A FURTHER NOTE ON THE COST OF CAPITAL FOR THE DAMPIER TO BUNBURY NATURAL GAS PIPELINE

Prepared for

Epic Energy

by

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1. INTRODUCTION AND SUMMARY

Epic Energy submitted a rate of return calculation based on a Capital Asset Pricing Model (CAPM) methodology as part of its proposed access arrangement for the Dampier to Bunbury Natural Gas Pipeline (DBNGP). That submission relied in part on a study prepared by The Brattle Group in October 1999, entitled "The Cost of Capital for the Dampier to Bunbury Natural Gas Pipeline" (the 1999 Report).

We have been asked to review the 1999 Report and the finance literature and empirical evidence that has emerged since Epic Energy's initial filing to determine whether the values of four key CAPM parameters proposed by Epic remain valid: the market risk premium (MRP), the gamma factor, the gearing ratio, and the debt beta. We review the basis for each parameter estimate, note additional relevant evidence, and comment on concerns that have been raised by regulators, and in particular by the Gas Access Regulator (the Regulator) in the Epic Energy Final Decision.

We find that additional evidence regarding the MRP indicates that Epic Energy's proposed value is likely to be conservative. The historical evidence continues to provide the most reliable data, and academic studies in the US regarding changes in the MRP over time are not developed sufficiently to provide a basis for forecasting MRP. Nonetheless some Australian studies that attempt to estimate recent MRP's find values consistent with the historical average. Regarding gamma, recent empirical evidence focused on large companies with foreign ownership finds values near zero, well below Epic's proposed value. Ignoring the fact that Australia is a large capital importer would require estimation of the entire range of CAPM parameters under that assumption which would imply higher debt yields and possibly a higher MRP. Evidence regarding gearing ratios is limited, but we have seen no evidence that would support a revision to Epic Energy's proposed value. The failure to distinguish the risk of transmission companies from that of distribution companies may have generated some confusion in the empirical data. Finally, the methodology used by the Regulator to estimate the debt beta contains a conceptual flaw that results in an overstatement of the true debt beta, and confirms that Epic Energy's proposed value is reasonable.

2. THE MARKET RISK PREMIUM

The market risk premium represents the incremental return above the yield on government securities that investors expect in exchange for holding the market portfolio (or a security with the same systematic risk). We noted in the 1999 Report that the historical risk premium in Australia had ranged from 6 to 8 percent. Based on the 1999 Report, Epic Energy proposed an MRP of 6.5 percent, representing the midpoint of the range used by most practitioners in Australia of 6 to 7 percent. We explained that the volatility of the historical data required the use of long-term averages and urged caution in making adjustments from the evidence provided by long-term market data. This is because there was no reliable way to quantify how the MRP might change over time and to forecast its value prospectively.

Evidence developed since the 1999 Report indicates that the historical average continues to be the best way to estimate the MRP for Australia. No reliable method has emerged to forecast how the MRP would change prospectively. For example, a recent attempt by Professor Lally to apply an alternative model to account for changes in market volatility across time that could explain changing MRP's concluded that, consistent with the historical averages, an MRP of 7 percent for Australia was reasonable.[1] Work by Professor Bowman benchmarking the Australian market to the US market in order to account for the relatively recent opening of the Australian economy finds an MRP of nearly 8 percent, which we understand has since been revised to about 7 percent.[2] Given that Australia has a relatively high-beta, resource-based economy and sovereign risk greater than that of the US, it is not surprising that studies benchmarked against the US indicate a higher MRP for Australia. Work by Professor Gray reveals that there simply is no statistical evidence from historical returns that the MRP has declined in recent years

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1 Lally, M. 2002, The Cost of Capital Under Dividend Imputation, pp.28-29.

2 Bowman, R. 2001, 'Estimating the market risk premium' JASSA, 3 Spring, pp. 10-13. The method used by Professor Bowman benchmarked the Australian MRP to the US MRP. Professor Bowman has indicated to us, however, that he has revised his view of the US MRP since the publication of his paper lower by about one percent.

and finds that the precision of historical averages will exceed that of ex ante estimates of the MRP.[3]

New evidence indicates also that Epic Energy's proposed value of 6.5 percent is conservative. The latest evidence from Dimson (2003) reveals that the market risk premium for Australia over a century has averaged 8.0 percent, at the very top of the range traditionally cited for Australia of 6-8 percent.[4] Thus, Epic Energy's proposed MRP of 6.5 percent is below the historical average of 8 percent and below the midpoint of the 6-8 percent range commonly cited based on the work of Officer. Therefore, while we would reject such arguments as speculative at this time, Epic Energy's proposed value is not inconsistent with arguments that the current MRP is below the historical average. We have seen no reliable evidence that 6.5 percent is not an appropriate and conservative estimate of the Australian MRP.

Despite the strong historical evidence, academics and practitioners have recently argued that the current MRP is below the historical average. While we believe that further research into these theories is valuable, we do not find that they presently offer a sound basis for deviating from the historical averages. We comment briefly on these arguments.

2.1 SURVIVORSHIP BIAS

Some academic studies suggest that because the share markets for some countries have failed in the past, risk premia from markets that have succeeded, and in particular the United States, will overstate the expected risk premium over all markets. While this argument is correct in principle, the most comprehensive recent review of the risk premium across markets fails to find material effects. In the careful study of returns across sixteen countries over a century, the United States ranked only sixth in terms of

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3 Gray, S. 2001 Issues in Cost of Capital Estimation, October.

4 8.0 percent is the arithmetic average of the MRP for Australia for the period 1900 – 2000. The arithmetic mean is the correct average for estimating the cost of capital. As Brealey and Myers (2003) note: "If the cost of capital is estimated from historical returns or risk premiums, use arithmetic averages, not compound annual rates of return" (at p. 157). See also Ibbotson Associates (2003): "[T]he arithmetic mean…is the appropriate one for estimating discount rates and the cost of capital" (at p. 101).

equity risk premium. Thus, the authors conclude that "…investors may not have been materially misled by a focus on the United States and, to a lesser extent, UK experience."[5]

2.2 MARKET RISK PREMIUM CHANGES OVER TIME

Some academics and regulators suggest that it is questionable whether the market risk premium has remained constant over time and argue that *if* past returns were high due to market imperfections, then the historical average MRP will overstate the prospective MRP. Evidence from the US studies is cited by the Regulator in the Final Decision in support of this possibility. The US evidence, however, is based entirely on attempts to apply *ex ante* valuation models to the market. Among other problems, however, these models are highly sensitive to key variables that cannot be observed (for example the cash flows for the market must be estimated in perpetuity) and omit important option values, and as a result they are unreliable for purposes of estimating the current MRP.[6] Indeed where the parameters are more readily observable or estimable, such as in highly-leveraged takeovers, academic studies find relatively high risk premia.[7] Thus, the US evidence, while identifying interesting issues for future research, simply does not provide a sufficient basis to conclude the prospective Australian MRP has declined materially.

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5 Dimson, Elroy; Marsh, Paul; and Staunton, Mike. Triumph of the Optimists: 101 Years of Global Investment Returns, Princeton, N.J.: Princeton University Press, 2002, p.229.

6 The Regulator acknowledges that *ex ante* estimates of MRP are "subject to measurement error and are sensitive to assumptions made about the growth rate of dividends."

7 For example, Kaplan and Ruback find that a review of 51 takeovers between 1983 and 1998 indicated an MRP of just under 8 percent over long-term government bonds. Kaplan, S. and R. Ruback. See "The Valuation of Cash Flow Forecasts: An Empirical Analysis." Journal of Finance, (September 1995), 1059-93. Harris and Marston apply *ex ante* analyst forecasts to dividend paying companies for the period 1982 – 1998 and find a risk premium of over 7 percent. However, because their data omit higher-risk companies that pay no dividends, this is a downward-biased estimate of the MRP. See Harris, Robert S. and Marston, Felicia C., "The Market Risk Premium: Expectational Estimates Using Analysts' Forecasts" (Dec 22, 2000). Darden Business School Working Paper No. 99-08. Another recent study by Ibbotson and Chen using both historical and *ex ante* models in the US finds an MRP just under six percent. However, this MRP is estimated using debt with a maturity longer than the 10-year bond used in Australia and therefore the Australian-comparable MRP would be slightly higher. See, Ibbotson, R. and Chen, P., 2003, "Long-Run Stock Returns: Participating in the Real Economy," Financial Analysts Journal, Jan/Feb.

The Regulator also cites studies referenced in regulatory draft statements and draft decisions in 1999 and 2001 that discuss *ex ante* studies in Australia of the MRP and find a range of 4.5 percent to 7 percent. These studies, however, suffer the same flaws discussed above for *ex ante* studies in the US and, because the Australian market is relatively small, rely on even less data. We suspect, moreover, that the decline in equity markets since the publication of the studies cited by the Regulator has caused *ex ante* models to yield higher estimates of the MRP than they did previously. The existence of high stock prices led many people to speculate that the MRP must have fallen so as to justify the high prices. Yet, as Brealey and Myers note in the world's leading corporate finance text:

> *"As stock prices began to slide back from their highs of March 2000, this belief in a falling market risk premium began to wane. It seems that if the risk premium truly did fall in the 1990s, then it also rose again as the new century dawned."*[8]

The research into MRP continues, but it would be speculative and arbitrary to make adjustments to the historical MRP in Australia based on the research available today from US studies.

In short, recent research is exploring the issue of whether the MRP changes over time, but it remains speculative to conclude that the MRP has changed materially or that it can be forecasted accurately. More important, until it is well understood *how* and *why* the MRP might change, it is simply inappropriate for regulators to use unproven theories as a basis to adjust the historical average. The example of the postulated low risk premia to explain high equity prices during the stock market bubble in the US shows the dangers of reacting to short-term events. The benefit of long data series is that they incorporate a wide range of events and smooth changes that occur over time. As one leading academic put it:

> *"The data used to document the equity premium over the past 100 years is as good an economic data set as we have and this is a long series when it*

[8] Brealey, R.A. and Myers, S.C., Principles of Corporate Finance, New York, NY: McGraw-Hill, 7th edition, 2003, p. 160.

comes to economic data. Before we dismiss the premium, not only do we need to understand the observed phenomena but we also need a plausible explanation why the future is likely to be any different than the past. In the absence of this, and based on what we currently know, we can make the following claim: over the long horizon the equity premium is likely to be similar to what it has been in the past."[9]

3. THE GAMMA FACTOR

Traditionally, cost of capital has been calculated on an after-corporate tax basis. With the imputation tax, however, after-corporate tax dividends provide an additional return to resident taxpayers in the form of an offset to personal income tax equal to the company tax that paid on the income associated with the dividend. To account for this benefit, it becomes necessary to know what value investors attribute to the tax credits associated with a dollar of income—the gamma factor. Once this value has been determined, a WACC calculated using traditional approaches can be reduced to reflect the value of the tax credit to investors.

Based on the 1999 Report, Epic Energy had proposed that the gamma be calculated using the formula developed by Officer:

$$\gamma = \alpha \cdot \theta \cdot k$$

where α is the dividend payout ratio (the proportion of each dollar of income paid out as dividends), θ is the proportion of franking credits utilized (the value placed on each dollar of franking credits by investors, which will vary depending on the tax status of the investor), and k is the ratio of franked dividends to total dividends (the proportion of dividends that carry the franking credit, because only income fully taxed in Australia creates the credit).

Epic Energy proposed values of θ and k were derived from Australian empirical estimates of 55 percent and 80 percent respectively, and the dividend payout ratio was assumed to be 0.7. This provided an effective gamma value of 0.308.

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[9] Mehra, R. 2003 The Equity Premium in Retrospect (forthcoming in the Handbook of Economic of Finance), February, Working Paper.

New empirical analysis supports the view that Epic's gamma is reasonable or conservative. In particular, Cannavan, Finn & Gray find that if attention is focused on large companies that have substantial foreign investment, the value of the franking credits since the 1997 legislation was imposed is near zero, which is consistent with the view that either due to foreign investors or limited resident tax-paying individual investors, the value of franking credits is very low.[10] This finding is consistent with the economic logic that since Australia must attract considerable capital from sources that would place little or no value on the imputation tax credits, securities prices will not reflect the value of the imputation tax credit.

The Regulator states in his Final Decision that Epic Energy's proposed values for each of the three terms that determine the gamma are too low. In particular the Regulator argues that: 1) New research shows that the θ value is dramatically higher than the value from previous research cited by Epic Energy and that using lower values is inconsistent with the CAPM used to calculate the WACC; 2) that the value for α could be modified by extending the analysis to capture the effects of capital gains taxes at the personal level, although the extent and direction of any change that would result are unclear; 3) that the treatment of taxes suggests a value of 1 for *k,* and that in any case the use of an effective tax rate in calculating the pre-tax WACC addresses any problems that would lead to unfranked dividends. We review each of these arguments.

3.1 THE FRANKING CREDIT UTILISATION VALUE (θ)

The first argument is that Epic based its value on empirical evidence available at the time, and that more recent evidence shows a much higher value for θ *(0.5)* than previously established.

There are several concerns with the evidence cited in support of this argument. The study cited by the Regulator appears to be based on activity of a very narrow segment of the

[10] Cannavan, D, Finn, Frank, and Gray, S. 2003, "The Value of Dividend Imputation Tax Credits in Australia" February, Working Paper (forthcoming in the Journal of Financial Economics).

Australian market.[11] The author finds that the value of θ is about 0.9. However, the study is not a generalized study of dividends paid on the ASX, but rather focuses on a small set of issues that allow simultaneous trading *cum* dividend and *ex* dividend. Because of the small size and unique nature of the dividends they studied, it is likely that the results show the value of the franking credits not to the average investor but to a very limited clientele that is driven by tax considerations. It is doubtful that the results could be generalised to the market as a whole simply because there are not enough of the clientele that would value the franking credits to absorb all the credits available, and the authors caution against generalising their findings.

The issue of the value of franking credits is also tied up in the identity of the marginal (price-setting) investor in Australia. Australia is a large importer of capital, and, non-resident investors generally cannot realise the value of the tax credit. For example, laws introduced in 1997 restrict investors from effectively selling franking credits to other investors who might value them more. Thus, if the return on securities must be high enough to attract foreign investment, and foreign investors do not value the credit, it may be inappropriate to consider the franking credit at all.

Some regulators and academics have argued that not to value the franking credit is inconsistent with using the domestic version of the CAPM (which assumes only domestic investors). There are at least three serious concerns with this argument.

First, it is a fiction that the Regulator is applying a purely domestic CAPM. Australia imports large amounts of capital. The domestic data therefore simply do not reflect a hypothetical market where local investors supply all of the capital.[12] Because Australia does import capital, to assume a purely domestic market would require also assuming that this capital does not enter the Australian market. It should be clear that, given the large

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[11] Walker, S. and Partington, G. 1999, "The Value of Dividends: Evidence from Cum-Dividend Trading in the Ex-Dividend Period", Journal of Accounting and Finance 39, p. 275-296.

[12] The argument has, for example, been advanced by Professor Ragunathan that the MRP was higher in the past in Australia because investment and currency controls limited the market to domestic investors. See Ragunathan, V, 1999, "The Effect of Financial Deregulation on Integration: An Australian Perspective," Journal of Economics and Business, November, pp 505-514. Bond yields too would be higher. Thus, an assumption that all capital is supplied domestically would require a re-examination of several parameters of the CAPM.

capital imports into the country, the cost of capital (including the government bond yield) would rise, and perhaps markedly so, were the market restricted to local investors.

Second, even within Australia, much of the market is held by tax-advantaged entities—only about a fifth of ASX-traded shares are held by domestic individuals, which suggests that the average value of franking credits should be quite low. That is, even if we limited the analysis to Australian shareholders, this is not the same as limiting the analysis to resident individual taxpayers (who would value franking credits most highly).

Third, the alternative to using the domestic CAPM is to use an international CAPM and this can be quite difficult to implement. It is by no means clear that use of an international CAPM would result in a lower WACC. Australia is a resource-exporting economy and market performance is tied to global growth. As a result, Australia is relatively high beta in a global context and offers less diversification than other more domestic-oriented and more service-oriented markets. Until comprehensive work is done to develop international CAPM parameters, it appears reasonable to continue to use the domestic parameters.

3.2 THE DIVIDEND PAYOUT RATIO VALUE (α)

Epic Energy's proposed payout ratio was based on the actual observed payout ratios in Australia. The Regulator argues that this is likely to understate the proportion of franking credits that are paid out because he believes that the subset of firms that have available fully franked income for distribution would pay higher dividends. Although it is correct that firms that do not have franked income will have less incentive to pay dividends than firms that do, all else equal, the proposed use of the proportion of franking credits distributed on average across several years from a working paper written in 1996 appears to us to have an insufficient basis[13]. Absent current empirical research on the question of dividend payout ratios under differing availability of franking credits, there is not sufficient basis to adjust the payout ratio from the actual observed result. Indeed it would be important to understand how other factors that influence the payout ratio relate to the

[13] Hathaway, N. and R. Officer, 1996, The Value of Imputation Tax Credits, Working Paper, Melbourne Business School.

industry in question before adjustments from actual averages could meaningfully be made (for instance, the presence of regulatory risk might cause firms to hold more cash or equity than they otherwise would).

3.3 THE PROPORTION OF INCOME THAT HAS FRANKING CREDITS (K)

If not all income earns franking credits, then a downward adjustment must be made simply to reflect that some portion of dividends paid will not include franking credits. The Regulator appears to recognize this as a general proposition, but claims that the tax treatment of the DBNGP does not result in circumstances where this is an issue. We have not conducted any detailed analysis of Epic Energy's tax situation. However, it is understood that 67 percent of the ownership of Epic Energy is foreign and therefore this ownership group would not be entitled to the benefit of franking credits.

3.4 REGULATORY PRECEDENT

In the Final Decision, the Regulator seems to suggest that 1) his value for gamma of 0.5 is in line with other regulatory decisions, and 2) those regulatory decisions seem to him to be biased low. We comment only that 1) in fact, we are aware of no other regulatory body that has used a value greater than the one proposed by the Regulator, and 2) the fact that an analysis suggests much higher values for gamma than have ever been found before by other regulators may be not evidence that those other regulators adopted values at the bottom end of a reasonable range, but rather that the analysis in issue is reaching unreasonable conclusions (or is, at least finding values at the high end of some reasonable range). Because of obvious problems of circularity, we caution against the use of regulatory precedent to determine values that can be estimated more directly.

4. THE GEARING RATIO

Epic Energy proposed a gearing ratio of 55 percent, citing a broad range of international evidence developed in the 1999 Report. The Regulator chose a value of 60 percent, citing a sample of Australian companies used by the Essential Services Commission to determine access arrangements for gas distribution companies in Victoria. As the

Regulator noted, there was a very wide range of gearing levels for that sample (35 percent to 74 percent), but the sample average of 54 percent was consistent with Epic Energy's position. Arguing that only the most "pure-play" "gas transmission and distribution companies" should be used, the Regulator determined the average based on just three companies, Australian Pipeline Trust (56 percent), GasNet (69 percent), and Envestra (74 percent).

We agree in principle that the closest comparable companies should be used to estimate beta, but we do not believe the Regulator's decision reflects a sufficient analysis of comparability. Systematic risk will depend not only on the commodity being transported but also on the type of transportation service being provided and on the characterization of the customer base. For example, one would expect and studies in the US have shown that gas transmission is more risky than distribution, and it would be expected that having a greater proportion of industrial end-customers also will increase risk.[14] Care must be taken to analyze the proxy sample carefully, particularly when the number of observations is small. The fact that the Essential Services Commission used a gearing level of 60 percent for *distribution* suggests itself that Epic Energy's proposed value for *transmission* of 55 percent is reasonable.

5. DEBT AND EQUITY BETAS

Epic Energy proposed an asset beta of 0.58 based on a sample of US pipeline companies adjusted for the differences in the composition of the US share market and the Australian share market. The Regulator reached a virtually identical asset beta, 0.6, based on a range of evidence that included a review of other regulatory decisions. Whilst the asset beta determined by the Regulator is reasonable, we reiterate our caution against relying on other regulatory decisions to estimate parameter values that can be estimated more directly because of the danger of circularity.

[14] Impact of Deregulation on Capital Costs: Case Studies of Telecommunications and Natural Gas, report prepared for The Energy Association of New York State," by A. Lawrence Kolbe and Lynda S. Borucki, *The Brattle Group*, 1996.

The Regulator also estimated a debt beta of 0.2 based on the debt premium over government bonds allowed in the cost of debt. Epic Energy had proposed a value of 0.12, representing the top end of a range from 0.06 to 0.12 previously estimated in Australia. With some clarification on the definition of the cost of capital, it should be clear that the data relied on by the Regulator suggest a debt beta lower than 0.12. The debt beta is determined from the bond premium and in order to convert a bond premium to a beta, it is necessary to determine the *expected* return on the bond, not its promised yield. Because bond yields will include a premium for the risk of default, *the expected return on a bond that has any default risk is always less than its yield.*

The debt beta will correspond to the systematic risk of the present value of the expected cash flows of the bond; just as for a stock it measures the systematic risk of the expected present value of the share's cash flows (*i.e.*, the share price).

The bond yield determined by the Regulator likely includes three additional components that have little systematic risk. First, Regulators typically add a margin to the observed bond yields to reflect the cost of raising debt capital. Second, the observed debt yield would likely include compensation of the illiquidity of corporate bonds relative to government bonds. Third, bond yields will include a premium for the costs of financial distress.

While there may be some systematic component to the default, capital raising, illiquidity, and financial distress premia in the Regulator's bond premium, the systematic risk is only a portion of the total premium and may be small. Thus, many practitioners assume a debt beta of zero. In addition, to the extent that the Regulator has underestimated the market risk premium, his debt beta will be overstated (since the debt beta was estimated simply as the cost of debt margin divided by the MRP). Thus, it should be clear that given his cost of debt margin, the Regulator's debt beta *must* be overstated because it measures the beta as a function of all of the risks incorporated into the bond yield (as well as capital-raising costs) rather than only the systematic risk that properly applies in the CAPM.

If the debt beta is applied consistently in the levering and unlevering process, the resulting weighted average cost of capital will not be sensitive to the debt beta. However,

if (as appears to be the case here) the proxy sample had lower levels of gearing than the assumed gearing for the target company (here 60 percent), overstating the debt beta will cause the resulting cost of capital to be slightly understated. An example developed by the Regulator-General in Victoria using parameters similar to those in this case suggest a bias of perhaps 0.1 percent using a debt beta of 0.2 compared to using a debt beta of zero.[15]

[15] An example of this effect is provided in Office of the Regulator-General, Electricity Distribution Price Determination 2001-2005 – Vol 1: Statement of Purpose and Reasons, pp 267-268.