QR response to Authority's draft decision on DBCT

26 November 2004

1. Introduction

QR welcomes the opportunity to comment on the Authority's draft decision ("Draft Decision") relating to the Dalrymple Bay Coal Terminal (DBCT) draft access undertaking.

In reviewing the Draft Decision, QR is concerned that the Authority has not exercised sufficient caution in its analysis of the risks and returns associated with the DBCT.

Access regulation is based on ensuring that infrastructure owners only earn a normal level of return. However, this requires separating what is a normal variation in return from monopoly rents. If the regulator inadvertently clips the normal return in this process there will be a disincentive for future investment.

While QR recognises that the Authority needs to exercise its judgement to determine a normal level of return for the DBCT, this should be done after considering the potential consequences of inadvertently providing a disincentive for future investment. QR contends that the Authority should err on the upside when assessing normal levels of return as the potential costs of too high a return are outweighed by the costs of underinvestment or delayed investment.

As such, it is in the best interest of the public and infrastructure users that there are sufficient incentives for future investment in coal supply infrastructure; especially given that the recent growth in the demand for export coal may soon be constrained by the capacity of existing rail and port infrastructure. That is, with looming capacity constraints, the potential downside risk of underinvestment in coal supply infrastructure outweighs the potential costs of allowing an above normal level of return to infrastructure investors.

Key issues which may impact on the attractiveness of future infrastructure investment opportunities and are therefore covered in this response include:

- The risk of assets being stranded before investors are able to recoup their capital investment;
- The need to reconsider the key inputs used to determine a fair risk-adjusted rate of return; and
- The extent to which the Authority recognises and remedies asymmetric risks.

2. Stranding Risk

Real stranding risk for DBCT presents due to a range of possible causes, including:

- failure to recover depreciation before exhaustion of economic reserves; and
- premature (unexpected) mine closures.

The preferred basis for dealing with stranding risk is to provide a clear regulatory commitment to full capital recovery for all regulated assets as this is the simplest and cleanest mechanism to address stranding risk while not distorting investment incentives. However, this approach does not provide any compensation for residual stranding risk and to the extent that such a risk remains, QR believes that DBCT should be able to recover a

stranding risk premium, taking into account the probability of asset stranding beyond the assumed economic life.

2.1. Exhaustion of economic reserves

The extent to which mines in the Goonyella system may face exhaustion of economic reserves has been estimated by AME July 2002[1] which would suggest there may be an under recovery of capital for DBCT due to completion of mining activities prior to assets being fully depreciated.

This does not account for the impact of changes in international coal prices or exchange rates on the level of economic reserves and in many cases assumes that adjacent deposits to existing mines will be developed.

While the international coal market is currently highly buoyant, it is only reasonable to expect that this will vary quite dramatically over the typical 50-year life of rail assets and even longer for port assets. This is especially the case as mines generally first develop their most accessible reserves progressively moving into more marginal areas (for example, deeper coal seams/increased overburden in open cut mines and/or lower grade deposits).

2.2. Premature mine closures

There is a range of reasons why mines may be prematurely closed, including:

- geological conditions and safety concerns;
- the mines becoming uneconomic in isolation;
- the mines remaining profitable but becoming uneconomic in the context of a mining company's portfolio of mines.

It is sometimes forgotten that mining remains a risky activity, even with the advanced technologies able to be deployed. It is simply not always possible to detect geological conditions and how they may affect the efficacy of mining operations until after substantial investment is sunk and mining operations commence, particularly for underground mines.

It is also possible that mines may be closed before the scheduled depletion of the resource due to the combination of adverse mining conditions and market movements. Whilst the coal mining industry is currently enjoying extremely favourable conditions, it must be remembered that the continued profitability of mining depends very much on coal prices and exchange rates.[2]

The sensitivity of mining company profits to changes in price is highlighted by the impact of the appreciation of the Australian dollar against the US dollar over the last year. For example, in February 2004, Macarthur Coal issued a revised Net Profit After Tax (NPAT) forecast of between $6 million and $7.5 million for the 2003/04 financial year[3]. This included a negative $6.4 million impact on NPAT associated with a 5.5% rise in the AUD/USD exchange rate since the last profit forecast.

In fact, Macarthur Coal indicated that first half year performance in 2003/04 was expected to be a loss of $2 million. However, substantial USD price increases for new Japanese contracts were mooted as underpinning substantially improved profits in 2004/05.

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1 AME Mineral Economics (2002) *Analysis of the Global Coal Industry*, Confidential Report to QR.
2 See also Appendix A Table 1 – International Mine Closures
3 Macarthur Coal ASX release, 9 February 2004

Nevertheless, the 2003/04 first half loss indicates the extent to which profits and therefore ultimately commercial viability can change in very short periods of time.

Clearly, these changes are yet to threaten the viability of the mine – as, at least in the short term, continued production will be driven by cash costs for mine operations (so long as decisions are not made on the basis of the impact of the mine on a mining company's portfolio of assets).

However, it does serve to highlight that mines face a real exposure to volatility in prices and exchange rates, and that it is conceivable that even within the next 5 to 10 years, production at some mines could be shut down unexpectedly especially if we experience adverse changes in both the coal price and the exchange rate contemporaneously.

2.3. Implications for DBCT

Reduced demand from an exhaustion of economic reserves and/or mine closure increases the implied full cost recovery tariff above a commercially viable level, thus limiting the ability to recover sunk capital. In turn, this may well create a risk of asset optimisation at a subsequent regulatory review.

In Chapter 8 of the Draft Decision, it is noted that the DBCT User Group accept that "*the straight-line approach would enable the Authority to alter the depreciation profile of the terminal in future regulatory reviews should an asset stranding risk arise*" (DBCT User Group, sub. no. 5: 68).

It is also noted that the DBCT User Group submitted that "*the proposed economic constraint of 50 years effectively operates as an accelerated depreciation arrangement, resulting in higher charges for users. This effect arises because the constraint shortens an asset life from the outset of regulation and increases the amount of depreciation for that asset during the regulatory period*" (DBCT User Group, sub. no. 5: 67-68). QR submits that an accelerated depreciation arrangement **does not increase the charges over the life of the asset**, but that it merely provides for higher charges during a period of relatively high coal prices.

QR agrees with DBCT Management's and Connell Hatch's proposal that accelerated depreciation be applied to the lives of the terminal assets due to the potential for various factors, such as demand shocks and/or a weakening in the competitive position of Australian coal exports, to strand the assets.

QR further notes that the Authority considers that, in order for an economic constraint to be placed on the life of the terminal site, it must be demonstrated that such limitation is reasonably likely to arise during the period in question (ie 50 years). QR submits that this same test should apply for periods in excess of 50 years as the ultimate acceptance of an 80 or 100 year life without the application of this test is tantamount to a failure to recognise the limitation of economic constraint.

QR notes that the Authority did not have, at the time of the draft decision, evidence presented to support the likelihood of such a limitation. Whilst QR acknowledges that Energy Economics, for example, has forecast a relatively high rate of future growth for coal exports from DBCT, such long term forecasts are by their very nature very uncertain.

Whilst currently, the low cost structure of Bowen Basin coal production makes it very competitive in world coal markets, there is no certainty that the Bowen Basin's competitiveness against other world coal producing countries will continue due to

significant factors outside the control of the local players[4], for example exchange rate and taxation differentials.

Further events that could jeopardise the Bowen Basin's competitive position in the world coal market could involve the liberalisation of the economies in coal rich developing countries. Venezuela and Colombia are examples where changes in government policy involving foreign ownership and investments, including the privatisation of coal production in recent years have seen an enormous growth in coal exports[5]. Further moves by similar developing countries could 'change the coal markets', whereas the possibility in Australia (in comparison with these developing countries) is potentially only 'at the margin'.

In addition, the recent ratification of the Kyoto Protocols, possible further introduction of carbon taxes, and improved economics of alternatives to coal may further impact on the long term viability of the coal industry generally. Attachment B is a press release from CSIRO, indicating the potential for example for Titanium to replace steel. This would significantly impact on the demand for coking coal, used in the making of steel.

All in all, this makes long term forecast, i.e. beyond the 30 year mark, highly uncertain. This uncertainty would lead QR to support a limit on the economic lives of long term assets.

3. Cost of Capital Parameters

While determining a fair risk adjusted rate of return appears straight forward (i.e. using weighted average cost of capital methodologies which are in turn based on the Capital Asset Pricing Model), this is not the case. The key problem being that to determine a fair rate of return, the Authority must determine a preferred value for a range of key inputs.

Many of these inputs (e.g. market risk premium, equity beta, and gamma) are subject to significant debate and cannot be determined with any great precision. Not surprisingly, whatever value the regulator chooses is likely to be subject to criticism either from the service provider (whose profitability is impacted) or the service user (whose costs are impacted).

However, the determination of a fair rate of return not only has a distributional impact between the current owners and users of the infrastructure, it also impacts perceptions of what returns will be available for future investments in infrastructure. QR contends that given the looming capacity constraints in coal supply infrastructure, the Authority needs to err on the upside when assessing cost of capital inputs as this will assist in creating the right environment for future investment.

QR wishes to comment on the following parameters relating to the determination of the Cost of Capital as outlined in Chapter 9 of the Draft Decision:

- Market Risk Premium
- Dividend imputation (Gamma)
- Comparator companies used for assessing the asset beta
- Asset beta adjustment

[4] mining companies, ports, rail operators, rail managers, etc

[5] AME Thermal Coal Outlook, November 2004

3.1. Market Risk Premium (MRP)

The Authority considers that the MRP should be 6% based on previous regulatory decisions, and refuted argument by DBCT Management as it is based on a single empirical study.

QR disagrees with the Authority and considers that the MRP should be 7%. In QR's Supplementary Submission B to the Draft Access Undertaking (2005), QR provided empirical evidence supporting 7% based on long term averages, and refuted arguments that structural changes have occurred so that current MRP is more appropriate.

There exists much empirical evidence on MRP both in Australia and in other markets:

- US evidence from Ibbotson Associates indicates that for a 75 year period to 2000 the MRP is 9.2%;
- Merton (1980)[6] estimates historical US MRPs to range from 8% to 12%;
- Welsh (2000)[7] found that the average US MRP was 7 – 8%;
- The most commonly referred to evidence in Australia is Officer (1989)[8] where for a 106 year period to 1987 the MRP was found to be 7.94%. With using updated data to 2000 the MRP is closer to 7%;
- Bowman (2001)[9] suggests that using a historic calculation is fundamentally flawed. He suggests that one should consider a forward-looking MRP, and argues for an appropriate MRP of 7.8%.
- QR found that the MRP from 1903 to 2003 was 7.88%.

The MRP is time varying depending on the period used to determine the average MRP. A short period of averaging will result in large variations in the MRP. QR considers that the best estimate of a "true" long term MRP is one based on a long past history, particularly where long life assets are involved. For example, using 30 years of data will result in an average MRP of approximately 7%.

An alternate approach would be to use a method that utilises historical data and places more weight on the latest observations. An Exponentially Weighted Moving-Average (EWMA) model is appropriate on theoretical statistical grounds. The results of an EWMA model is a MRP of 7.44%

The MRP fell over the last twenty years. Some claim that the fall is due to the introduction of dividend imputation in 1987, but this cannot be supported as the MRP also fell in the US where dividend imputation does not exist.

Another claim is that there has been a change in capital structure over time. However, QR found no evidence of a change in the average capital structure of companies in the ASX 200 Index over the last ten years[10].

In summary, QR considers that 7% is a reasonable MRP.

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[6] Merton, R., 1980, "On Estimating the Expected Return on the Market: An Exploratory Investigation," Journal of Financial Economics (v8), pp 323-361

[7] Welch, I., 2000, "Views of Financial Economists on the Equity Premium and on Professional Controversies," Journal of Business (v73,4), pp 501-537

[8] Officer, R., 1989, "Rates of Return to Shares, Bond Yields and Inflation Rates: An Historical Perspective" in R. Ball, P. Brown, F. Finn and R. Officer, Share Markets and Portfolio Theory, University of Queensland Press, pp 207-211

[9] Bowman, R., "Estimating Market Risk Premium," JASSA, Spring 2001, pp10-13

[10] QR "Review of Cost of Capital Inputs for the 2005 Review of QR's Access Undertaking", April 2004, p21.

Given the significance of the MRP as an input to the cost of capital, QR considers it imperative that the Authority not only look to the regulatory precedents, but also consider the new and more current empirical evidence presented in determining the appropriate MRP.

3.2. Dividend Imputation (Gamma)

The Authority has decided to retain the value of gamma of 0.50 from previous decisions, which consisted of an utilisation rate of 0.625 and the imputation credits to tax paid ratio of 0.80. QR disagrees with the Authority and considers that the gamma should be 5%[11].

The values adopted by the Authority were those identified by Hathaway and Officer (1999)[12]:

- Tax credits are redeemed by the ultimate consumers of the tax credits. Each equity holder places a different value to imputation credits depending on their status. Hathaway and Officer found that the redemption factor was about 60%.

- The firms' dividend policy affects the value of the imputation credits. Not all firms pay a dividend, the dividend clientele argument allows for differing firms to have differing policies. Dividend imputation has seen pay-out ratios increase marginally. Hathaway and Officer found that 80% of company tax payments are distributed as imputation credits.

There exists many reasons for a gamma of less than one in a competitive market and the empirical evidence on market behaviour supports the arguments. QR believes that the value of gamma should be market determined as suggested in numerous regulatory decisions by both the QCA and the ACCC.

The market approach is one that uses a gamma that would be applicable if the organisation was a listed company. QR has calculated the value of gamma using data from 1990 to March 2004.

Table 1: QR Study with updated information

	Gamma	No. in sample
Officer 1985 – 1995	44%	1482
Total Current Study 1990 - 2004	39%	2918
1/1/1990 - 30/6/1991	25%	147
1/7/1991 - 30/6/1996	36%	827
1/7/1996 - 30/6/2000	33%	884
1/7/2000 - 31/3/2004	4%	1060

The methodology adopted by QR is the same as the Officer and Hathaway study. The period of analysis commenced in 1990 when the Government introduced a restriction on dividend streaming. Dividend streaming allowed firms to direct imputation credits to particular shareholders to ensure that any imputation benefit was not wasted. The stopping of dividend streaming had the expected effect of lowering the value of gamma.

[11] QR "Review of Cost of Capital Inputs for the 2005 Review of QR's Access Undertaking", April 2004, pp40-47.

[12] Hathaway, N., and R. Officer (1999), "The Value of Imputation Tax Credits", Finance Research Group, Melbourne School of Business.

During 1990 to 2000 there were a number of changes in the corporate tax rate, which had no effect on the value of gamma as little or no benefit was gained or lost just by a change in the corporate tax rate. A lower rate would mean a smaller imputation credit but a larger cash dividend.

During the late 1990s the Government removed indexation in the calculation of capital gains while introducing a 50% allowance. This change in legislation may have enhanced capital gain returns and reduced the relative benefits of dividend imputation.

Overseas shareholders cannot access imputation credits, but prior to 2000, they had devised schemes in which they would sell the shares to domestic investors just prior to the ex date and buy them back after the ex date. The domestic investors would benefit from the imputation credits and they were not wasted.

In 2000 the Government further limited imputation benefits by restricting trading in imputation credits and putting overseas investors at risk. This has been a structural change that lowered the value of gamma after 2000 significantly.

The QR study found a gamma value of 4% applicable after 2000.

Given that the Authority has retained the Officer CAPM, QR considers that the value of gamma should be revised to reflect market behaviour post 2000 and it should not retain the pre 2000 results.

The cost of capital is highly sensitive to the value of gamma employed; therefore, QR considers it imperative that the Authority take the new and more current empirical evidence into account in determining the appropriate value of gamma.

3.3. Comparator Companies

The Authority has relied upon a report prepared by Allen Consulting Group (ACG) for the choice of comparator companies. ACG has chosen comparator companies which have resulted in a low equity beta that is likely to be subject to significant criticism.

In this regard, QR's key concerns with the ACG's choice of comparators are:

- The decision to shift away from comparators based on a similar line of business – e.g. use of Macquarie Infrastructure Group and Macquarie Office Trust;
- The ignoring of industry averages which would encompass and reflect the systematic risk of the operations of DBCT;
- The use of a small number of comparators - measurement error can be reduced by maximising the sample size; and
- Reliance on point estimates with little consideration given to a reasonable and likely range of estimates.

Generally speaking QR believes that options for possible proxies for comparators could be grouped as follows,

- Prime Infrastructure
- Industries with similar systematic risk characteristics
- Specific firms with similar characteristics

Each of these possibilities has its own problems in terms of application.

In the case of just using Prime Infrastructure itself, there is not yet enough observable market data to obtain a reasonable approximation of the systematic risk of Prime. ACG provided a limited analysis of Prime and concluded with a point estimate. As data is limited, the range of possible asset betas is very large. Reliance on a point estimate calculated from limited data may be misleading if one ignores the range of reasonable estimates.

In addition, Prime has other investments in its portfolio leading to the need for adjustments to the calculation. An assessment on the basis of Prime alone would tend to indicate a larger systematic risk than suggested by the point estimate provided by ACG.

Using averages for related industries such as the coal industry, mining services or ports generally would provide broad approximations of the systematic risk of DBCT. The operations of DBCT are very closely linked to the coal industry, to ports obviously and to mining services. The systematic risks of these industries would certainly result in an asset beta estimate greater than 0.35 suggested by ACG.

ACG has adopted an asset beta based on a sample of only three firms. Industry averages have been ignored. One of the problems with ACG using a small limited sample is sampling error – the sample taken is not indicative of firms with similar characteristics to DBCT. If sampling error occurs, the results of the analysis will not be indicative of firms in the systematic risk class of DBCT.

There is a large range of the estimates for the three firms. One firm, which is one third of the sample, has a negative beta. Using such selective sampling may mean that the results of the analysis may very well be biased.

Using specific firms with similar characteristics introduces non systematic risks into the analysis and becomes far more problematic. QR is of the view that too many differences exist between DBCT and the businesses of the comparators chosen, particularly the two non-port related entities, for the analysis of the Authority's consultant to be relied upon in the manner it has.

As stated earlier, the exercise of judgement by the Authority brings with it the risk of determining a less than normal rate of return with the consequential disincentives for investment in coal supply infrastructure. As such, QR would encourage the Authority to take a more conservative approach to determining comparators and therefore a more appropriate equity beta.

Advice available to QR would indicate that, on the basis of normal practice and by reference to regulatory precedent, the equity beta for DBCT should be considerably higher than that selected by the Authority and its consultant.

3.4. Asset Beta Adjustment

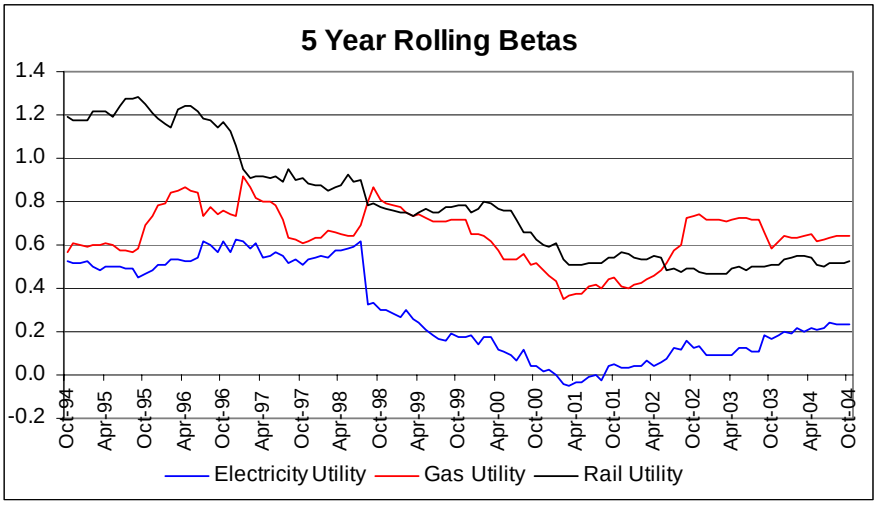
The Authority has relied upon a report prepared by Allen Consulting Group (ACG) for the Asset Beta proxy. ACG provided an argument for an adjustment to the asset beta because of the dot.com bubble. They argued that the asset beta is understated due to the bubble.

ACG noted that the Australian share market did not have the same rise and fall as the US during the dot.com bubble. The following diagram is the NASDAQ index. It can be seen that the dot.com bubble occurred from the beginning of 1999 to early 2001.

Figure 1: NASDAQ. Source of data, Bloomberg

The effect of the dot.com bubble is much easier to see when viewing a large sample of firms experiencing the same event. Figure 2 below illustrates some sub-indices of the US market (there is no such index in the Australian market).

Figure 2 Indices in the US Market. Source of data, Bloomberg



Equity betas have been calculated using sixty monthly observations. Over time when a new observation is added, the oldest observation is dropped. The rolling beta for three utility type industries has been calculated. It can be seen that both the rail and electricity industry betas have fallen with the dot.com bubble.

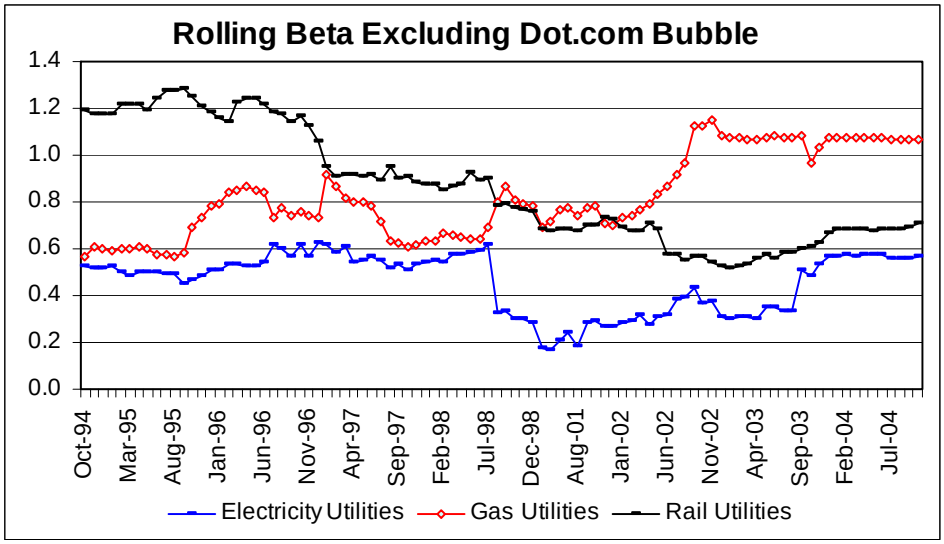
ACG has attempted to eliminate the effects of the dot.com 'bubble' in beta estimates for sample firms.

> "As a result of these recent market disruptions, we have analysed betas for proxy companies at calendar year intervals from 1997 to 2003. Since the

year 2000 was watershed between the pre-bubble and post-bubble measured betas, we have omitted this year and display average betas for two sets of three years, 1997-1999 and 2001-03. This separation provides a clearer picture of the general impact of the bubble on asset betas in the period that includes data for the year 2000. In this manner it is possible to estimate the effect of the bubble and the likely course of future measured asset betas."[13]

If we consider that the bubble is an aberration, transitory, not indicative of the future, then it is reasonable to adjust. However, the correct adjustment is not to view the beta up to the bubble then again after the bubble (which is what ACG did). The correct method is to remove the outlier, and exclude the bubble data all together.

Figure 3 Indices adjusted for the dot.com bubble. Source of data, Bloomberg



The rolling beta excluding the dot.com bubble results in a higher equity beta. The effect is summarised in table 2.

Table 2: Betas adjusted for dot.com bubble. Source of data – Bloomberg

	Electricity	Gas	Rail
With the Bubble	0.23	0.64	0.52
Without the Bubble	0.57	1.07	0.71
Difference	0.34	0.43	0.18

An average difference in equity betas of 0.30 may be attributed to the dot.com bubble for these three utility related industries.

4. Modelled Asymmetric Cash Flows

It is pleasing to observe that the Authority accepts the need for compensation for asymmetric risks. The Authority suggests that:

[13] Allen Consulting Group Report on Proxy Betas page 37.

- if asymmetric risks are systematic then the risk should be reflected in the asset beta; and
- if the asymmetric risk is not systematic then the adjustment should be incorporated in the cash flows.

QR agrees with the Authority in that there should be an appropriate recognition of systematic risks if the risk can be established and the effect can be reasonably quantified. QR also refers the Authority to QR's recent submissions on the topic of asymmetric risk in respect to QR's Access Undertaking and believes similar treatment and recognition of such risks to the extent they arise in the business of DBCT would be appropriate.

5. Conclusion

QR's comments largely focus on the need for the Authority to take care in exercising its judgment in assessing risks and determining an appropriate rate of return for DBCT. With significant growth in demand for export coal and looming capacity constraints for coal supply infrastructure, it is important that the Authority allows sufficient return on investment so as to encourage rather than discourage future infrastructure investment.

In this regard, QR has presented new and more current evidence on several 'cost of capital' input parameters. While the Authority may have a leaning towards relying on regulatory precedent in setting these parameters, it is important that the Authority objectively assess the new evidence provided and transparently disclose the reasoning for its decision to accept or reject the evidence provided.

QR encourages the Authority to acknowledge the imprecision with which cost of capital parameters are determined and to err on the upside in setting these parameters so as to avoid the significant downside risk of underinvestment in coal supply infrastructure.

Appendix A

Market cycles turn at some stage and Australia has seen more than its fair share of mining related booms. A good example of the often tenuous nature of mining activity can be seen from Table 1 below which provides an indication of recent mine closures around the world. Many of these mines are gold mines which were developed during times of bullish industry sentiment. While gold mines exhibit much greater marginal operating costs than coal mines, and therefore are more likely to be closed down during periods of low gold prices, the number of mines identified in the table is an indication of the potential volatility that always exists in the mining sector and the potential for what appears to be buoyant conditions to rapidly become extremely harsh conditions.

Table 1 International mine closures[14]

Operation	Location	Owner(s)	Approximate closure
Tambo Mine	Chile	Barrick Gold	June-2000
Hellyer Mine	Australia	Western Metals Ltd.	June, 2000
Continental Copper	Montana, USA	Asarco, Montana Resources	July, 2000
Rosebud Mine	USA	Newmont/Hecla Mining Company	August, 2000
Gregg River Mine	Canada	Luscar Ltd	August 31, 2000
Telfer Mine	Australia	Newcrest	August-2000
Quintette Coal Ltd	BC, Canada	Teck Corporation	4th quarter,2000
Andacollo Mine	Chile	Dayton Mining Corp	September, 2000
Dee Mine	USA	Glamis Gold Ltd.	November, 2000
LTV Steel Mining Co.	USA	LTV Steel	Q1, 2001
Syama Mine	Mali	Randgold Resources	Q1, 2001
Sigma Lamaque	Canada	McWatters Mining	Q1,2001
Sunshine Mine	USA	Sunshine Mining	Q1, 2001
Fortnum Mine	Australia	Peryila Ltd	Q2 2001
No. 28 Mine	USA	Doe Run Company	Q2 2001
No. 29 Mine	USA	Doe Run Company	Q2 2001
Misima Mine	Papua New Guinea	Placer Dome	Q4, 2000
Trail Mountain Coal Mine	USA	Energy West Mining Co.	Q3, 2001
Kidston Mine	Australia	Placer Dome	mid-2001
Sullivan Mine	Canada	Cominco	2001
Castle Mountain	USA	Viceroy Resource	2001
St Helena	South Africa	Goldfields	2001
Homestake Mine	USA	Homestake	Q1, 2002
Golden Sunlight Mine	Montana, USA	Placer Dome	Q2, 2002
El Indio Mine	Chile	Barrick Gold	early 2002*
Bousquet Mine	Canada	Barrick Gold	2003
Bullmoose	Canada	Teck Cominco	Q2, 2003
Minahasa Mine	Indonesia	Newmont	2003
PT Kelian Equatorial Mining	Indonesia	Rio Tinto	2004

[14] http://www.mininglife.com/mine_closures.htm

Appendix B

Media Release - Ref 2001/219 - Oct 02 , 2001 Mineral Processing and Metal Production Media Releases

Multi billion dollar titanium prospects

Australia has a golden opportunity to take a world lead in light metals, with the establishment of a multi-billion dollar industry in industrial-grade titanium.

The discovery of a vast mineral sands resource across the lower Murray-Darling Basin in NSW, Victoria and South Australia, has opened the way for a new metal industry to complement the boom metals aluminium and magnesium, says Dr Rod Hill, Chief of CSIRO Minerals.

"In CSIRO Minerals we are exploring five alternate technologies for the processing and extraction of titanium metal. We're quite confident it will be possible to reduce the cost of production by about a half," Dr Hill says.

The difference to Australia's bottom line could be staggering. The raw value of the resource is around $13 billion. If this were to be processed into titanium metal and other high-end products, the value would be closer to $300 billion.

The Murray Basin mineral sands are an artefact of Australia's geological ups-and-downs. They are ancient, fossilised beachlines which lie in what, six million years ago, was a great inland sea called the Moravian Gulf. This extended from Adelaide to Cobram and Horsham nearly to Broken Hill (see map).

Wave action over the millennia sorted and deposited ilmenite, rutile, zircon, monazite and xenotime into some of the richest deposits on earth. In total, an estimated 45 million tonnes.

"CSIRO is investigating five different technologies for processing these minerals which we believe can deliver a 50 per cent cut in titanium metal production costs," Dr Hill says.

The technologies include molten salts, fluidised beds, plasmas,and vapour-phase reduction. Only commercial trials can decide which of the technologies will ultimately prove the most efficient and environmentally sound.

The "Holy Grail", as Dr Hill puts it, is to go from ilmenite to titanium in a single step, replacing the current multi-stage process.

The real opportunity, as he sees it, is to make titanium a staple construction metal for the transport, building, water, chemical and marine industries.

"Titanium is seen as a rather rare and expensive metal. That's because it is mainly used in the aerospace industry, and consequently has to be produced to very, very high standards of purity to meet testing and safety standards.

"The big opportunity is to produce an industrial grade titanium suitable for use in cars, buildings, chemical and desalination plants and ships. To make titanium a "household metal" like aluminium and more recently, magnesium.

"We should remember that, in the 1920s, aluminium was costlier than gold, and nobody knew how to treat or process it. Titanium is in a similar position today.

"Titanium has considerable advantages over other metals. It is 43% lighter than steel, tougher and more flexible than steel and far more corrosion resistant."

The metal industry is put off by the expensive price tag. But Dr Hill says that, on a volume rather than a weight-for-weight basis, and taking into account its superior corrosion resistance, titanium is competitive with steel.

"Australia has potentially a strong competitive advantage in titanium production. We have secure high-grade raw material supplies, cleaner, greener, cheaper processing methods, high levels of skills and the opportunity to develop new products for many end uses. "

A titanium metal industry could also help revive the regional economy of a large area of southeastern Australia, creating new jobs and opportunities, he says.

To view a larger version of the image above click here.

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