Discussion Paper

Capacity Expansion and Access Pricing for Rail and Ports

April 2013

Level 19, 12 Creek Street Brisbane Queensland 4000
GPO Box 2257 Brisbane Qld 4001
Telephone (07) 3222 0555
Facsimile (07) 3222 0599

general.enquiries@qca.org.au
www.qca.org.au

© Queensland Competition Authority 2013

The Queensland Competition Authority supports and encourages the dissemination and exchange of information. However, copyright protects this document. The Queensland Competition Authority has no objection to this material being reproduced, made available online or electronically but only if it is recognised as the owner of the copyright and this material remains unaltered.

SUBMISSIONS

This report is a draft only and is subject to revision. Public involvement is an important element of the decision-making processes of the Queensland Competition Authority (the Authority). Therefore submissions are invited from interested parties concerning this report. The Authority will take account of all submissions received.

Written submissions should be sent to the address below. While the Authority does not necessarily require submissions in any particular format, it would be appreciated if two printed copies are provided together with an electronic version on disk (Microsoft Word format) or by e-mail. Submissions, comments or inquiries regarding this paper should be directed to:

Queensland Competition Authority
GPO Box 2257
Brisbane QLD 4001
Telephone: (07) 3222 0526
Fax: (07) 3222 0599
Email: mark.scanlan@qca.org.au

The **closing date** for submissions is 30 June 2013.

Confidentiality

In the interests of transparency and to promote informed discussion, the Authority would prefer submissions to be made publicly available wherever this is reasonable. However, if a person making a submission does not want that submission to be public, that person should claim confidentiality in respect of the document (or any part of the document). Claims for confidentiality should be clearly noted on the front page of the submission and the relevant sections of the submission should be marked as confidential, so that the remainder of the document can be made publicly available. It would also be appreciated if two copies of each version of these submissions (i.e. the complete version and another excising confidential information) could be provided. Again, it would be appreciated if each version could be provided on disk. Where it is unclear why a submission has been marked "confidential", the status of the submission will be discussed with the person making the submission.

While the Authority will endeavour to identify and protect material claimed as confidential as well as exempt information and information disclosure of which would be contrary to the public interest (within the meaning of the *Right to Information Act 2009 (RTI)*), it cannot guarantee that submissions will not be made publicly available. As stated in s187 of the *Queensland Competition Authority Act 1997* (the QCA Act), the Authority must take all reasonable steps to ensure the information is not disclosed without the person's consent, provided the Authority is satisfied that the person's belief is justified and that the disclosure of the information would not be in the public interest. Notwithstanding this, there is a possibility that the Authority may be required to reveal confidential information as a result of a RTI request.

Public access to submissions

Subject to any confidentiality constraints, submissions will be available for public inspection at the Brisbane office of the Authority, or on its website at www.qca.org.au. If you experience any difficulty gaining access to documents please contact the office (07) 3222 0555.

Information about the role and current activities of the Authority, including copies of reports, papers and submissions can also be found on the Authority's website.

GLOSSARY

ARTC	Australian Rail Track Corporation
AT_2, AT_5	AT_2 is the capacity component charge in Aurizon Network's current Reference Access Tariff and is charged on the basis of the number of reference train paths (rtp) the access holder has contracted to utilise. AT_5 is the part of the current Reference Access Tariff which recovers the cost of Aurizon Network's electrification costs
DAAU	Draft amending access undertaking
DAU	Draft access undertaking
DBCT	Dalrymple Bay Coal Terminal
GAPE	Goonyella to Abbot Point Extension
GAWB	Gladstone Area Water Board
mtpa	million tonnes per annum
NML	Northern Missing Link
NAPE	Newlands to Abbot Point Expansion
QCA	Queensland Competition Authority
RAB	Regulatory asset base
Rtp	Reference train path
SBR)	Surat Basin railway
TCO	Total cost of ownership
ToP	Take-or-pay
UT3, UT4	UT3: Aurizon Network's 2010 Approved Access Undertaking UT4: Aurizon Network's upcoming Access Undertaking proposed for 2013
WACC	Weighted average cost of capital
WICET	Wiggins Island Coal Export Terminal
WITAP	Wiggins Island terminal access policy

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This paper investigates options for pricing access to major expansions in capacity for rail and port infrastructure. 'Access' refers to the ability to purchase the services of a declared intermediate input used to produce a final service, where the access service providers may be vertically integrated downstream.

Access services in Queensland are typically contracted to access buyers via long-term capacity contracts. It is usual, as in rail and ports for example, that new capacity is underwritten by long-term take-or-pay access contracts and sometimes also with direct user funding. In a normal commercial setting, the parties would agree an access price that would apply over the contract period. In the case of regulated declared access, the service is provided by a monopolist and the price of access is determined by the Authority after the parties have signed long-term capacity contracts. When they sign these contracts, access buyers and sellers understand that a regulated cost-based price will apply.

Although the complex and numerous end-user pricing options that are covered at length in microeconomic textbooks are relevant background to the pricing of access, the pricing options analysed in the economics literature on access are significantly narrower than for end-user prices. This is largely because access price discrimination by a monopolist that is vertically integrated can undermine competition between access buyers. Thus access sellers are usually limited by law as to the type of price discrimination they can pursue. For this reason a single access price might be required across all capacity tranches in situations where different access prices risk undermining competition.

Because of the importance of the particular circumstances that apply in each case to the pricing of new access capacity, it is not possible to define hard and fast rules that can be applied to price access to any capacity expansion efficiently and fairly. The pricing of access to major capacity expansions will thus need to be decided on a case-by-case basis. However, there are some key propositions that are based on relevant economic efficiency, fairness and governance principles, which can help in arriving at fair, efficient and practical regulatory decisions.

The key propositions that apply when capacity is already committed to 'established' users through long-term take-or-pay contracts are as follows.

(a) If average costs are decreasing substantially with capacity, adding the expansion costs to the cost base of the established capacity will usually provide an acceptably efficient and fair outcome. An exception would be if foundation customers signed take-or-pay contracts which included a clause that enabled them to pay the price of the lowest cost tranche of capacity.

(b) If average costs are increasing substantially with capacity, a separate access price should normally be calculated and charged to those whose capacity underwrites the new tranche of capacity that reflects the average cost of that new capacity.

A conventional explanation for (b) is that where new users are different from established users, averaging the costs of established and new capacity will involve the new users paying less than the cost their incremental demand causes. Established users would also be paying more than prices consistent with the average stand-alone cost of serving them. From this perspective a price that averaged the cost of existing and new capacity (a 'socialised' price) would in effect entail a subsidy from existing users to new users.

An additional argument supporting (b) is that established users may have committed to purchase capacity with an expectation that the regulatory arrangements would lead to a cost-based price based on the cost of the capacity that they had contracted for rather than a price that would escalate significantly to reflect higher costs of new capacity. This expectation about a reasonable price is referred to in recent economic papers as a 'reference transaction'. Prices that deviate substantially from what is considered to be a reasonable reference transaction are likely to be perceived as 'unfair'.

They may both deter certain efficient investment and reduce confidence in the efficacy of the regulatory arrangements.

Note that even if established and new capacity is inseparable in use, i.e. it is not practical to physically allocate all new capacity to new users for their exclusive use, and established capacity to established users for their exclusive use; the new capacity costs can still be identified and charged to the new users.

Although there appears to be some asymmetry in these propositions, they are justified by consideration of what would reasonably be expected to occur in a negotiated contract prior to sunk costs being incurred by either the access provider or the access seeker. These propositions are considered to be perceived as 'fair' to access providers and access seekers and consistent with achieving overall economic efficiency. Clarification of how prices would be set in the context of capacity expansion, as outlined here, is also important for the transparency and credibility of the regulatory governance arrangements.

Additional points are:

(a) If the capacity is functionally different, separate access prices may be required;

(b) In cases where costs are decreasing with capacity, first movers that underwrote the utility's capacity through signing long-term take-or-pay contracts and perhaps also providing user funding, may consider that a levy should be paid to them in order to permit new capacity to be built incrementally onto the capacity they underwrote. This would be justified as compensation for Greenfield risk or for the prior payment for excess capacity;

(c) If there are no long-term contracts or a customer group for which there is an explicit or accepted implicit reference transaction, then all demand can be said to contribute to total demand and the same price should prevail across established and new capacity.

Under long-term contracting, demand will be more price inelastic after contracts have been formalised. However, if long-term capacity contracts do not apply, demand will typically be substantially more responsive to the price of access. Because of this if costs are falling with capacity, the average incremental cost of the new tranche of capacity will be below the price that recovers average costs across established and new capacity. If costs are rising, a socialised (average) price will be below the average cost of the new tranche of capacity. In either case market clearing conditions would not apply since price will not correspond on the margin to the cost of supply. This in turn suggests some allocative inefficiency in the form of sub-optimal use of the capacity. However, in practice the situation of there being no long-term contracts is rare at least and thus pricing inefficiencies are not practically important.

To sum up, the rationale for precluding the socialisation of costs from higher cost capacity expansion essentially relates to the explicit or implicit contractual arrangements and expectations of existing users concerning the price they would pay for access. The main arguments precluding averaging of costs across existing and new higher cost capacity relate to 'fairness' considerations rather than economic efficiency considerations. However, charging different access prices depending on which tranche of capacity access contracts underwrote may be precluded if it means that competition is blunted between access buyers that are downstream competitors.

1. INTRODUCTION

This paper is concerned with access pricing, and more specifically with the pricing of access for major capacity expansions. It considers how the monopoly infrastructure provider should be compensated when it makes major investments in new facilities to serve a significant increment in demand for the access service. More specifically, it considers the circumstances in which access to one tranche of capacity should be priced the same or differently to another.

Addressing the question of pricing for major capacity expansions requires information about existing prices and price structures, about the drivers of the expansion, and the nature of the access service provided. Depending on the circumstances, details about the following are required:

(a) the existing contractual and institutional arrangements between a utility service provider and access buyers;

(b) details about the access price structure, especially whether simple average cost-based prices or a more complex price structure applies;

(c) the extent to which new capacity is separable-in-use from established capacity;

(d) whether the new tranche of capacity has materially higher or lower unit cost compared to established capacity; and

(e) whether the capacity expansion is driven by general economic growth where it is not practicable to identify those responsible for the expansion.

The issues raised by these points are relevant for determining how the cost of a major expansion in capacity should be recovered including determining who should pay for an expansion in capacity.

There is no well defined economic solution for allocating costs through prices and price structures in order to recover the cost of a major capacity expansion. This is because there are various trade-offs to consider relating to various aspects of economic efficiency and other pricing principles – especially fairness in a commercial context. The most suitable solution in any particular case will depend on the specific circumstances. Criteria for assessing the range of relevant issues to be considered are discussed in Chapter 2. The key relevant considerations for determining capacity expansion cost recovery are analysed in Chapter 3. Chapter 4 is primarily descriptive and outlines the pricing of access in practice in Queensland.

2. CRITERIA FOR EVALUATING REGULATED PRICING

Criteria or principles for evaluating pricing options can help in making recommendations about how to set prices for capacity expansion. Criteria for evaluating pricing options need to be specified based on regulatory policy objectives and effective regulatory practice. Key criteria for these purposes are summarised below. Some criteria are typically more important than others but application of the criteria necessarily involves trade-offs that vary depending on specific circumstances. Each criterion will normally have some relevance for evaluating pricing structures and will need to be applied with judgement based on specific circumstances. It is not possible to specify the criteria in a way that provides a clear rules-based solution to the determination of optimal price structures in all circumstances.

The criteria set out below are relevant for evaluating regulated prices in the context of paying for capacity expansion as well as evaluating pricing structures and cost allocation proposals more generally. Each criterion also has a number of sub-criteria or aspects to be considered.

The criteria are discussed in more detail in a separate Authority Discussion paper: "Regulatory Objectives and the Design and Implementation of Pricing Principles" (QCA, 2013).

2.1 Criterion 1 – Economic Efficiency

Are the pricing arrangements consistent with achieving economic efficiency – broadly defined to encompass all aspects of economic efficiency including allocation and management of risk?

The primary consideration in evaluating whether a specific pricing proposal or structure is justified from a public policy perspective is whether it is clearly consistent with increasing overall economic efficiency (comprehensively defined) on a net present value basis. If this is not the case there would have to be well justified non-efficiency based reasons as to why it should be supported.

Economic efficiency in this respect encompasses:

(a) Allocative efficiency: this essentially requires allocating scarce resources to their most highly valued uses. Allocative efficiency is dependent on output being produced at a level consistent with price being equal to short-run marginal cost (defined comprehensively to represent the marginal cost from society's perspective and the cost of congestion when supply constraints apply);

(b) Productive efficiency: this requires that output is produced at minimum cost; and

(c) Dynamic efficiency: this encompasses the inter-temporal aspects of efficiency including innovation and investment.

Economic efficiency also requires the optimal allocation of risk. This allocation should reflect the parties' comparative (not absolute) advantage in risk-bearing, based on their preferences toward risk and their costs of managing risk. In general, when these factors are recognised, some form of risk-sharing between the firm and its customers is almost always more optimal than an extreme allocation. Further, economic efficiency can require either stable or volatile prices, depending on the parties' preferences for price risk.

There is currently not a well developed framework for allocating risks optimally in a regulatory context (although the capital asset pricing model (CAPM) is widely applied to price investors' non-diversifiable risks). However, a key conclusion of the literature is that

the choice of pricing structure or form of regulation can impact risk allocation. As a result, to the extent that the risk is non-diversifiable, the regulator's choice of control affects the beta parameter in the CAPM. The implication is that the firm's form of regulation and cost of capital cannot be determined independently from each other. The issue of risk and its impact on the cost of capital are discussed in the separate Discussion Paper, Risk and the Form of Regulation (QCA 2012).

Any relevant externalities must also be accounted for when assessing economic efficiency. This could be done by adjusting regulated prices as appropriate to reflect positive or negative externalities.

Achieving economic efficiency is not always a dominant consideration but it is the primary starting point for a comprehensive economic assessment. Consideration of economic efficiency as the primary starting point helps to make the opportunity cost of other objectives very clear.

In considering the question of who should pay for use of capacity a relevant economic efficiency pricing principle is cost causative pricing. Allocative efficiency requires prices to reflect marginal costs. If an entity's use of a service causes costs to increase at the margin, then for allocative efficiency to be achieved, the entity needs to face a price that reflects the marginal contribution of its use to costs. This principle is sometimes referred to as the 'user pays' or 'impactor pays' principle. The costs that are caused should include the cost of imposing any adverse externalities or reduced to reflect the value of positive externalities. Cost causative pricing also needs to be modified to take account of dynamic efficiency effects, in particular where pricing based on marginal costs does not generate sufficient revenue to finance efficient investment. However, the cost-causative principle also has application where the incremental cost that is caused relates to more than a single unit of output.

Economically efficient use of an expansion of capacity (an aspect of allocative efficiency) refers to the need to ensure that once the infrastructure expansion has been completed, the infrastructure is used efficiently. This can have implications for the structure of charges so as not to deter marginal demand in excess of short-run marginal cost. However, where capacity is allocated though long-term contracts the access price structure can be largely irrelevant for reason discussed in Chapter 3.

Efficiency in the operation of a regulated business is also an aspect of economic efficiency but is not likely to be directly affected by the choice of a price structure or the issue of who should pay for capacity expansion. Operational efficiency is more likely to be affected by the regulatory arrangements for total cost recovery and the ability of the business to retain profits associated with cost saving efforts. However, efficiency in operation could be affected by the extent to which the price structure impacts adversely on third party competition in relation to access to the infrastructure. This depends on the extent to which competition creates pressure for improvements in productive efficiency.

In summary the efficiency criterion entails consideration of:

(a) Efficient investment;

(b) Efficient use;

(c) Efficient operation;

(d) Efficient allocation of risk; and

(e) Externality effects.

2.2 Criterion 2 – Fairness

Are the pricing arrangements fair and reasonable from the perspective of both service providers and users?

The concept of fairness is difficult to define and its interpretation depends on individual value judgements. The approach that is adopted here sets out key underlying principles that the literature has identified for assessing fairness in commercial transactions and also for assessing fair treatment of individuals in different circumstances. It is also noted that there is an intersection between many aspects of fairness and the pursuit of economic efficiency. In addition procedural fairness is a fundamental aspect of regulatory governance which is covered under Criterion 3.

A primary fairness consideration in a commercial context is the extent to which the proposed pricing arrangements are consistent with a reasonable understanding of how prices would be set before sunk investments were made by either party. This is a relevant characterisation of the '**reference transaction**' proposed by Kahneman et al (1986), particularly in a context where buyers might have to pay for some costs that were not directly associated with their use.

In addition to consideration of the reference transaction, the proportionality principle – that individuals in similar circumstances should be treated equally and individuals in different circumstances should be treated in proportion to their differences – is relevant. These perspectives are often referred to as horizontal and vertical equity respectively. They can be applied in a wide range of circumstances covering both commercial transactions and impacts on individuals.

Equity or fairness issues also arise wherever there are perceptions of subsidies being provided to one competitor but not another, or perceptions of cross-subsidies being paid by one group of users so that another group of users can pay less than its costs.

In this context a working definition of a subsidy-free price, is that access buyers provide revenue no greater than the stand-alone cost of providing them with access, and revenue no less than incremental cost of providing that access[1].

In summary, the fairness criterion entails consideration of:

(a) Consistency with an appropriate 'reference transaction';

(b) Consistency with the proportionality principle implying horizontal and vertical equity; and

(c) The existence and rationale for a subsidy.

2.3 Criterion 3 – Regulatory governance

Do the regulatory laws, rules, procedures, and regulatory capacity and associated pricing arrangements result in the regulator performing its functions in a professional and appropriately transparent manner such that stakeholders can judge whether the regulatory decisions that affect them are sound and they have not been unfairly treated?

[1] Absent significant market failure, cross-subsidies are considered inefficient in part because they distort prices in a way that has allocative efficiency costs. In addition, they may not have a strong equity rationale.

As explained above there are a number of regulatory governance and practice principles that are important for ensuring that the objectives of economic efficiency and fairness can be achieved in the design and application of pricing principles. At a high level, economic efficiency and fairness are important regulatory governance principles. In addition there are a number of operational and lower order principles that are relevant:

(a) Transparency and procedural fairness. The methodology for determining prices needs to be as transparent and procedurally fair as practicable, to ensure participants have confidence that outcomes are consistent with relevant public policy and regulatory objectives.

(b) Predictability. The regulatory arrangements and outcomes need to be as predictable as possible given other objectives. Predictability is likely to promote confidence in the regulatory arrangements and also economic efficiency by reducing uncertainty associated with long term decisions. Stability of prices is often advocated as a principle in its own right but there may be circumstances where stability of prices is not consistent with economic efficiency and is really an aspect of considerations about risk. Predictability does not require stability of prices and is more important than stability in facilitating efficient future decisions.

(c) Practicability. The regulatory arrangements need to be practicable and flexible and minimise administrative and compliance costs as much as possible given other objectives.

3. ACCESS PRICING UNDER ALTERNATIVE CIRCUMSTANCES

3.1 Introduction

The type of capacity expansion that is the subject of this chapter involves major investments in new capacity tranches. The pricing of 'access' involving minor or incremental works that improve the operation of the infrastructure and which may expand capacity in a relatively modest way, is not the subject of this paper[2].

Deciding on how best to price access to major expansions in capacity is complicated by the fact that it can require analysis of a number of cross-cutting issues. However, the key issues can be usefully analysed under the following four questions:

1. What are the existing contractual and institutional arrangements between a utility service provider and access buyers?

2. Are access prices simple average cost-based prices or based on a more complex price structure?

3. Is the new tranche of capacity physically separable-in-use from established capacity?

4. Is the unit cost of the new tranche of capacity higher or lower than for established capacity?

In practice the allocation of access capacity mainly occurs through long-term contracts. Issues that can arise in relation to long term contracts for access capacity include: how to price access to different capacity tranches; the possible existence of cross-subsidies; and perceptions of fairness among stakeholders. In Queensland long-term capacity contracts for volumes are common but without specific agreement on an access price or specific principles for setting an access price. Rather, since the QCA Act has been in place, both the sellers and buyers of access have understood that a reasonable cost-based price would later be determined by the Authority. Where such a price operates along with long-term capacity contracts, it forms the basis of a 'reference transaction', as defined in Chapter 2.

The relevance of long-term capacity contracts to the pricing of access to major capacity expansions is discussed in section 3.2. Issues covered under this topic are those of: price structure; separability in use; and average cost-based pricing. Sub-sections on separability in use and access price structure can be found in 3.2.2 and 3.2.3 respectively. The relevance of average cost pricing when access capacity is allocated though long-term contracts, is addressed in sub-section 3.2.4.

Where long-term access capacity contracts apply, the most important factor in deciding on the pricing of access to a major new tranche of access capacity is likely to be the unit cost of the new tranche compared to the existing capacity. When the access price is an averaged cost-based access price calculated by pooling the costs of existing and new capacity, this is sometimes described as cost socialisation. Circumstances when this is relatively efficient and when it is not, are discussed in section 3.3. Specifically, the situation of increasing average costs is addressed in sub-section 3.3.1 and the situation of decreasing average costs is addressed in sub-section 3.3.2. The latter includes a discussion of possible strategic behaviour that may affect the timing of infrastructure investment where it is understood the

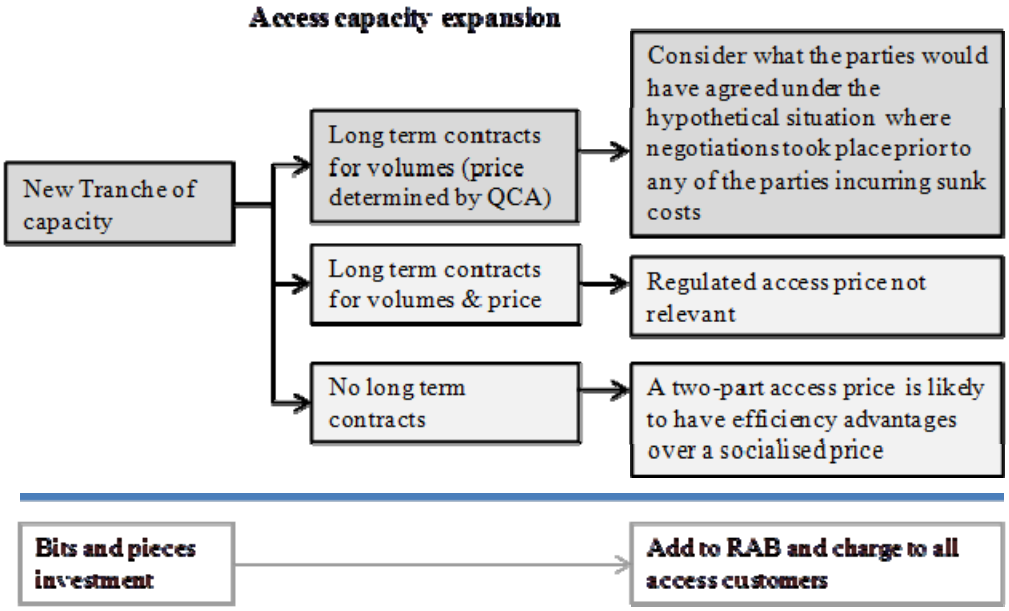
[2] Relatively small investments which improve system capacity usually result in all or a proportion of those costs being added to an existing RAB and a new price per unit being derived. Any access price rise that may result from such upgrades would be relatively small and would not normally lead to a dispute with established take-or-pay capacity customers.

first tranche of capacity will have substantially higher per unit costs than subsequent tranches.

An analysis of capacity expansion pricing when access capacity is not allocated via long-term contracts is provided in section 3.4. Under these circumstances average cost-based access pricing is more likely to involve efficiency costs. A more complex price structure such as a two-part access tariff is likely to have efficiency advantages by enabling a usage price that reflects the marginal cost of usage.

Figure 3.1 provides an overview of the importance of capacity contracting when analysing access pricing when there are different tranches of capacity that have different average costs. The figure indicates that where volumes are contracted but the access price is determined by the Authority, as is the usual case, considering the hypothetical of what the parties would have decided themselves prior to any of them having incurred any sunk costs can provide a key insight into how to set an access price for a new tranche of capacity.

Figure 3.1: Access price determination and the role of capacity contracting



It is common that markets for access involve access providers that are vertically integrated and in direct competition with firms that buy access upstream. Because of this, competition concerns will often limit the access pricing options of the access provider; a point addressed further in section 3.5.

In analysing these issues this chapter employs the principles of economic efficiency, fairness and those of good regulatory governance; as outlined in Chapter 2.

3.2 Long-term capacity contracts for access

3.2.1 Long-term capacity contracts and their structure

Access buyers will typically contract to buy access capacity over a lengthy period. Rail and port access buyers, for example, commonly contract for capacity by signing 10 or 15 year take-or-pay (ToP) contracts[3]. In Queensland, the access buyer and service providers have

[3] Contracts with Aurizon Network are for train paths which are defined by dividing the actual tonnes railed by the tonnage on a reference train (or the train configuration the operator is using).

tended not to agree on a price, relying on the Authority to later approve an appropriate access price under an Access Undertaking. Long-term capacity contracts specify that for each period (or day) from the beginning of the contract until the end of the 10 years, a certain quantity of access capacity is allocated to the contracted user[4].

Long term contracting for an access service provides advantages to both access seekers and access providers. In the context being examined here, both parties have large sunk investments with long economic lives. This means that both parties have incentives to agree to long term contracts to provide relative certainty regarding the economic utilisation of their assets. Indeed, it is often the case that the capacity provided by the access service provider is determined jointly with the upstream investments made by access buyers from which their demand for the access service derives.

In many cases the economic lives of the sunk investments are far longer than the contracted period. In such cases there will likely be an implicit, if not explicit agreement, to re-contract under broadly similar terms and conditions from one contracted period to another.

The existence of regulatory arrangements that enable access prices to be determined by a regulator effectively displace the private negotiations and arbitration arrangements that might otherwise arise between access providers and access seekers for large scale infrastructure. Where long term contracts exist that specify volume and price arrangements, there is likely to be minimal need for regulatory intervention. However, as noted, in Queensland long term contracts for rail and port infrastructure typically specify only volume components with an expectation that relevant access prices will be determined by the Authority.

3.2.2 Long-term access capacity contracts and separability in use

When access is sold to access buyers according to long-term capacity contracts and the new facilities are functionally the same as the established facilities, such that access buyers are indifferent as to which facilities they use, the issue of physical separability has no bearing on the capacity expansion pricing issue. This is because the cost of the expansion can be recovered from new access capacity contractors, as it is clear that they have 'caused' the need for capacity expansion and the costs can be identified. Which capacity is used in practice to satisfy new access demand has no bearing on the access seller's ability to charge new access customers for the new capacity.

3.2.3 Long-term access capacity contracts and the structure of access prices

Where a service provider's capacity is contracted to access customers over the long term, the price structure has relatively little relevance for the seller's behaviour once the contract is signed. This is because under a revenue cap the service provider receives virtually the same revenue whether the access price is stated as an average cost price or, say, a two-part tariff.

While the volumes would not change for each access buyer, the total amount each would pay for the contracted volume will depend on the structure of the access price decided by the Authority. For example, compared to an average cost-based price a two-part tariff introduces economies of scale to access purchases such that smaller users will pay more than they would pay for the same capacity under average cost access pricing. However, since the volumes are contracted, the individual parties would not be able to alter their contracted volumes once the price structure was decided. The price structure decided by the Authority will have relatively little impact on the behaviour of contracted access buyers.

[4] In practice above rail access contracts allow a small percentage of this capacity to be optional – see section 3.2.3 for further discussion.

The practice in Queensland in regard to coal railing contracts is that volumes are not completely determined once capacity contracts are signed. There are two aspects to the contracted volumes. There is a take-or-pay (ToP) part and, an option to take volumes in addition to the ToP volumes. The decision to exercise option volumes occurs after the contract is signed. Access buyers do not pay an express amount for this option. For example, in the case of rail and Aurizon Network (formerly QR Network[5]), the ToP aspect of the contracts typically applies to 90% of the total contracted capacity. The remaining 10% of the contracted capacity is optional. If the option is not exercised, the access price may need to rise in later periods in order for the access provider to earn its regulated rate of return over the economic life of the relevant investments. In the case of the Western System in South East Queensland the option is for 20% of the capacity[6]. Such capacity options may mean that actual purchased volumes of access buyers will depend in a relatively small way on the access price structure which is usually known with a high degree of confidence at the time the contract is signed[7]. Interestingly, the 'option' part of the contract mirrors the typical structure of coal sale contracts, where customers such as power stations have historically had the option to take just 85% of the contracted amount, or ask for as much as 115%.

A further reason why, even prior to contracting, the behaviour of access buyers is in many cases unlikely to differ significantly is that the cost of the access service makes up a small portion of the price of coal. This is true whether an average cost-based price structure or a more complex price structure such as a two-part tariff applies. For quite some time it appears that coal has been providing high returns to coal miners. This being the case the access quantities demanded by access buyers are unlikely to be greatly affected by the access price. In addition, where access buyers earn substantial economic rents their demand for rail access is likely to be inelastic with respect to rail and port access prices[8]. In these circumstances it is quite likely that the quantities of access purchased would change little whether access was priced according to, say, a two-part tariff or an average cost price. This suggests that there would be minimal adverse allocative efficiency effects from different price structures that might be applied to long-term capacity contracts for rail and port capacity in Queensland.

[5] QR Network is the name used in the list of references. The name change to Aurizon Network occurred on 3 December 2012, after the publication date of the QR Network documents referenced.

[6] A further condition is that if 90% of total contract capacity across all access customers on a system is railed, no access customer will be required to pay for any capacity they have not taken even if this means they have taken less than 90% of their contracted volume.

These capacity options appear to work much as an insurance system where the cost of claiming is spread over all the insured; in this case the above rail operators. If in one charging period, an access contractor took only 90% of its total contract capacity, assuming the optional capacity is not purchased by another access provider, the standard access charge would need to increase in the next period due to the under-recovery which occurred because the 10% of the access contractor's capacity was unused and not paid for. Because all access buyers will pay the high access price if the optional volumes are not used and paid for, the option creates incentives that may result in access buyers contracting for more capacity than they expect to use.

[7] This analysis abstracts from recontracting which will occur at the end of typically 10 to 15 year contract periods.

[8] For coal miners, for example: the total railing price of thermal coal from mine to port is thought to be less than $10 per metric tonne. Below rail costs are approximately $3 to $4 per metric tonne. The port handling charge at DBCT is $2.90 per metric tonne. Thermal coal prices were between $US40 and $US192 a tonne between 2004 and 2012, and between approximately $US24 and $US41 a metric tonne in the 20 years preceding this. Thus rail and port costs are a relatively small proportion of total revenues.

3.2.4 Long-term access capacity contracts and average cost-based access prices

Prices are allocatively efficient when they reflect short-run marginal cost. Short-run marginal cost is the cost of producing one more unit of the good or service when at least one factor of production cannot be varied. When price equals short-run marginal costs[9] the cost to society of producing more output is equal to the value paid for it.

The Authority regulates access to utility monopolies that have large fixed costs and relatively low short-run marginal production costs. Under these circumstances short-run marginal cost pricing cannot be used because the resulting revenues would fail to recover all of the access provider's fixed costs, both embedded and incremental.

Basing access contracts on average cost-based prices is not likely to have a material allocative economic efficiency loss when long-term capacity contracts apply. Both the access supplier and access buyers need to recover long-lived capital investments for which the provision of access is crucial and this is consistent with both parties typically favouring long-term contracts in access capacity. In practice most access provided in Queensland appears to be priced according to average cost-based prices.

If the expansion in capacity is not expected to be filled for quite some time, several options for cost recovery are possible. Some excess capacity can be the efficient solution when capacity tranches are unavoidably lumpy. This would reflect economies of scale in constructing the additional capacity. In some cases the cost of excess capacity may not be paid by established users but capitalised for recovery from the prices paid by future users[10]. However, capitalisation entails demand risk and it may be optimal to have some near permanent excess capacity paid for by existing users because of economies in construction.

Demand risk of the excess capacity can be significant and those carrying this risk where it is relevant and non-diversifiable and excess capacity is efficient, will need to be appropriately compensated for it or provided appropriate assurance of reasonable cost recovery.

3.3 Long-term contracts and the allocation of new capacity costs

3.3.1 Increasing average cost and access prices

Several established buyers of access are concerned that where new increments of capacity have significantly higher unit cost than the unit cost of existing capacity, the cost of a new tranche of capacity may be added to the existing RAB leading to a substantially higher access price.

[9] To achieve economic efficiency, short run marginal cost needs to be defined as short run social marginal production cost plus the net marginal cost of any externalities and the marginal congestion costs when capacity constraints apply.

[10] In the 2005 and 2010 reviews of the Gladstone area Water Board [(Gladstone Area Water Board: Investigation of Pricing Practices, June 2010), (QCA, 2005. Gladstone Area Water Board: Investigation of Pricing Practices. March, 2005)], the Authority adopted a 20-year model to smooth prices over the expected period for take-up of spare capacity, based on demand forecasts. In both the 2005 and 2010 reviews, the Authority recognised that, by setting prices smoothed over a 20-year planning period GAWB's expected revenues would under-recover (or over-recover) its building blocks costs during the 5-year regulatory pricing period. When determining prices for each of the subsequent pricing periods, the Authority included the capitalised value of any under-recovery (or over-recovery) of costs attributable to price smoothing when calculating prices for the next regulatory period. By doing so, the Authority has maintained an outcome based on allowing a full recovery of costs and return on capital over time. However, prices in the current regulatory period may generate revenues higher or lower (more likely lower) than that required level to achieve a full rate of return within the regulatory period. Despite this outcome, the use of a 20-year planning period for a business that has predominantly long-life assets may result in a current revenue requirement (and prices) being higher than would apply if a longer planning period for capital costs (return on and of capital) was applied.

Various factors may explain why capacity expansions in infrastructure-based businesses have higher unit costs than for established capacity. The costs of construction may have increased substantially because of increases in input costs or specific 'locational' factors may cause incremental expansion costs to rise. In addition, if a substantial portion of the new capacity is not expected to be filled for some time and existing users are required to pay for the excess capacity, the price they pay could rise substantially.

It is helpful to consider three options for the pricing of access in the context of increasing average unit cost following a major capacity expansion.

(a) A uniform average cost-based access price is charged across existing and new capacity (this is often referred to as 'cost socialisation'). Where average costs are increasing, the access price for established users would increase.

(b) A separate (higher) access price would apply for each expansion reflecting the average total cost of each major capacity expansion.

(c) Separate access prices would apply for existing and new demand, with users of the new capacity paying more than the average unit cost of the capacity expansion, and existing users paying a commensurately lower price for their access. The extra charge for new capacity would represent a levy to support a lower price for existing users in order to compensate them for risk of underwriting initial capacity or for their previous contributions to paying for excess capacity. With rising average costs this option seems most unlikely to be seriously considered, and so is not discussed in this section. It is however discussed in the decreasing cost section below.

When costs are increasing in capacity and access customers sign long-term capacity contracts, and new capacity is built to accommodate new demand, averaging the costs of established and new capacity will involve the new users paying less than the cost their demand causes. What is more, established users will be paying prices higher than the average stand-alone cost of serving them[11].

Under these circumstances cost averaging is unlikely to be considered fair. It may adversely impact on investment incentives in the future to the extent that established users invested on the assumption that substantial increases in their access price in the event of new demand-driven capacity expansion would not apply to them, particularly given their status as first mover investors. However, the extent of this affect is likely to be small where the costs of access after the price increase continue to be a small part of overall costs.

Where the expansion results in a modest access price rise, it is possible that there would be no objection to charging a new and slightly higher averaged access price. If, however, some users were not expanding or not expanding significantly and would face a substantial rise in their access price if costs were socialised, these users are likely to object to cost socialisation on fairness grounds.

[11] Established access buyers (*Holders*) may receive benefits following an expansion that they did not previously enjoy. In principle these benefits may be such that they should be reflected in the access price they pay. If an access buyer has not previously agreed a price for a very similar benefit and the circumstances surrounding the benefit are not substantially the same, it may be difficult and contentious to decide what they should pay. For this reason benefits that are conferred on a beneficiary but not at a price agreed with the 'beneficiary' may prove difficult to price and recover from established access buyers.

Finally, where there are long-term contracts for capacity, the case for charging a separate access price for new higher unit cost capacity can be based on user-pays or cost-causative principles[12].

Some infrastructure access providers and users have developed a written policy addressing possible future expansions. All are consistent with the principle that when costs are rising significantly, substantial capacity expansions should be funded by the new users. For example WICET (Wiggins Island Coal Export Terminal) is open to new members to join under the Wiggins Island terminal access policy (WITAP) which includes a method for pricing access to any new tranche of capacity[13]. The WITAP states that if the average cost is rising, existing entitlements will continue to be priced as they were prior to the expansion, while users of the new capacity would pay an access charge calculated to meet the incremental cost of expansion Another example is the Australian Rail Track Corporation Ltd in the Hunter Valley, (ARTC 2011, "Hunter Valley Coal Network Access Undertaking", 23 June), and the policy recommended by the Queensland Resources Council (QRC Issues paper, 8 February 2011). These examples are discussed further in Chapter 4.

3.3.2 Decreasing average cost and access prices

The same three possibilities outlined in the case of increasing average cost discussed above are also considered here except that this sub-section involves unit costs that are decreasing as capacity expands. The three possibilities are:

(a) A uniform average cost access price is charged across existing and new capacity;

(b) A separate declining access price would apply for each expansion, meaning new users will pay a lower access price than the existing users; and

(c) Separate access prices would apply for existing and new demand, with the users of the new capacity paying more than the average unit cost of the capacity expansion and existing users paying a commensurately lower price for their access. As for the case of increasing average cost, the extra charge for new capacity would represent a levy paid to support lower prices for existing users in order to compensate them for risk of underwriting initial capacity or for their previous contributions to paying for excess capacity. It is also possible to envisage other contractual conditions being insisted upon by foundation access contractors, for example there could be a commitment to always allocating the lowest cost capacity to foundation members[14].

Where costs are declining, a uniform average cost based access price (option (a)) may be the preferred solution by the access seller and access buyer alike. Such a scenario does not seem to raise significant concerns for existing or new users and does not appear to have any significant economic efficiency implications. It is the option preferred by the Queensland Resources Council (QRC), as noted above, and implicitly the miners it represents; and it is

[12] Exceptions to the application of cost-causative pricing can arise if: (i) the buyers of the new capacity involve the same group that purchases the established capacity, (ii) there are no long-term capacity contracts or benchmark 'reference' transactions, or (iii) if externality or cross-product effects are strong enough. Cross-product affects involve different types of elasticities including cross-price elasticities involving complementary or substitute products. Depending on the nature of the complementarity or substitution it may be efficient to price a product at less than the cost of its provision, or more than the stand along cost. A research topic in economics known as multi-sided platform markets is concerned with cases where cross-product effects are large giving rise to unusual pricing practices and related regulatory issues.

[13] The WITAP contract can be found at www.wicet.com.au/

[14] This is analogous to the most favoured nation clauses that exist with respect to import tariff policies for countries and which are described as most preferred customer clauses in business.

also what has been agreed at Wiggins Island in the WITAP. It seems likely that new users would accept a uniform access price, where costs are declining with capacity expansion.

The second option of price set equal to the average cost for each expansion, so that with declining average costs, users of new capacity would pay a lower price than existing users. This would most likely be perceived by both new and existing users as unfair to the original take-or-pay (ToP) access contractors. Where they have had to pay for some excess capacity or bear the risk associated with being foundation or early users, it would also seem economically efficient from a relative rewards perspective for them to benefit from a lower average access price as capacity expansion occurs. This is particularly the case where at the time of entry they expected average cost prices to decline in the future.

To elaborate, consider the issue of risk associated with being an original or early access buyer committing to a substantial take-or-pay (ToP) contract. For example, where miners enter into commitments to buy ToP capacity for 10 or 15 years from Aurizon Network, a significant portion of Aurizon Network's green-field project risk is borne by the miners. Consider a situation where new rail capacity is added that will be used by a different group of miners (second movers). These second-mover access seekers also bear risk when they contract for new capacity. However, the risk they bear, in expected value terms, will typically be lower where costs are declining compared to their first mover rivals since:

(a) the cost per unit of the expanded capacity is lower than for the foundation capacity, and

(b) ceteris paribus the probability of project failure is typically lower since the expansion is a Brownfield and not a Greenfield investment.

Prior to the capacity expansion, foundation access customers will at the outset have paid access charges that are higher than those paid at the outset by second movers (this is not a situation that applies when costs are rising). These circumstances may provide an incentive to be a second rather than first mover, depending on the impact on profitability. This may lead to inefficient delays in committing to ToP contracts which in turn may lead to inefficient delays in investment by both access buyers and access service providers. Such an incentive may be nullified if the expected profitability of the first mover's core business is judged at the time to be high enough, i.e. that the rent earned in the foundation period prior to expansion is more valuable from the time access customers' assets were sunk, than the uncertain higher profits expected by a second mover. In either case this analysis provides some rationale for second movers to pay a rebate to first movers. This would mean that the effective access price to be paid by first movers following a capacity expansion which lowered average costs overall would decline by more than the decline in average cost due to the capacity expansion[15].

If the new capacity is not functionally equivalent but can be either used by established or new uses and is preferred by both (i.e. it is a superior substitute for established capacity), then the situation is more challenging. If average unit cost is declining with the expansion, and the per unit cost of the expansion is significantly lower than it would be to build that capacity in the absence of existing access infrastructure, then it may be efficient and considered fair that a per unit levy is paid by those who contract for the new capacity. As

[15] An argument against a rebate being paid to original Greenfield ToP access customers by second movers is that modifying the prices for expanding users to account for the rebate may lead to under-utilisation of the new capacity, most especially if the price elasticity of demand for access by new users is elastic. It has been explained previously, primarily in section 3.2 but also in 3.3, why this is unlikely. If there was a significant effect, however, it could outweigh efficiency and fairness considerations for supporting lower charges for existing users. The demand elasticities of first and second movers (ToP contractors) will be important in assessing this effect should it arise. An elaboration of this point is provided in section 3.4 and in Appendix A.

indicated, foundation contractors with long-term capacity contracts will have borne Greenfield risk. New capacity users will have also signed long-term contracts but will not face the same Greenfield risk. The possible options for what might be agreed may too numerous or complex to predict an outcome.

Given the possibility for outcomes to be inefficient due to second mover advantages, it is useful to consider what all the parties would have agreed to as a remedy, prior to any sunk costs having been incurred. What would potential access buyers think was reasonable given that at the time of considering the problem, none identified themselves or others as either first or second movers?

If the asymmetry in risk is perceived to be large, the parties might agree that a levy be paid by 'subsequent' access buyers, which effectively requires them to pay a price for access that is more than the long-run average cost of their new capacity tranche.

3.4 No long-term access capacity contracts, separability in use and access price structures

When there are no long-term capacity contracts or an established reference transaction, and established and new capacity is functionally equivalent, no subset of overall demand has a superior claim to the lower cost capacity[16,17].

Assume that as well as access to established and new capacity being functionally equivalent, the conditions for access price discrimination do not apply, there are no long-term contracts for capacity, and access prices are uniform. With these assumptions, a simple average cost price may entail some efficiency costs. The main reasons for this is that whereas with long-term access capacity contracting access will likely be highly price inelastic[18], if access purchases are only short-term with no ongoing arrangement such as a long-term contract or reference transaction, access is expected to be significantly more price elastic. Under these circumstances whether average cost is falling or rising with capacity, the cost of new capacity will be different (lower or higher) than a socialised price which is based on combining established and new capacity costs. More specifically, when costs are increasing

[16] Under these circumstances the issue of whether there is physical separability in use is not relevance to the pricing of access. If capacity tranches are in sufficiently different geographic locations however, such that access to one is not functionally equivalent to access to the other, a different access price would normally be justified.

[17] Separability in use makes it possible to charge different prices to access different tranches of capacity but deciding which access buyers would get access to the cheaper capacity on any one day or short-term contractual period would require a capacity allocation mechanism such as an administrative decision. There are several possibilities including allocating on the basis of: (i) first-come-first-served; (ii) lottery; (iii) an equal allocation of the different unit capacity costs to each buyer, and (iv) some allocator that is considered fair. Such assignment methods can be considered economically arbitrary.

[18] There are a number of factors likely to contribute to this price inelasticity. The primary reason is that demand is likely in practice to be highly price inelastic, arguably the two mains ones are:

a) Access capacity is built often only after volumes are contracted via long-term take-or-pay contracts. Buyers of a particular form of access are typically small in number and will have large relatively indivisible costs of their own which will shape their demands for access. In many cases the scale of their own lumpy infrastructure is likely to be at least as influential in explaining the scale of access infrastructure as will the price of access, and
b) From the demanders' perspective, there is no alternative supplier that access buyers can switch their purchases to if they do not like the cost of the option being offered.

Prices do not therefore have the same signalling or information function on the demand side as they do in competitive markets which are so important to them functioning efficiently. The allocative inefficiency problem of averaging costs in access markets with long-term capacity contracts is likely to be relatively small in practice. Further discussion is provided on page 9 including footnote 8.

in capacity, averaging the costs of established and new capacity will involve a price that is below the unit cost of the new capacity.

In practice, the situation of there being no long-term contracts or established users that can cite a reference transaction, appears in practice to be rare at least but is included here for completeness[19].

If established and new capacity is not functionally equivalent, such as two connected rail systems that service a different client base, then separate access prices should apply. This result is supported by the concept of cost causative pricing[20].

Finally, where there is excess capacity following an expansion[21] and no long-term ToP contracting, a socialised (uniform) access tariff that is based on units of total available access (which is greater than allocated capacity), would not fully fund the capacity over its life, as the unused capacity would not be funded until it was allocated. Ways of addressing the problem of efficient excess capacity include: (i) to capitalise the associated loss and have it funded by future users; or (ii) 'socialise' it, with the estimated annualised excess capacity cost recovered from users of existing and expanded facilities.

3.5 Competition issues

Where two or more buyers of access to a declared facility are being charged a different price for access which in functional terms is identical, and these access buyers compete in a relevant downstream market, there is the potential for the discriminatory access prices to significantly distort competition in the downstream market[22]. Such discriminatory pricing is unlikely to be permissible under the QCA Act[23].

[19] With long-term capacity contracts, prices do not therefore have the same signalling or information function on the demand side that enables the market to function efficiently, as they do in competitive markets. The allocative inefficiency problem is likely to be relatively small in practice.

[20] Where capacity expansion needs to occur to accommodate general population and economic growth it may be practically impossible or undesirable to seek to grandfather access rights according to whether usage began prior to some date. If such a date was defined such that those whose first usage occurred after this date would be deemed to be responsible for new capacity costs, if the average cost of this capacity was substantially more costly in present value terms than the original investment. For example, if the Gold Coast motorway needed additional lanes because of increasing congestion from population growth, it would not make sense to seek to recover the cost from those who settled in South East Queensland after a certain date and are thus assumed to have caused the need for the expansion. In this case it is not feasible to separately identify long-term users from new users. Separability in use based on the date of residency is not practically possible. When motorways are expanded and there are no long-term implied or express contracts with users, the introduction of tolls or peak-period charging can be employed to recover costs. At the time of their usage all users are treated equivalently.

[21] Where demand is expected to grow and investment in capacity is lumpy, it will typically be optimal to build capacity that is in excess of current needs.

[22] Specifically, if the access monopolist is integrated downstream, the conditions imposed by s104 of the QCA Act appear to prevent the access monopolist from charging any other access buyer a higher access price than is paid by its own down-stream provider.

[23] The QCA Act states in section 168 on access pricing principles that access prices are permitted which,
"(b) allow for multi-part pricing and price discrimination when it aids efficiency".
This suggests that the efficiency gains from price discrimination, which can enable a less inefficient recovery of costs, must be greater the harm done to competition by price discrimination applied to access buyers.
Section 104 of the QCA Act which is concerned with "Preventing or hindering access" states,
"(1) An access provider or user of a declared service, or a related body corporate of the access provider or user, must not engage in conduct for the purpose of preventing or hindering a user's access to the declared service under an access agreement."
An access seller that is integrated downstream such that it competes with other access buyers, is deemed to be *preventing or hindering access* if it suppliers to competitors on less favourable terms that it provide access to itself (104(2)).

3.6 Conclusion

Where both the service provider and access buyers have large sunk costs and long recovery times for major capital assets, long-term contracts for capacity may be optimal for all parties to the contracts.

If capacity is contractually allocated over the long-term, the structure of access prices can be expected to have relatively little impact on behaviour once long-term contracts are signed. What is more, even at the time of contracting, the structure of access prices will likely have little impact on an access buyer's behaviour if the cost of access makes up only a small proportion of the access buyer's overall cost or revenue. Under these circumstances, the insights of an analysis of how to recover the cost of a major capacity expansions under average cost access pricing are likely broadly applicable to access prices that are not a simple average cost-based price.

The suitability of average cost based access prices as a basis for assessing efficient and fair pricing of access to a major expansion in capacity does not imply that access prices should be uniform. To the contrary, in many circumstances, different average cost based access prices should be charged to existing and new demand where they are responsible for different capacity tranche costs.

Whether or not new capacity is separable in use between existing and new capacity will usually not affect the access supplier's ability to charge separate access prices to existing and new users. With long-term capacity contracting, if average costs are rising substantially with a new tranche of capacity, it will in general be neither fair nor efficient for the higher costs of the new tranche to be added to existing costs and a socialised price then charged. In this case, socialisation of costs clearly implies a subsidy to expanding users where there is no apparent economic efficiency or fairness rationale for doing so.

Where capacity costs are declining as capacity expands, a uniform access price based on average cost is likely to be generally acceptable to existing access capacity contractors, new access contractors, and the service provider. In particular, where the original access users have had to pay for some excess capacity or bear the risk of being a Greenfield take-or-pay contractor, it would also seem both fair and economically efficient for them to benefit from a lower average access price if lower unit cost capacity expansion occurs. Indeed, in these circumstances it may not be unreasonable for existing users to share more than proportionately the benefits from lower costs associated with capacity expansion.

Although there appears to be some asymmetry in these propositions, they are arrived at by consideration of what would reasonably be expected to occur in a negotiated contract prior to sunk costs being incurred by either the access provider or the access seeker. These propositions are considered to be perceived as 'fair' to access providers and access seekers and consistent with achieving overall economic efficiency. Clarification of how prices would be set in the context of capacity expansion, as outlined here, is also important for the transparency and credibility of the regulatory governance arrangements.

In making its decision whether to approve or refuse to approve a voluntary draft access undertaking, s138(2) of the QCA Act requires the Authority to consider all of the following factors:

- the object of Part 5 of the QCA Act, which is:
  - *"to promote the economically efficient operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets"* (s. 69E).

(...)

- *"the public interest, including the public interest in having competition in markets (whether or not in Australia)";*

For clarity, the typical situation in relation to large users of rail and port infrastructure in Queensland is as follows:

(a) existing users have contracts for specified capacity but the access price is not specified. Access prices are determined by the Authority;

(b) existing users have expectations that the price of access to them would be predominantly based on the average total cost of existing infrastructure;

(c) new users cannot displace existing users from their access to capacity without their agreement;

(d) existing users took the above factors into account in making their investment decisions and did not expect they would have to pay a material increase in charges associated with a capacity expansion where they are not the drivers of the expansion; and

(e) a material increase in access charges for existing users due to a higher unit cost of capacity expansion would likely be perceived as unfair by existing users and could reduce their confidence in the credibility of the regulatory arrangements.

Recognising these circumstances and applying the principles and propositions set out in this paper there is not a reasonable rationale for socialisation of costs that entails a substantial increase in prices for existing users, following an expansion of capacity. However, there is a reasonable rationale for existing users to benefit from lower costs of capacity expansion where they have borne initial Greenfield project risk or have funded excess capacity.

If long-term contracts for access capacity do not apply or more generally no users have a reference transaction, then effectively there are no 'established' or 'new' access customers. Given that the capacity is functionally the same and price discrimination between access buyers is not possible, the access price offered to all buyers should be the same. However, a simple average cost-based price may involve efficiency costs as the price will be below (above) the average cost of the most recent capacity when costs are increasing (declining). A more complex price such as a two-part tariff is likely to be less inefficient. This problem may be relatively unimportant in practice since long-term capacity contracts appear universal and under these circumstances access will be price inelastic.

In summary, the rationale for precluding the socialisation of costs from higher cost capacity expansion essentially relates to the explicit or implicit contractual arrangements and expectations of existing users concerning the price they would pay for access. The main arguments precluding averaging of costs across existing and new capacity costs relate to 'fairness' considerations rather than economic efficiency considerations. However, non-uniform pricing may be precluded if it means that competition is blunted between access buyers that are downstream competitors.

A summary of the main propositions is contained in the box below.

Key propositions regarding pricing for capacity expansions

If there are long-term contracts for capacity:

- **the access provider can recover expansion costs from new users whether existing and new capacity is physically separable-in-use or not;**
- **access price structure has little relevance once the contracts are signed; and**
- **average cost-based access prices are not likely to have a material adverse impact on economic efficiency.**

With long-term contracts and a substantial increase in average cost, and with new capacity being functionally equivalent to established capacity:

- **a uniform average cost-based ('cost socialisation') is unsuitable since it means established users subsidise new users;**
- **cost socialisation is likely inconsistent with a relevant reference transaction and thus likely considered unfair; and**
- **a separate (higher) access price should apply as the default position for each substantial capacity expansion.**

If the new capacity is clearly not functionally equivalent: separate access prices will sometimes be fair and efficient.

With long-term contracts and a substantial decrease in average cost:

- **a uniform average cost-based price ('cost socialisation') is reasonable as it will allow established users to be compensated for Greenfield risk or prior funding for excess capacity and would be perceived as fair;**
- **under some circumstances it may be efficient and fair for new users to pay an additional access levy in order to build incrementally on existing capacity;**

If there are no long-term contracts in access capacity:

- **there are effectively no established and new users that can be charged different access prices based on a relevant reference transaction; and**
- **uniform pricing should apply across all capacity where buyers appear to be in the same relevant market.**

4. DISCUSSION OF RELEVANT CASES

This chapter describes some examples relating to capacity expansion and provides some basic analysis using the principles and methodology set out in the preceding chapters. At this stage it is largely exploratory and descriptive in nature rather than a definitive analysis.

Section 4.1 discusses the Dalrymple Bay Coal Terminal capacity expansions. Section 4.2 considers various issues concerning rail system expansions. Sub-section 4.2.1 addresses the recovery of the $1 Billion Northern Missing link expansion which links the Goonyella system to the Newlands system, and provides related capacity upgrades in the Newlands and Goonyella systems to accommodate the additional traffic. Sub-section 4.2.2 discusses system expansion costs and the objections raised by the domestic power stations, Stanwell and Gladstone. Sub-section 4.2.3 reports on Aurizon's 2011 DAAU and the recovery of its electric infrastructure costs. It also outlines the Authority's proposed solution which was presented in a public meeting.

4.1 Ports: The Dalrymple Bay Coal Terminal (DBCT)

There is some evidence that coal ports and other bulk terminals exhibit a 'classic' pattern of economies of scale, with average and incremental costs each declining as capacity expands, and then starting to increase at higher capacities. This can be explained by looking at the way coal terminals operate. Typically, they have three main parts – rail unloading loops, a stockpile area, and shiploaders, all connected by conveyor belts. Single modern unloading loops and the shiploader, with associated stockpile space, have annual capacity of about 25 or 30 million tonnes[24]. Ports along the east coast of Australia have kept expanding until they have had as many as three unloading loops, and three shiploaders. However, beyond that point, the complexity of the web of conveyor belts required to connect every unloading loop to every stockpile, and then supply every shiploader, creates a technical barrier to further expansion. This can be seen at Gladstone, where the RG Tanna terminal is regarded as full at about 75 million tonnes of annual capacity, with three unloading loops and three shiploaders[25].

The terminal is owned by DBCT Holdings Pty Ltd. It is leased to DBCT Trustee which sub-leases it to DBCT Management Pty Ltd. DBCT Management sub-contracts the day-to-day operations of the terminal under an operations and maintenance contract (OMC) with an independent company DBCT Pty Ltd (the Operator). The Operator is owned by five of the eight existing mining company users of the terminal and is responsible for the daily operation and maintenance of the terminal[26]. The Operator Shareholders' Agreement provides for any current or future user to become a shareholder of the Operator[27] , with an upper limit of share ownership proportional to the user's annual entitlement for throughput tonnage, as per its user agreement with DBCT Management[28] .

At DBCT, miners have long term contracts for port capacity that specify volume rights but not prices. These volume rights may provide access buyers with a property right given that DBCT management has set up a secondary market in port capacity. The primary market price is the reference tariff set for DBCT by the QCA. These contracts have options to renew. Options to contract for new capacity that becomes available as a result of capacity

[24] *The Wall Street Journal, 21 February 2011.*
[25] *See Gladstone Ports Corporation, 50 year strategic pla*n, Updated: July 2012.
[26] At DBCT the majority of mining company users have formed a consortium which leases the port from the State and runs it on behalf of all miners. Even though all users have a right to join the consortium a minority of users have chosen not to.
[27] See p. 31 in http://www.qca.org.au/files/DBCTDAURequestforComments.pdf
[28] The OMC commenced in 1999, was extended until March 2009 and then again until 2014. The Operator may request a third successive extension, but DBCT Management is under no obligation to grant this.

expansion also exist. Where expansion has occurred, the additional capacity provided has been taken up by a mix of those miners with contracts for existing capacity, and other miners who did not use the port or have long term contracts for port capacity[29].

Most of the investments in new capacity appear to be of the type that does not involve assets that will only be used by those who contract for the new capacity. Rather, the nature of port functions probably makes it impractical to attempt to separate the users of the new capacity from users of existing capacity.

If the long-term contracts of existing users amounted to a full property right in capacity, truly spare existing capacity could then be assigned to new demand at a price agreed with an existing holder of capacity property rights. However, existing users do not have a full property right in the take-or-pay commitments (capacity) they sign up to.

Over time the terminal infrastructure charge at the Dalrymple Bay Coal Terminal (DBCT) has increased as follows:

(a) $1.45/tonne at 59 million tonnes per annum (mtpa) in 2006;

(b) $2.77/tonne at 85 mtpa, following the recently completed 7x expansions; and

(c) an estimated $5.60/tonne at 145 mtpa, if a further expansion to this level occurs[30].

These prices are in nominal terms.

While established customers have been happy to take advantage of declining prices as facilities have expanded, non-expanding customers are clearly not keen on higher access prices due to major capacity expansion costs being socialised. The 2010 DAU provided for uniform pricing of existing and new capacity for the more costly post-85 mtpa expansions (which have not yet been approved). Two objections were received to the socialisation of costs across existing capacity and the planned new tranche of capacity. The objectors withdrew their objections and agreed with DBCT Management that this matter would be better dealt with as an amendment to an approved 2010 undertaking rather than as part of the assessment of the 2010 DAU[31]. There have been no significant developments since this time.

The profile of charges set out above is a clear example of a major facility having expanded on to the increasing part of its long run average cost schedule. As new access buyers are required to sign similar long-term ToP capacity contracts which occurred prior to the expansion being built, it appears most appropriate that the new contractors would pay for the new capacity which is the general recommendation found in subsection 3.3.1. However, the 2010 Access Undertaking[32] envisages that new capital would be added to the existing RAB and a new uniform access price calculated on the basis of the new RAB value (see the modelling appendix in the Access Undertaking).

[29] See Master plan 2009, p. 19 at http://www.qca.org.au/files/P-2010dbctdau-DBCT-DAUMasterPlan-0310.pdf
[30] These figures were obtained from DBCT Management.
[31] In its reply to the objections to socialise the cost of port expansion, the Authority wrote that it "*[...] will commence a broad cross-sector review of pricing matters. This review will cover all industries regulated by the Authority (including rail and water) as pricing structures in circumstances of increasingly expensive capacity expansions is an issue of general concern to stakeholders and not just the existing users of DBCT. The Authority will consider any potential DBCT DAAU on pricing in the context of this review.*" (Dalrymple Bay Coal Terminal, 2010 Draft Access Undertaking, Final Decision, September 2010: p13.)
[32] Dalrymple Bay Coal Terminal, "2010 Draft Access Undertaking, Final Decision" (September)

4.2 Rail

4.2.1 Socialisation of the costs of Goonyella to Abbot Point, and Surat Basin rail links

GAPE and NAPE

Miners on the Newlands and Moura systems have previously indicated their concerns about higher access charges as a result of a possible 'socialisation' of the costs of developing the Goonyella to Abbot Point expansion (GAPE) project and the Surat Basin railway (SBR) which would connect to the Moura system and the Port of Gladstone. In each case, there is new Greenfield track connecting to an existing rail system. The existing infrastructure would in each case have to be upgraded to carry the increased traffic resulting from the new connection to port.

GAPE Deed customers are predominantly located in Goonyella system and will utilise the 69 km of the Northern Missing Link (NML).

The analysis presented here is preliminary in nature reflecting the authors understanding of the situation which has not yet been resolved among the various parties.

The proposed GAPE tariff (at around $10.08/net tonne) is significantly higher than for Goonyella ($2.60/net tonne) and other systems such as Blackwater ($4.57/net tonne). This is due to the:

(a) high cost of the GAPE project; and

(b) very low initial volumes over the mine ramp-up period – Aurizon Network has used volume estimates of 2 million tonnes for 2011-12 and 10.5 million tonnes for 2012-13. This is expected to grow to 30 million tonnes per annum in the longer term.

GAPE has been completed, and trains started running late in 2011 from mines along the new track which connects the Newlands system with the Goonyella system. The work has included new passing loops and infrastructure improvements on the Newlands line. Customers have contracted capacity under either a GAPE or NAPE (Newlands to Abbot Point expansion) Deed.

It is understood that differences concerning the recovery of investment costs have largely been resolved and that:

(a) none of the parties that pay for GAPE or Newlands enhancements is protesting the cost numbers or the allocation of costs;

(b) Newlands users are not complaining about any degradation of service. Apparently they will get more rail capacity as a result of the upgrades. However, Xstrata wants confirmation that the level of costs is reasonable;

(c) One Newlands user has agreed to pay for some of the NML (Northern Missing Link) costs even though it does not use the NML;

(d) Newlands specific costs are socialised among Newlands users (no NAPE customer appears to be complaining about this). The relevant Newlands enhancements are those needed irrespective of the NML and come to $126.0m: 40m is included in the existing UT3 access agreement; $86m will go in the UT4 (the next) access agreement, and

(e) based on a report by an independent coal chain specialist, Goonyella users are complaining that they will lose capacity due to the interaction of GAPE traffic with the Goonyella system.

Point (e) appears to be the primary matter of dispute. Whatever the legal rights of the parties, a drop in the capacity of the Goonyella system suggests that the contracted capacity cannot be delivered as expected by users due to congestion. This in turn has implications for the value of the service to them relative to what they pay based on the regulated access price. As access prices on Goonyella are largely based on average cost pricing, if the same RAB values are retained, a drop in traffic would result in an access price rise in the next period. Thus a key point for consideration is the degree to which Aurizon's decisions have degraded the capacity of the Goonyella system. In this respect, existing RAB values might not be appropriate following a drop of capacity on Goonyella. A relevant aspect is whether Aurizon has in effect reduced capacity on the Goonyella system in order to try to realise higher profits elsewhere.

Surat Basin rail links

The Surat Basin Rail (SBR) link is still in the planning stages. It will connect mines in the Surat Basin with the ports at Gladstone, using the existing Moura line for a substantial part of the trip. It is expected that the Moura tracks would need substantial upgrades, including both extending existing passing loops and adding more of them, as the tonnages from the SBR would most likely exceed the existing volumes on the Moura line. Anglo Coal, which is the main user of Moura for coal from its Dawson project, has argued that it should not have to pay increased costs for the expanded use of the line, given it is not increasing its volumes on Moura.

The costs of the SBR expansions can be separated into:

(a) new infrastructure that is exclusively used by new users; and

(b) new infrastructure that is caused by the need to accommodate traffic from the SBR on the existing Moura system but which is used by both existing and new users.

The discussion below assumes that access buyers contract for their capacity through long-term ToP contracts.

The new infrastructure referred to in (a) is clearly used only by the new users and should be recovered from new users, unless there are network effects or other externalities that justify cost sharing with others. Many if not all the access costs indicated by (b) will not be separable-in-use between existing and new users. However, this does not prevent the access service provider pricing access to new users in a way that also recovers (b) class costs where these are incremental in order to accommodate traffic arising from the SBR.

If the costs suggested by (a) and (b) are pooled with existing Moura system costs, resulting in a substantially higher access price for established users of the Moura system, such an approach is likely to be considered unfair by them. Moreover, it would also suggest that new users are paying less than the cost of the capacity investments required to provide access caused by their demand and in breach of the cost causative principle. Based on the principles set out in preceding chapters, there would not be a strong economic rationale for a substantial access price rise for established access buyers resulting from costs caused by the expansion.

Complications potentially arise if there is excess capacity in the existing rail system or if the expansion would lead to excess capacity on the enhanced existing system. In such cases

some relevant questions are as follows. Do existing users have any claim to unused train paths on the existing system, assuming these are at a lower cost than the train paths that would be added with an expansion of capacity on the existing system? If so what access prices should apply for these paths? Will an expansion of established users on the existing rail system involve more expensive track paths because excess capacity on the existing system has been taken up by the Surat Basin expanding users? Contractual agreements would likely need to be studied in order to answer these questions.

Abstracting from any externalities, substantial cross-product effects[33], and the case where there is excess capacity following the expansion, the above discussion points toward the need for a separate access price to be estimated and charged for coal trains originating from the new mines. The access charge would cover the costs imposed by (a) and (b) above. It is worth noting that NAPE and GAPE deed miners may yet come to an agreement on prices (subject to confirmation by the Authority's consultant engineers that the investments were prudent) that is consistent with the arguments outlined in this section.

In the case of the possible Surat basin rail expansion, if neither Aurizon Network nor stakeholders have incurred significant sunk costs relating to the expansion, the parties themselves may be in the best position to decide on access prices or to decide how they would be derived, and whether they would be uniform or otherwise.

4.2.2 Tariff socialisation: Power station issues

There is also a cost socialisation issue regarding electricity generators who are domestic users of coal. Stanwell and Gladstone power stations have questioned why they have to pay for higher infrastructure costs caused by increased coal exports. In response to Aurizon Network's 2009 Draft Access Undertaking (DAU), Stanwell queried the inclusion of costs relating to early works regarding the Wiggins Island coal terminal into the general pool of capital expenditure projects for which Stanwell would contribute through the access price its rail operator pays when transporting coal to its power station. Stanwell's rail haul does not involve Aurizon Network's Wiggin's Island expansion.

Rio Tinto Alcan as manager of the Gladstone power station submitted a response stating that it should not be required to contribute to capital costs of below rail infrastructure expansions given that it has a fixed generating capacity and does not receive any direct material benefit from the capacity expansion.

An issue that appears to run across this case is that rail system costs that make up the access tariff appear to have been averaged over a range of services or sectors involving significantly broader parts of the system than are used by the power stations. Gladstone power station appears to be paying an access charge that relates to a broader system than that used for its coal deliveries. Substantial investment in the form of capacity expansions could and apparently did occur in a part of the rail system that the Gladstone Power Station coal supply trains do not use. This has resulted in claims that access price rises are unfair. Examples like this implicitly question the appropriateness of the access price averaging that occurred prior to a capacity expansion; i.e. the expansion raises questions about pre-expansion cost averaging.

It is understood that coal trains to Stanwell do use some of the new capacity or upgraded facilities, although Stanwell does not admit to gaining any benefit from the new investments, which it considers were undertaken for the benefit of others. The situation is similar for Gladstone; those who apparently gain nothing from the expansion are being required to pay for capacity upgrades.

[33] See footnote 12 for an explanation.

Price averaging of areas, systems or services, where some buyers purchase access but use only a subset of what the access tariff covers, may raise fairness concerns at some time by those buyers. In principle, an access buyer's access tariff ought to match the service being purchased, but historic practice, the administrative costs involved in setting and operating a system of more disaggregated tariffs, or a lack of (competitive) alternatives, will sometimes mean that in practice this does not occur. There are corollaries to be found in everyday shopping by individuals, such as when someone wants to purchase three batteries but batteries are only packaged in twos or fours.

A pertinent question is whether at the time they entered into the access agreement with Aurizon Network the power stations should have realised that in time they may be asked to pay for some investment costs that would be recovered through a system-wide access price?

Arguably there might be an issue with transparency and predictability based on a claim that the power stations were not informed that their access price was derived as an 'average' for a network system only part of which is used by trains delivering coal to the power stations. And because of this, the power station may face significant access price rises in future but with no direct compensatory benefit.

It is worth considering that a rail system that served only the power stations would likely never have been built; and that the scale of a viable rail system that also serves the power stations is a substantially larger system than the parts used by the power stations. A relevant question to ask is what do the track paths look like that would have been available to other users if coal trains stopped running to the relevant power station? This goes to identifying the opportunity cost of the access service provider of selling a train path to a particular power station. This opportunity cost is relevant for determining the access price per train path that might be charged to a power station.

The main efficiency issue in this case seems likely to concern the question of whether Aurizon Network has an efficient array of prices across its network system and services. There would probably be little disagreement amongst regulatory economists that utility networks with market power are more likely to require customers to buy aggregates of products that contain more than what buyers want, than the options they would face if the market was effectively competitive. The reasons for this are alluded to above: historic practice; the cost of changing existing systems, and a lack of pressure to offer more disaggregated products due to a lack of alternative providers that buyers can switch to. Whether this is the case here it has not been possible to conclude.

Where each customer uses certain parts of a network but not others, or certain services but not others, pricing that accurately reflects all such differences may be too complex and lack practicability. A level of cost 'averaging' may be justifiable in such cases. This would be an application of the practicability criterion.

4.2.3 Tariff socialisation: Pricing of electric traction services

Background

Tariff averaging issues also arise in the case of Aurizon Network's December 2011 Draft Amended Access Undertaking (DAAU) to change the way users are charged for electric infrastructure. As background, the Goonyella system is intended to be an electric locomotive only system, and currently, both Aurizon National and Asciano operate electric trains on Goonyella. A relatively small number of diesel trains also operate on this system, mainly involving rail spurs that are not electrified. The Blackwater system is a mix of electric and diesel trains – Aurizon National runs electric as well as diesel, while Asciano runs primarily diesel.

The access price relating to the electric infrastructure is estimated separately for the Goonyella and Blackwater systems by dividing each system's annualised electric network costs by its electric traffic forecasts. The access charge diesel and electric trains pay on Blackwater for their use of the track is effectively the same. The overall access charge for electric trains is, however, higher than for diesel since electric trains must also pay for the electric infrastructure.

The existing electric infrastructure tariff on each system is an average price that is lower on the Goonyella system than on the Blackwater system due, in part, to higher utilisation of electric locomotives on the Goonyella system.

A principal claim made by Aurizon Network is that electric traction is more efficient if economies of scale are reached – referred to as the total cost of ownership (TCO). Along with average cost pricing, this also implies that the fewer are the number of electric traction users the higher will be the access price they are required to pay. The concern appears to be that a "tipping point" might be reached when users start to abandon the use of electric trains in favour of diesel trains. Aurizon Network's arguments are that electric infrastructure is unlikely to reach efficient volumes that would enable access prices charged to electric traction users to reflect the economies of scale available. The risk is that without a change to the existing regulatory arrangements, Aurizon Network's Blackwater electric tariff might spiral upwards resulting in Aurizon Network (and Aurizon National) facing a significant under-utilisation of their electric system assets[34].

In its DAAU (QR Network (2011) and during 2012[35] Aurizon Network proposed that:

(a) the electric infrastructure asset bases for the Goonyella and Blackwater systems be combined and a single electric tariff across both systems calculated,

(b) most diesel trains on the Blackwater system would pay the electric tariff, and

(c) future increases in the new combined AT_5[36] tariff would be limited to no greater than 5% in any one year by deferring recovery of electric revenue cap amounts.

In effect (a) and (b) would each contribute to lowering the Blackwater electric infrastructure access tariff which is currently significantly higher than the Goonyella electric infrastructure access tariff, and as a consequence the Goonyella access tariff would increase.

This situation is one involving the sharing of electrification costs among users who may not have paid those costs previously. This is not a situation where expanding demand has resulted in a capacity expansion.

Aurizon Network also claimed spill-over benefits to Goonyella users from the investment in electric assets in the Blackwater system. The argument made was that when buffer capacity[37] is required for Goonyella, electric locomotives can be diverted from Blackwater, which results in the following spill-over or unaccounted for benefits:

[34] Aurizon Network has provided capital guarantees for rail-specific infrastructure built by electricity transmission company Powerlink, in the order of $600 million.
[35] See the linked documents on the QCA's webpage, http://www.qca.org.au/rail/2010-DAUamend/ETS-Daau/
[36] The AT_5 tariff is an electric tariff component that recovers the costs of overhead electric infrastructure expressed on an electric gross tonne kilometre basis.
[37] Aurizon Network said that buffer locomotive capacity is required to manage fluctuations in demand, and locomotive and network availability (QR Network (December 2011), Submission to QCA, "Electric Access Draft Amending Access Undertaking", p.16).

(a) retaining the all-electric nature of the Goonyella system avoids the congestion costs that could result from the operation of multiple train types with different performance characteristics); and

(b) the diesel locomotives in the Blackwater system provide a reserve capacity for the all-electric Goonyella system. This is because any shortfall in capacity on Blackwater resulting from the switching of electric locomotives to Goonyella is managed through reserve diesel locomotives on Blackwater.

A number of important issues are raised by the DAAU, in particular the following:

(a) many of the miners using the Blackwater system have already underwritten substantial investments by Asciano in diesel traction. Thus they have sunk costs based on the existing pricing arrangements, and some of these assets may become uneconomic should Aurizon Network's proposals be adopted;

(b) the DAAU will change the pricing framework on which investment decisions in diesel traction were made previously by miners and Asciano[38];

(c) the proposals would require users in one system to contribute to the funding of the electrification of other systems, and

(d) a competitive advantage would appear to be provided to Aurizon National, which runs a substantial electric fleet in Blackwater, over its above-rail competitor Pacific National (Asciano), which runs mostly diesel trains in Blackwater.

Those most likely to lose out were Goonyella users, users of diesel traction in the Blackwater system and Asciano which has invested in diesel locomotives which it operates in competition with Aurizon National Coal's diesel and electric locomotive powered Blackwater services.

Aurizon Network proposals were vigorously opposed by several stakeholders. Aurizon Network's claim that electric traction was more efficient than diesel traction was refuted by several stakeholders.

The issues potentially involve issues of economic efficiency, competition and regulation. The matter was considered by the Authority in its July 2012 Draft Decision (see following section).

The Authority's involvement to date

In its July 2012 Draft Decision the Authority effectively rejected Aurizon Network's proposals contained in the 2011 DAAU. The Authority found Aurizon Network's case that Electric traction was more efficient than Diesel, unconvincing. It also considered there was insufficient evidence of buffer capacity spillover benefits for Goonyella users from running both diesel and electric trains on the Blackwater system. The Authority also considered that Aurizon Network's proposals would adversely affect competition in several above-rail markets and would, on balance, have an adverse impact on the interests of current and future access holders/seekers. The Authority concluded that Aurizon Network did not make a compelling case that the proposed changes would improved efficiency of below-rail markets, nor promote effective competition in above-rail markets. The Authority acknowledged that

[38] Asciano invested in diesel locomotives for Blackwater in 2008 and 2009, when Aurizon National argued there was not spare capacity for electric traction trains, although the rail network in general was not so congested; in effect Asciano had little choice but to invest in diesel locomotives.

the tariff structure may need to be reviewed in future to address concerns raised by Aurizon Network and stakeholders.

In January 2013 the Authority organised a meeting of stakeholders where the issues could be discussed. It published a discussion paper for discussion at this meeting. The paper reported the issues raised by stakeholders as:

(a) the need to consider AT_2[39] and AT_5 contemporaneously;

(b) optimisation of the Aurizon electric traction asset base;

(c) the relative benefits of diesel and electric traction;

(d) the disincentive to using electric traction in the short term; and

(e) the capital expenditure approval process.

With the abandonment of spill-over benefit arguments, the need to address AT_2 and AT_5 contemporaneously appears to have subsided.

Several options were outlined in the Authority's discussion paper:

(a) Retain the current asset base as optimised under the customer vote; and

(b) Re-optimise the access infrastructure given the lower level of access demand.

Option (a) would enable the existing WACC to be maintained. Option (b) on the other hand would mean that a higher WACC would need to apply to recognise optimisation risk (asset stranding risk).

The Authority's proposed solution would effectively involve the annual reset being abandoned enabling the access prices relating to the electric infrastructure to be reduced in the early part of the life of the assets, with the plan to attract more demand for electric traction because of lower electric access prices[40]. This strategy is aimed at allowing Aurizon Network more access pricing flexibility, potentially allowing it to capture sufficient economies of scale which would contribute toward Aurizon Network earning a fair return on its electric infrastructure investments. The idea is that Aurizon Network could reduce its access prices to electric infrastructure, so as to attract users and any losses incurred in the early years by Aurizon Network would potentially be compensated by profits that would accrue in later years as the costs were spread across higher volumes.

[39] AT_2 is the capacity component charge in the Reference Tariff and is charged on the basis of the number of reference train paths (rtp) the access holder has contracted to utilise. On average, the revenues from this component of the reference tariff have made up less than 10% of the overall revenue QR National earns from selling access service in any charging period, including take-or-pay revenues received from access holders (when they have not used their contracted paths).

[40] See p.5 of the QCA's January 2013 Discussion Paper, "Workshop on the Electric Infrastructure Tariff (AT_5)"

5. CONCLUSION

This paper has investigated options for pricing access to major expansions in utility capacity. 'Access' refers to the ability to purchase the services of a declared intermediate input used to produce a final service, where the access service provider may be vertically integrated downstream.

The economic literature on access pricing considers a much narrower range of pricing options than apply to retail pricing. This is partly because access price discrimination by a monopolist that is vertically integrated, can undermine competition between access buyers. Thus price discrimination by access sellers is usually limited by law. For this reason a single access price might be required across all capacity tranches in situations where different access prices risk undermining competition.

The roll of fairness in economic regulation has a relatively prominent role in this paper. The importance of the economic definition of efficiency to regulation is widely accepted, but the importance of fairness is less well understood. Fairness, as considered in this paper, is important because: (i) it impacts directly on efficiency – especially dynamic efficiency and the perceived investment environment; and (ii) because it reflects on regulatory governance which is also closely related to dynamic efficiency. Fairness is considered in more detail in a separate paper (QCA 2013).

The main fairness issues of relevance here concern the possible transfers of surplus between parties that occur because of regulatory decisions or unexpected game changing events where the allocations are significantly different to what all the parties would have agreed prior to any of them having incurred sunk costs. Regulatory decisions that result in the transfer of significant value between the parties risk being interpreted as a lack of respect for property rights. As a governance system that stands in place of private contracts largely because of ongoing commitment problems and the potential for hold-up, this paper highlights that regulation should reflect on the hypothetical case of what the parties would have agreed prior to any of them having incurred sunk costs.

Because of the importance of the particular circumstances that apply in each case to the pricing of new access capacity, it is not possible to define hard and fast rules that can be applied to price access to any capacity expansion efficiently and fairly. The pricing of access to major capacity expansions will thus need to be decided on a case-by-case basis. However, there are some key propositions that are based on relevant economic efficiency, fairness and governance principles that can help in arriving at fair, efficient and practical regulatory decisions.

The key propositions that apply when capacity is already committed to 'established' users through long-term take-or-pay contracts, are as follows.

(a) If average costs are decreasing substantially with capacity, adding the expansion costs to the cost base of the established capacity will usually provide an acceptably efficient and fair outcome. An exception would be if foundation customers signed take-or-pay contracts which included a clause that enabled them to pay the price of the lowest cost tranche of capacity.

(b) If average costs are increasing substantially with capacity, a separate access price should normally be calculated and charged to those whose capacity underwrites the new tranche of capacity, which reflects the average cost of that new capacity.

A conventional explanation for (b) is that where new users are different from established users, averaging the costs of established and new capacity will involve the new users paying less than the cost their incremental demand causes. Established users would also be paying more than prices consistent with the average stand-alone cost of serving them. From this perspective a price that averaged the cost of existing and new capacity (a 'socialised' price) would in effect entail a subsidy from existing users to new users.

An additional argument supporting (b) is that established users may have committed to purchase capacity with an expectation that the regulatory arrangements would lead to a cost-based price that related reasonably closely to the cost of the capacity that they had contracted for rather than a price that would escalate significantly to reflect higher costs of any subsequent capacity expansion. This expectation about a reasonable price is referred to in recent economic papers as a 'reference transaction'. Prices that deviate substantially from what is considered to be a reasonable reference transaction are likely to be perceived as 'unfair'. They may both deter certain efficient investment and reduce confidence in efficacy of the regulatory arrangements.

Note that even if established and new capacity is inseparable in use, i.e. it is not practical to physically allocate all new capacity to new users for their exclusive use, and established capacity to established users for their exclusive use; the new capacity costs can still be identified and charged to the new users.

If there are no long-term contracts or a customer group for which there is a reference transaction, then all demand can be said to contribute to total demand and the same price should prevail across established and new capacity. However, under these circumstances a level of allocative inefficiency is likely unless a two part tariff is applied where the unit price reflects the unit cost of the most recent capacity tranche. This is primarily because marginal demand will typically be substantially more responsive to the price of access compared to what it would be with long-term contracting. However, in practice the situation of there being no long-term contracts is rare at least and thus pricing inefficiencies are not practically important.

Finally, if the capacity is functionally different, separate access prices might be required.

APPENDIX A: A SIMPLE ECONOMIC MODEL OF CAPACITY EXPANSION

This chapter/annex presents a simple economic model to illustrate the approaches to pricing major expansions to capacity discussed in Chapter 3. The implications for pricing when the cost of new capacity is equal to or higher than the cost of existing capacity are illustrated. Alternative pricing rules for these situations are analysed.

Framework

The model developed here is intended to illustrate the options for pricing access to capacity expansions that are both significant and lumpy. 'Lumpiness' is defined in various ways in the economics literature. For present purposes a lumpy investment is defined as a situation where providing capacity for a small increment in demand requires building a large increment of capacity. In this case there are typically significant economies of scale relative to the size of the market.

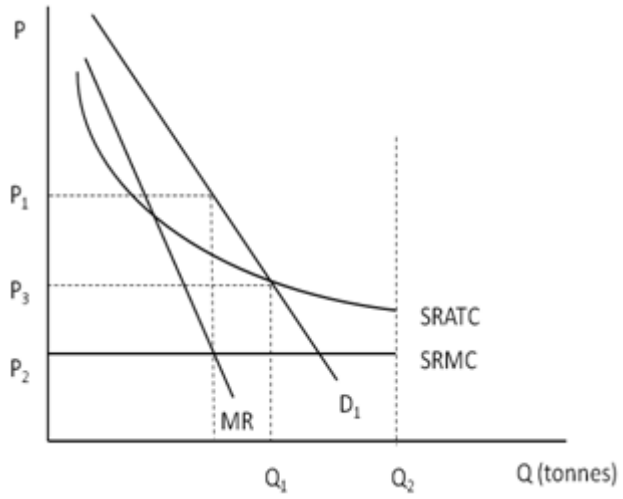
This can be illustrated with a simple model of railroad expansion. Consider the decision to build a railroad from a mining region to a port. The line is capable of handling a large number of trains. Even if the initial requirement is for only a single 10 car train, the investment required might be the same as that required to handle a multiple number of trains.

An increase in demand for rail capacity can be accommodated, at least up to some point, without additional investment. Cars can be added to the train or additional trains can be added to the line. However, with growing demand the line will eventually become congested so that longer trains or additional trains cannot be accommodated. At this point an additional mine to port track must be added to increase capacity[41].

Figure 1 illustrates this situation. The significant lumpy investment required to build the railroad allows shipment of a maximum of Q_2 tonnes from the mine. For simplicity it is assumed that there is a fixed capital investment and a constant marginal cost per tonne shipped. The short run average total cost of using the line is SRATC. The short run marginal cost curve (SRMC) reflects the constant cost per tonne shipped. D_1 shows the initial demand. As the quantity shipped on the line increases, the cost per tonne falls as the initial fixed investment is used more intensively. When the capacity of the line is reached at Q2 no additional tonnes can be shipped.

[41] Real world investment and expansion decisions are obviously more complicated than the stylised model presented here. It will be less expensive to build a single track railroad to carry a single train than it would be to build a line capable of taking the stress of a heavier traffic load. There may be incremental investments that can be made to increase the capacity of a single line railroad. For example, sidings and sophisticated signalling systems can be added to allow trains going in opposite directions to pass one another thus increasing the capacity of the line. These complications are ignored here, but the underlying principles would apply to decisions to expand the capacity of a single line track by these means.

Figure 1: Initial Cost and Demand



Pricing for Initial Demand

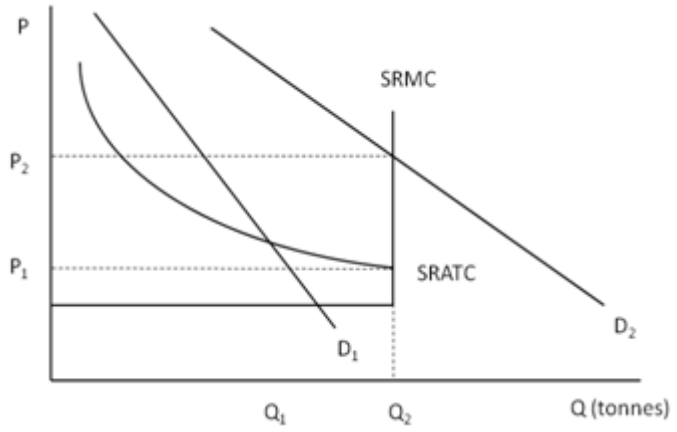
Before considering the implications of investing in a second line it will be useful to consider how prices for using the initial line should be determined. A number of observations are relevant at this point. First, the railroad is a natural monopoly. Dividing the initial quantity demanded between two separate railroads will cost more than shipping the entire quantity demanded over a single railroad. An unregulated monopolist would maximise profits by charging a price for access that exceeds average total cost. For example the monopolist would charge at P_1 in Figure 1. This is the price corresponding to the profit maximising quantity – where marginal revenue equals marginal cost. The monopolist would earn substantial profits at this price.

The ability of the monopolist to charge excessive prices is a primary motivation for regulating the railroad. Allocative economic efficiency requires prices to equal short run marginal cost. When price equals short run marginal cost the customer for the railroad is paying for the actual resource costs additional traffic imposes, and no more. In the example in Figure 1 this occurs at P_2. But at P_2 the railroad operator loses money – it cannot recover the full cost of building and operating the railroad. For this reason regulators typically set prices at average total cost – P_3 in the diagram. At P_3 the railroad operator does not earn excess profits but does achieve revenue sufficient to cover its costs and justify the investment.

Figure 2 shows an increase in demand from D_1 to D_2. The Figure also shows that after the maximum physical capacity of the railroad is reached the railroad will experience congestion costs, represented by the vertical portion of the short run marginal cost curve[42]. Charging at the average total cost of providing the maximum possible capacity (P_1) will result in excess demand – the miner will want to ship more tonnes than the railroad can carry. The marginal buyer would be willing to pay P_2 for an additional unit, if the capacity were available (determined by the intersection of the vertical portion of the short run marginal cost curve with the demand curve D_2). Again, the efficient solution is to charge a price equal to short run marginal cost. Price would increase to P_2 and the quantity demanded and supplied would be in balance.

[42] When there are capacity constraints short run marginal cost equals short run production cost plus the opportunity cost of not serving marginal demand which is represented by a price that would clear the market given the capacity constraint. The opportunity cost of not serving marginal demand is also referred to as marginal congestion cost.

Figure 2: Increase in Demand Resulting in Congestion Costs



Pricing in this manner recognises the scarcity value of the capacity. However, just as in the case where the quantity demanded is less than capacity, marginal cost pricing may not be feasible due to procedural or other constraints or may be considered to be unfair due to the transfer of rent to the access provider. If marginal cost pricing including the marginal value of congestion costs cannot be implemented, demand must be rationed by non-price means – for example using a rule of thumb such as 'first in line first in right'. In effect, there is an opportunity cost that reflects that some excluded users value capacity more than some users who are served.

Finally, it should be noted that demand exceeding capacity is not a sufficient condition for building additional capacity. New capacity cannot be justified unless the costs of congestion exceed the cost of building the new capacity.

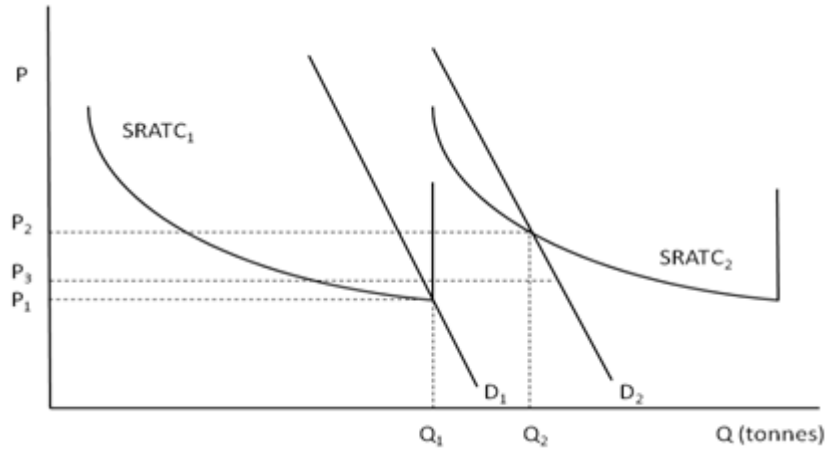
Pricing for Capacity Expansions

Assume now that it is efficient to build the second track because the congestion costs are high enough to justify the capacity expansion. In general, it might be expected that it will be more expensive to supply units of the new capacity than it is to supply the existing capacity. Figure 3 shows the addition of the new line on the assumption that the costs of building and operating the second line are identical to those of the first. New demand can be measured from Q1, the limit of the existing capacity.

Given the expected demand and the lumpy nature of the investment, the average total cost of operating the second line is higher than the average total cost of operating the first line because the second line is being utilised below capacity. In the situation shown a price of P2 for using the new capacity would allow the recovery of average total costs for the new capacity. Only in the unlikely event that the new capacity is fully utilised at the outset would the average total costs for using the new and old capacity be the same[43].

[43] Construction input prices (for example, land values and capitalised construction labour costs) may have increased in real terms since the original track was built, implying that for any given quantity of output the average costs of the expansion capacity will be higher than shown. This might imply that the cost of using the expansion track would be greater than that of the original track even if the new track were to be used at capacity. Alternatively, if there has been technological change or there are economies of scope in providing the second line, the new SRATC curve could be below the old one. If demand were sufficient, the cost of the new track could be below the cost of the original one.

Figure 3: Capacity Expansion



If there is only one customer for the railroad, the pricing problem is simple. The customer would be charged a per tonne rate equal to P1 for the first Q1 units and a price of P2 for the incremental quantity demanded beyond that point, which is effectively the weighted average total cost of the two lines. This blended price would satisfy the regulatory constraint that the railroad operator recover its full costs.

Multiple customers complicate the pricing problem. Two pricing rules can be considered:

Pricing rule 1: Charge existing users the old price and new users the new price, which effectively allows the infrastructure provider to recover its total costs. Existing users would pay P1 and new users would pay P2. One way to do this is to 'grandfather' existing demand units at the pre-existing price. If the users of the old capacity have entered into contracts with the access provider to take capacity at a certain price, their prices are grandfathered for the term of the contract by definition.

Pricing Rule 2: Charge an average price sufficient to recover the new average cost of operating the combined facility (Total Cost/(Q1 + ΔQ)). P_3 in Figure 3 illustrates this result. P_3 lies in between the short run average cost of providing the old and new capacity.

The economic efficiency impacts of these two alternatives may differ. In the case of differential pricing (pricing rule 1) there will be allocative efficiency losses due to the deviation of price from marginal cost for new demand, just as there is an allocative efficiency cost for the old demand. The efficiency impacts of pricing rule 2 are ambiguous, and will be affected by the relative marginal costs of providing the old and new services and whether demand for new service is more or less elastic than demand for the old service. Price averaging increases the efficiency loss from the old service and reduces the efficiency loss from the new service, compared to de-averaged prices.

With a uniform price (rule 2) existing users will be paying higher prices than they were before. These existing access customers will understandably consider it to be unfair to pay higher access rates (unless, of course, the new users and the existing users are the same and impose costs in similar proportions). However, if it is impossible or too difficult to distinguish old and new users, then averaged pricing appears to be the only alternative. If existing customers do not have long term supply contracts and are effectively buying in a spot market (that is, there is no 'reference transaction') the case for distinguishing between old and new usage is not strong.

If the original users were incurring congestion costs, they might consider themselves better off even if they have to pay a higher price after expansion. At least some of these customers were in effect incurring opportunity costs due to congestion or, if the regulator allows congestion pricing in this hypothetical example, were paying the marginal cost of congestion directly.

In competitive markets with many buyers and sellers and homogeneous services, there can only be one price in the market, determined by the intersection of the market demand curve and the marginal cost curve[44]. In a competitive market with increasing long run average costs an increase in demand will lead to everyone paying higher prices. Suppliers using lower cost inputs would earn economic rents. However, economic efficiency is achieved because prices will be at marginal cost.

Implications of Average Cost Pricing

As noted above, regulators generally set prices to allow firms to recover their average costs. This is done to ensure revenue adequacy without the need for subsidies, which would be required if prices were set at marginal cost[45]. As explained below, in the case of major capacity expansions where firms contract a priori for the additional capacity, the efficiency concerns do not necessarily arise.

The key transaction from an efficiency point of view is the contract between the miner and the railroad operator to build the facility. In a market where there are multiple suppliers willing to build the lumpy facility, efficient bargaining will result in a contract that recovers the full economic costs of building the facility – and no more.

Marginal cost pricing ensures that the customer for the railroad is paying for the actual resource costs additional traffic imposes, and no more. When capacity is provided to a small group of customers at their request, these customers are in effect causing the capacity costs to be incurred and economic efficiency requires that they pay for both the capacity charges and the cost of operating the new capacity. In this sense the customers are paying the long run incremental costs incurred by the railroad[46].

Economic efficiency losses from average cost pricing may not be significant even in the case where only short run costs are considered. If the miner's cost of rail transportation is small relative to total downstream revenue, its demand is likely to be inelastic (see Diewert 1971). Efficiency losses from departing from marginal cost pricing will be small if demand is inelastic. This is illustrated in Figure 4.

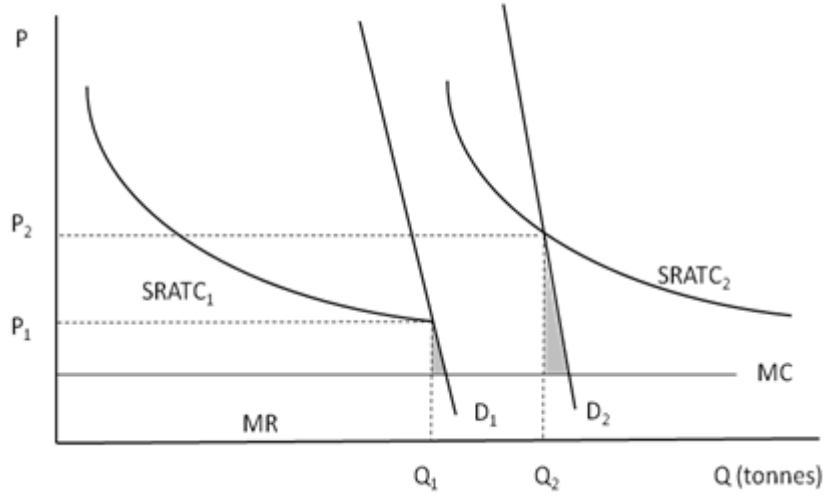
The difference between marginal cost and average cost may be large, but the loss in output due to average cost pricing is small. The efficiency loss is measured by difference between marginal cost and the price charged times the output lost divided by two (the shaded triangle formed by the demand curve and the intersection of the line measuring the differences in price and quantity between the efficient and average cost situations). The output loss is small. Therefore, the efficiency loss is small. After a capacity expansion there will be another efficiency loss, but it will be correspondingly small relative to the total cost.

[44] A single price is the result of a competitive market but is not necessary to achieve economic efficiency. The efficient level of output can be achieved with perfect price discrimination – that is, charging for each unit of output at the maximum buyers are willing to pay.

[45] In some cases regulators might apply two part tariffs to allow usage charges to be set at marginal cost while allowing capacity charges to be recovered from fixed charges.

[46] In the long run all inputs can be varied. Pricing at long run marginal cost allows recovery of all investment and operating costs and is appropriate when the relevant "margin" involves a decision to build a large increment to capacity.

Figure 4: Efficiency Losses from Average Cost Pricing



If the loss of efficiency is considered significant, it may be addressed with a two-part tariff. Total costs would be recovered through a fixed capacity charge paid by all customers and a usage charge based on marginal cost. This approach may not always be possible or appropriate, particularly in the case of access pricing where price discrimination may harm access seekers that are competing with one another in downstream markets.

REFERENCES

ARTC (2011), "Hunter Valley Coal Network Access Undertaking" (23 June).

Dalrymple Bay Coal Terminal, "2010 Draft Access Undertaking, Final Decision" (September).

Diewert, W.E. (1971), A Note on the Elasticity of Derived Demand in the N-Factor Case, Economica, pp. 192-198, May.

Kahneman, D., J. Knetsch, and R. Thaler (1986), "Fairness as a Constraint on Profit Seeking: Entitlements in the Market", *American Economic Review*, Vol. 76, No. 4, pp. 728-741.

QCA (2013), "Regulatory Objectives and the Design and Implementation of Pricing Principles", Discussion Paper.

QCA (2012), "Risk and the Form of Regulation", Discussion Paper.

QCA Draft Decision, (2012), "QR Network Electric Traction Services Draft Amending Access Undertaking" (July).

QCA (2010), "Final Report, Gladstone Area Water Board: "Investigation of Pricing Practices", (June).

QCA. (2005), "Gladstone Area Water Board: Investigation of Pricing Practices". Final Report (March).

QR Network (2011). "Draft Amending Access Undertaking for Sustainable Electric Traction Pricing" (December).

QR Network (2009), "Draft Access Undertaking", Draft Decision, (December).

Queensland Resources Council (2011) "QRC Issues paper, 8" (February).