriage of coal).

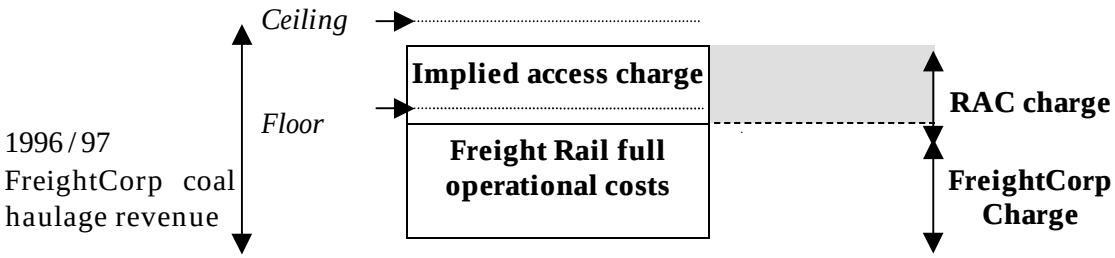
Category 3 applies where a coalmine paid rail freight charges in 1996/97 which were below the sum of, full train operational costs and the floor test cost for access. These mines will pay the floor test level to RAC (and, separately, the full train operational costs to FreightCorp.

[13] Above rail costs are those related to train operation and rolling stock. Below rail costs are those related to the track itself and the supporting structures as well as the signalling systems, overhead electrical power supply systems and the trackside fencing.

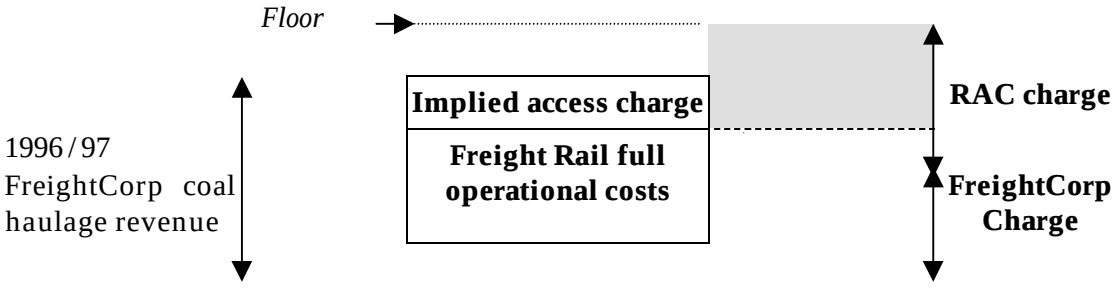
Category 1 Coal Mine



Category 2 Coal Mine



Category 3 Coal Mine



The Tribunal wishes to ensure that the rail assets used in the carriage of coal are properly accounted for in terms of their underlying value, depreciation methodology, and rate of return earned.

The Tribunal seeks comment on the treatment of rail assets used in the carriage of coal within the context of the Rail Access Regime.

4 DEFINITION OF ECONOMIC TERMS

The process of determining prices for rail operators in NSW involves the calculation of the costs borne by RAC in providing rail services. RAC's charges are determined according to Schedule 3 of the NSW Rail Access Regime. The terms of reference for this review require the Tribunal to report on appropriate definitions of the following terms in Schedule 3 of the Regime:

(a) direct costs
(b) fixed costs
(c) full incremental costs
(d) incremental fixed costs
(e) full economic costs
(f) stand alone economic costs.

The Tribunal seeks comments on the following issues which underpin the economic definitions in Schedule 3.

- ***What are the overall pricing objectives in the context of which the terms are to be defined? Is the intention of prices to achieve economic efficiency, to achieve financial viability for RAC, to meet statutory requirements, or some combination of these? Will these objectives conflict and how can the definition of the cost terms assist in resolving any potential conflict? Will the definitions of the cost terms be governed by different pricing objectives or are they independent?***
- ***Are the costs to be examined, forward looking or backward looking? In other words should the costs be based on RAC's historical costs or on costs expected to be incurred in the future? What are economic costs as opposed to accounting costs?***

4.1 Allocation of costs

Several of the economic terms which are used in the Floor Test and Ceiling Test, and on which the Tribunal has been asked to report, require the allocation of costs to individual operators. Where costs can be exclusively related to particular services or operators, there is little concern about cost allocation. But where a number of rail operators or groups of rail operators use the same rail line section difficulties may arise.

This is particularly the case with a rail network where there are high costs associated with the provision of any network and where additional operators do not necessarily lead to substantial additional costs. Where there is more than one operator on the network, there are immediately issues about the methods by which the joint costs shared by all operators should be recovered from those operators or attempted to be recovered. The underpinning for any appropriate cost allocation process must be a clear statement about the objectives for which the cost allocation is being undertaken.

Practical difficulties occur in the application of economic theory to the allocation of costs. An appropriate allocation is not always easily achieved and is often subject to significant judgement. Where costs are incurred to supply two or more rail operators, it can be difficult to apportion these costs between operators. Additionally, sophisticated accounting systems may be required to keep track of costs of an individual operator.

The costs incurred by the access provider should be allocated appropriately between customers depending on the characteristics of their operations. For example, heavier loads

travelling at higher speeds will impose greater maintenance costs on the infrastructure provider. Also a possible distinction may be made between costs such as maintenance costs which are a cost of 'usage' versus the costs involved in taking up train paths and setting priorities which may be termed costs of 'access'.

In order to gain a better understanding of the context in which the economic terms are to be applied, the Tribunal seeks input as to the nature of the costs that are relevant to using and providing access to the rail system.

Another issue relates to the situation where the prices charged by RAC might not reflect the costs of service provision resulting in a cross subsidy between rail operators or groups of rail operators.[14] The quantification of this cross subsidy will depend on the method of cost allocation used. Cross subsidies result in distorted resource use because the prices for different services cease to reflect the cost. That is, one service provided by RAC may be under-utilised because the price is higher than the cost of service provision whilst another service is over-utilised because the excessive price of the first service is used to subsidise the latter service. This may lead to an inefficient use of resources both within the rail section and in downstream and upstream industries affected by the cross subsidies

In its *Access Pricing Policy*[15] the RAC states that "Subject to Government policy or directive, Rail Access will not use profits to cross-subsidise between operators or sections of the network".

The existence of cross subsidies, and their measurement, may have implications for the application of the economic terms listed in the terms of reference. Accordingly, the Tribunal seeks input as to the extent of cross subsidies in the provision of rail access.

The difficulty with cost classification is that the process by which costs are defined, attributed, allocated and recovered does not necessarily produce a unique solution. In fully competitive markets the commercial imperative is to set prices as high as the market will bear and ensure that the total costs are lower than the total revenues which those prices produce. In such markets, if costs exceed market prices, and cannot be reduced, individual firms cease operations. Under these conditions, whether costs are defined in particular ways or allocated in particular ways is an issue for internal management control, not market consideration.

In the case of a natural monopoly, market conditions do not apply downward pressure on prices except to the extent that users of the monopoly service are themselves subject to competitive market conditions and substitutes. Where such a monopolist is accountable for setting prices and where there are concerns about the possibility of it capturing monopoly rents, there is generally a requirement for more segregation in cost components and more transparency.

Appendix B discusses some of the alternative cost allocation methods available for the calculation of prices. The Tribunal is concerned to ensure that the costs included in the above definitions are allocated in an appropriate manner.

The Tribunal seeks comments regarding the appropriate allocation of costs that would be consistent with the cost definitions to be used.

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[14] The economic definition of a cross-subsidy is when one service is priced below avoidable cost, while simultaneously another service is priced above stand alone costs.

[15] *Access Pricing Policy*, Rail Access Corporation, September 1996, Section 3.5.

4.2 Direct costs

Direct costs are those variable and fixed costs which can be unequivocally attributed to a single operator. They include labour and materials used to produce the service. An important issue to consider is what else might be included in direct costs.

The NSW Government has proposed that "Direct cost means the change in the Corporation's total costs (excluding returns on the asset value) caused by the use of the infrastructure by a given Rail Operator.[16]

The Tribunal seeks comment on the definition of direct costs and the nature of costs that should be considered to be direct costs in the context of rail. In particular:

- ***What is the relevance of non-operating costs?***
- ***Do capital costs constitute a direct cost (or are they only a fixed cost as discussed below)?***
- ***In the context of the definition proposed by the NSW Government does "the change in the Corporation's total costs " refer to changes in the long run or short run. How should long run and short run be defined?***
- ***Should direct costs be based on RAC's actual costs incurred or on the equivalent efficient costs?***
- ***How might efficient costs be calculated?***

4.3 Fixed costs

Fixed costs are costs which do not vary with output over the short run. The length of time period that encompasses the short run will determine which costs are fixed, as all costs become variable in the long run. For example, rent, administration costs, information technology and capital costs are usually considered to be fixed costs in the short run.

The NSW Government has proposed that "Fixed costs means costs (excluding a rate of return on the asset value) which do not vary in the long term with usage of the infrastructure (except by closure of the infrastructure)".[17]

The Tribunal seeks comment on the definition of fixed costs and the nature of costs that should be considered to be fixed costs in the context of rail. What is the definition of long run that would be consistent with the definition of direct costs?

4.4 Full incremental costs

Full incremental costs (FIC) consist of incremental fixed costs and incremental variable costs. It could be argued that that over the long run planning horizon the full range of production inputs are variable. If so, one approach to defining full incremental costs would be to base them on 'long run incremental costs' (LRIC).

The calculation of LRIC for each railway line section estimates all costs saved assuming the line section was closed or did not exist. LRIC includes all direct costs for a particular line

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16 *Application for Certification of the NSW Rail Access Regime, Draft Recommendation*, National Competition Council, April 1998, p17.

17 Ibid, p17.

section and an estimate of the decrease in overheads and, possibly, capital costs, which may be viewed as incremental fixed costs (as noted in section 4.5 below), that are avoided if the line section did not exist[18].

The size of LRIC is dependent on the assumptions made with regard to plant and the extent to which the system can be optimised. Optimisation would, for example, allow for improvements in technology and a more efficient track layout. The use of full incremental costs would also depend on the ability of RAC to provide the requisite data given that this might require costs to be gathered on an activity basis.

The Tribunal seeks comment on the definition of full incremental costs and the nature of costs that need to be considered in determining full incremental costs in the context of rail. Should capital costs be treated separately or are they partly or fully subsumed in other costs? The Tribunal also seeks submissions whether RAC is able to provide the requisite data.

4.5 Incremental fixed costs

Incremental fixed costs are a subset of full incremental costs. Such costs are considered to be 'fixed' because they do not vary with output (at least in the short term), and are 'incremental' in the sense that they could be avoided if the line segment was to be removed.

The Tribunal seeks comment on the definition of incremental fixed costs and the nature of costs that need to be considered in determining incremental fixed costs in the context of rail.

4.6 Full economic costs

Full economic costs are considered to include all the costs, both variable and fixed, for providing rail services over the longer term.

In examining full economic costs, the issue arises as to whether the costs to be examined are forward looking or to be based on RAC's historical costs. Some historical costs such as capital costs may be considered to be sunk costs[19] and recovery of original or revalued costs may not be appropriate. This could apply particularly in the case of some branch lines where there may be no intention of replacing or upgrading the lines when their economic lives have expired.

There is an issue as to whether the costs used should be RAC's actual costs, or efficient costs. If RAC's efficient costs differ from its actual costs then the use of efficient costs in the definitions is more likely to promote appropriate resource allocation and encourage RAC to improve its cost structure. Alternatively, if RAC is not able to cover its actual operating costs then this may jeopardise the financial viability of the business and lead to under-investment and reduced levels of maintenance.

The figure below represents a possible make-up of full economic costs bearing in mind that issues for this review include whether depreciation (ie return of assets) and opportunity cost of capital (ie return on assets) are appropriately defined.

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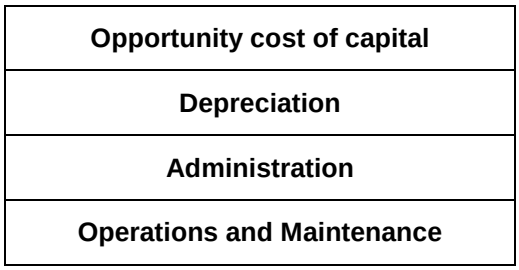
[18] LRIC differs from long run marginal cost, which refers to the additional costs incurred from producing one more unit of output.

[19] The capital value of infrastructure is regarded as 'sunk' if it cannot be moved to an alternative investment.

Figure 4 Definition of economic costs



In examining the nature of full economic costs it is pertinent to question whether an operator's ability to meet certain costs (ie willingness to pay) should be a consideration in deciding whether they are included. The opportunity cost of capital (in determining charges for an under-utilised line section, say) may be such a cost.

The Tribunal invites comments on the definition of full economic costs and the nature of costs to be included.

- ***Should the definition be based on RAC's efficient costs or actual costs?***
- ***Should an operator's willingness to pay or his ability to meet certain costs be a consideration as to whether they are included or not, in determining charges?***

4.7 Stand alone economic costs

Stand alone costs can be defined as those costs incurred in servicing an individual operator or group of operators in isolation. The concept of stand alone costs is particularly relevant in the context of cost allocation to individual customers and groups of customers. Cost allocation issues are discussed in the section below.

To paraphrase Baumol et al:

> Stand alone cost is the cost that would be incurred by an efficient entrant to the industry if it were to produce only some specified set of commodities… That is, it is the cost to produce just those items, 'standing alone'. The concept also applies to an entrant that decides to produce only a single commodity …[20]

Full stand alone economic costs imply the inclusion of full economic costs as detailed above. The concept of stand alone costs in relation to cost allocation is examined in greater detail in Appendix B.

The Tribunal seeks comment on the definition of stand alone economic costs in the context of rail operations.

5 ASSET VALUATION AND DEPRECIATION

The choice of an asset valuation method is relevant for the calculation of the ceiling test. The asset value currently specified in the Regime for the assets of RAC is the current cost depreciated replacement value. The Tribunal is required by the Terms of Reference for this review to report on appropriate asset valuation methodologies.

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[20] *Toward Competition in Local Telephony*, Baumol, W.J., and Sidak, G.J., AEI Studies in Telecommunications, MIT Press, 1994, p58.

In a competitive environment, market forces determine prices, and asset values adjust accordingly. Since the rail infrastructure market is not contestable, there needs to be an assessment of the value of RAC's assets so that an appropriate return on assets can be calculated. Rail transport is, however, subject to competition from road transport (Hunter Valley coal haulage is an exception). This can limit the prices that can be charged for rail access and should be considered when determining asset values.

5.1 Asset valuation

Essentially, there is no necessarily 'right' answer to asset valuations - it largely depends on the objectives for which the asset valuations are sought. Of the numerous methods of asset valuation available, some of the most common are:

- depreciated actual cost (DAC)
- replacement cost
- current cost depreciated replacement value
- depreciated optimised replacement cost (DORC)
- earnings based value
- deprival value.

An important question is whether there can be more than one appropriate asset valuation methodology. For example, it may be beneficial to value new investments differently from the asset valuation methodology used for existing assets, which may or may not be expected to remain unchanged into the future. This might provide more efficient signals for both RAC and rail operators in their negotiations on additional investment.

5.1.1 Depreciated actual cost

The depreciated actual cost (DAC) of assets (ie book value or historical cost) reflects the original cost of purchasing or constructing the assets, less accumulated depreciation. No adjustment is made for inflation or technological advancement.

Supporters of historical cost argue that, if the Regime is to act as a surrogate for a competitive market framework, the asset valuation methodology should be the same as that used for competitive industries. As most companies in Australia use actual cost as the basis for recording asset values, it can be argued that government owned corporations should also use actual cost.

Opponents counter that the historical cost generally bears little resemblance to the value of the cash flows generated by an asset in its normal use and that it is therefore an irrelevant measure of asset value, especially in the case of long-lived assets. It is argued that prices based on historical cost will not give consumers the correct economic price signals in relation to the cost of the service in today's dollars.

5.1.2 Replacement cost

Replacement cost reflects the current cost of reconstructing the existing rail system. Revalued historical cost is often used as a proxy, whereby historical costs are restated according to changes in economic indices, such as the Consumer Price Index. An alternative is the Modern Equivalent Asset approach which is based on the cost of replacing the service

capacity of the assets with the most efficient modern assets, rather than the assets that were actually constructed.

Proponents argue that using replacement cost as an asset valuation methodology is beneficial as it results in prices that more closely reflect the cost of providing additional capacity. However, it can be argued that this could lead to over recovery of costs for the access provider, as it allows the provider to earn a return on the difference between the revised value and the original capital amount invested, resulting in a windfall gain to owners.

The complexity of estimating replacement costs is increased by the following:

1. the high average age of the NSW rail infrastructure
2. the subjectiveness of replacement estimates using modern track construction technology
3. a periodic maintenance program which theoretically gives track an unlimited life
4. replacement of most of the existing network is not commercially viable.

5.1.3 Current cost depreciated replacement value

This is similar to the above replacement cost method. It reflects the cost of replacing existing infrastructure with comparable, efficient technology infrastructure. But additionally it nets off depreciation charges based on the remaining useful life of existing assets.

5.1.4 Depreciated optimised replacement cost

Depreciated optimised replacement cost (DORC) is the replacement cost of an 'optimised' system, less accumulated depreciation. An optimised system is a re-configured system designed to serve exactly the current load with current technology, with some allowances for growth. This method excludes any unused or under utilised assets and allows for potential cost savings that may have resulted from technological improvement. Calculating depreciation for this valuation approach is often a contentious issue.

5.1.5 Earnings based value

The earnings based approach to valuing the asset base relates to the net present value of the cash flows that are expected from the use of the asset. This method suffers from judgemental considerations of an appropriate discount rate, forecast of revenues, and the residual value of the asset.

In regulated industries, methods based on the net present value of future earnings suffer from the major problem of circularity. The circularity arises because future revenues are dependent on the allowed return on assets. But the value of the underlying asset base in turn depends on the value of future earnings. In the case of rail, however, circularity may not be a problem as prices could be dictated by market forces such as competition from road transport. In favour of this approach, it is argued that it best represents the market value of the asset. This method is widely used in valuation for investment purposes.

5.1.6 Deprival value

Under this approach to asset valuation, assets are valued at an amount representing the entire loss, both direct and indirect, that may be expected to be incurred if an entity were deprived of the service potential of the asset.[21] It is an attempt to reconcile the cost based valuation methods and the earnings based valuation methods. According to Bonbright et al[22]

> The cost-based rationale is that the original costs have lost significance *because they no longer reflect*, in terms of dollars of current purchasing power, *the net financial sacrifice* for which investors are still entitled to fair compensation under a cost-of–service principle of rate control. … The value-based rationale is that the original costs have lost significance *because they no longer reflect the current values of the assets* devoted to the public service and hence an allowed annual return on the original cost would not even crudely measure annual service value of the assets to the consuming public.

The notion of deprival value stems from the work of Bonbright's earlier work in the area of valuation for insurance purposes.[23] The logic of deprival valuation is captured in one line by the following expression[24]

$$\text{Deprival Value} = \textit{minimum}\{\text{RC}, \textit{maximum}[\text{NPV}, \text{NRV}]\}$$

where RC is the replacement cost of the asset, NRV is the net realisable value or residual value of the asset, and NPV is the net present value of the earnings stream that would be generated by the asset.

The Tribunal seeks comments in regard to the application of asset valuation methodologies to the rail infrastructure assets of Rail Access Corporation (including those assets used for the carriage of coal). The Tribunal seeks comment as to the nature of currently used asset valuation methods and the impact that any changes to the valuation methodology may have on rail operators.

5.2 Depreciation

The value of the underlying asset base at any point in time will depend on the depreciation methodology adopted. But the debates surrounding depreciation are as varied and complex as those surrounding asset valuation.

A major issue is the appropriate asset base for depreciation. Depreciation can be thought of as a return of capital to investors. But many argue that to allow depreciation on a written up (or current cost) asset base is akin to returning capital that was never invested. Conversely, other stakeholders would argue that depreciation on the historical cost asset base does not provide for the maintenance of the operating capacity of the network. If a written up asset base is to be used, should there be, over a number of years, a rough equivalence of depreciation expense and replacement or renewal related capital expenditure?

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[21] Report of the Expert Group on Asset Valuation Methods and Cost Recovery Definitions, December 1994, p19.

[22] *Principles of Public Utility Pricing*, Bonbright, J., Danielson, A., and Kamerschen, D., Public Utilities Reports Inc., 1988, p214.

[23] *The Valuation of Property*, Bonbright J. C., McGraw Hill New York, 1937, p71.

[24] Review of the Asset Valuation Guidelines of the Steering Committee on National Performance Monitoring of GTE's, Johnstone, D.J., and Gaffikin, J.R., Department of Accounting and Finance University of Wollongong , Draft June 1995, p 4.

It is important for stakeholders to be explicit in their submissions regarding the nature of the asset base on which depreciation is calculated. This information should also specify where possible the depreciation treatment to be afforded to customer funded or contributed assets.

A further debate focuses on the useful life of the assets being depreciated. Questions arise as to whether assets should be depreciated according to a measure of economic life or technical life. The pattern of depreciation expense (eg straight-line depreciation or declining balance depreciation) is another point of debate.

The Tribunal considers that it is important for stakeholders to be explicit in their submissions regarding the patterns of depreciation to be applied to major asset groups.

An alternative to calculating accounting depreciation for assets with very long lives is to adopt a renewal annuity approach. Under this approach, an amount is charged to the operating statement each year, sufficient to maintain the entire system of infrastructure operating at the same level of effectiveness in perpetuity. The level of the annuity payment is determined with reference to the current condition of the assets, and the future expenditure necessary to maintain the assets' operating capability.

The key to adopting a renewals annuity approach is the development of detailed asset management plans for infrastructure networks. The renewals annuity calculation depends largely on the availability of quality information, and on the condition and performance of the assets.

Proponents of the renewal annuity approach contend that it is a more tangible reflection of the consumption of the assets' service potential than a depreciation charge. The renewals approach is particularly relevant to rail lines, for example, which are renewed and maintained, section by section, on a continuos basis – in contrast to being replaced as a single entity. Opponents argue that the task of assessing the probable course of renewal or repair work in the future introduces a degree of arbitrariness that renders the approach no more useful than standard methods of estimating accounting depreciation.

The Tribunal seeks comments on the most appropriate way of reflecting reductions in service potential, or returns of capital to investors, in determining the value of the underlying asset base. The Tribunal seeks comments in regard to the application of appropriate depreciation methodologies to the rail network assets of Rail Access Corporation. Should allowance be made for the renewable nature of rail infrastructure and if so how?

6 RATE OF RETURN ON ASSETS

The Regime specifies that "full stand alone economic costs include a rate of return on the asset value of the relevant line section (or group of line sections) and on assets which are in the nature of corporate overheads (eg Schedule 1, Table 3)". The section below describes possible approaches to determining an appropriate rate of return.

Two fundamental economic principles underpin the appraisal of appropriate rates of return for regulated entities. One relates to the supply side of capital markets, the other to the demand side. Rational investors seek to maximise their return on investments. They also expect the returns earned on investments of comparable risk to be the same. If not, they will switch to investments offering higher returns for the same risk. This implies a utility will be

unable to attract capital to meet service demand and maintain financial integrity unless it can offer a rate of return comparable to those investments of similar risk.

On the demand side, a utility will be unwilling to continue to invest in physical assets unless the expected return on these investments at least equals the utility's cost of capital. Regulators therefore need to set prices or revenue at levels sufficient to provide returns equal to the cost of capital, bearing in mind that prices cannot be set independent of the market conditions affecting the operators. The demand side principle has become increasingly important following the introduction of shareholder value-driven financial performance measurement by NSW Treasury. In essence, the shareholder value of a firm can only be maintained if the firm achieves returns equal to the cost of capital. Otherwise, shareholder value may be lost.

Therefore it is important that the rate of return is set at a level which at least matches the cost at which the regulated business is able to continue to obtain finance from the capital market. Setting a rate of return below the cost of funds in the market could induce the regulated businesses to reduce maintenance and capital expenditure below optimum levels and so degrade the quality of service.

However, if the rate of return is set at too high a level by the regulator, the regulated businesses would earn a return in excess of their cost of capital in the market place, assuming that market conditions allowed them to charge higher prices. This would also distort pricing signals to consumers and investors, resulting in misallocation of resources and sub-optimal economic outcomes.

In the case of rail, the determination of an appropriate rate of return on assets for RAC cannot be made without taking note of the fact that currently two of the main operators are also owned by the NSW government, with different operating charters from RAC's. In other words, the issue is not one of a monopolist infrastructure supplier with a range of fully contestable operators.

It has been argued that a higher rate of return should be permitted in the ceiling price for an individual line section in order to allow RAC the opportunity to earn an appropriate rate of return 'on average' over the whole network, because there are some line sections where no return, or minimal return is earned.[25] If so, the question arises as to how much higher the permissible maximum rate of return should be in order to earn the appropriate rate on average, taking into account the issue of potential cross subsidisation which may occur.

The Tribunal seeks comment on whether RAC should be permitted to earn a higher rate of return on some line sections in order to be able to earn an average return across the system, and if so, how much higher the maximum rate should be. The Tribunal seeks input as to what would be the consequences of charging a high ceiling for some individual line segments.

In assessing an appropriate maximum rate of return it is necessary to specify whether the rate is quoted in nominal or real terms (taking into account inflationary effects). How the rate is quoted will depend on the method adopted to value the underlying asset base and to roll it forward. If the method is based on historical cost then the effect of inflation should be allowed for by applying a nominal rate of return. However, if the asset base is valued using

[25] This argument is critiqued in KPMG's *Report on the pricing principles in the NSW Rail Access Regime* for the National Competition Council, September 1997, p44.

a current cost method[26], then a real rate of return should be used in determining the return on assets.

The Tribunal seeks comment as to whether the rate of return should be quoted in nominal or real terms, in consistency with the asset base to which it is to be applied.

6.1 Weighted Average Cost of Capital

Whilst the rate of return is ultimately a matter for regulatory judgement, there are methods which assist in determining an appropriate value. In practice, the required rate of return is usually linked to the organisation's weighted average cost of capital (WACC). The components used in determining the WACC of a firm include:

- expected return on equity , R_E (the firm's cost of equity)
- expected return on debt R_D (the firm's cost of debt)
- capital structure (the firm's debt (D) / equity (E) mix).

The basic formula for evaluating the WACC is shown below.

$$WACC = R_E \times \frac{E}{(E+D)} + R_D \times \frac{D}{(E+D)}$$

The exact form to be used will depend on whether pre or post tax returns are being determined and on whether dividend imputation is to be allowed for. The formula applicable in each of those cases is shown in Appendix C.

The Tribunal seeks comment as to the appropriate methodology for determining the maximum rate of return on assets.

6.2 Evaluating the cost of equity

The cost of equity can be determined by using the following methodologies:

- Capital asset pricing model (CAPM).
- Discounted cash flow models.
- Comparable earnings test.
- Arbitrage pricing theory (APT).

Most practitioners use CAPM. According to the CAPM the expected return on equity is equal to the risk-free return (R_f) plus the company's systematic risk (Beta, β) times the risk premium of the market ($R_m - R_f$), - see also Appendix C. Despite having the merit of relative simplicity in defining and measuring the risk factor, empirical evidence shows that the interpretation and application of the CAPM remains controversial. Its attraction is that it is the most widely used approach in practice. Thus, it has gained greater acceptance than the other approaches and is discussed in detail below.

[26] ie the internal asset base, however determined, is to be indexed or revalued using a general or asset specific measure of inflation.

The application of CAPM to entities such as the RAC is difficult because of the absence of relevant comparators. RAC does not have a share price that can be used to compare its risk with other firms that are listed on the stock exchange. Therefore, judgment is required in determining its Beta.

6.2.1 Capital Asset Pricing Model

The basis of the CAPM is the relationship between risk and return. Over the long term, evidence indicates that there is a linear and positive relationship between risk and return.

The essential elements in establishing a required return on equity for a specific stock are:

- the estimation of the risk free rate
- the estimation of the risk premium for the market as a whole
- the estimation of the individual stock's risk relative to the market's risk as a whole, ie the stock's beta factor.

$$R_E = R_f + \beta (R_m - R_f)$$

Where,	R_E	is the expected rate of return of the stock
	R_f	is the risk free rate of return
	β	Beta, is the measure of the riskiness of the stock relative to that of the market as a whole
	$(R_m - R_f)$	is the return of the market as a whole over that of the risk free rate.

In many cases, the value of the above inputs is a matter of some debate. Consequently, it is often preferable to examine the results of a range of values, rather than relying on the outcome of one particular set of values.

6.2.2 Discounted cash flow models

Discounted cash flow models are based on projections of future cash flows, which would be generated by the firm's assets. A discount rate is applied to bring these cash flows back to present dollar terms. The appropriate discount rate is calculated by equating the present value of the future cash flows to some measure of shareholder expectation such as the share price. The advantages of this approach are that no value is placed on the under-utilised parts of the asset, and it provides the correct economic signals to encourage efficient investment. The disadvantages are attributable to the subjective nature of predicting the future cash flows, the difficulty of predicting rates of growth in utilisation, and estimating the cost of future periodic and major maintenance. These models are analogous to the Net Present Value method described above in the section on Asset Valuation Methodologies.

The dividend growth model (DGM) is based upon the premise that the value of a stock is equal to the present value of the dividend stream from that stock. The cost of equity is assumed to be the discount rate that equates the current market value of the share with the present value of that dividend stream. The general formula for the DGM is:

$$R_E = (D_1 / P_0) + g$$

Where

R_E	=	cost of equity
D_1	=	expected dividend
P_o	=	current share price
g	=	rate of growth in dividends

Assumptions inherent in the DGM include dividend growth at a constant rate in perpetuity and that the expected dividend growth can be accurately estimated. These are major weaknesses of the DGM.

6.2.3 Comparable Earnings Test

The comparable earnings test is a benchmarking process where the returns of existing efficient railways, say, would be compared to the NSW system. The advantage of this process is that it is an independent evaluation of rate of return for rail infrastructure assets. The difficulties lie in finding a rail system with similar characteristics as the NSW system. This method may assist in calculating a replacement cost as outlined in Section 5.1 on Asset Valuation but the market value of rail assets and the associated market return are wholly dependent on the profitability of the intermediate goods (commodities) and final goods (passengers) that they carry.

6.2.4 Arbitrage Pricing Theory

The Arbitrage Pricing Theory APM is a multi-factor equivalent of the CAPM. The CAPM determines the return on equity using a single risk factor related to the market return. The latter is measured in terms of the rate of return on a well-diversified portfolio such as the All Ordinaries index. Instead of a single estimate of systematic risk the APT uses many. The use of APT would require the macroeconomic factors affecting the stock to be identified, the risk premium for each of these factors to be measured, and the sensitivity of the firm's shares to each of these factors also to be measured. Again, in the case of entities such as RAC, the problem arises that they do not have traded shares. The APT approach is rarely used in practice due to its complexity of calculation.

The Tribunal seeks comments as to the appropriate methodology for determining the cost of equity. Comment is sought regarding the appropriate level of the parameters to be used for this purpose.

APPENDIX A: TERMS OF REFERENCE

This review has been referred to the Tribunal by the Premier, under Section 12A (1) of the *Independent Pricing and Regulatory Tribunal Act 1992* (Reference: 98/110).

The Tribunal is required to investigate and report on the following matters by 28 February 1999, in respect of the NSW Rail Access Regime as amended from time to time ("the Regime"):

1. an appropriate definition of economic terms referred to in Schedule 3 of the Regime, the relevant terms being:

(a) direct costs;
(b) fixed costs;
(c) full incremental costs;
(d) incremental fixed costs;
(e) full economic costs; and
(f) stand alone economic costs.

2. appropriate asset valuation methodologies and depreciation methodologies from which to calculate and apply the rate of return on assets for the purposes of applying the ceiling test under Schedule 3, clause (i)(b) of the Regime; and

3. an appropriate maximum rate of return on assets under the Regime for the purposes of applying the ceiling test under Schedule 3, clause (i) (b), particularly taking account of the combinatorial nature of the ceiling test.

In conducting this investigation, the Tribunal should consider the assets used for the carriage of coal.

APPENDIX B: COST ALLOCATION AND PRICING ISSUES

The following section discusses some of the relevant cost allocation and pricing issues.

Fully Distributed Costs

Under the fully distributed cost (FDC) method, the total costs of the activity or business are allocated across all the services provided by RAC. Direct costs are allocated to their respective line section, while indirect and joint costs are allocated across all services. For example, indirect costs can include capital costs associated with corporate overheads. Thus the cost base for each service will include a proportion of the capital costs of the business, including those used indirectly to produce the service. These latter costs may include the assets of corporate services areas.

In most cases indirect costs are allocated to activities on a pro-rata basis. They may, for instance, be allocated as a proportion of:

- staff involved in the activity as a proportion of total staff
- the activity as a percentage of total resource use
- the budget for the activity as a percentage of the total business budget.

Marginal cost

Marginal cost is the change in total costs for the production of an additional unit of a good or service. It can be measured in the short run or long run. Conceptually short run marginal cost (SRMC) gives the best indication of the cost of producing an additional unit at any point in time. It excludes capital costs because these are fixed in the short run. SRMC also excludes a range of indirect costs such as generic advertising or management time of the chief executive officer, since they too are not expected to vary with output in the short run.

In practice, the SRMC is difficult to define and measure. There are problems in specifying what period is the short run, over what increment in output costs are measured and how to treat joint costs. In addition, prices for services such as rail, which use capital in large incremental steps, could display significant variability if they were based on SRMC. For example, if the current capacity of a line section is fully utilised, then pricing at SRMC will result in high prices because the cost of producing one more unit of service will include the cost of new investment in infrastructure. Any new investment is likely to take into account projected future demand and that the initial utilisation of new line sections is likely to be low. Using SRMC for pricing after the completion of new investment will result in a dramatic fall in prices since the cost of providing one more unit of service output will be negligible (on the assumption that, having just completed a major capital project, there would no intention of further investment in the short run).

An alternative measure is the long run marginal cost (LRMC). LRMC is the cost of supplying an additional unit of a good or service when capacity can be varied. It comprises not only operating costs, but also capital costs associated with increasing productive capacity in the longer term. Conceptually, LRMC is the correct cost base for making investment decisions, and setting prices based on LRMC could overcome much of the variability inherent in SRMC.

However, LRMC also encounters measurement difficulties, and may require complex calculations to incorporate the impact of new capacity on the production system already in existence.[27]

Incremental cost

One practical implementation of marginal cost can be the incremental cost method. While there are a number of definitions of incremental cost, in practice it is usually related to larger increments of output, and a longer time frame than SRMC. That is, incremental cost is the increase in the businesses' total cost attributable to the production of a particular type of service rather than just the cost of producing the final unit of the service. Long run incremental cost (LRIC) includes operating and maintenance costs, incremental capital costs and incremental indirect costs. However, unlike FDC, the LRIC excludes indirect costs that remain unchanged whether the service is supplied or not. Refer to Table B1 for an example of the costs included and excluded under different cost allocation methods.

Although some discussions of LRIC suggest joint capital costs can be allocated on much the same basis as under an FDC approach, a purer interpretation of LRIC excludes these costs. The essence of joint costs is that they are not incremental to providing the additional service.

Avoidable cost

Avoidable cost is another practical measure of marginal cost. It includes all costs attaching to a service which could be *avoided* if the service was not provided by RAC. Once again, many joint costs cannot be avoided if the service is discontinued, and are therefore excluded from the cost base of the service.

In practice, there is generally little difference between avoidable cost (the reduction in costs over a range of output when production is decreased) and incremental cost (the increase in costs over a range of output when production is increased). This is because the cost saved by not producing a service is often the same as the additional cost in making the service available. However, where the existing railway infrastructure is at or near full capacity then avoidable cost and incremental costs will result in different outcomes.

The following table summarises the treatment of various categories of costs under each cost allocation method.

[27] *Cost Allocation and Pricing*, Commonwealth Competitive Neutrality Complaints Office, October 1998, p9.

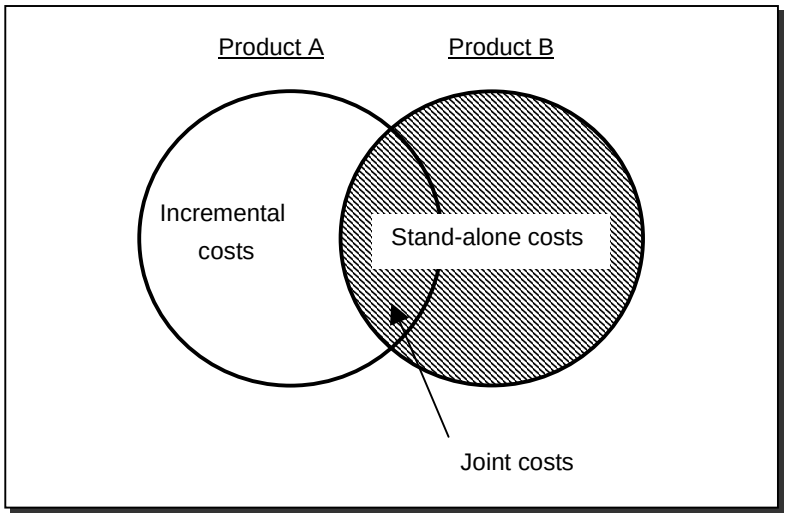
Table B1 Inclusion of costs under different allocation methods[28]

Indicative Cost Category	SRMC	LRMC	Avoidable /Incremental Cost	Fully Distributed Costs
Direct Costs (eg direct labour, material costs, sales tax)	Yes	Yes	Yes	Yes
Management /executive costs	No	No	No	Yes
Rental charges	No	Often, but not always	Often, but not always	Yes
Other corporate overhead costs	No	Yes	To the extent avoided if activity is not undertaken	Yes
Capital related costs exclusive to the activity	No	Yes	Yes	Yes
Joint capital costs	No	No, in most cases	To the extent avoided if activity is not undertaken	Yes

Monopoly rents and cross subsidies

The nature of rail access pricing under the Regime as outlined in Section 3 of this paper and the cost definitions described in Section 4, raise the issues of monopoly rents and cross subsidies. The following discussion addresses some of the economic concepts underlying these issues, particularly in relation to incremental costs and stand alone costs.

By way of example, the following diagram presents an illustration of cost allocation between two products or services[29]:



In the above diagram:

- Incremental costs of Product A are represented by its corresponding circle less the area which overlaps Product B.
- The shaded circle represents stand alone costs of Product B. Stand alone costs are incurred if a group of customers is supplied in isolation.

[28] *Cost Allocation and Pricing,* Commonwealth Competitive Neutrality Complaints Office, October 1998, p11.

[29] From a report prepared for BHP by London Economics (BHP submission to AGL Gas Networks Limited Access Undertaking, IPART Determination, October 1996).

- Joint costs are represented by the overlap of the two circles.
- Total costs are the incremental costs of Product A plus the stand alone costs of Product B.

Measurement of cross subsidies and monopoly rents can be explained with the use of a hypothetical example. Assume:

- a firm produces two products, A & B
- the total cost of producing A & B is $100
- the stand alone cost of producing B is $80
- the incremental cost of producing A is $20.

Three alternative pricing scenarios can be used to illustrate the difference between cross subsidies and monopoly rents.

Table B2 Examples of cross subsidy calculation

Scenario	Revenue from Product A	Revenue from Product B	Revenue from Products A + B
1	10	90	100
2	10	80	90
3	20	90	110

Scenario 1 results in a cross subsidy from B to A. The price for product A is below incremental cost by $10. This shortfall is funded from a $10 over-recovery against stand alone costs of product B. Total revenues are only just sufficient to cover costs and provide a 'normal' return.

Scenario 2 results in under-recovery of costs funded by below normal profits. Prices for product B do not exceed stand alone costs and total revenues do not cover costs and a ‘normal’ return.

Scenario 3 results in an over-recovery of costs, which funds monopoly rents. Prices for product B exceed stand alone costs by $10. However, this does not fund a shortfall against product A's costs. Instead, it funds a higher-than-normal return for the firm.

The above example is easily understood because the incremental costs of A plus the stand alone costs of B equal the total costs (ie in the case of two products or two customers). It should be noted that the problem is more complex in the case of three or more customers and is not easily tractable.

For the carriage of coal, the NSW Government charges monopoly rents on miners depending on their geographical location. In the current version of the NSW Access Regime, these rents will be phased out by 1 July 2000. These monopoly rents are essentially a tax on the extraction of coal in order to provide a benefit to the community for the exploitation of their resources. The use of the rail freight system to collect this tax is likely to have significantly distorted rail freight pricing. The revenues from these high freight

charges have been either appropriated directly by the government into general revenue or have been used to allow the rail authority to at least partially fund loss-making services.

The level of monopoly rents or coal resource tax is a matter for the NSW Government. However, the method used to collect them may have had unintended and undesirable impacts on the efficiency of the railway system. The separation of the resource tax from rail freight charges would allow the performance of the rail network to be monitored more closely and promote economic efficiency.[30]

Ramsey pricing

At the current level of demand for rail services, the average cost of service production by RAC (including fixed overhead costs and a rate of return on capital) is greater than the cost of producing a small but measurable increase in output; ie its short run marginal costs (SRMC). If prices for rail access were set at SRMC then RAC would make a loss. In fact, if prices for rail access were set at LRMC, then it is likely that RAC would still make a loss, albeit a lower loss. RAC has a commercial charter and is encouraged to earn a rate of return on its assets. As a result, the Regime attempts to provide a method of allocating costs that should ensure RAC's continuing viability.

If prices set by RAC were variable and dependent on usage of rail line sections, then any mark up of prices over SRMC will reduce usage of the rail line sections. The result is an inefficient use of the communities rail assets. This is where Ramsey pricing principles can be used in theory to minimise the losses in allocative efficiency that in theory result when prices for all rail operators on a line section are set above SRMC. These pricing principles state that the mark-up above SRMC to cover costs such as overheads and a rate of return should be inversely proportional to the change in services demanded by a rail operator when the price changes. In other words, those rail operators who have a high demand for access to the network, and whose demand is not going to change very much if the price of access is changed, should be charged a higher mark-up over SRMC. Those operators whose demand is likely to change significantly if the price is altered should be charged a lesser mark-up over SRMC.

In addition, a two-part tariff could be utilised where the fixed access charge covers some or all of the fixed overheads and the variable usage charge promotes efficient allocations of track use by setting the variable part of the price equal to SRMC. The fixed access charge could also incorporate Ramsey pricing principles to reduce efficiency losses and to reflect different values associated with different train paths. The smallest reduction in rail line utilisation can be achieved this way, so long as the most marginal operator is not forced out of the market.

It is generally accepted that Ramsey pricing is the most theoretically sound method of allocating costs in the situation where natural monopolies such as RAC are required to ensure their ongoing viability. It results in the highest utilisation of the network. However, it is noted that there is considerable difficulty in estimating demand relationships mainly due to data limitations. With the exception of the Sydney metropolitan passenger network and the Hunter Valley coal network, the rest of the network is generally thinly trafficked. SRMC pricing might be used by RAC for those line sections that are under-utilised. This could promote economic efficiency in the allocation of existing resources and still cover RAC's variable operating costs. The Regime allows the RAC to adopt Ramsey pricing

[30] Concepts from report by the Industry Commission, *The Australian Black Coal Industry*, April 1998, p166.

within certain limits determined by the floor and ceiling of the Baumol band. This could, however, result in prices that may not be fully cost reflective and seen by some customers to be inequitable and price discriminatory.

APPENDIX C: CALCULATION OF WACC

Classical tax system

Before tax,

$$WACC = \frac{R_E}{(1-T)} \times \frac{E}{(E+D)} + R_D \times \frac{D}{(E+D)}$$

After tax,

$$WACC = R_E \times \frac{E}{(E+D)} + R_D (1-T) \times \frac{D}{(E+D)}$$

Imputation tax system

Before tax,

$$WACC = \frac{R_E}{[1-T(1-\gamma)]} \times \frac{E}{(E+D)} + R_D \times \frac{D}{(E+D)}$$

After tax,

$$WACC = \frac{R_E(1-T)}{[1-T(1-\gamma)]} \times \frac{E}{(E+D)} + R_D (1-T) \times \frac{D}{(E+D)}$$

where γ is the dividend imputation factor.

Cost of equity (R_E) - Capital Asset Pricing Model

$$R_E = R_f + \beta (R_m - R_f)$$

where,	R_E	is the expected rate of return of the stock
	R_f	is the risk free rate of return
	$(R_m - R_f)$	is the return of the market over the risk free rate
	β	Beta, is the measure of the riskiness of the stock relative to that of the market as a whole.