SUBMISSION 8: Rate of Return

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DBNGP (WA) Transmission Pty Limited
ABN 69 081 609 190
Level 6, 12-14 The Esplanade
Perth WA 6000

Contact: Trent Leach, Manager Regulatory and Government Policy
Telephone: 08 9223 4357
Email: trent.leach@dbp.net.au

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1. EXECUTIVE SUMMARY

1.1. Proposed revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline (DBNGP) were submitted to the Economic Regulation Authority (ERA), for approval, on 1 April 2010. Theses revisions were prepared in accordance with the requirements of the National Gas Access (WA) Act 2009, which gives effect to the National Gas Law (NGL) and the National Gas Rules (NGR) in Western Australia.

1.2. The proposed revisions to the Access Arrangement include a proposed revised reference tariff. This proposed tariff has been designed to meet the requirements of Rule 95(1) of the NGR. It has been designed:

(a) to generate from the provision of each reference service the portion of total revenue referable to that reference service; and

(b) as far as is practicable consistently with paragraph (a), to generate from the user, or the class of users, to which the reference service is provided, the portion of total revenue referable to providing the reference service to the particular user or class of users.

1.3. The total revenue (a proportion of which is to be generated from provision of the reference service at the proposed reference tariff) has been determined for each year of the access arrangement period, 1 January 2011 to 31 December 2015, using the building block approach and the building blocks set out in Rule 76. The building blocks include a return on the projected capital base for each year of the access arrangement period.

1.4. Return on the projected capital base has been calculated, for the purpose of determining the total revenue, by applying a rate of return to the projected capital base at the beginning of each year of the access arrangement period. This submission describes the way in which that rate of return has been established.

1.5. The submission comprises fourteen principal sections, which follow a brief introduction (section 2), and five supporting attachments. The principal sections of the submission set out:

(a) the objective of the regulatory regime - the regime of the NGL and the NGR - within the context of which the rate of return is to be established;

(b) the criteria of Rule 87(1), which are to be applied in establishing the rate of return, and which require a rate which is to be commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services;

(c) the requirements of Rule 87(2), which outlines a flexible approach which guides determination of the rate of return which is to conform with Rule 87(1), and which necessarily requires a degree of information gathering, analysis, estimation and judgment in its application;

(d) use of a real pre-tax weighted average of the costs of equity and debt (real pre-tax WACC) in the application of Rule 87(2);

(e) estimation of the cost of equity;

(f) estimation of the cost of debt;

(g) the weighting of equity and debt - the gearing - which has been assumed;

(h) the assumption made about the tax rate;

(i) the valuation of imputation credits for the purpose of determining a pre-tax WACC;

(j) estimating expected inflation;

(k) pre-tax real WACC determination in accordance with Rule 87(2);

(l) applying Rule 87(2) to meet the Rule 87(1) criteria: establishing costs of equity and debt commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and

(m) establishing the rate of return which meets the criteria of Rule 87(1).

1.6. The rate of return established for the purpose of determining the total revenue and proposed revised reference tariff for the DBNGP has been set at 10.76% (real pre-tax).

1.7. This rate of return has been established as a weighted average of a cost of equity and a cost of debt which are commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services. It is, therefore, a rate of return which satisfies the criteria of Rule 87(1). When used to determine the total revenue and proposed revised reference tariff for the DBNGP, it should allow a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates. That is, the rate of return is the rate intended by the revenue and pricing principles of section 24 and, in particular, by section 24(5), of the NGL.

2. INTRODUCTION

2.1. On 1 April 2010, DBNGP (WA) Transmission Pty Ltd (the **Operator**) filed the following documents with the Economic Regulation Authority (**ERA**):

(a) proposed revised Access Arrangement (**Proposed Revised AA**); and

(b) proposed revised Access Arrangement Information (**Proposed Revised AAI**).

2.2. These documents contain the information that the National Gas Access (WA) Act 2009 (**NGA**) (which includes the Western Australian National Gas Access Law text (**NGL**) and the National Gas Rules (**NGR**)) requires to be included in order to enable them to be approved by the ERA.

2.3. The ERA also issued a Regulatory Information Notice on 2 March 2010 (**RIN**).

2.4. In addition to the Proposed Revised AA and Proposed Revised AAI, a number of additional submissions on key issues will be or are to be filed to assist the Regulator to assess the Proposed Revised AA and to address the categories of information requested in the RIN. These included the following:

1. Background Information
2. AA & AAI Compliance Checklist
3. Pipeline Services
4. Basis for Total Revenue
5. Terms and Conditions Justification
6. Explanation of Queuing Requirements
7. Capacity and Throughput Forecast
8. Rate of Return (being this submission)
9. Justification of Actual expansion Capital Expenditure (2005 – 2010)
10. Actual Stay-in-Business Capital Expenditure (2005 – 2010)
11. Forecast Capital Expenditure (2005 – 2010)
12. Actual Operational Expenditure and Forecast Operational Expenditure

2.5. Accordingly, this submission is aimed at supplementing the information in the Proposed Revised AA and Proposed Revised AAI in order to:

(a) address the information requested by the ERA in the RIN in relation to the rate if return; and

(b) enable the aspects of the Proposed Revised AAI relating to the rate or return to be approved by the ERA.

2.6. The structure of this submission is therefore as follows:

(a) Sections 3 to 5 of this submission contain the Operator's submissions on a number of interpretational issues with the relevant provisions of the NGA on the element of rate of return; and

(b) Sections 6 onwards then applies that interpretation to derive and substantiate the rate of return in the Proposed Revised AAI.

3. OBJECTIVE OF THE REGULATORY REGIME

National Gas Access (Western Australia) Law

3.1. The National Gas Access Law is implemented in Western Australia, with certain modifications to suit Western Australia's specific circumstances, by the National Gas Access (WA) Act 2009 and, under section 7 of that Act, is to be referred to as the National Gas Access (Western Australia) Law (abbreviated in this section to "**WA NGAL**").

3.2. Under section 28(1) of the WA NGAL, the ERA must, in assessing revisions to an applicable access arrangement and in making a decision in respect of those revisions, assess and make its decision (including exercising a discretion) in a manner that will or is likely to contribute to the achievement of the "national gas objective".

3.3. Section 23 of the WA NGAL defines the national gas objective thus:

> *"The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas."*

3.4. All provisions of an access arrangement must be consistent with the national gas objective (National Gas Rules, Rule 100). However, by reason of the particular stance taken by Western Australia in relation to the implementation of the National Gas Access Law and the physically discrete nature of its market, in determining whether this requirement is complied with, the natural gas services referred to, and the consumers referred to, are services and consumers in Western Australia.

3.5. That there is a need to take into account the Western Australian market specific circumstances is reinforced by the second reading speeches of Ministers in both houses of the WA Parliament when the Bill to enact the NGA was tabled. In both speeches, the government's intention to ensure that the Act was able to accommodate the State's unique characteristics was expressly stated.

3.6. In addition, the ERA must, in accordance with section 28(2) of the WA NGAL, take into account the revenue and pricing principles, which are set out in section 24, when exercising discretion in approving or making those parts of an access arrangement relating to a reference tariff. Section 24(2) of the WA NGAL requires that:

> *"A service provider be provided with a reasonable opportunity to recover at least the efficient costs which it incurs in:*
>
> *(a) providing reference services; and*
>
> *(b) complying with a regulatory obligation or requirement or making a regulatory payment."*

3.7. Section 24(5) requires that:

> *"a reference tariff should allow for a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates."*

3.8. These requirements further serve to reinforce the fact that the determinations to be made under the WA NGAL are not abstract determinations—it is always necessary to take account of the peculiar situation of the relevant service provider.

3.9. Rule 74(2) requires that a forecast or estimate:

> *"(a) must be arrived at on a reasonable basis; and*
>
> *(b) must represent the best forecast or estimate possible in the circumstances".*

3.10. Rule 76 of the NGR indicates that the efficient costs which a service provider can be expected to incur will include the efficiently incurred costs of financing the assets used to provide reference services. These efficiently incurred financing costs may be recovered through a reference tariff which, in accordance with section 24(5) of the NGLWA NGAL:

> *". . . should allow for a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates."*

4. RATE OF RETURN - RULE 87(1) OF THE NATIONAL GAS RULES 2009

4.1. The return for which a reference tariff should allow can be determined as the product of a rate of return and the projected capital base (although neither the NGL nor the NGR is explicit on this matter).

4.2. Rule 87(1) of the NGR identifies the criteria which are to be applied in establishing the rate of return. The rate of return to be used in determining the total revenue and reference tariffs "... is to be commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services". This rule invokes 2 distinct criteria.

4.3. The first criterion, being the requirement that the rate of return on capital be commensurate with prevailing conditions in the market for funds, refers to the general market for funds to which a relevant provider of reference services would need to have recourse to procure funds in the amounts required to meet its needs for capital. Given the scale of the operations of the Operator, this necessarily means the international capital markets.

4.4. The second criterion, which relates to "... the risks involved in providing reference services", concerns the risks involved in providing the reference services to which the tariff relates. This second principle reflects legislative recognition of the difference between risks which affect all participants in the market for funds, or generic risks, and risks which affect the provider of reference services. There is thus a specific requirement, in the case of a provider of reference services, to take into account not only of the generic risks but also the particular risks which the service provider faces in providing the reference services which the service provider itself provides.

4.5. Accordingly, Rule 87(1) requires that the rate of return should reflect both of the nominated criteria - firstly, the prevailing conditions in the relevant market for funds generally and, secondly, the particular risks faced by the service provider in providing the reference services. This approach is consistent with objectives referred to in paragraph 3.2 above and the emphasis on the position of the particular service provider in ss. 24 and 28(2) of the WA NGAL and Rule 76 referred to above.

4.6. These provisions mean that an overall objective of the NGL is to allow a service provider to obtain a rate of return on capital commensurate with the regulatory and commercial risks involved in providing a reference service in the market in which the service provider operates.

4.7. The determination of the rate of return under Rule 87 must be consistent with the national gas objective, must accommodate the revenue and pricing principles and must be made in compliance with Rule 74(2). These requirements do not, however, constrain the range of issues which must be considered in the determination—rather, they condition or direct the decision-making process under Rule 87.

4.8. In other words, the decision-making process under Rule 87 necessarily involves an assessment of whether the approach used in making that determination—whether the assessment of the WACC or the use of any particular financial model—represents a reasonable basis for determining a rate of return, produces the best forecast or estimate of the cost of capital possible in the circumstances, and produces a result that is consistent with the national gas objective and accommodates the revenue and pricing principles.

4.9. As is emphasized in paragraphs 3.1 and 3.4 above, and as will be discussed later, the Operator operates in the Western Australian gas market and is exposed to commercial

risks that are additional to and different from those which operators in the Eastern States gas markets face.

5. RULE 87(2)

5.1. Rule 87(2) outlines an approach to the determination of the rate of return which is to conform with Rule 87(1). It is important to note that Rule 87(2) does not prescribe a calculation the application of which provides a uniquely correct answer. On the contrary, rule 87(2) outlines a flexible approach which guides the determination of a rate of return on capital. This reflects the very nature of the principles which are mandated in rule 87(1), as their very nature is such that the application of them necessarily requires a degree of information gathering, analysis, estimation and judgment.

5.2. Rule 87(2) provides that:

> *"In determining a rate of return on capital:*
>
> *(a) it will be assumed that the service provider:*
>
> *(i) meets benchmark levels of efficiencies; and*
>
> *(ii) uses a financing structure that meets benchmark standards as to gearing and other financial parameters for a going concern and reflects in other respects best practice; and*
>
> *(b) a well accepted approach that incorporates the cost of equity and debt, such as the Weighted Average Costs of Capital, is to be used; and a well accepted financial model, such as the Capital Asset Pricing Model, is to be used."*

5.3. There are aspects of Rule 87(2) which give rise to a number of interpretational issues. They are discussed in turn in this section.

"Benchmark levels of efficiencies" and "benchmark gearing rations and other financial parameters for a going concern"

5.4. Rule 87(2) (a) requires two assumptions to be made in the process of determining a rate of return on capital.

(a) The first assumption to be made is as to what are benchmark levels of efficiencies.

(b) The second assumption is as to financing structures. However, this assumption requires an assessment (or assumption) as to benchmark gearing ratios and other financial parameters for a going concern and what constitutes best practice.

5.5. It is important to note that the assumptions required to be made are themselves based on assumptions or assessments.

5.6. There are a number of interpretational issues relating to these provisions. The first of these interpretational issues relates to the context in which the provisions are to be construed. DBP submits that in interpreting these provisions, it can not be argued that the values or principles for rate of return parameters that have been set by regulators in their decisions on regulated electricity businesses under the National Electricity Law (**NEL**) are appropriate reference points for either the term "benchmark levels of efficiency" or "benchmark standards" under Rule 87(2)(a). This is so for a number of reasons.

5.7. The first reason is that, in assessing the rate of return for regulated electricity businesses, regulators have been applying a different regulatory framework in the NEL. In its 2009

decision on the WACC under the National Electricity Rules (NER) (AER, Final Decision: WACC Review, 1 May 2009), the AER acknowledged that the NER do not define a "benchmark efficient" service provider as the concept is used in NER 6.5.4(e)(3) and 6A.6.2(j)(3), which require that the need for credit rating levels or the values attributable to, or the methods of calculating, the parameters referred to in paragraph (d)[1] that vary according to the efficiency of the Distribution [Transmission] Network Service Provider to be based on a benchmark efficient Distribution [Transmission] Network Service Provider.

5.8. The proposition that relying on values that have been set by regulators for an electricity transmission or distribution business in any Australian market on the basis that the values are a proxy for benchmark levels of efficiency in relation to a gas transmission business in Western Australia is unsupportable, and would produce a result that is directly contradictory to the requirements of Rule 87(1), the national gas objectives and the pricing principles.

5.9. The second reason is that, in the case of the NEL, the concept of "benchmark efficiency" appears to be one of "benchmark financial efficiency", because the considerations to which the concept is to be applied are all measures of financial structure or environment. However, in Rule 87(2) of the NGR, "benchmark levels of efficiency" is a separate concept from "benchmark standards as to gearing and other financial parameters", and the concept of benchmarking in relation to financial parameters is limited to "gearing and other financial parameters for a going concern".

5.10. The third reasons is that the use of the WACC and CAPM are mandatory under the NER (NER Rule 6.5.2(b) etc), whereas that is clearly not the case under the NGR. So there is no pre-ordained need, in applying or interpreting the NGR, to assume that all or any of the factors set out in Rules 6.5.4(d) and 6A.6.2(i) of the NER need to be determined, other than a benchmark gearing level.

5.11. The final reason is that the central aim of benchmarking efficiency and financial structures and parameters is said by the AER, in the case of the NER, to be the achievement of competitive neutrality in tariff-setting. DBP questions whether the same can be said in relation to the NGR, where it appears a far more subjective approach is contemplated in relation to a range of matters.

5.12. The second interpretational issue relating to Rule 87(2)(a) is that clearly, the service provider under the NGR is to be assumed to meet benchmark levels of efficiency under Rule 87(2)(a)(i) by the very nature of the drafting of that provision. In view of the exclusion from this part of the Rule of considerations of financial structure, gearing ratios and other financial parameters, DBP takes the view that Rule 87(2)(a)(i) addresses other issues such as operational efficiency and efficiency in the raising and utilisation of capital.

5.13. The benchmarking of these activities cannot occur in the abstract—they are dependent upon the reliability of gas suppliers, the location of the assets, the conditions in which they are operated and maintained, the state and efficiency of capital markets, the credit-worthiness of contractual counterparties and so on. These are matters susceptible to subjective judgment, and these judgments are ones against which a final determination of a return on capital that meets the requirements of the Rules as a whole must be made.

5.14. The third interpretational issues relating to Rule 87(2)(a) is that it is also clear that under Rule 87(2)(a)(ii), the financing structure must be benchmarked in certain respects, namely as to gearing and other financial parameters for a going concern. These relate to meeting solvency tests and other matters considered by company directors and auditors in making

[1] The nominal risk free rate, the equity beta, the market risk premium, maturity period and bond rates, ratio of debt to equity, credit rating levels and utilisation of imputation credits etc.

going concern determinations. DBP's views as to "benchmark" level of gearing are set out in section 9. Given the nature of the markets to which DBP has had recourse in procuring its capital requirements, DBP is confident that it meets or betters benchmark levels on other measures of solvency such as interest cover, debt repayment cover, expenditure approval processes and the like.

5.15. However, in other respects, what is required by Rule 87(2)(a)(ii) is that the financing structure "reflects…best practice", not that it is assumed to conform with benchmarks determined by sampling or other benchmarking techniques. Practices are responsive to conditions and context—what is best practice in one context may clearly not be best practice in another. To ignore context would, in DBP's view, be to act contrary to the requirements of Rule 74(2). By way of example, DBP's utilisation of imputation credits is a matter to be tested against the standard of best practice, not a benchmark.

5.16. If such things as the nominal risk-free rate, the equity beta, the market risk premium and credit rating levels to be applied to DBP are to be based on an assumed benchmark, where is the justification for that in Rule87(2)(a)?

"Well accepted approach" and "well accepted financial model"

5.17. The use of the term "approach" in rule 87(2)(b) is revealing. What is described in the rule is a method of determination that necessarily involves a process of analysis and assessment of general market conditions and the risks relevant to the particular service provider. The method is to incorporate use of a tool, such as WACC, to assess the cost of equity and debt, and use of another tool, such as CAPM, to assess rates of return from a financial economics perspective. Each of such tools must be employed with particular regard to its strengths and weaknesses as a possible determinant of the governing criteria in Rule 87(1).

5.18. This is especially so when using a "well accepted financial model". It is important to understand and take into account the inherent ability or inability of a model to provide reliable information in respect of both elements of the criteria contained in Rule 87(1). In other words, it is necessary to consider the inherent ability of a "well accepted financial model" to produce a rate of return that is commensurate with prevailing conditions in the market generally for funds also and the peculiar risks which the service provider faces in the providing the relevant reference services. Unless this is done, Rule 87(1) cannot be satisfied and the objects of the rate of return will not be achieved.

5.19. Rule 87(2)(b) allows the use of a well accepted approach that incorporates the cost of equity and debt, such as the Weighed Average Cost of Capital. So far as the cost of equity is concerned, the rule does not require that the service provider only use the Capital Asset Pricing Model—rather, it requires the identification of an appropriate approach to determining the cost of equity. The rule permits a variety of approaches to be used, as long as they are well accepted. Whatever approach is used, it must result in a rate of return on equity capital, for inclusion in the WACC (or other appropriate approach), that is commensurate with the peculiar risks faced by the service provider in providing the reference services and ultimately permits the national gas objective and the revenue and pricing principles to be achieved and satisfied.

5.20. The meaning of the expression "well accepted" has proven to be somewhat problematic. The argument that a model cannot be regarded as "well-accepted" because Australian regulators have so far not endorsed it is circular and cannot be what is intended by the legislation. All financial models of the kind referred to in Rule 87 have their origins in academic theory; all have been applied with differing degrees of success in commerce; and all continue to be the subject of continued academic discourse and refinement.

6. APPLYING RULE 87(2): USE OF A REAL PRE-TAX WACC

6.1. Rule 87(2)(b) allows the use of a well accepted approach that incorporates the cost of equity and debt, such as the Weighed Average Cost of Capital.

6.2. To guide the process of establishing a rate of return which is to be used in determining the total revenue and proposed revised reference tariff for the DBNGP, a WACC has been calculated in accordance with the requirements of Rule 87(2). In fact, as will be explained later in this submission, multiple WACCs have been calculated, as is to be expected given that the process is one involving estimation and the exercise of judgement. In the assessment of these WACCs, Rule 74 requires an estimate or forecast to be arrived at on a reasonable basis, and that it represent the best forecast or estimate possible in the circumstances.

6.3. Use of a WACC is, in accordance with Rule 87(2), a well accepted approach.

6.4. The WACCs which have been calculated are real, pre-tax WACCs. Although the national regulator, the Australian Energy Regulator (AER), now uses a nominal post tax method for total revenue determination, the NGL and the NGR do not preclude use of a real pre-tax WACC.

6.5. In the absence of an imputation tax system, the nominal post-tax form of the WACC is:

$$WACC_{\text{nominal post-tax}} = E(r_e) \times E/V + E(r_d) \times (1 - t) \times D/V,$$

where:

- $E(r_e)$ is the nominal post-tax expected rate of return on equity - the cost of equity;
- $E(r_d)$ is the nominal pre-tax expected rate of return on debt - the cost of debt;
- E/V is the proportion of equity in the total financing (which comprises equity and debt);
- D/V is the proportion of debt in the total financing; and
- t is the tax rate.

6.6. Australian taxation law requires the payment of tax by corporations, recognises shareholder payment of tax on dividends as involving double taxation of the same income stream, and provides credits to shareholders for tax already paid at the corporate level. In these circumstances, the calculation of the WACC must be modified to properly represent the additional element of shareholder return available through the taxation system:

$$WACC_{\text{nominal post-tax}} = E(r_e) \times (1 - t) \times 1/[1 - t \times (1 - \gamma)] \times E/V + E(r_d) \times (1 - t) \times D/V,$$

where γ (gamma) is the proportion of tax collected at the corporate level which is to be credited against personal tax payments (γ is a measure of the value of imputation credits).

6.7. The equivalent nominal pre-tax WACC can be obtained by dividing the right hand side of the formula for the nominal post-tax WACC by 1 – t:

$$WACC_{\text{nominal pre-tax}} = E(r_e) \times 1/[1 - t \times (1 - \gamma)] \times E/V + E(r_d) \times D/V.$$

6.8. A real pre-tax WACC is then obtained by removing expected inflation from the nominal pre-tax WACC:

$$WACC_{\text{real pre-tax}} = (1 + WACC_{\text{nominal pre-tax}})/(1 + \pi^e) - 1,$$

where π^e is expected inflation.

7. ESTIMATION OF THE COST OF EQUITY

7.1. So far as the cost of equity is concerned, rule 87(2) does not require that the service provider only use the Capital Asset Pricing Model - rather it requires the identification of an appropriate approach to determining the cost of equity and debt. The rule permits a variety of approaches to be used, as long as they are well accepted. Whatever approach is used, it must result in a rate of return on equity capital, for inclusion in the WACC, that is commensurate with the peculiar risks faced by the service provider in providing the reference services.

7.2. Rule 87(2) requires:

(a) use of a well accepted approach, such as the WACC, which incorporates the cost of equity and the cost of debt; and

(b) use of a well accepted financial model, such as the CAPM.

7.3. The CAPM, and other asset pricing models, are models which have been developed by financial economists to explain the prices of financial assets. Often asset prices are expressed as rates of return. If an investor buys an asset today, at price p, and that asset provides a payoff x one period later, the rate of return on the asset is r = x/p - 1: the asset's price and its rate of return are directly, but inversely, related.

7.4. The term "Capital Asset Pricing Model" is not defined in the NGL or in the NGR. The literature of financial economics reports many capital asset pricing models but, in that literature, the phrase "the Capital Asset Pricing Model" is usually reserved for the capital asset pricing model proposed, during the 1960s, by William Sharpe, John Lintner, Jan Mossin and others.[2]

7.5. Asset pricing models can be used to price – to estimate the cost to the buyer of - different types of financial assets. Often asset pricing models are used to estimate the cost of equity. In their access price determinations, Australian regulators have not usually used asset pricing models to estimate the cost of debt. They have sought to approximate the cost of debt as the sum of a nominal risk free rate of return and a debt risk premium.

7.6. Having regard to the matters raised in section 7.1 of this submission, to guide the setting of the rate of return to be used in determining the total revenue and proposed revised reference tariff for the DBNGP, four real pre-tax WACCs have been calculated. In accordance with the requirement of Rule 87(2), each of those WACCs is a weighted average of the cost of equity and the cost of debt.

7.7. The cost of equity to be used in these calculations is the expected rate of return on equity. That expected rate of return must be estimated, and Rule 87(2) requires estimation using a well accepted financial model.

7.8. Four asset pricing models have been used to estimate the cost of equity for calculating WACC's to guide the process of establishing a rate of return which is to be used in determining the total revenue and proposed revised reference tariff for the DBNGP. The four models are:

(a) the CAPM;

[2] The model now referred to as the CAPM was initially reported in the following published papers: William F. Sharpe (1964), "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk", Journal of Finance, 19(3): 425-442; John Lintner (1965), "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets", Review of Economics and Statistics, 47(1): 13-47; and Jan Mossin (1966), "Equilibrium in a Capital Asset Market", Econometrica, 34(4), 768-683.

(b) Black's zero beta capital asset pricing model;

(c) the Fama-French three factor model; and

(d) the zero beta version of the Fama-French three factor model.

7.9. Each of these four models is, like all models, a simplified description of a complex reality.

The CAPM

7.10. The CAPM is a model in which the capital market equilibrium rate of return on a risky asset is explained in terms of the expected rate of return on the market portfolio, the portfolio comprising every asset held in a proportion which is the ratio of the total market value of the asset to the market value of all assets.[3] The CAPM may be written:

$$E(r_i) = r_{rf} + [E(r_m) - r_{rf}] \times \beta_i,$$

where $E(r_i)$ denotes the expected rate of return on risky asset i, and r_{rf} denotes the rate of return on a risk free asset. $E(r_m)$ is the return on the market portfolio, and β_i - the beta of asset i - is the ratio $cov(r_i, r_m)/\sigma^2(r_m)$, where:

(a) $cov(r_i, r_m)$ is the covariance between the return on asset i and the return on the market portfolio; and

(b) $\sigma^2(r_m)$ is the variance of return on the market portfolio.

7.11. The CAPM explains the expected rate of return on an asset in terms of the risk free rate of return and a premium for risk. The premium for risk is the product of the market risk premium, $E(r_m) - r_{rf}$, and the asset's beta. The beta of the asset measures the contribution which the asset makes to the risk of the market portfolio. Investors are assumed to hold diversified portfolios (in which no individual asset accounts for a large part of total investment) and, in consequence, the risk of a particular asset depends on the covariance of its return with the returns on other assets, rather than on the variance of its return. The CAPM explains the premium (above the risk free rate) in the expected rate of return on a risky asset in terms of this covariance risk.

7.12. Rule 87(2) states that the CAPM is well accepted, and Australian regulators, including the ERA, have used the CAPM to estimate the cost of equity for access pricing decisions. The CAPM is well accepted, not because it provides the best estimates or forecasts of the rate of return, but because it provides an important insight into the nature of the relationship between risk and return.

7.13. That the CAPM did not provide the best estimates or forecasts of expected rates of return became apparent when the first econometric tests of the model were carried out in the late 1960s and early 1970s.[4] (Subsequent studies, using more refined statistical methods, continued to show that the CAPM was not a particularly good model of asset pricing.[5]) The

[3] See NERA Economic Consulting, *The Required Rate of Return on Equity for a Gas Transmission Pipeline: A Report for DBP*, 31 March 2010, pages 3-4. NERA's report, which is subsequently referred to as NERA (2010), is attached as Attachment 1 to this submission.

[4] See, for example, Irwin Friend and Marshall Blume (1970), "Measurement of Portfolio Performance Under Uncertainty", American Economic Review, 60(4): 561-575; Fisher Black, Michael C. Jensen and Myron Scholes (1972), "The Capital Asset Pricing Model: Some Empirical Tests", in Michael C. Jensen (ed.), *Studies in the Theory of Capital Markets*, New York: Praeger; Marshall E. Bloom and Irwin Friend (1973), "A New Look at the Capital Asset Pricing Model", Journal of Finance, 28(1): 19-33; Marshall E. Bloom and Frank Husic (1973), "Price, Beta, and Exchange Listing", Journal of Finance, 28(2): 283-299; and Eugene F. Fama and James D. MacBeth (1973), "Risk, Return, and Equilibrium: Empirical Tests", Journal of Political Economy, 81(3): 607-636.

[5] See, for example, Rolf W. Banz (1981), "The Relationship Between return and Market value of Common Stocks", Journal of Financial Economics, 9: 3-18; Marc R. Reinganum (1982), "Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings' Yields and Market values", Journal of Financial Economics, 9: 19-46; Michael R. Gibbons (1982), "Multivariate Tests of Financial Models: A New Approach", Journal of Financial Economics, 10: 3-27; Robert F. Stambaugh

first econometric tests indicated that the relationship between expected rate of return and risk (measured by the equity beta) was linear, as the CAPM predicted. It was not, however, the linear relationship of the CAPM: the slope of the relationship between rate of return and beta appeared to be less than the slope implied by the CAPM.

7.14. The CAPM is derived from a model of portfolio choice in which investors choose, at a point in time, portfolios of assets which yield returns one period later. The following key assumptions are made for the derivation:

(a) quantities of the assets are fixed, and the assets are assumed to be perfectly divisible and perfectly liquid (marketable);

(b) the market in which assets are traded is perfectly competitive: investors take the market prices of the assets prices as given;

(c) there are no restrictions on the short selling of assets, no transaction costs are incurred when assets are traded, and there are no taxes;

(d) one of the assets available in the market is a risk free asset: investors can borrow and lend, in unlimited amounts, at a the rate of return on this risk free asset (the risk free rate of rate of return) which is fixed and determined outside the model;

(e) the return on a portfolio of assets is not known with certainty at the time the portfolio is chosen, but all investors know the true joint probability distribution of returns at the end of the period (the assumption of homogeneous expectations); and

(f) investors maximise the expected utility of terminal wealth by choosing among alternative portfolios which can be ranked in terms of expected portfolio return and risk, with risk measured as the variance, or standard deviation, of portfolio return.

7.15. Some of these assumptions are questionable, and have been identified as possible causes of the empirical failure of the CAPM.

Black's zero beta capital asset pricing model

7.16. In 1972, Fischer Black derived, within the mean-variance framework within which the CAPM was derived, a capital asset pricing model (Black's CAPM) without assuming the existence of a risk free asset, and without assuming unrestricted borrowing and lending.[6]

7.17. In Black's derivation, the return on a portfolio for which return is uncorrelated with the return on the market portfolio acts as the equivalent of the risk free rate of return. Black called this portfolio the zero-beta portfolio, and denoted its expected return $E(r_z)$.

7.18. Black's CAPM explains the expected return on any asset i as the following linear function of the asset's beta:

$$E(r_i) = E(r_z) + [E(r_m) - E(r_z)] \times \beta_i.$$

7.19. Black also showed that when there is a risk free asset available, but investors are not able to take short positions in that asset, $r_{rf} < E(r_z) < E(r_m)$. In these circumstances:

(1982), "On the Exclusion of Assets from Tests of the Two Parameter Model: A Sensitivity Analysis", Journal of Financial Economics, 10: 237-268; Jay Shanken (1987), "Multivariate Proxies and Asset Pricing Relations: Living with the Roll Critique", Journal of Financial Economics, 18: 91-110; and Eugene F. Fama and Kenneth R. French (1992), "The Cross Section of Expected Stock Returns", Journal of Finance, 47(2): 427-465.

[6] Fischer Black (1972), "Capital Market Equilibrium with Restricted Borrowing", Journal of Business, 45(3): 444-455. See also M J Brennan (1970), "Capital Market Equilibrium with Divergent Borrowing and Lending Rates", Journal of Financial and Quantitative Analysis, 6(5): 1197-1205. Black's CAPM is discussed in NERA (2010), pages 5-6.

(a) when β is low, the expected return predicted by the CAPM is less than the expected return predicted by the Black's CAPM; and

(b) when β is high, the expected return predicted by the CAPM is greater than the expected return predicted by Black's CAPM.

7.20. This seemed to accord with the results of econometric tests by Friend and Bloom (1970), and by Black, Jensen and Scholes (1972). Using US share price data for the period 1926 to 1966, Black, Jensen and Scholes had found that expected returns on portfolios of shares with low betas were consistently higher than the expected returns predicted by the CAPM, and expected returns on portfolios of shares with high betas were consistently lower than the expected returns predicted by the CAPM.[7]

7.21. Black was able to explain why the slope of the relationship between rate of return and beta was less than the slope implied by the CAPM by dropping one of the most contentious of the assumptions required for CAPM derivation, the assumption of unlimited borrowing and lending at the risk free rate of return. Furthermore, his explanation retained the simple linear relationship between expected rate of return and beta. Black's CAPM has, therefore, fared a little better in the literature on asset pricing than the CAPM.[8] It does not, however, provide a fully satisfactory explanation of asset prices, possibly because its derivation requires many of the same questionable assumptions that were made to derive the CAPM.[9]

Asset prices and the stochastic discount factor

7.22. In 1973, Robert Merton made the following assessment of the state of asset pricing theory:

Although the model has been the basis for more than one hundred academic papers and has had a significant impact on the non-academic financial community, it is still subject to theoretical and empirical criticism. Because the model assumes that investors choose their portfolios according to the Markowitz mean-variance criterion, it is subject to all the theoretical objections to this criterion, of which there are many.[10]

7.23. The "model", to which Merton was referring, was the CAPM, but his concerns apply equally to Black's CAPM which was derived within the same mean-variance framework. Merton sought to avoid the theoretical objections to the mean-variance framework by deriving a general form of the asset pricing relationship using the standard model of intertemporal choice from microeconomic theory. His use of intertemporal choice theory allowed another of the strong assumptions required for derivation of the CAPM and Black's CAPM – the assumption of a single time period – to be dropped, and opened the way to explicit consideration of the role of time in investment decisions and asset pricing.[11]

7.24. Merton showed that, in equilibrium, expected rates of return must compensate investors for bearing market risk (the key insight of the CAPM), and they must also compensate for the bearing of the risk of unfavourable shifts in the set of investment opportunities over time. If economic circumstances change over time, the explanation of the CAPM is inadequate, and a second risk factor is required to explain asset prices.

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7 The references are in footnote 2.

8 See, for example, Jay Shanken (1985), "Multivariate Tests of the Zero-Beta CAPM", Journal of Financial Economics, 14: 327-348; Shmuel Kandel and Robert F Stambaugh (1989), "A Mean-Variance Framework for Tests of Asset Pricing Models", Review of Financial Studies, 2(2): 125-156; and John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay (1997), The Econometrics of Financial Markets, Princeton: Princeton University Press.

9 See NERA (2010), pages 6-7.

10 Robert Merton (1973). "An Intertemporal Capital Asset Pricing Model", Econometrica, 41(5): 867-887.

11 See NERA (2010), page 6.

7.25. Subsequent application of Merton's method – the use of the standard model of intertemporal choice – has shifted the focus of asset pricing theory away from portfolio choice, to the macroeconomic factors which are the ultimate determinants of the risk premia in asset prices.[12]

7.26. Intertemporal choice leads to the simple, but starkly abstract, asset pricing model:

$p_t = E_t[m_{t+1}x_{t+1})]$,

where p_t is the equilibrium asset price at time t, x_{t+1} is the uncertain payoff on the asset at time t + 1, and m_{t+1} is a stochastic discount factor.[13] This model expresses the simple idea that, in a competitive capital market, the price of an asset is its expected discounted payoff, the expectation being formed at time t, the time at which a decision to purchase the asset is made.

7.27. The stochastic discount factor, m_{t+1}, is determined by the ratio of the marginal utility from the consumption of goods and services tomorrow (period t + 1) to the marginal utility of consumption today (period t). It reveals a fundamental determinant of asset prices and, hence, of rates of return: the rate at which investors are willing to substitute consumption tomorrow for consumption today. This rate is, in turn, determined by the rate of growth in consumption between today and tomorrow. Asset prices, and rates of return, are, therefore, determined by expectations about consumption growth. This important result links asset prices to the state of the economy.

7.28. For a number of reasons, relating the stochastic discount factor directly to consumption growth does not facilitate the development of asset pricing beyond the rather abstract presentation in paragraph7.26.[14] In these circumstances, more specific representations of the discount factor have been sought. In one line of research, the discount factor is modelled as a linear function of the economic factors, f_i, which determine consumption growth. The asset pricing equation then has the beta representation:

$E_t(r) = a + b_1 \times \beta_{f1,\,r} + b_2 \times \beta_{f2,\,r} + \ldots + b_n \times \beta_{fn,\,r}$,

where $E_t(r)$ is the expected rate of return on an asset; a is a constant; $b_i = \alpha \times var(f_i)$, α a constant; and $\beta_{fi,\,r} = cov(f_i, r)/var(f_i)$.

7.29. These linear factor models have been an area of theoretical and empirical research in financial economics for at least two decades.[15] A key issue for this research has been the question of what are the appropriate factors. Theoretical considerations, as outlined above, require that they be variables which can be explicitly related to investor marginal utility or consumption growth.

7.30. One such factor is the return on a portfolio of total wealth. Consumption is high when investor returns on a portfolio of all assets is high. This portfolio of all assets would comprise financial assets, real – tangible – assets, and intangible – but valuable – assets such as investments in human capital. If the number of factors is restricted to one, and that one factor is the return on a portfolio of total wealth (r_w), the beta representation of the basic asset pricing equation is:

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12 See, for example, the recent textbook on asset pricing by John H. Cochrane (2005), *Asset Pricing*, revised ed., Princeton: Princeton University Press, and the recent textbook by Sumru Altug and Pamela Labadie (2008), *Asset Pricing for Dynamic Economies*, Cambridge: Cambridge University Press.

13 Since the rate of return on the asset is $r_{t+1} = x_{t+1}/p_t - 1$, the model can be written in terms of the rate of return rather than the asset's price: $E_t(m_{t+1}(1 + r_{t+1}) = 1$.

14 See John H. Cochrane (2005), *Asset Pricing*, revised ed., Princeton: Princeton University Press, page 77.

15 See John Y. Campbell (2000), "Asset Pricing at the Millennium", Journal of Finance, 55(4): 1515-1567; and John H Cochrane (2007), "Financial Markets and the Real Economy", in Rajnish Mehra (ed.), *Handbook of the Equity Risk Premium*, New York: Elsevier.

$E_t(r_{t+1}) = r_{rf} + (E(r_w) – r_{rf}) \times \beta_{w,r}$.

7.31. This is the conditional CAPM (the expected rate of return is conditional on the information available today). If further assumptions are made (for example, returns distributions are identically and independently multivariate normal), the conditioning can be removed, and the model reduces to the CAPM.

7.32. Restriction of the number of parameters to one – return on a portfolio of total wealth – is, however, arbitrary. Since the work of Merton in 1973, there has been a recognition that multiple factors are required to explain equilibrium asset prices. Currently, the most widely recognised – and tested – multiple linear factor model is the Fama-French three-factor model.[16]

7.33. Fama and French have proposed and tested a model in which asset prices - rates of return - are explained by:

(a) the excess return to the market portfolio, $E(r_m) – r_{rf}$;

(b) the difference between the return to a portfolio of high book-to-market shares and the return to a portfolio of low book-to-market shares (HML); and

(c) the difference between the return to a portfolio of small capitalization shares and a portfolio of large capitalization shares (SML).

7.34. The Fama-French three-factor model is:

$E(r) = r_{rf} + [E(r_m) – r_{rf}] \times b_{rm} + HML \times h + SMB \times s$.

7.35. Tests using US stock market data have shown that the three factor model appears to have significantly greater explanatory power than the CAPM.[17] Similar results have also been obtained using Australian share prices.[18]

7.36. Like the CAPM, the Fama-French three factor model has been shown to underestimate expected rates of return on low beta assets, and this has motivated use of a zero-beta version of the model.[19] In a zero beta version, the assumption of unrestricted borrowing and lending at the risk free rate of return (r_{rf}), is dropped, and the risk free rate is replaced by the return on an asset for which the return is not correlated with the return on the market portfolio.

7.37. Economic theory places a specific restriction on the factors used in multiple linear factor models: they must be variables which can be explicitly related to investor marginal utility or consumption growth. Beyond this, theory does not provide a precise specification of the factors. Critics have therefore argued that the Fama-French three factor model incorporates factors which are tainted by selection to “fit the data”. Others have provided evidence supporting the view that the Fama-French book to market (HML) and size (SML) factors do, in fact, act as proxies for variables which can be related to investor marginal utility or consumption growth.[20]

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16 John H. Cochrane (2005), *Asset Pricing*, revised ed., Princeton: Princeton University Press, page 438; NERA (2010), pages 7-10.

17 See, for example, Eugene F. Fama and Kenneth R. French (1996), “Multi-factor Explanations of Asset-Pricing Anomalies”, Journal of Finance, 47: 426-465.

18 Clive Gaunt (2004), “Size and book to market effects and the Fama French three factor asset pricing model: evidence from the Australian stockmarket”, Accounting and Finance, 44: 27-44.

19 NERA (2010), page 10. See, also, Jonathon Lewellen, Stefan Nagle and Jay Shanken (in press), "A sceptical appraisal of asset pricing tests", Journal of Financial Economics.

20 For example, A. Craig MacKinlay (1995), “Multifactor models do not explain deviations from the CAPM”, Journal of Financial Economics, 38: 3-28”, argues that factor selection may be little more than “data snooping” (although the inadequacies of the

A well accepted financial model

7.38. Each of the CAPM, Black's CAPM, the Fama-French three factor model, and the zero beta version of the Fama-French model is a well accepted financial model, although:

(a) each is well accepted for different reasons; and

(b) acceptance does not means that the model is without defects.

7.39. The CAPM is well accepted, not because it provides better estimates of the rate of return, but because it provides an important insight into the nature of the relationship between risk and return.[21]

7.40. Black's CAPM is well accepted because it overcomes a significant concern about the way in which the CAPM was derived while still retaining a simple linear relationship between expected rate of return and beta. This relationship provided better estimates of the expected rate of return than the CAPM.

7.41. Black's CAPM is, like the CAPM, a single factor model. Both the CAPM and Black's CAPM were derived in a static, single period setting. However, the investment decisions which they purport to model are, fundamentally, decisions about resource allocations over time. They are not appropriately modelled in a static, single period setting. As Merton showed, in 1973, modelling the consumption-investment decision in an intertemporal framework implies a multiple factor model. Multiple factor models, explaining expected rates of return or asset prices in terms of linear representations of the stochastic discount factor, have, since the 1970s become the standard models of asset pricing.

7.42. The best known of the multiple factor models is the Fama-French three factor model, although that model may underestimate expected rates of return on low beta assets. This underestimation can be "corrected" by specifying a zero-beta version of the model (in the same way that underestimation by the CAPM is corrected by Black's zero beta capital asset pricing model). Although there is not, at the present time, strong theoretical support for the three factors, the Fama-French model and its zero-beta version, are well accepted models of the economic processes by which expected returns on equity are determined.[22]

Estimating the four asset pricing models

7.43. NERA, has made estimates of the values for certain parameters of the CAPM, Black's CAPM, the Fama-French three factor model, and the zero beta version of the Fama-French model, using Australian data. The data and methods of estimation are described in NERA's report for DBP, which is attached as Attachment 1.

7.44. Using NERA's parameter estimates, estimates have been made of the expected rate of return on equity - the cost of equity - for a pipeline service provider. To make these estimates of the cost of equity, estimates of the nominal risk free rate of return and of the market risk premium were required.

CAPM which multiple factor models are seeking to address remain). Jimmy Liew and Maria Vassalou (2000), "Can book-to-market, size and momentum be risk factors that predict economic growth?", Journal of Financial Economics, 57: 221-245, and Maria Vassalou (2003), "News related to future GDP growth as a risk factor in equity returns", Journal of Financial Economics, 68: 47-73, provide evidence supporting the view that the Fama-French factors are proxies for specific macro-economic risks.

[21] NERA (2010), pages 12-21.

[22] NERA (2010), pages 21-24.

Nominal risk free rate

7.45. The nominal risk free rate of return is a theoretical construct (the return on an "ideal" risk free asset), and cannot be measured directly. In consequence, consideration must be given to:

(a) choice of a proxy for the (theoretical) asset which yields a risk free rate of return; and

(b) the period over which the return on the proxy – the estimate of the risk free rate of return – is to be measured.

7.46. Low risk Commonwealth Government securities with terms to maturity of 10 years provide a proxy for the asset which yields a risk free rate of return, and the nominal risk free has been estimated from the most recent available yields on those securities. Recently reported yields incorporate the latest market information and expectations about future rates, but they also contain a random component ("noise"). Some averaging of yields reduces the effect of this noise on the estimate of the risk free rate of return, with longer-term averages achieving better noise reduction. However, longer term averaging may introduce a bias because greater weight is given to superseded prior expectations.

7.47. To balance noise reduction against this potential for bias, the nominal risk free return has been estimated by averaging daily yield data, reported by the Reserve Bank of Australia, for Commonwealth Government securities with term to maturity of 10 years, over a period of 20 trading days to 18 March 2010. The average - the estimate of the nominal risk free rate - is 5.48%.

7.48. This estimate has been arrived at on a reasonable basis, and represents the best estimate possible in the circumstances.

Market risk premium

7.49. Following an examination of the statistical evidence, the AER concluded in its May 2009 decision on WACC parameters to be applied in the setting of prices for access to electricity transmission and distribution networks, that:

(a) a market risk premium (MRP) above 6.0% now seemed appropriate; and

(b) a premium of 6.5% was commensurate with conditions in the market for funds.[23]

7.50. Subsequently, the ERA required the use of a MRP of 6.5% in its October 2009 Draft Decision on proposed revisions to the access arrangement for the Goldfields Gas Pipeline, and in its December 2009 Final Decision on Western Power's South West Interconnected Network.

7.51. A MRP of 6.5% has, therefore, been used to estimate the cost of equity for the application of Rule 87(2) in guiding the setting of a rate of return to be used to determine the total revenue and proposed revised reference tariff for the DBNGP.

7.52. This estimate of the MRP has been arrived at on a reasonable basis, and represents the best estimate possible in the circumstances.

[23] Australian Energy Regulator, *Final Decision: Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, May 2009, pages 175-138.

Four estimates of the cost of equity

7.53. Four estimates of the cost of equity were obtained from the four asset pricing models for which parameters were estimated by NERA. NERA's estimates, and the expected rate of return on equity estimated from each of the models, are shown in Table 1.

Table 1
Estimates of the cost of equity

Parameter values			
	Nominal risk free rate	r_{rf}	5.48%
	Market risk premium	$E(r_m) - r_{rf}$	6.50%
CAPM			
$E(r_e) = r_{rf} + \beta \times (E(r_m) - r_{rf})$			
	Beta	β	0.51
	Cost of equity	**$E_{CAPM}(r_e)$**	**8.79%**
Black's zero beta capital asset pricing model			
$E(r_e) = r_{rf} + z + \beta \times (E(r_m) - r_{rf} - z)$			
	Beta	β	0.51
	Zero beta premium	z	6.50%
	Cost of equity	**$E_{ZB}(r_e)$**	**11.98%**
Fama-French three factor model			
$E(r_e) = r_f + b \times (E(r_m) - r_f) + h \times HML + s \times SMB$			
		b	0.57
		h	0.41
		s	0.28
	High minus low	HML	6.12%
	Small minus big	SMB	-0.45%
	Cost of equity	**$E_{FF}(r_e)$**	**11.57%**
Zero beta Fama-French model			
$E(r_e) = r_{rf} + z + b \times (E(r_m) - r_{rf} - z) + h \times HML + s \times SMB$			
		b	0.57
		h	0.41
		s	0.28
	Zero beta premium	z	6.50%
	High minus low	HML	6.12%
	Small minus big	SMB	-0.45%
	Cost of equity	**$E_{ZBFF}(r_e)$**	**14.36%**

8. APPLYING RULE 87(2): COST OF DEBT

8.1. In the application of economic regulation in Australia, the (nominal) cost of debt has usually been estimated as the sum of:

(a) the nominal risk free rate of return;

(b) a debt risk premium; and

(c) an allowance for debt raising costs.

8.2. A formal asset pricing model, such as the CAPM, has not been used to estimate the cost of debt.

8.3. Estimation of the debt risk premium has been a contentious issue in the recent decisions of Australian regulators. The premium has been derived from extrapolations of, and interpolations between, value curves obtained from services such Bloomberg and CBASpectrum. These extrapolations and interpolations are considered necessary to obtain an estimate which is consistent with use of a time horizon of 10 years (the nominal risk free rate and other parameters are estimated from rates of Commonwealth Government securities with term to maturity of 10 years) and a credit rating of BBB+ for the benchmark service provider of Rule 87(2).

8.4. However, in recent years, there have been few commercial debt issues in the Australian market with a tenor of 10 years, by businesses with BBB+ credit ratings, which can assist estimation of the debt risk premium.

8.5. An alternative approach has, therefore, been taken to estimate of the cost of debt for use in determining a series of real pre-tax WACCs which can guide the establishment of the rate of return used in determining the total revenue and proposed revised reference tariffs for the DBNGP. A substantial part of the existing debt which finances the DBNGP must be refinanced in 2010 and 2011, and AMP Capital Investors was engaged to advise on possible options for refinancing. As part of this refinancing process, AMP Capital Investors has provided advice on the likely pricing of debt by lenders for use in estimating the cost of debt for the purpose of establishing the rate of return to be used in determining the total revenue and revised reference tariff for the DBNGP.

8.6. DELETED

8.7. DELETED

8.8. The reference rate for the pricing of debt by lenders is not the nominal risk free rate (a theoretical concept), or yields on Commonwealth Government bonds (from which the nominal risk free rate is usually estimated). It is the Bank Bill Swap Rate (BBSW) for a tenor of 10 years. The cost of debt is then expressed as a total cost above BBSW, with this total cost comprising a number cost components including the lender's margin and some costs of which may be specific to particular markets.

8.9. BBSW varies daily, and an indication of the current level of the rate has been obtained by averaging the rates reported by the Bloomberg service over a period of 20 trading days to 18 March 2010. The average rate was 6.06%.

8.10. Conditions in the market for funds are such that a capital intensive business requiring a substantial volume of debt (in the order of $3 billion) would currently be unable to secure all of its requirement in Australian capital markets. A large regulated utility would expect to source at least some funds in international capital markets.

8.11. The domestic and international markets in which a large Australian regulated utility might expect to be able to obtain funds at the lowest total costs are:

(a) Australian domestic bond market;

(b) Australian bank market;

(c) US public bond (144a) market;

(d) US private placement market;

(e) Asian bank market;

(f) Sterling market; and

(g) Eurobond market.

8.12. DELETED

8.13. The Australian domestic bond market is less well developed than its counterparts in Europe and North America, and a large Australian regulated utility seeking to access this market may have some difficulties because issues are generally restricted to more highly rated enterprises. However, investors participating in the bond market understand Australian utilities regulation, and market access negates any requirement for cross currency hedging.

8.14. The principal source of Australian dollar debt finance for a large Australian regulated utility is the Australian bank market. However, tenor is an issue in this market: it is available for 5 to 7 years, but only a small number of banks have the capacity to finance for as long as 7 years.

8.15. Longer term financing, with a tenor of around 10 years, is only available in highly liquid debt markets in the United States, principally the public bond market (144a market), and the private placement market.

8.16. DELETED

8.17. DELETED

8.18. DELETED

8.19. The approach allows an estimate of the cost of debt to be made on a reasonable basis: as a build-up of the costs which are likely to be incurred by a benchmark service provider requiring debt finance for investment in a gas transmission pipeline system. The approach recognises the fact that the benchmark service provider will source funds in a number of markets, including international capital markets.

8.20. Furthermore, the approach recognises the real limitations of these markets. In some markets debt with a term of 10 years is not available. This is not a limitation which can be addressed by extrapolation and interpolation between yield curves for borrowers with high credit ratings who have some access 10 year debt, and borrowers (similar to a service provider) who have lower credit ratings and are restricted to debt with a shorter tenor.

8.21. This approach to estimating the cost of debt is the approach taken by lenders when pricing debt. It is well accepted by capital market participants. It is a reasonable basis of estimation, and provides the best estimate possible in the circumstances.

9. APPLYING RULE 87(2): GEARING

9.1. In the application of economic regulation in Australia, a benchmark gearing of 60% debt has generally been assumed for regulated assets in the energy sector. The appropriateness of this level of gearing was reaffirmed by the AER in its May 2009 decision on WACC parameters to be applied in the setting of prices for access to electricity transmission and distribution networks.[24] In making its decision, the AER examined the recent gearing of Australian gas and electricity businesses.

9.2. Gearing of 60% was determined, by the ERA and by its predecessor, the Western Australian Independent Gas Pipelines Access Regulator, to be the efficient level of gearing for the DBNGP.

9.3. DELETED

[24] Australian Energy Regulator, Final Decision: Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters, May 2009, pages 125-127.

10. APPLYING RULE 87(2): TAX RATE

10.1. A tax rate of 30% has been used in applying rule 87(2) to calculate a pre-tax WACC.

10.2. This is the current corporate tax rate, and is the rate appropriate for the setting of access prices for a service provider which uses a financing structure which meets benchmark standards as to gearing and other financial parameters for a going concern and reflects in other respects best practice.

11. APPLYING RULE 87(2): VALUE OF IMPUTATION CREDITS

11.1. Australian regulators have long held the view that an appropriate estimate for the factor gamma (the factor which values imputation credits) in the WACC formulae in paragraphs 6.6 and 6.7 above) is 0.5. In May 2009, following a review of rate of return parameters to be applied in the setting of prices for access to regulated electricity transmission and distribution networks, the AER estimated the value gamma to be 0.65 (the higher value implying, other things being equal, a lower real pre-tax WACC).[25]

11.2. In its October 2009 Draft Decision on proposed revisions to the access arrangement for the Goldfields Gas Pipeline, and in its December 2009 Final Decision on Western Power's proposed revisions to the access arrangement for the South West Interconnected Network, the ERA determined that an estimate of gamma should lie in the range 0.57 to 0.81.[26]

11.3. On careful examination, the evidence which the AER and the ERA have relied upon for their estimates of gamma does not support the contention that 0.65 is an estimate which has been arrived at on a reasonable basis, and which represents the best estimate possible in the circumstances. Nor does it support the view that an estimate of gamma should lie in the range 0.57 to 0.81.

11.4. This careful examination of the evidence has been undertaken for the Operator by finance consultants Strategic Finance Group (SFG). SFG concluded:

(a) market practice is to set gamma to zero or, equivalently, to make no adjustment to the WACC in relation to any assumed value of franking credits;

(b) current market evidence supports a value of gamma within the range of 0 to 0.23; and

(c) the evidence indicates a point estimate of 0; there is no evidence which supports a value of gamma above 0.23.

11.5. From the advice received from SFG, a value of 0.20 has been assigned to the factor gamma for the purpose of a WACC calculation made in accordance with rule 87(2).

11.6. SFG's report for Dampier Bunbury Pipeline is attached to this submission as Attachment 3.

[25] Australian Energy Regulator, Final Decision: Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters, May 2009, pages 466-469.

[26] Economic Regulation Authority, Draft Decision on GGT's Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline – Redacted version, 9 October 2009, paragraph 529; and Final Decision on Proposed Revisions to the Access Arrangement for the South West Interconnected Network, 4 December 2009, paragraph 922.

12. APPLYING RULE 87(2): EXPECTED INFLATION

12.1. In a number of recent access pricing decisions, the AER has proposed that expected inflation be estimated as the geometric mean of Reserve Bank of Australia inflation forecasts (forecast changes in the Consumer Price Index) for the next 10 years.[27]

12.2. The ERA has proposed that the same method be used to estimate expected inflation for use in revising the total revenue and reference tariffs of the access arrangements for the Goldfields Gas Pipeline and Western Power's South West Interconnected Network.[28]

12.3. Use of a geometric weighted average of existing inflation forecasts is a reasonable basis of estimation, and use of forecasts made by the Reserve Bank provides the best estimate possible in the circumstances.

12.4. This method has been used to estimate expected inflation for the purpose of calculating a real pre-tax WACC for the DBNGP.

12.5. The Reserve Bank of Australia forecasts which have been used are:

(a) 2.50% for the year to June 2011;

(b) 2.75% for the year to June 2012; and

(c) 2.50% for each year from December 2012.

12.6. The forecasts for June 2011 and June 2012 are from the Reserve Bank's February 2010 *Statement on Monetary Policy*. The forecast for each year from December 2012, 2.50%, is the midpoint of the Reserve Bank target range for inflation.

12.7. The geometric mean of these forecasts – the estimate of expected inflation to be used for the purpose of calculating a real pre-tax WACC for the DBNGP – is 2.52%.

[27] Australian Energy Regulator, *Draft Decision – public version: ActewAGL Access arrangement proposal for the ACT, Queanbeyan and Palerang gas distribution network 1 July 2010 – 30 June 2015***,** November 2009, pages 59-62; *Draft Decision – public version: Country Energy Wagga Wagga Natural Gas Distribution Network Access Arrangement proposal***,** November 2009, pages 44-45; and *Draft Decision - public: Jemena Access Arrangement proposal for the NSW gas networks 1 July 2010 - 30 June 2015*, February 2010, pages 140-142.

[28] Economic Regulation Authority, *Draft Decision on GGT's Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline – Redacted version*, 9 October 2009, paragraphs 426-439; and *Final Decision on Proposed Revisions to the Access Arrangement for the South West Interconnected Network*, 4 December 2009, paragraph 837.

13. PRE-TAX REAL WACC DETERMINED BY APPLYING RULE 87(2)

13.1. Four calculations of a real pre-tax WACC have been made for the purpose of guiding the process of establishing the rate of return which is to be used in determining the total revenue and proposed revised reference tariff for the DBNGP. This use of a WACC is a well accepted approach.

13.2. These four calculations use the different estimates of the cost of equity obtained from each of the four well accepted financial models described in section 7 of this submission.

13.3. In each case, the WACC was a weighted average of the cost of equity and the cost of debt, and the weighting – the gearing – was, as noted in section 9 above, 60% debt.

13.4. A common estimate of the cost of debt - 9.73% - has been used in the WACC calculations. The way in which the cost of debt was estimated was explained in section 8 of this submission. Although an asset pricing model derived from economic theory was not used to estimate the cost of debt, the less formal model which was used (build up of the cost of debt from its components) is a well accepted financial model.

13.5. The calculations are of pre-tax WACCs. As noted in section 10 above, the tax rate used in the calculations was 30%. An adjustment made for that part of equity return provided through the dividend imputation provisions of Australian taxation law used a value of gamma of 0.20 (see section 11 above).

13.6. Real pre-tax WACCs were calculated from nominal pre-tax WACCs using an estimate of expected inflation of 2.52%. The way in which the inflation estimate was made was described in section 12 of this submission.

13.7. The values of the parameters used, and the four pre-tax WACCs which have been calculated, are summarised in Table 2.

Table 2
WACC parameter values and real pre-tax WACC

Parameter		Value
Cost of equity (nominal):		
CAPM	$E_{CAPM}(r_e)$	8.79%
Black's CAPM	$E_{Black}(r_e)$	11.98%
Fama-French three factor model	$E_{FF}(r_e)$	11.57%
Zero beta Fama-French three factor model	$E_{ZBFF}(r_e)$	14.36%
Cost of debt (nominal)	$E(r_d)$	9.73%
Gearing (debt to total value)	D/V	60.00%
Tax rate	t	30.00%
Gamma	γ	0.20
Expected inflation	π^e	2.52%
Real pre-tax WACC		
Model used for estimating cost of equity:		
CAPM		7.75%
Black's CAPM		9.38%
Fama-French three factor model		9.17%
Zero beta Fama-French three factor model		10.60%

13.8. The four pre-tax real WACCs shown in Table 2 have been used to guide the process of establishing the rate of return which has been used to determine the total revenue and proposed revised reference tariff for the DBNGP. The process of investigation and reasoning which leads to the choice of the rate of return is set out in the next section of this submission.

14. APPLYING RULE 87(2) TO MEET THE RULE 87(1) CRITERIA – DO THE MODELS MEET THE 87(1) CRITERIA?

14.1. In applying Rule 87(2), it is necessary to bear steadily in mind that the object of the exercise is to determine a rate of return which satisfies rule 87(1) and the statutory purposes of allowing such a rate of return.

14.2. Put another way, in using financial models, such as CAPM and other well accepted models, it is necessary to evaluate the model's ability to provide guidance in relation to the two criteria in Rule 87(1).

14.3. In this section of this submission, a detailed explanation is given as to why none of the models described in section 7, each of which is "well accepted", provides, on its own, a reasonable basis for determining the cost of equity, and why none can then produce the best forecast or estimate of the rate of return possible in the circumstances in compliance with Rule 74. If a model does not provide a reasonable basis for forecasting or estimating the cost of equity, and cannot produce the best forecast or estimate possible in the circumstances, concluding that it will, on its own, provide a complete or accurate result for a rate of return which satisfies the criteria in Rule 87(1) will be difficult.

14.4. A rate of return is an aggregation of a number of components. If the criteria of Rule 87(1) are to be satisfied, the components of this aggregation should, themselves, to the extent that this is meaningful, satisfy these criteria.

14.5. Although rule 87(2) does not define the rate of return, it indicates that the components of the rate of return may include the cost of equity, the cost of debt, gearing and certain other financial parameters. Rule 87(2) also indicates that the aggregation of these components might be effected by forming a weighted average.

14.6. For the purpose of establishing the rate which has been used to determine the total revenue and proposed revised reference tariff for the DBNGP, the rate of return has been conceptualised as a weighted average of the cost of equity and the cost of debt, with the weightings being the proportions of equity and debt in total pipeline financing.

A cost of equity commensurate with prevailing conditions in the market for funds

14.7. As outlined in section 7, for the purpose of applying rule 87(2), four estimates were made of the cost of equity using four different, but well accepted, financial models. The models, and the four estimates obtained from them, were set out in Table 1 above. The estimates (all nominal) range from 8.79% (obtained using the CAPM), to 14.36% (obtained using the zero-beta version of the Fama-French three factor model).

14.8. Each of these estimates of the cost of equity has been made using current financial market data. The use of those data is, however, not sufficient for the estimate to be commensurate with prevailing conditions in the market for funds. This is because accepted financial models are simplified descriptions of the market in question and of conditions in that market. Any model which is used to estimate the cost of equity takes into account only some aspects of the market for funds, leaving others aside because:

(a) they are outside the scope of the conceptual framework within which the model has been developed; or

(b) the way in which they are to be taken into account within that framework is not, at present, well understood; or

(c) from the perspective of the conceptual framework within which the model is derived, they are unimportant to the economic processes determining the cost of equity.

14.9. Even when it is applied using current financial market data, the CAPM will not provide an estimate of the cost of equity which is commensurate with prevailing conditions in the market for funds. The econometric testing of the CAPM, noted in paragraph 7.13 above, showed the model to be an inadequate explanation of the economic processes which generate expected rates of return on financial assets.

14.10. In the derivation of Black's CAPM, one of the most contentious assumptions required for derivation of the CAPM (unlimited borrowing and lending at the risk free rate) is dropped, and econometric testing has indicated that resulting asset pricing model is a better explanation of the economic processes which generate expected rates of return than the CAPM.

14.11. As discussed in section 7 of this submission, theoretical argument and the empirical testing of asset pricing models, have led to the view that the economic processes which generate expected rates of return are better explained by multiple linear factor models than by single factor models (the CAPM or Black's CAPM). Economic theory places a specific restriction on the factors used in these multiple linear factor models: they must be variables which can be explicitly related to investor marginal utility or consumption growth. However, beyond this, theory does not provide a precise specification of the factors, and the most widely recognized of these models, the Fama-French three factor model incorporates factors which, critics have argued, are tainted by selection to "fit the data". Others have provided evidence supporting the view that the Fama-French book to market (HML) and size (SML) factors do, in fact, act as proxies for variables which can be related to investor marginal utility or consumption growth.

14.12. In these circumstances, Cochrane's (2005) view is apposite:

The argument over the status and size and book/market factors continues, but the important point is that it does so. Faced with the spectacular failure of the CAPM documented in Figures 20.9 and 20.11 one might have thought that that any hope for rational asset pricing theory was over.[29]

14.13. Deciding whether the estimates of the cost of equity made using the four well accepted financial models described in section 7 of this submission are commensurate with prevailing conditions in the market for funds is, clearly, problematic. Do similar difficulties emerge when those estimates of the cost of equity are assessed against the second of the criteria in rule 87(1): commensurability with the risks involved in providing reference services. A cost of equity which is not commensurate with the risks involved in providing reference services will not lead to a reference tariff which allows for a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates.

A cost of equity commensurate with the risks involved in providing reference services

14.14. The risk criterion of rule 87(1) is expressed in the abstract: the risks with which it is concerned are those involved in providing reference services. In section 24(5) of the NGL, the risks for which the service provider should be compensated via the return provided by the reference tariff determined using the rate of return are the specific regulatory and commercial risks involved in providing the reference service to which that tariff relates.

[29] John H. Cochrane (2005), *Asset Pricing*, revised ed., Princeton: Princeton University Press, page 444.

14.15. Although the risk criterion in rule 87(1) is expressed in the abstract – "the risks involved in providing reference services" – the risks with which it is concerned are not the risks which are captured by the CAPM, Black's CAPM and multiple linear factor models including the Fama-French model. The risks with which rule 87(1) is concerned may include the broad types of risk which each of the well accepted financial models purports to capture (contribution to the riskiness of a well diversified portfolio in the case of the CAPM and Black's CAPM; underlying macroeconomic risk in the case of the multiple linear factor models). However, specific reference to "reference services" implies that the criterion of rule 87(1) is concerned with more. This is made clear by section 24(5) of the NGL. The relevant risks are the regulatory and commercial risks involved in providing specific reference services – the reference services for which reference tariffs are to be determined using the rate of return.

14.16. In discussions of asset pricing models, a distinction is sometimes made between "systematic risk" and "idiosyncratic risk".[30] Systematic risk is described, somewhat loosely, as the risk which is associated with the covariation of asset return with other economic variables. Equally, loosely, idiosyncratic risk is "unsystematic risk", or risk which is independent of economic activity. Systematic risk is, from the perspectives of the CAPM and Black's CAPM, the only type of risk for which investors are compensated by market rates of return. Underlying these models is a view that investors have no need to bear idiosyncratic risks. By holding well diversified portfolios, they can limit the risk which they bear to systematic risk. Asset prices do not, therefore, need to compensate them for bearing idiosyncratic risks.

14.17. The multiple linear factor models extend the types of systematic risk for which investors are compensated via equilibrium rates of return in financial markets. Like the CAPM and Black's CAPM, they do not explain equilibrium rates of return in terms of compensation for the bearing of idiosyncratic risks.

14.18. The four well accepted financial models described in section 7 of this submission explain asset prices in terms of only one or a small number of systematic risks. The reason for this is the limited perspective of each of these models. In these models, the only risk that matters for asset pricing is investor consumption risk as measured by the covariance of asset return with investor expectations about consumption growth. (In the case of the CAPM and Black's CAPM, investor expectations about consumption growth can be viewed as being correlated with variation in the return on a portfolio of total wealth, and risk is then the contribution of a specific asset to the riskiness of the market portfolio.) This is because the underlying theoretical scheme of each of the models is limited to investors buying and selling financial assets. This scheme is that of a simple exchange economy. It does not incorporate production, technological change, government and the regulation of economic activity, and economic growth. Because they are derived by assuming a simple exchange economy, the four well accepted asset pricing models of section 7 cannot provide a complete explanation of the determinants of asset prices. In particular, they cannot explain asset prices in terms of economy-wide technological and regulatory risks. The effects of these risks are excluded by the choice of premises from which the models are derived.[31]

[30] See, for example, the well known finance textbook by Thomas E. Copeland and J. Fred Weston (1988), *Financial Theory and Corporate Policy*, third ed., Reading, Massachusetts: Addison-Wesley, pages 198-200.

[31] That technological and other risks may be important in the explanation of asset prices is indicated by the growing number of pricing models developed within a general equilibrium framework incorporating production as well as exchange and consumption. These models are relatively new and untested. See, for example, John H. Cochrane (1996), "A Cross-Sectional Test of an Investment-Based Asset Pricing Model", Journal of Political Economy, 104(3): 572-621; Urban J. Jermann (1998), "Asset pricing in production economies", Journal of Monetary Economics 41: 257-275; Joao F. Gomes, Leonid Kogan and Lu Zhang (2003), "Equilibrium Cross Section of Returns", Journal of Political Economy, 111(4): 693-732, Leonid Kogan (2004), "Asset prices and real investment", Journal of Financial Economics, 73: 411-431; and Joao F. Gomes, Leonid Kogan and Motohiro Yogo (2009), "Durability of Output and Expected Stock Returns", Journal of Political Economy, 117(5): 941-986.

14.19. Not only are the four well accepted asset pricing models discussed in section 7 of this submission derived in such a way that risks – technological risks and regulatory risks – which are potentially important for any assessment of risks involved in delivering gas pipeline reference services are excluded. They are also derived in a way which removes the need for any examination of the role of idiosyncratic risks in explaining asset prices. Portfolio diversification is assumed to limit the risk which investors bear to systematic risk, and asset prices do not need to compensate them for bearing idiosyncratic risks.

14.20. This may not, however, be the case. That investors do not hold well diversified portfolios is well known. A large percentage of the wealth of the typical household is held in the form of illiquid assets such as human capital, sole proprietorships, partnerships, equity in other closely held firms, deferred compensation, pension plans, superannuation funds, and residential real estate. Among institutional investors, an increasing amount of wealth is being allocated to illiquid assets such as private equity, emerging markets, venture capital, commercial real estate, and hedge fund investments. Recent research has shown that when investors hold heterogeneous expectations about investment opportunities and expected returns, optimal portfolios will not be well diversified, and idiosyncratic factors are important in explaining asset prices.[32]

14.21. The research referred to in the preceding paragraph - research which is showing that optimal portfolios will not be fully diversified, and that idiosyncratic factors are important in explaining asset prices - is being carried out within a conceptual framework in which investors maximise expected utility subject to constraints on investment and consumption opportunities including constraints on wealth and on the availability of information. It is being carried out within the "rational actor" framework of standard microeconomic theory in which individual behaviour is described in terms of utility maximisation. This was the framework within which the CAPM, Black's CAPM, intertemporal capital asset pricing and multiple linear factor models were developed.

14.22. Periodically, concern has been expressed over the naivety of the psychological foundations of the rational actor framework and, more specifically, over the presumption of expected utility maximization.[33] During the 1980s, these concerns, and the fact that rational actor models did not seem to provide adequate descriptions of financial markets, drove the emergence of a new conceptual framework - behavioural finance - based on more realistic psychological foundations supported by experimental and empirical analysis.[34]

14.23. The research which has been undertaken within the behavioural finance paradigm provides further reasons to expect that the four well accepted asset pricing models considered in section 7 of this submission do not provide a complete view of risk as it affects expected rates of return on financial assets.

14.24. After reviewing then recent research on the relationship between the stochastic discount factor and macroeconomic risks, and nearly two decades of work in behavioural finance, Campbell concluded his 2000 survey of asset pricing:

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32 Again, the models are relatively new and untested, but are indicative of a growing areas of research in asset pricing. See, for example, George M. Constantinides and Darrell Duffie (1996), “Asset Pricing with Heterogeneous Consumers”, Journal of Political Economy 104(2): 219-240; John Y. Campbell, Martin Lettau, Burton G. Malkiel and Yexiao Xu (2001), “Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk”, Journal of Finance, 54(1): 1-43; Alon Brav, George M. Constantinides, Christopher C. Geczy (2002), “Asset Pricing with Heterogeneous Consumers and Limited Participation: Empirical Evidence”, Journal of Political Economy, 110(4): 793-824; Fangjian Fu (2009), “Idiosyncratic Risk and the cross-section of expected stock returns”, Journal of Financial Economics, 91: 24-37; Francis A. Longstaff (2009), “Portfolio Claustrophobia: Asset Pricing in Markets with Illiquid Assets", American Economic Review, 99(4): 1119-1144.

33 On the issues with expected utility maximisation, see Mark Machina (1987), "Choice Under Uncertainty: Problems Solved and Unsolved", Journal of Economic Perspectives, 1(1): 121-154.

34 A brief history of behavioural finance and a review of the earlier literature is provided by Robert J Shiller (2003), "From Efficient Markets Theory to Behavioral Finance", Journal of Economic Perspectives, 17(1): 83-104.

> *Despite the promise of such* [stochastic discount factor] *research, in my opinion it is unrealistic to hope for a fully rational, risk based explanation of all the empirical patterns that have been discovered in stock returns. A more reasonable view is that rational models of risk and return describe a long-run equilibrium toward which financial markets gradually evolve. Some deviations from such models can be quickly arbitraged away by rational investors; others are much harder to arbitrage and may disappear only after a slow process of learning and institutional innovation.*[35]

14.25.

14.26. The estimates of the cost of equity made using the four well accepted financial models described in section 7 of this submission cannot, therefore, be commensurate with the risks involved in providing reference services. Although the Fama-French three factor model, and the zero beta version of that model, incorporate broader characterizations of risk than are incorporated in the CAPM and Black's CAPM, none of the models takes account of all of the possible types of systematic risk in its explanation of asset prices. Furthermore, none of the models gives consideration to the possible effects of idiosyncratic risks.

14.27. Even if the cost of equity is estimated using the Fama-French three factor model, or the zero beta version of that model, the result is not commensurate with the risks involved in providing reference services. A reference tariff determined using a rate of return established from such a cost of equity is, other things being equal, unlikely to allow a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates.

[35] John Y. Campbell (2000), "Asset Pricing at the Millennium", Journal of Finance, 55(4), 115-1567.

15. APPLYING RULE 87(2) TO MEET THE RULE 87(1) CRITERIA – ESTABLISHING COSTS OF EQUITY AND DEBT COMMENSURATE WITH PREVAILING CONDITIONS IN THE MARKET FOR FUNDS AND THE RISKS INVOLVED IN PROVIDING REFERENCE SERVICES

15.1. None of the four estimates of the cost of equity which have made using the four well accepted financial models described in section 7 of this submission is, unequivocally, an estimate commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services. At best, each provides an indication of the relevant cost of equity. However, the range of the indications provided is wide: from 8.79% to 14.36%.

15.2. Since each of the four well accepted models is inherently limited in its ability to satisfy the criteria of rule 87(1) accurately, it is necessary to conduct a comparative analysis of the most reliable models, and of the available empirical evidence. Empirical evidence provides the relevant data to "fill in the gaps" left by the models. In particular, the empirical evidence is essential because the models do not incorporate or reflect the particular risks facing the Operator in supplying the DBNGP reference service and therefore do not, themselves, provide evidence of the relevant cost of equity.

15.3. Such a comparative analysis, in conjunction with the approach referred to in rule 87(2), conducted in light of the requirements of rule 87(1), will ultimately yield a rate of return which conforms with rules 74 and 87.

15.4. This section of this submission reports empirical evidence which has been used in a comparative analysis to establish the rate of return for the DBNGP. The section also examines the approach which the national regulator, the AER, has taken to addressing the question of whether the method of determination of the cost of equity it has proposed for use in the setting of access prices for electricity network service providers is commensurate with prevailing conditions in the market for funds and the risks involved in providing regulated services.

Empirical evidence for the cost of equity

15.5. DELETED

15.6. DELETED

15.7. DELETED.

15.8. DELETED

15.9. DELETED

15.10. DELETED

15.11. DELETED

The AER's approach

15.12. In its May 2009 decision on WACC parameters to be applied in the setting of prices for access to electricity transmission and distribution networks, the AER has had to consider whether the issue of whether the resulting rate of return is commensurate with prevailing conditions in the market for funds and the risks involved in providing regulated services.

Although, it must be remembered that this approach was adopted for the purposes of the NEL and in this regard, the Operator refers to its submissions in section 5 as to the differences between the NEL and the NGL in so far as rate of return is concerned.

15.13. The AER required use of the CAPM, but with the results adjusted to better reflect current market and other conditions by adjustment of the value of beta. The econometrician retained by the national regulator found that the statistical evidence - obtained from a sample of returns on investments in traded electricity network and gas pipeline businesses - pointed to an estimate of beta lying in the range 0.4 to 0.7. In consequence, the AER argued that "market data suggests a value lower than 0.8", and "there is persuasive evidence to depart from either the previously adopted equity beta of 1.00 or 0.90".[36]

15.14. The AER formed - but did not explain - the view that prevailing conditions in the market for funds supported a higher value - 0.8 - for beta.

15.15. Using a nominal risk free rate of 5.48% (see paragraph 7.47 above), and a market risk premium of 6.50% (paragraph 7.51 above), the AER's approach provides an estimate of the cost equity of 10.68%.

What are the risks involved in providing the DBNGP reference service?

15.16. The risks involved in providing reference services using a gas transmission pipeline can be broadly classified as:

(a) commercial risks, which include:

(i) supply risk: risk that the availability of economical natural gas supplies could affect a pipeline's revenue-earning capability;

(ii) market risk: risk arising from the overall size of the market and the market share that a pipeline is able to capture;

(iii) competitive risk: risk that results from competition for customers at both the supply and market ends of a pipeline system; and

(b) operating risk: risk to the income-earning capability that arises from technical and operational factors; and

(c) regulatory risk: risk to the revenue-earning capability of the pipeline which arises from regulation imposed by the State and Commonwealth Governments.

15.17. Consistent with the Operator's submissions in section 3 of this submission, these risks must be assessed in the context of the Western Australian gas market and the provision of services on the DBNGP.

15.18. In so far as the risks in the context of the Western Australian gas market is concerned, the Western Australian market is the market of customers in Western Australia who are supplied principally from gas fields within or offshore of Western Australia for use in Western Australia. This market is one of the three distinct and geographically separate regional markets into which the Australian gas market is divided. The other two markets are:

(a) the Eastern gas market, which is the market of customers of gas in Eastern Australia who are supplied principally from gas fields in Bass Strait, in the Cooper Basin in South Australia, and from coal seams in Queensland; and

[36] Australian Energy Regulator, *Final Decision: Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, May 2009, page 343.

(b) the Northern Territory gas market, currently a much smaller market than either the Western Australian or the Eastern gas market, which is the market of customers of gas in Northern Territory supplied from the Amadeus Basin.

15.19. The DBNGP is exposed to significant supply risk. Currently, some 30% of gas used in Western Australia is used in mining, a further 30% is used in minerals processing and manufacturing, and around 30% is used in electricity generation.[37] However, the pattern of gas use in Western Australia is changing as the price of gas in the local market is rising markedly to become more closely aligned with the price of gas available via international trade in liquefied natural gas (LNG). The rise in the price of gas threatens its continued use in mining and manufacturing (including minerals processing), and in electricity generation. In some minerals processing operations, and in base-load electricity generation, coal is becoming a substitute for higher priced gas. In fact, the most recent base load electricity generation project endorsed by the State Government as part of its power procurement process is to be fueled by coal. The prime reason for this was because coal was a cheaper fuel source than gas. In mining and minerals processing, higher gas prices threaten product competitiveness in international markets.

15.20. Gas pipeline systems serving the Eastern gas market are also exposed to supply risk from rising gas prices as coal seam gas (CSG) is diverted to LNG production and export, but the risk there is likely to be less severe than in Western Australia. About 35% of gas used in Victoria, and some 14% of gas used in New South Wales, is used for price-inelastic residential purposes. Furthermore, a number of factors are expected to mitigate the effects of the upward pressure on gas prices in the Eastern market. These are:

(a) the availability of substantial volumes of "ramp-up" gas during the start up of LNG production from CSG;

(b) a large number of supply basins ensuring diversity of supply;

(c) relatively low barriers to entry into onshore gas production and processing; and

(d) access to an extensive transmission network linking producing basins and distribution systems.[38]

15.21. Perceptions of greater supply risk in Western Australia have recently been heightened by concerns over the diversity and reliability of gas supplies in the State. A gas explosion and fires at the Varanus Island processing plant, in June 2008, reduced gas supply to the local market by around 30% for an extended period during which only limited additional supplies were available from the State's other gas processor.

15.22. With their relatively small numbers of shippers, and greater dependence on small numbers of end users requiring gas for mining and minerals processing, Western Australian gas transmission pipelines are more exposed to market risk than pipelines serving the Eastern market. This has been highlighted by the Global Financial Crisis during which volumes transported fell, and creditworthiness of a number of shippers came into (and remains) in question.

15.23. The Varanus Island incident, referred to in paragraph 15.21 above, has not only affected perceptions of market risk. Response to the incident has focused attention on the fact that the gas market in the south west of Western Australia is largely dependent upon supply via a single transmission pipeline - the DBNGP - and calls for a second pipeline in the State owned corridor have raised the prospect of competitive risk. While DBP itself does not

[37] ABARE, Energy consumption by industry and fuel type, Table f - f8, available at http://www.abare.gov.au/publications_html/data/data/data.html

[38] Australian Energy Regulator (2009), State of the Energy Market 2009, page 234.

accept this as a risk, the fact that it is being publicly mentioned by government (for example in the State Strategic Energy Initiative), it is reasonable to assume that an investor would perceive this as a risk.

15.24. The principal regulatory risk to which the DBNGP is exposed at the present time is the risk associated with government policy response to climate change, both nationally and internationally, and the impact this will have on the utilisation of hydrocarbons such as natural gas. Whether the exposure to this regulatory risk is greater in Western Australia than in the Eastern gas market is difficult to assess; both markets are affected by the policy uncertainty. However, in the case of the Western Australian market, there are sound reasons as to why the implementation of an emissions trading scheme that provides significant financial assistance to exporters so as to compensate them from the effects of such a scheme (such as is proposed under the current Bill tabled in parliament to give effect to the CPRS) creates significant risk for the pipeline business. Firstly, under that scheme, the assistance is likely to be available to gas sold by producers in the LNG market. This is likely to create a further incentive for these producers to market the gas in the LNG market ahead of the domestic WA market, as the gas sold in the local market will be subject to the full effect of the CPRS, thereby leading to lower margins for the producers, or alternatively to a higher price for gas thereby putting it at a greater risk of being less competitive with alternative fuel sources. The second reason is that alternative fuel sources for customers on the DBNGP (such as coal) will, at current prices in Western Australia, prolong the period before which gas becomes price competitive with coal. Analysis undertaken by the DomGas Alliance and contained in a submission to the State Government in March 2010 as part of the Strategic Energy Initiative review (a copy of which is contained in **Attachment 5**)[39], concluded that, at a wholesale gas price as low as $7 per gigajoule (before transport costs), natural gas would only be competitive with $2 per gigajoule coal at the following carbon costs:

(a) $90 per tonne carbon cost - on a long run marginal cost (LRMC) basis, that is, for new baseload power plant construction;

(b) $110 per tonne – on a short run marginal cost (SRMC) basis, that is, for plant already built.

15.25. There are also some regulatory risks that arise from the Varanus Island incident referred to in paragraph 15.21 above. The government has indicated that it wishes to proceed with the implementation of some new regulatory regimes to facilitate the trading of gas. To the extent that these regimes are not appropriately structured, they may result in either a reduction in the current level of use of gas or in a distortion in the price for gas.

15.26. These regulatory and commercial risks are, at the present time, significant for equity investors in gas transmission pipelines in Western Australia. They are given greater relevance in the case of the DBNGP through regulatory arrangements which extend beyond 60 years the period over which those investors can recover their investments. However, these risks are not explicitly recognised in any of the well accepted financial models which might be used to determine the cost of equity, in part because some of them are idiosyncratic rather than systematic risks.

[39] DomGas Alliance submission to the State Strategic Energy Initiative, March 2010, page 44

Indicators of the relevant cost of equity

15.27. The indicators of the cost of equity which have been obtained for the purpose of establishing a rate of return for the DBNGP are summarised in Table 3.

Table 3
Indicators of the cost of equity

Method of estimation	Value
CAPM – NERA estimate of beta for DBP (β = 0.51)	8.79%
CAPM – AER estimate of beta (β = 0.80)	10.68%
Black's CAPM	11.98%
Fama-French three factor model	11.57%
Zero beta Fama-French three factor model	14.36%
Empirical evidence from analysts' reports - SFG	13% - 14%

15.28. The results from the four well accepted financial models indicate a cost of equity which may be:

(a) as low as 8.79%, and probably not higher than 10.68%, when estimated using the CAPM;

(b) around 12% when estimated using Black's CAPM and the Fama-French three factor model; and

(c) as high as 14.36% when estimated using the zero beta version of the Fama-French model.

15.29. As discussed in section 7 of this submission, the CAPM, Black's CAPM and the Fama-French three factor model (including the zero beta version of that model) are all well accepted financial models, but their acceptance does not mean that they are without defects. The CAPM is well accepted because it provides an important insight into the nature of the relationship between risk and return, and not because it provides better estimates of the cost of equity. Black's CAPM and the Fama-French three factor model are responses to the deficiencies of the CAPM. They provide better estimates of the cost of equity.

15.30. Black's CAPM and the Fama-French three factor model are, like the CAPM, simplified descriptions of the economic processes which generate expected rates of return on equity. Black's CAPM retains the single risk factor of the CAPM. The Fama-French model incorporates proxies for a small number of macroeconomic risks. Neither incorporates broad technological and regulatory risks, because it has been derived from premises which preclude these risks being taken into account. Furthermore, those premises, and the way they are interpreted preclude any consideration of idiosyncratic risks in the explanation of rate of return. That is, they preclude any consideration of the specific risks which are involved in delivering reference services, and cannot lead to a rate of return and a reference tariff commensurate with regulatory and commercial risks involved in providing the reference service to which that tariff relates.

15.31. The zero beta version of the Fama-French model provides higher estimates of the cost of equity as a result of removal of the questionable assumption that unlimited borrowing and lending can occur at the risk free rate of return, and replacement of the risk free rate with the rate of return on a zero beta portfolio. However, it has the same inherent limitations as the Fama-French three factor model. It does not take into account broad technological and

regulatory risks. Nor does it take into account the idiosyncratic risks which are involved in the provision of pipeline reference services.

15.32. The AER's approach to addressing the issue of a rate of return which is commensurate with prevailing conditions in the market for funds and the risks involved in providing regulated services does not assist. The AER has retained use of the CAPM, but has adjusted beta upward to 0.8. But why 0.8? Why not 0.9 or 1.0, or an even higher value? Statistical analysis led the AER to the conclusion that there was persuasive evidence of a lower value for beta. In choosing 0.8, the national regulator then disregarded the statistical analysis, and took into account other factors - "prevailing market conditions" - in determining the rate of return. It did not explain these other factors, or how they were brought to bear in arriving at a specific estimate - 0.8 - for beta. When these other factors were taken into account, the argument that there is persuasive evidence supporting a lower equity beta – an argument which relies on the statistical evidence – is no longer valid. In these circumstances, the AER's decision to use 0.8 as an estimate of beta is essentially arbitrary: the AER's estimate has not been arrived at on a reasonable basis.

15.33. Empirical evidence indicates that investors in large infrastructure business with significant regulated energy or utility activities require rates of return on equity in the range 13.0% to 14.0%. These rates of return on equity take into account the risks to which investors are exposed through the provision of regulated services. However, they are rates of return on equity for specific businesses all of which have substantial assets serving the energy market in Eastern Australia. That market - and, in particular, the gas sector of that market - is characterised by larger scale, larger numbers of end-users across a wider range of economic activities, and greater diversity in sources of energy supply than is the case in Western Australia. Investors in Western Australian gas transmission pipelines providing regulated reference services have a greater exposure to commercial and regulatory risks than investors financing assets in the Eastern gas market. and will, in consequence, require higher returns. The cost of equity for a Western Australian pipeline - such as the DBNGP - will, therefore, be at the upper end of the range indicated by the empirical evidence. Indeed, its being above the upper limit of the range is not precluded.

15.34. Well accepted financial models indicate a cost of equity in the range 11.57% (Fama-French three factor model) to 14.36% (zero beta version of the Fama-French model), but these models do not properly account for all of the risks involved in providing reference services. Relevant empirical evidence indicates that, when these risks are taken into account, the cost of equity is in the range 13.0% to 14.0% and, in the case of a Western Australian pipeline, it is likely to be at the upper end of that range, or possibly higher.

15.35. The cost of equity has, therefore, been conservatively set at 13.50% for the purpose of establishing the rate of return to be used in determining the total revenue and proposed revised reference tariffs for the DBNGP. This rate of return is commensurate with prevailing conditions in the market for funds and the risks involved in providing the reference service.

A cost of debt commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services

15.36. The way in which the cost of debt was estimated was explained in section 8 of this submission. Although an asset pricing model derived from economic theory was not used, the less formal model which was used – build up of the cost of debt from its components – is a financial model well accepted by capital market participants.

15.37. The components from which the cost of debt was built up (which were set out in **Error! Reference source not found.** of this submission) were obtained from lenders in March

2010 for the purpose of estimating a cost of debt of a large regulated utility. The cost of debt derived from those components – 9.73% – is a cost of debt cost of debt commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services.

15.38. Because it models the pricing of debt by lenders, and seeks to recognise all of the relevant costs, the approach which has been taken to estimating the cost of debt provides a better estimate than the alternative of a theoretical base rate (the nominal risk free rate) plus debt risk premium, especially in current circumstances where the market for certain types of debt issues is thin and the debt risk premium is difficult to estimate with any degree of precision.

16. THE RATE OF RETURN THAT MEETS THE CRITERIA IN RULE 87(1)

16.1. A WACC has been determined from:

(a) the estimate of the cost of equity which is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services – 13.50% (nominal); and

(b) the estimate of the cost of debt which is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services – 9.73% (nominal).

16.2. The weightings in this weighted average were 40% equity and 60% debt. This is the gearing which has been deemed appropriate for the DBNGP.

16.3. In determining the WACC, no allowance has been made for the value of imputation credits.

16.4. In the WACC framework set out in section 6 of this submission, only a proportion of the market equilibrium return to equity investors is provided by the business issuing equity. The remainder of the equity return is provided, through the taxation system, from franking credits. If the value of those credits (gamma) were set at 0.20 (see section 11 of this submission), then, with a tax rate 30%, some 8% of the return to equity investors would be in the form of imputation credits. This would mean that non-resident investors, unable to use those credits, would receive a return that is 8% below the market equilibrium required return. Non-resident investors currently provide a material amount of the equity which funds regulated infrastructure assets including gas transmission pipelines. Providing those investors with a return that is 8% below the market equilibrium required return is not commensurate with prevailing conditions in the market for funds.[40]

16.5. The parameter estimates required for calculation of a WACC commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services, and the WACC which has been calculated from those estimates, are set out in Table 4.

Table 4
WACC commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services

Parameter	Estimate
Cost of equity	13.50%
Cost of debt	9.73%
Gearing: equity to total value	40.00%
Gearing: debt to total value	60.00%
Tax rate	30.00%
Value of imputation credits (gamma)	0.00
Expected inflation	2.52%
WACC	
Nominal pre-tax WACC	13.55%
Real pre-tax WACC	10.76%

[40] If the value of gamma were set at 0.65, as has been the case in recent Australian regulator decisions, some 22% of the return to equity investors would be in the form of imputation credits, and non-resident investors would receive a return which is 22% below the market equilibrium required return. The is clearly inconsistent with prevailing conditions in the market for funds. See section 9 of SFG's report to Dampier Bunbury Pipeline which is attached as Attachment 3 to this submission.

16.6. The rate of return to be used in determining the total revenue and proposed revised reference tariff for the DBNGP has been set at 10.76% (real pre-tax).

16.7. This rate of return has been established as a weighted average of a cost of equity and a cost of debt which are commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services. It is, therefore, a rate of return which satisfies the criteria of Rule 87(1). When used to determine the total revenue and proposed revised reference tariff for the DBNGP, it should allow a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates. That is, the rate of return is the rate intended by the revenue and pricing principles of section 24 and, in particular, by section 24(5), of the NGL.

17. DELETED

ATTACHMENT 1

NERA Report

ATTACHMENT 2 - DELETED

ATTACHMENT 3

SFG Report on Gamma

ATTACHMENT 4 - DELETED

ATTACHMENT 5

DomGas Alliance Submission to the State Energy Initiative review, March 2010