



AGL Gas Networks Ltd

**Weighted Average Cost of
Capital**

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1 Executive summary

1.1 Introduction and purpose of report

AGL Gas Networks Pty Ltd ("AGLGN") owns and operates the gas distribution system in NSW. The gas distribution system is covered under the National Third Party Access Code for Natural Gas Pipeline Systems ("the Code" or "National Gas Code"). Coverage means that as the owner and operator of the gas distribution system, AGLGN is required to lodge an Access Arrangement for approval by the relevant regulator. The relevant regulator in this instance is the Independent Pricing and Regulatory Tribunal ("IPART").

The Access Arrangements currently applying to the gas distribution system is due to expire on 31 December 2004. In accordance with the requirements of the Code, AGLGN must submit a revised Access Arrangement to IPART for approval, to take effect on 1 January 2005.

AGLGN has appointed KPMG to provide advice and recommendations on what constitutes an appropriate Rate of Return for the gas distribution system. Under section 8.30 of the National Gas Code, the Rate of Return is one of the inputs required for the determination of Reference Tariffs for a covered pipeline.

This report sets out our recommendations on the appropriate Rate of Return for AGLGN's gas distribution system, and the basis for our conclusions.

1.2 Main conclusions

KPMG considers that an appropriate rate of return to adopt for the purpose of setting the revenue stream for AGLGN's gas distribution system in accordance with the requirements of the Gas Code is currently a pre-tax real weighted average cost of capital ("WACC") of **at least 8.0%**.

This figure is drawn from a feasible range of 7.5% to 8.4% for the pre-tax real WACC, which has been estimated from the underlying parameter value ranges discussed in this report and summarised in the table below.

Table 1: Pre-tax real WACC – parameter estimates

Parameter	Feasible Range		
	Low	High	Mid
Nominal risk free rate *	5.66%	5.66%	5.66%
Real risk free rate *	3.42%	3.42%	3.42%
Inflation expectation (implied)	2.17%	2.17%	2.17%
Asset beta	0.45	0.50	0.475
Equity beta	0.86	1.24	1.05
Debt beta	0.17	0.00	0.09
Market risk premium	6.0%	6.0%	6.0%
Equity proportion	40%	40%	40%

Parameter	Feasible Range		
	Low	High	Mid
Debt proportion	60%	60%	60%
Pre-tax cost of debt	7.21%	7.61%	7.41%
Debt margin *	1.55%	1.95%	1.75%
Corporate tax rate	30%	30%	30%
Value of imputation credits	30%	50%	40%
Pre-tax real WACC	7.49%	8.39%	7.94%

** estimate will be subject to movements in interest rates at the time of IPART's final determination*

The pre-tax real WACC point estimate we have advocated lies just above the midpoint of the calculated WACC range. In selecting a point estimate from within this range, KPMG has taken into account the weight of evidence from independent and authoritative experts on the appropriate objective and direction of access regulation. This evidence is outlined in Section 2.

It is perhaps best summarised in the findings of the Productivity Commission's ("PC") inquiry into the effectiveness of Australia's national access regime. In its final report, the PC identified the potential for access regulation to deter investment in essential infrastructure as the key risk to continued investment in infrastructure in Australia.

The PC noted that irrespective of how well regulators perform their task, the determination of efficient access prices was a formidable task, particularly given that many of the tools and methodologies available to regulators to set access prices were inherently imperfect. Furthermore, the consequences of 'getting it wrong' can have significant adverse ramifications for infrastructure investment and economic welfare. In this context, the PC urged regulators to not be "*too ambitious*" in terms of their attempts to remove perceived monopoly rents.

KPMG considers that the following statement, extracted from the PC's 2000-01 Annual Report, appropriately summarises the approach that regulators should take:

"Given uncertainties and information difficulties, there are limits to what regulators can achieve. Rather than aiming for an ideal, but unattainable outcome, the public policy goal should be a set of regulatory arrangements that will improve efficiency through time and that will reduce some of the bigger risks of making regulatory errors. A framework is needed in which regulators are encouraged to intervene only when significant improvements in efficiency are in prospect and not be overly ambitious in finetuning the prices they regulate... The Commission's recent inquiries have revealed a need to re-balance the emphasis away from achieving immediate gains for users and consumers from existing infrastructure – much of it government owned or previously government owned – to a regulatory framework that will also facilitate efficient investment in augmented and new facilities."

KPMG believes that a pre-tax real WACC of **at least 8.0%** would, in the current environment, appropriately balance the interests of investors in, and customers of, AGLGN's gas distribution system, and provide appropriate incentives for further investment in the gas distribution assets. We also consider that a pre-tax real

WACC of 8% is reasonable and lies within the required return range that investors in AGLGN's gas distribution system would reasonably expect, given the uncertainty in the underlying WACC parameter values.

1.3 Qualifications and disclaimer

This report has been prepared by KPMG on the basis of information available as at the date of this report. Nothing in this report should be taken to imply that KPMG has verified any information supplied to us, or has in any way carried out an audit of the books of accounts or other records of AGLGN for the purposes of this report. We have considered and relied upon information from a range of sources, including information provided by AGLGN, which we believe to be reliable, complete and not misleading. We have no reason to believe that any material facts have been withheld from us but do not warrant that our inquiries have revealed all of the matters which an audit or extensive examination might disclose.

In accordance with KPMG's policy, we are obliged to advise that neither KPMG nor any member nor employee undertakes responsibility in any way whatsoever to any person or organisation (other than AGL Gas Networks) in respect of the information set out in this report, including any errors or omissions therein, arising through negligence or otherwise, however caused.

2 Regulatory developments affecting WACC

KPMG's estimate of the cost of capital for AGLGN's gas distribution system recognises that:

- there is now a significant body of opinion from independent and legal bodies that regulatory decisions need to give greater weight to investment incentives and the provision of incentives consistent with those found in workably competitive markets; and
- the inevitable imprecision of cost of capital estimates, including the methodological limitations associated with approaches such as the CAPM, mean that the estimated cost of capital needs to be applied and interpreted with care. This is particularly relevant in a regulatory context because the impacts are magnified.

The first of these issues is addressed below, while the second is addressed in the context of the parameter analysis that follows this section.

2.1 Recent regulatory developments

Recent events have provided greater clarity on what should be the objectives of regulation. These have included the:

- PC's report on its Review of the National Access Regime¹ and the Government's Response²;
- PC's draft report on the Review of the Gas Access Regime³;
- Parer Report⁴;
- Minister Ian Macfarlane's Statement of Reasons in his Final Decision⁵ to revoke coverage of parts of the Moomba-Sydney Pipeline overturning the National Competition Council ("NCC")'s Final Recommendations;
- Epic Decision⁶;
- The Australian Competition Tribunal ("ACT")'s decision on an appeal by Epic Energy in relation to the ACCC's decision on the Moomba to Adelaide pipeline⁷; and
- The ACT's decision on an appeal by GasNet⁸.

¹ Productivity Commission, Review of the National Access Regime: Inquiry Report, 28 September 2001.

² Government Response to the Productivity Commission Review of the National Access Regime, released 17 September 2002.

³ Productivity Commission, Review of the Gas Access Regime: Draft Report, Canberra, December 2003.

⁴ Council of Australia Governments Energy Market Review Panel, Towards a Truly National and Efficient Energy Market: Final Report [Parer Report], 20 December 2002.

⁵ Final Decision: Applications for Revocation of Coverage on Certain Portions of the Moomba-Sydney Pipeline System, 19 November 2003.

⁶ *Re Dr Ken Michael AM; Ex parte Epic Energy (WA) Nominees Pty Ltd* [2002] WASCA 231.

⁷ Application by Epic Energy South Australia Pty Ltd [2003] ACompT 5, 10 December 2003.

⁸ Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT 6, 23 December 2003.

These statements represent reassertions of the objectives of regulation from authoritative and independent sources.

2.1.1 The Productivity Commission

Review of the National Access Regime

The first and one of the strongest reassertions of the objectives of regulation came from the PC's Review of the National Access Regime, which was intended as an interim assessment of the effectiveness of the regime after five years of operation. One of the major themes of this assessment was the issue of "regulatory error" risk, and the realisation that the potential costs associated with too little infrastructure investment are far greater than those associated with too much investment. In short, there is asymmetry in the consequences of regulatory pricing errors:

"Given that precision is not possible, access arrangements should encourage regulators to lean more towards facilitating investment than short term consumption of services when setting terms and conditions ...

[and] given the asymmetry in the costs of under- and over-compensation of facility owners, together with the informational uncertainties facing regulators, there is a strong in principle case to 'err' on the side of investors".

It is in this vein that the PC provided a clear warning against an excessive focus on the removal of so-called "monopoly rents" from the revenue streams of facility owners, quoting a submission to the review by Network Economics Consulting Group ("NECG"), which stated:

"In using their discretion, regulators effectively face a choice between (i) erring on the side of lower access prices and seeking to ensure they remove any potential for monopoly rents and the consequent allocative inefficiencies from the system; or (ii) allowing higher access prices so as to ensure that sufficient incentives for efficient investment are retained, with the consequent productive and dynamic efficiencies such investment engenders.

There are strong economic reasons in many regulated industries to place particular emphasis on ensuring the incentives are maintained for efficient investment and for continued productivity increases. The dynamic and productive efficiency costs associated with distorted incentives and with slower growth in productivity are almost always likely to outweigh any allocative efficiency losses associated with above-cost pricing. (sub. 39, p. 16)"

As a result the PC review highlighted the need to modify implementation of the regime and made 33 recommendations to improve its operation. In particular it identified as a:

"threshold issue, the need for the application of the regime to give proper regard to investment issues" and "the need to provide appropriate incentives for investment"⁹. *The Commonwealth Government's response*

This was supported by the Commonwealth Government's response: it decided to make changes to the Trade Practices Act which "endorse the thrust" of the PC's recommendations.¹⁰ In particular, it will modify the regime to:

- Include a clear objects clause:

"The objective of this part is to promote the economically efficient operation and use of, and investment in, essential infrastructure services thereby promoting effective competition in upstream and downstream markets..."

- Insert pricing principles:

"The ACCC must have regard to the following principles:

(a) that regulated access prices should:

- (i) be set so as to generate expected revenue for a regulated service or services that is **at least sufficient** [our emphasis] to meet the efficient costs of providing access to the regulated service or services;*
- (ii) include a return on investment commensurate with **the regulatory and commercial risks involved** [our emphasis]..."*

- Include a provision for merit review of decisions by the ACCC on proposed undertakings.

The Review of the Gas Access Regime

More recently, the PC has argued in its Draft Report on the Review of the Gas Access Regime that:

"...there are problems with the current regime, mainly arising from the considerable costs it imposes and its potential to distort and deter investment."¹¹

"There is uncertainty about the regulatory outcomes. The building block and incentive regulation approaches used to assess access arrangements are intrusive and costly for service providers and have a high potential for regulatory error because of uncertainty about the multitude of assumptions and parameters used."¹²

⁹ PC, Review of the National Access Regime: Inquiry Report, 28 September 2001, p.xxii.

¹⁰ Commonwealth Government, "Government Response to Productivity Commission Report on the Review of the National Access Regime: Interim Response", September 2002, p. 1.

¹¹ Productivity Commission, Review of the Gas Access Regime: Draft Report, December 2003, page XXV.

¹² Ibid., page XXVIII.

The Draft Report on the Review of the Gas Access Regime identified setting the ex ante regulatory rate of return as one of the key uncertainties.

The PC's concerns regarding regulatory implementation has continued to be reinforced by the PC's Chairman, Gary Banks, who recently highlighted the *"problem of regulatory overreach, or undue ambition"*, expressed the need for *"the requisite policy humility for such abstention"*, and warned against the *"seductiveness of controlling 'market power'"*¹³.

2.1.2 The Parer Report

More recently, the Parer report on the Energy Market Review has called for a less intrusive approach to utility regulation. It concluded that there are *"distorted and inappropriate signals from the current network regulation framework."*¹⁴ It also noted *"that future debate would be most effective if it focussed on moving regulation to a less intrusive form."*¹⁵

2.1.3 The Commonwealth Government

In addition to endorsing the PC's findings on the review of the National Access Regime, the Commonwealth Government has been providing its views on how the Gas Code should be interpreted.

The Minister for Industry Tourism and Resources, Ian MacFarlane, recently overturned the NCC's recommendation on the application for revocation of coverage of certain portions of the Moomba-Sydney Pipeline ("MSP") System.¹⁶ Instead, the Minister decided that coverage of part of the MSP Mainline (the part that extends from Moomba to Marsden) was to be revoked. This decision is now understood to be the subject of several appeals to the ACT.

While the Minister's decision relates to a case for lifting regulation – and it follows over 20 (mostly successful) revocation applications – the Minister in his Statement of Reasons emphasised a number of important points of regulatory implementation. The Minister stressed the need to move away from *"a presumption of access regulation or monopoly service provision"* and to provide evidence of the *"actual circumstances"* of pipelines as opposed to making a *"generic"* assessment or any assessment that *"bears limited relationship to the market realities"*, or arguing from a *"theoretical proposition."*¹⁷

The decision therefore highlighted the need for regulators to exercise their powers with a recognition of the commercial situation and market realities.

¹³ Gary Banks, "The good, the bad and the ugly: economic perspectives on regulation in Australia", Address to the Conference of Economists, Business Symposium, 2nd October 2003, page 10.

¹⁴ Council of Australian Government's Energy Market Review Panel, Towards a Truly National and Efficient Energy Market, 20 December 2002, p. 12. This was quoted by the ACCC in its submission to the PC Review of Gas Access Regime, September 2003, p.46.

¹⁵ Ibid., p. 16.

¹⁶ Final Decision: Applications for Revocation of Coverage on Certain Portions of the Moomba-Sydney Pipeline System, 19 November 2003.

¹⁷ Statement of Reasons, 19 November 2003, sections 56-58, page 15.

2.1.4 Judicial decisions

There has been a series of recent judicial decisions that have assisted in clarifying the role of the regulator and how access regulation should be applied.

The Epic Decision

The Western Australian Supreme Court ordered the Western Australian Independent Gas Access Regulator – the predecessor to the current Economic Regulation Authority (“ERA”) - to revise its Draft Decision for the Dampier-Bunbury Natural Gas Pipeline’s (“DBNGP”) access arrangement to be more in line with the objectives of the regulatory regime. More specifically, in applying the Gas Code to set revenues for regulated gas businesses, the regulator is bound by the considerations in section 2.24 over all other parts of the Gas Code. That is to say, the regulator must take into account the interests of the Service Providers, Users and Prospective Users, and the public interest¹⁸.

In particular, the Court considered that the Western Australian regulator (and by implication other regulators in Australia, given the similarity in the approaches they are adopting) have been approaching regulation in a way that is reflective of an underlying “perfect competition” model - which is inconsistent with the Gas Code. In contradistinction, the Court considered that regulation should be based on a model of “workable competition”.

What the Epic Decision highlights is the need to regulate in accordance with the fundamental objectives of the Hilmer reforms, from which the regulatory regime and the Gas Code are descended. It notes: “*it would be surprising if what was contemplated was a theoretical concept of perfect competition, as the subject matter involves very real-life commercial situations*”¹⁹. It goes on to note that “*Workable competition seems far more obviously to be what is contemplated. This is clearly consistent with the approach of the Hilmer Report ...*”.

We note that in applying the principles emerging from the Epic Decision in its Final Decision, the WA regulator appeared to have restricted the application of the principle that it is bound by the factors in Section 2.24 as fundamental considerations, primarily to its assessment of the Initial Capital Base. For example, the final decision indicates that the regulator has assessed the cost of capital by making a “*best estimate of the true cost of capital*” as required under Section 8.2(e) of the Code, rather than by considering the factors in Section 2.24.

We do not believe that the WA regulator’s narrow interpretation of the Court’s findings is correct. The requirement to observe Section 2.24 was discussed in the context of the Initial Capital Base in the Epic Decision presumably because that was the key issue of contention in that dispute. It does not follow from this that the requirement to observe Section 2.24 in assessing access arrangements generally should be restricted to considering the Initial Capital Base. We believe that the principle is equally applicable when considering the question of the appropriate cost of capital.

¹⁸ Noted in *Re Dr Ken Michael AM: ex parte Epic Energy (WA) Nominees Pty Ltd & Anor* [2002] WASCA 231 (“the Epic decision”), at 85. The WA Supreme Court has rightly highlighted that this section echoes the principles set out in the Hilmer Report, at 97.

¹⁹ *Re Dr Ken Michael AM: Ex parte Epic Energy (WA) Nominees Pty Ltd* [2002] WASCA 231, para. 124.

The Australian Competition Tribunal

Two recent ACT decisions have offered important clarifications on issues such as the role and powers of the regulator and the way in which access arrangements should be assessed under the Code.

In December 2003, the ACT handed down its decision on Epic Energy's appeal against the ACCC's refusal to approve its access arrangements for the Moomba Adelaide pipeline ("MAP"). Some of the guiding principles emerging from this decision concern how the regulator should select estimates under circumstances where a range of possible values exist:

- regulators must give clear and substantiated reasons for reaching their conclusions regarding the values they select where a range of possible values exist;²⁰
- where a range of possible values exists, there is no requirement in the Code that the lowest value should be selected.²¹ The Tribunal specifically stated that:

"Epic must be allowed the opportunity to earn a revenue stream that recovers the efficient costs of operating the Reference Service, and the need to replicate the outcomes of a competitive market does not demand the use of the lowest indicated price based on general, albeit informed, inquiries."

- under conditions of uncertainty, a reasonable and prudent service provider would not select a value that lies at the low end of a range of possible values. Doing so creates an asymmetric exposure to risk.²²

Important principles regarding the role and powers of the regulator can also be drawn from the recent ACT decision on GasNet's appeal against the ACCC's final decision on its access arrangements. In this decision, the Tribunal expressed the view that it is beyond the power of the regulator not to approve the service provider's access arrangements where the arrangements proposed fell within reasonable and acceptable ranges:

"...where the AA proposed by the Service Provider falls within the range of choice reasonably open and consistent with Reference Tariff Principles, it is beyond the power of the Relevant Regulator not to approve the proposed AA simply because it prefers a different AA which it believes would better achieve the Relevant Regulator's understanding of the statutory objectives of the Law."²³

The view expressed by the Tribunal reinforces the Court's finding in the Epic decision that there is no single correct value for most of the parameters used in setting reference tariffs. In this context, it is not open to the regulator to reject the service provider's proposed access arrangements and replace it with its own judgments as to what is more appropriate, unless it is found that the proposals do not comply with the factors listed in Section 2.24 of the Code.

Importantly, these concepts can be extended to the regulator's assessment of the Rate of Return. At paragraph 42 of the decision, the Tribunal stated that:

²⁰ Application by Epic Energy South Australia Pty Ltd [2003] ACompT 5, 10 December 2003, para. 32, 48, 84.

²¹ Application by Epic Energy South Australia Pty Ltd [2003] ACompT 5, 10 December 2003, para. 92.

²² Application by Epic Energy South Australia Pty Ltd [2003] ACompT 5, 10 December 2003, para. 62, 94.

²³ Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT 6, 23 December 2003, paragraph 29.

“Contrary to the submission of the ACCC, it is not the task of the Relevant Regulator under s 8.30 and s 8.31 of the Code to determine a ‘return which is commensurate with prevailing conditions in the market for funds and the risk involved in delivering the Reference Service’. The task of the ACCC is to determine whether the proposed AA in its treatment of Rate of Return is consistent with the provisions of s 8.30 and s 8.31 and that the rate determined falls within the range of rates commensurate with the prevailing market conditions and the relevant risk.”

Having clarified that the regulator’s role is not to set the Rate of Return but to assess if it falls within acceptable ranges under the provisions of Section 8.30 and 8.31 of the Code, the Tribunal concluded that:

“When the proposed AA was delivered by GasNet to the ACCC, insofar as it contained a Rate of Return which was used to determine the Reference Tariff established by the use of the CAPM, the only issue for the ACCC to determine in respect of the Rate of Return was whether GasNet had used the model correctly. That is, whether it had used the CAPM to produce a Rate of Return which was consistent with the conventional use of the model. If GasNet had done so, then there was no occasion to refuse to approve the proposed AA on the basis that the Rate of Return had not been determined on a basis which was consistent with the objectives contained in s 8.1.”²⁴

2.1.5 Guiding principles

Collectively, KPMG considers that the following guiding principles on access regulation emerge from recent judicial precedents:

- the role of the regulator is not to set the terms of the service provider’s access arrangements, but to assess if the access arrangements are consistent with the provisions of the Code;
- the outcomes of a workably competitive market are the appropriate benchmark against which to make these assessments;
- there is no requirement that regulators must establish reference tariffs based on the lowest value for any underlying parameters. Under conditions of uncertainty, a reasonable and prudent service provider would not pick the lowest value since this would expose the service provider to the highest risk of under-estimation;
- the regulator can only reject the service provider’s access arrangements if the proposals are found to be inconsistent with the provisions of the Code;
- there is sufficient uncertainty regarding the principles that are applied in setting reference tariffs such that *“...different minds, acting reasonably, can be expected to make different choices within a range of possible choices which nonetheless remain consistent with the Reference Tariff Principles.”²⁵*; and
- given the uncertainty noted above, the regulator cannot reject the service provider’s access arrangements because the regulator prefers a different access arrangement that it considers are more consistent with the provisions of the Code.

²⁴ Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT 6, 23 December 2003, paragraph 45.

²⁵ Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT 6, 23 December 2003, paragraph 29.

2.2 Conclusion

KPMG's application of the CAPM, and our estimate of the cost of capital for AGLGN's gas distribution system, is consistent with the principles emerging from recent regulatory developments.

There is now a significant independent body of opinion that demonstrates the importance of avoiding regulatory error and the nature of that error as posing significant risks to a regulated business's future investments, and hence the level of economic welfare.

In addition, there is now sufficient judicial precedent that confirms that the role of the regulator is not to set the terms and conditions of the service provider's access arrangements, but to assess if the access arrangements fall within reasonable and acceptable ranges, and are consistent with the provisions in the Code. There is also no requirement that the lowest value of underlying parameters must be adopted in order for reference tariffs to comply with the requirements of the Code.

As the remaining sections in this report point out, estimation of WACC is an inherently imprecise exercise, given both the methodological uncertainties underlying the theory and limitations in relation to the measurement of underlying parameters. Such considerations are relevant to IPART's assessment of the reasonableness of the WACC that we have recommended for AGLGN's gas distribution system.

We consider that application of the set of principles we have used and highlighted above would provide an outcome that is consistent with the correct interpretation of the Gas Code. It would also encourage an investment environment that is far more conducive to maximising the economic welfare both of consumers and infrastructure owners than alternative approaches, thereby addressing the concerns of PC and the Government.

3 The Weighted Average Cost of Capital

3.1 Introduction

The cost of capital is the rate of return required by the marginal investor in a firm (i.e. the last investor willing to contribute funds). Equivalently, it represents the minimum return on capital that a firm must expect to earn on its investments to attract new capital and to maintain its current value.

The cost of capital of a firm is typically measured by reference to the current cost of raising funds via the various classes of its capital (e.g. equity, debt, etc.), each weighted by the target proportion of each class of capital to the total market value of capital of the firm. Hence, the cost of capital of a firm is often referred to as a Weighted Average Cost of Capital ("WACC").

In estimating WACC, the Capital Asset Pricing Model ("CAPM") is widely applied to estimate the cost of equity²⁶. The CAPM is based on the assumption that an investor in a risky asset requires additional return to compensate for bearing additional risk. In simple terms, the CAPM asserts that the required rate of return on a risky asset is a function of the risk free rate of return (R_f) plus a risk premium that reflects the return on a well-diversified portfolio of risky assets over the risk free rate ($R_m - R_f$), scaled by the "beta" of the risky asset. Therefore, the required rate of return for equity securities (K_e) is determined as follows:

$K_e = \text{Risk free rate} + \text{Risk premium}$

$$K_e = R_f + \beta_e * \{R_m - R_f\}$$

Beta (denoted by β_e) is a measure of the risk of the risky asset relative to the market index. In theory, the only risks that are captured by beta are those risks that cannot be eliminated by the investor through diversification. Such risks are referred to as systematic, undiversifiable or uninsurable risks – they affect all assets since they derive from underlying economy-wide influences. Portfolio diversification is assumed to eliminate all other risks. In practice, however, diversification to the extent that the CAPM assumes is uncommon²⁷. For this reason, some investors are likely to require compensation for risks that are considered to be diversifiable under the CAPM.

²⁶ There are a number of other theories that can be applied to estimate the cost of equity. However, the CAPM remains the most popular theory.

²⁷ For example, Goetzman, W. and A. Kumar, *Diversification Decisions of Individual Investors and Asset Prices*, January 2004, unpublished working paper Yale School of Management, conducted an empirical study of 60,000 individual investors during a six year period (1991-1996) and found that the vast majority of investors in their sample were under-diversified. The authors suggest that if investors systematically hold less than fully diversified portfolios, they are likely to demand compensation for the idiosyncratic risk in their equity portfolios. Further analysis suggested that the diversification decisions of these investors will also be reflected in asset prices. In addition, we are also aware of research which has found that the non-systematic risk related to the risk of the firm has increased in recent times, and due to this, elimination of non-systematic risk is no longer possible by holding a portfolio of 20 to 30 stocks. (refer Campbell, Lettau, Malkiel and Xu, *Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk*, Journal of Finance, Vol. LVI, No. 1, February 2001). Finally, Malkiel and Xu (2002) also postulate that if there are investors who cannot hold the market portfolio for exogenous reasons (i.e. they are not diversified to the extent the CAPM presumes), other remaining investors will also be unable to hold the market portfolio (since the sum of the two make up the whole market). Under such a scenario, investors will care about total risk, not just market risk. (refer Malkiel, B and Y. Xu, *Idiosyncratic risk and security returns*, December 2002, unpublished working paper).

The risk-return concepts underlying the CAPM are applicable to any risky asset. Therefore, the required rate of return for risky debt securities can be similarly estimated:

$K_d = \text{Risk free rate} + \text{debt risk premium}$

$$K_d = R_f + \beta_d * (R_m - R_f)$$

In practice, rather than estimating the individual components underlying the debt risk premium (i.e. β_d , R_m and R_f), the observed yields on issued debt securities provide an indication of the debt risk premium as a whole.

In addition to the CAPM, capital structure theory is also applied to estimate the target weights that are applied to the cost of equity and the cost of debt in estimating WACC. Capital structure theory focuses on the factors which influence the mix of capital employed by the firm.

In the context of revenue setting by regulators, the cost of capital is effectively converted into a cash flow item. That is, it is applied to a measure of the value of the regulatory asset base, and the result is then added to other revenue building blocks to derive a measure of the required revenue of the regulated entity. In order to ensure that the revenue derivation formula is internally consistent, it is clear that the cost of capital cannot be considered in isolation of the definition of other components of overall revenue determination in regulatory decisions. Care must be taken to ensure this mutual dependency is observed. This also applies to the treatment of inflation, risk and tax. It is in this context that capital structure theory and the CAPM also intersect. For example, the variance of possible future costs influences capital structure choice, the cost of debt and possible cash flows under conditions of distress. Consequently both the cost of capital and the expected operating costs are influenced by variance however the CAPM focuses only on the non-diversifiable element of variance.

3.2 WACC formula

WACC can be expressed in a variety of ways. For each definition, there is a corresponding cash flow definition.

We have estimated a pre-tax real WACC for AGL Gas Networks. The pre-tax real WACC that we have estimated for AGL Gas Networks is based upon the post-tax nominal WACC adjusted for imputation:

$$\text{WACC} = K_e * (1-t) / \{1-t*(1-\gamma)\} * E/V + K_d*(1-t)*D/V$$

grossed up by 1 minus the statutory corporate tax rate to obtain the pre-tax nominal WACC:

$$\text{Pre-tax nominal WACC \%} = K_e * 1 / \{1-t*(1-\gamma)\} * E/V + K_d*D/V$$

and then adjusted for inflation:

$$\text{Pre-tax real WACC} = \{(1+\text{Pre-tax nominal WACC \%}) / (1+\text{CPI})\} - 1$$

4 Gearing

In selecting an appropriate capital structure for the purposes of estimating WACC, it is standard practice to examine the observed gearing levels of other businesses operating in the same industry.

In Australia, an assumed gearing level of 60% has emerged as the regulatory benchmark for regulated gas network businesses, as shown in Table 2 below.

Table 2: Gearing values adopted in recent gas and electricity determinations

Gas network decision	Gearing (D/V)
Moomba Sydney (2003)	60%
DBNGP (2003)	60%
NT Gas (2002)	60%
GasNet (2002)	60%
Victorian Gas Distributors (2002)	60%
Electricity network decisions	Gearing (D/V)
SPI PowerNet (2002)	60%
ElectraNet (2002)	60%
Envestra (2001)	60%
Powerlink (2001)	60%

As shown in Table 3 below the empirical evidence that we have reviewed suggests that the regulatory benchmark capital structure of 60% debt to total assets is reasonably consistent with market practice.

Table 3: Observed gearing (defined as year end debt to total enterprise value) levels of comparable companies

Company	2000	2001	2002	2003	Average
Australian Gas Light	37%	46%	40%	29%	38%
Australian Pipeline Trust	56%	54%	56%	50%	54%
AlintaGas	45%	38%	32%		38%
GasNet		67%	66%		67%
Envestra Limited	82%	78%	78%	72%	78%
Average	55%	57%	54%	50%	55%

Source: Aspect Financial Ratio Analysis, Annual Ratio Analysis; KPMG analysis

On the basis of the above evidence, KPMG considers that a 60% gearing ratio is not an unreasonable assumption to adopt for the purpose of establishing the cost of capital for AGLGN's gas distribution system.

5 The risk free rate of return and inflation

For the purpose of establishing a cost of capital for input into the revenue setting process, the basis upon which the risk free rate of return is established must address:

- choice of proxy for the risk free security; and
- the sampling window over which the risk free rate of return is measured.

5.1 Choice of proxy

KPMG considers that for the purpose of establishing a cost of capital for input into the setting of access charges for AGLGN's gas distribution system:

- the nominal risk free rate of return should be determined by reference to the yield on 10 year Commonwealth Government bonds, as currently represented by the benchmark May 2013 Commonwealth Government Bond; and
- the real risk free rate should be determined by reference to the yield on an Indexed Linked Government Bond with a term to maturity corresponding with that on the nominal risk free rate of return. This yield has been estimated by interpolating between the August 2010 and August 2015 Index Linked Government Bond yields.

KPMG is aware that there has been substantial debate concerning the choice of proxy for the risk free security for a number of years. This debate has emerged due to the ACCC's persistence in adopting a risk free rate of return that matches the length of the regulatory period, when other Australian regulators have universally accepted the approach we have adopted.

KPMG notes that this debate has now been resolved by the recent Australian Competition Tribunal's ("ACT") decision on GasNet's appeal against the ACCC's revisions to its access arrangements. In that decision, the Tribunal found in favour of GasNet that the ACCC's use of the five year government bond rate as the risk free rate was inappropriate in the context of the CAPM.

5.2 Sampling window for measuring the risk free rate

It has been the standard practice in regulatory determinations to adopt some period of historical averaging in estimating the risk free rate of return rather than an "on the day" rate. Given that the rates observed on any particular day could be temporarily influenced by market anomalies, KPMG agrees that some short term averaging of recent historical rates is desirable.

KPMG notes that IPART's practice has been to adopt a 20 day sampling window in measuring the risk free rate of return. In theory, the most recent interest rates embody the latest information about market conditions, and therefore, the longer the period of averaging, the less weight would be attached to the latest market rates. This has led some regulators to adopt a shorter sampling window (e.g. 10 days). However, from a practical

perspective, a sampling window that is too short could create problems for a regulated entity that is intending to seek to hedge over the sample period.

On balance, KPMG considers that IPART's practice of adopting a 20 day sampling period is a pragmatic choice. It would also be desirable for IPART to provide advance notice regarding the date on which the 20 day sampling period would commence or end to facilitate AGLGN's forward planning with respect to hedging. The 20 day sampling period is also consistent with the approach adopted by the Victorian ESC and the QCA.

5.3 Inflation

The standard practice for estimating the rate of expected inflation is to solve for that parameter using the nominal and real risk free rates of return as inputs into the Fisher equation. We concur with this practice.

5.4 Conclusion

For the purposes of estimating an appropriate WACC for AGLGN's gas distribution system, KPMG recommends the following values²⁸:

- a nominal risk free rate of **5.66%**. This rate reflects the yield on 10 year Commonwealth Government bonds, as currently represented by the benchmark May 2013 Commonwealth Government Bond, averaged over the 20 days to 23 January 2004; and
- a real risk free rate of **3.42%**. This rate reflects the yield on an Indexed Linked Government Bond with a term to maturity corresponding with that on the nominal risk free rate of return. Given that there is currently no Indexed Linked bond maturing in May 2013, this yield has been estimated by interpolating between the August 2010 and August 2015 Index Linked Government Bond yields, and averaging over the 20 days to 23 January 2004.

Collectively, the above rates imply an expected inflation rate of around **2.17%**.

²⁸ It is acknowledged that the specific values adopted for the real and nominal risk free rate will change as a result of movements in interest rates depending upon the time it is measured.

6 The market risk premium

6.1 General

The equity market risk premium ("MRP") represents the additional return over the risk-free rate of return that an investor would require as compensation for the risks of investing in a diversified equity portfolio. It is essentially a measure of investors' appetite for risk.

Measurement of the MRP is a highly contentious issue. In theory, what we need to measure is essentially the size of the risk premium that investors, on average, *require* over the risk-free rate to invest in the stockmarket. In essence, what we are really seeking to determine is the *forward-looking* price that investors place on risk. The problem is that this forward-looking measure is not directly observable and the tools available to estimate the forward-looking MRP are inadequate.

In practice, there are four main ways in which the MRP has been estimated:

- by surveying of the expectations of investors or economists;
- by applying 'supply side' approaches (such as the Dividend Growth Model) to estimate an *ex-ante* MRP;
- by extrapolating the MRP from foreign markets; and
- by measuring past levels of the MRP.

In our view, the MRP is best estimated by reference to long term historical averages. Whilst all of the methodologies noted above are imperfect, we believe that past levels of MRP provide objective estimates of what the MRP has been and investors are likely to take into account past observations in forming their views on the required risk premium.

Our specific concerns regarding the other methodologies are set out below.

Firstly, we are sceptical about the evidence from surveys since the evidence is very much dependent upon the design of the survey question and the incentives of the survey promoter. In the Jardine Fleming Capital Markets Survey 2001, for example, we are aware that some respondents to the survey indicated negative expectations of the ex-ante MRP²⁹. In the minutes to the Trinity Best Practice Committee Meeting which discussed the survey results, Professor Robert Officer was quoted as stating that those responses were "completely irrational" and Professor Bruce Grundy stated that in his opinion, "*...this survey was flawed because it asked the wrong question. It asked what the respondents thought the expected ERP would be, rather than asking what they thought investors' required ERP would be.*"³⁰

²⁹ It is irrational to for investors to demand a negative risk premium for investing in risky stocks versus risk free bonds. Investors can expect or forecast a negative equity risk premium, however, this would imply that the investors in the survey have been asked the wrong question.

³⁰ Minutes of the meeting of the Trinity Best Practice Committee, "The Equity Risk Premium – An Australian Perspective", 15 September 2000 (page references not provided).

Secondly, we consider that estimates of the MRP produced by brokers or fund managers, and used in their marketing materials, should be viewed with caution. As Professor Stephen Gray has previously pointed out, such material is often "*designed to encourage individuals to actively trade in equities*" whilst the lower estimates produced by pension fund managers are "*consistent with their incentive to motivate the use of lower benchmarks against which to assess their performance.*"³¹

Thirdly, we question the strength of the advice provided to the Victorian ESC by Mercer Investment Consulting ("Mercer")³². Our review of Mercer's advice indicates that it is heavily qualified on some key issues. In particular:

- Mercer's survey appears to be based on interviews with a small number of their contacts within institutional investment management. The strength of their survey results is therefore questionable;
- Mercer highlights that they perceive that "*brokers and investment managers maintain relatively higher estimates of the [MRP] than academics, and some academics have higher estimates of the [MRP] than asset consultants*"³³. This suggests that asset consultants (of which Mercer is one) tend to employ the lowest estimates of the MRP;
- Mercer notes that it does not actually require nor employ a forecast of the MRP in the context of giving strategic asset allocation advice to its clients. What matters, amongst other things, is the relativity between shares and bonds; and
- Mercer states that the implied MRP from its forecast of returns on Australian shares is much lower than historical excess returns, however, they also state they "*do not conclude which of these measures of the MRP is more correct.*"³⁴

Finally, we are concerned about the nature of the assumptions that underpin supply side approaches for estimating the MRP. Such approaches often require strong assumptions to be made regarding dividend growth rates in perpetuity, real GDP growth rates into perpetuity and constant levels of inflation, all of which are almost certainly to be violated in reality. For example, in Kortian (1998), the author expressed considerable caution in using the dividend discount model due to the high degree of sensitivity of equity prices to changes in the dividend yield, which is in turn dependent upon the real bond yield, the rate of growth in real dividends per share and the equity premium. Kortian (1998) calculated that if the dividend yield is currently 2%, then a 1% permanent decline in the equity premium would result in a 50% increase in share prices, all other things being constant. Such scenarios are highly unlikely to be borne out in reality.

Most importantly, we consider that estimates of the MRP derived from the application of approaches such as surveys and supply side approaches, should be treated with a high degree of caution due to the persistence of the 'equity premium puzzle'. This puzzle describes the inability of economic theory to rationalise the size of the historical US equity premium. As the founders of the puzzle have noted:

³¹ Gray, S., Issues in Cost of Capital Estimation, 19 October 2001, downloaded at http://www.esc.vic.gov.au/pdf/2001/sub_uqbs_gaspospapoct01.pdf (page 11).

³² Letter dated 1 July 2002 from Mercer Investment Consulting to the ESC on the Australian Equity Risk Premium.

³³ Letter dated 1 July 2002 from Mercer Investment Consulting to the ESC on the Australian Equity Risk Premium, p. 7.

³⁴ Letter dated 1 July 2002 from Mercer Investment Consulting to the ESC on the Australian Equity Risk Premium, p. 8.

"The puzzle cannot be dismissed lightly, since much of our economic intuition is based on the very class of models that falls short so dramatically when confronted with financial data. It underscores the failure of paradigms central to financial and economic modelling to capture the characteristics that appear to make stocks comparatively so risky."³⁵

Furthermore:

"The data used to document the equity premium over the past 100 years is as good an economic data set as we have and this is long series when it comes to economic data. Before we dismiss the premium, not only do we need to understand the observed phenomena but we also need a plausible explanation why the future is likely to be any different from the past. In the absence of this, and based on what we currently know, we can make the following claim: over the long horizon, the equity premium is likely to be similar to what it has been in the past and the returns to investment in equity will continue to substantially dominate that in T-bills for investors with a long planning horizon."

Given the lack of success that economic theory has had in rationalising the historical MRP to date, it would seem inappropriate to place weight upon studies that attempt to predict the ex-ante MRP using existing analytical approaches and economic rationale.

6.2 Empirical evidence – long term historical averages

Empirical evidence based on the historical market risk premium in Australia provides support for an MRP in the range of 6% to 8%³⁶. Table 4 below sets out the measured historical MRP in Australia reported in various studies and research.

³⁵ Mehra, R., and E. Prescott, The Equity Premium in Retrospect, Forthcoming in the Handbook of Economics of finance, Edited by G.M. Constantinides, M. Harris and R. Stulz, North Holland, Amsterdam.

³⁶ This same conclusion was arrived at by the Queensland Competition Authority ("QCA") after considering various historical measures of the MRP. Refer QCA, Proposed Access Arrangements for Gas Distribution Networks, October 2001, p.216.

Table 4: Measured historical MRP in Australia

Source	Period	Risk premium (%)
AGSM:		
Arithmetic average, incl October 1987	1974-1995	6.2
Arithmetic average, excl October 1987	1974-1995	8.1
Arithmetic average ³⁷	1974-1998	4.8
Arithmetic average, incl October 1987 ³⁸	1974 – Sep 2000	6.2
Arithmetic average, excl October 1987	1974 – Sep 2000	7.7
Officer (1989) – arithmetic mean	1882 – 1987	7.9
Officer (1989) updated – arithmetic mean ³⁹	1882 – 2001	7.2
Officer⁴⁰:		
Arithmetic mean	1946-1991	6.0 to 6.5
Hathaway (1996)⁴¹		
Arithmetic mean	1882-1991	7.7
Arithmetic mean	1947-1991	6.6
Gray (2001) (note 1)	1883 – 2000	7.3
Dimson, Marsh and Staunton (2000) ⁴²	1900 – 2000	7.6
Notes:		
1 Gray (2001) is based on an update of Officer's work as reported in S. Gray, <i>Issues in Cost of Capital Estimation</i> , 19 October 2001 downloadable at http://www.esc.vic.gov.au/PDF/2001/SubUQBS_GasPosPapOct01.pdf		

In interpreting the evidence presented above, KPMG notes that the MRP estimates show some degree of variation but has remained largely within the 6% to 8% range. Whilst this might appear to be a relatively wide range, we do not find the variance disconcerting since we expect that the actual MRP will vary from one point in time to another. When averaged over long time frames however, we expect that such variation will be smoothed out.

KPMG also note that post-1987 MRP data is biased downwards since the market index used to measure the MRP does not capture the average value of franking tax credits. In the Jardine Fleming Capital Markets Survey

³⁷ Refer ABN AMRO (1999) Submission to the Office of the Regulator General Victoria Regarding 2001 Electricity Distribution Price Review; the Cost of Capital Financing (Consultation Paper No. 4) p12. A copy of this is available at http://archive.esc.vic.gov.au/1999/electric_ConsPap4Resp_abnamro.pdf

³⁸ Referred to in independent expert report by Deloitte Touche Tohmatsu dated 19 December 2000 to Woodside Petroleum shareholders in relation to a takeover offer by Shell Investments.

³⁹ Refer ABN AMRO (1999) Submission to the Office of the Regulator General Victoria Regarding 2001 Electricity Distribution Price Review; the Cost of Capital Financing (Consultation Paper No. 4) p12

⁴⁰ Officer, R.R. (1992), Rates of Return to Shares, Bond Yields and Inflation Rates: An Historical Perspective, as updated for a 1993 Seminar at the University of Melbourne.

⁴¹ Refer ABN AMRO (1999) Submission to the Office of the Regulator General Victoria Regarding 2001 Electricity Distribution Price Review; the Cost of Capital Financing (Consultation Paper No. 4) p12.

⁴² Dimson, Marsh and Staunton, "Twelve Centuries of Capital Market Returns", Business Strategy Review, 2000, Vol 11 Issue 2

2001, Professor Robert Officer stated that "...if you assume that franking credits represent about 20% of total stock returns, the historic ERP could be biased downward by as much as 1%."

Gray's paper also re-iterates the benefit of a long term perspective in estimating the MRP and the challenge faced in forming a sound and supportable view that the MRP has changed recently.

There has been substantial variation in the MRP by decade, both in Australia and the US, as shown in Table 5 below.

Table 5: Comparison of MRP in Australia and the US, by decade

	USA ⁴³	Australia ⁴⁴
1926 – 1929	17.6%	11.2%
1930's	2.3%	5.7%
1940's	8.0%	6.4%
1950's	17.9%	13.5%
1960's	4.2%	9.6%
1970's	3.0%	0.4%
1980's	7.9%	7.9%
1990's	7.9%	2.9%

Taking a longer term view leads to a lower standard error of the estimated MRP. Table 6 below shows that over the period 1883 – 2000, the average MRP is 7.3% with a standard error of 1.56%, whereas the estimate from 1971 – 2000 is 4.8% but is much less reliable with a standard error of 4.4%. As Gray points out, the 4.8% average obtained for more recent decades is not statistically different from the longer term historical average.

Table 6: Historical Australian Market Risk premium with varying start and finish years

Start Year	Finish Year	Mean %	Standard Error %
1883	2000	7.3	1.56
1883	1970	8.2	1.5
1971	2000	4.8	4.4

Source: Gray, S (2001), Issues in Cost of Capital Estimation, available at http://www.esc.vic.gov.au/PDF/2001/SubUQBS_GasPosPapOct01.pdf

6.3 Regulatory precedents

Regulators around Australia have, to date, adopted a value for the MRP of 6%, with the exception of IPART. An MRP of 6% takes into account historical measures of the MRP that have typically ranged from 6% to 8%, but clearly, adopts the lower end of this range to place some weight on what regulators have referred to as emerging evidence of a decline in the historical MRP. Table 7 below sets out the MRP that has been adopted in other regulatory decisions on gas networks since 1998.

⁴³ Anmin, M., Falaschetti, D., *Equity Risk Premium, Valuation Strategies*, January / February 1998, obtained at http://www.ibbotson.com/Research/papers/Equity_Risk_Premium/

⁴⁴ Updated data to 2000 from Officer, R. R. (1989), *Rates of Return to shares, Bond Yields and Inflation Rates: An Historical Perspective*, in Ray Ball, Phil Brown, Frank Finn and Bob Officer, *Share Markets and Portfolio Theory*, University of Queensland Press, pp. 207-211.

Table 7: MRP adopted in gas network determinations in Australia since 1998

Determination & Date	Regulator	MRP adopted
Victorian gas distribution access arrangements (Oct 1998)	ORG	6.0%
Victorian gas transmission access arrangements (Oct 1998)	ACCC	6.0%
Final decision on Great Southern Energy (Mar 1999)	IPART	5.0% - 6.0%
Final determination on AlintaGas (Jun 2000)	OffGAR	6.0%
Access Arrangements for Central West Pipeline (Jun 2000)	ACCC	6.0%
Access arrangements for AGL Gas Networks (Jul 2000)	IPART	5.0% - 6.0%
Access arrangements for the Moomba-Adelaide Pipeline (Sep 2001)	ACCC	6.0%
Queensland Gas Distribution (October 2001)	QCA	6.0%
Envestra (Dec 2001)	SAIPAR	6.0%
Victorian gas distribution access arrangements (Oct 2002)	ESC	6.0%
GasNet Final decision (Nov 2002)	ACCC	6.0%
Dampier to Bunbury Natural Gas Pipeline Final Decision (May 2003)	OffGAR	6.0%

6.4 Conclusion

KPMG acknowledges that problems in measuring the MRP make it difficult to establish with any certainty, the appropriate value to attribute to the MRP. Such problems are exacerbated by the wide range of views that exist on what the appropriate value of the MRP should be. Furthermore, irrespective of whether a historical or forward-looking methodology is utilised, there can be considerable variation in the measure.

Based on the evidence reviewed, KPMG believes that 6% represents a reasonable point estimate for the MRP. The historical-based evidence we have reviewed in this report, particularly those spanning long time periods, supports this view. We believe that a point estimate of 6% - which is at the low end of the observed historical average range - would reflect a conservative estimate that takes into account the possibility that the current MRP may be lower than that indicated by long term historical averages.⁴⁵ It is also consistent with regulatory precedents on this parameter.

⁴⁵ For the avoidance of doubt, KPMG does not advocate relying upon short term recent averages for estimating the MRP. However, we recognise that the MRP at any point in time may be different from its long term historical average trend. We believe that choosing the lower end of the range of values observed from long term historical averages is one way of addressing this concern.

7 Beta

7.1 Introduction

Under the CAPM, the total risk of an asset can be divided into two parts: systematic risk and unsystematic risk. Systematic risk is a function of broad macroeconomic factors that affect the prices of all assets. Unsystematic risk⁴⁶ is a function of the characteristics associated with a particular asset as opposed to the overall market.

Under CAPM theory, investors can eliminate unsystematic risk by holding a diversified portfolio of assets. The rationale is that in a diversified portfolio, positive events affecting some stocks will be offset by negative events affecting other stocks, so that on average, the return on the overall portfolio will equate to the weighted average expected return on all stocks in the portfolio. Hence, it is assumed that investors will not care about unsystematic risk and will not require any compensation for such risk in the form of a higher return. By contrast, diversification cannot eliminate systematic risk since it affects all stocks. Under the CAPM, the systematic risk of an asset is measured by its 'beta' factor, which reflects the contribution of that asset to risk of a diversified investor's portfolio.

In statistical terms, the beta factors reflect the extent to which possible future returns are expected to co-vary with the overall market return. A beta of 1 means the asset has the same risk as the market whereas a low risk asset will have a beta less than one and display less systematic response to market-wide events than will the average asset.

KPMG has based its estimation of WACC for AGLGN's gas distribution system on the CAPM framework. In applying this framework, however, we are highly cognizant of the limitations of the model, in the context of both theory and practice. In particular, we consider that the cost of equity determined under the CAPM framework has the potential to under-state the true cost of equity for price regulated utilities which face an asymmetric exposure to downside and upside risks. We consider that this issue is best dealt with not by abandoning the conventional CAPM methodology, but by relaxing the strict constraints around the division of risk into diversifiable and non-diversifiable elements in the process of estimating an appropriate beta factor.

7.2 Estimation method

7.2.1 Equity beta

Betas are usually estimated by regressing historical share market returns against a market index. There are a number of services that provide such estimates including, the Risk Measurement Service of the Centre for Research in Finance at the Australian Graduate School of Management's ("AGSM") Centre for Research in Finance (CRIF), London Business School, Bloomberg, DataStream, and Value Line. These services can assist in quantifying the likely equity beta for a stock, however, we stress that such estimates provide a *guide* rather than a definitive estimate of the appropriate equity beta for a stock. There are a number of reasons for this.

⁴⁶ Unsystematic risk is also commonly referred to as unique risk, diversifiable risk or non-market risk.

- Estimation error is high. Confidence intervals around beta estimates are quite wide and in addition, betas vary over time and often, significantly so. The AGSM beta estimates shown later in Table 13 of this report demonstrate the extent of the imprecision in the estimates.
- In theory, the market portfolio under the CAPM should be a market value weighted index of the entire universe of investable assets – not just equity. However, in practice no such index exists. As a result, it is necessary to adopt a proxy for the market portfolio. An overall market index is the most common choice for a proxy, however, even so, many market indices exist and each one will produce a different measure of the equity beta for a stock.
- Beta estimates can be measured over different return intervals – daily, weekly (including weekly ending or starting on specific days) or monthly. Depending on the size of the return interval, return correlations between the stock and the market may or may not be properly captured.
- The beta estimates (derived from regression analysis) are historical estimates even though the CAPM is forward looking. Therefore there is an assumption of stability in betas across at least the estimation period and the period for which it is used. The selection of an estimation period is a trade off between:
 - being long enough to obtain enough observations to minimise the standard error of the estimate; and
 - minimising an error in the estimate due to changes in the underlying determinants of beta.

The measurement period varies across risk measurement services. For instance, CRIF at AGSM uses 48 monthly observations and the default for Bloomberg's is 60 monthly observations. Beta estimates derived from these different sources can differ due to the time period selected.

- Comparables are used as a guide if the business under examination is not listed or there is too much estimation error to rely solely on the beta estimate for one business alone if it is listed. Unfortunately listed, pure play comparables are few and far between, particularly in Australia and for gas distribution. Often, comparables from other countries are used as a guide in order to present an expanded data set for consideration. However, interpretation of overseas data presents additional challenges because different tax regimes can influence financial leverage and different mixes of industries and sectors can mean betas relative to the home country index would not be the same as those relative to an Australian index. The Australian economy is quite unusual in that it is very heavily influenced by the resources sector. Thus translating betas from other countries to Australia requires careful judgment.
- Since financial leverage can vary across industries, countries and firms, and furthermore, financial leverage is a determinant of equity beta, it is common to de-lever comparable betas to arrive at an "asset" beta then to re-lever at the target financial leverage considered appropriate for Gas Distribution in this case. However, there are a number of different formulas that can be applied to de-lever/re-lever betas, as discussed later in Section 7.3.1 of this report.

- For regulated utilities which face an asymmetry in their return distribution⁴⁷ due to limitations in upside price potential, there is some evidence to indicate that the conventional CAPM cost of equity understates the true cost of equity. Conine and Tamarkin (1985) demonstrates this with testing on a sample of 60 utilities over the period from 1971 – 1980 and their results indicated that on average, the cost of equity was understated by approximately 1.35 percentage points.⁴⁸

The discussion above serves to highlight that selection of an appropriate value for beta for a regulated utility entails more than merely selecting a number from a beta measurement service. It also requires an understanding of the limitations of the CAPM, the measurement biases that can arise through the necessary use of proxies, and careful judgment. Our estimate of the appropriate beta for AGLGN's gas distribution system is the outcome of a number of processes guided by theory, evidence and practice.

In some recent regulatory decisions the ACCC has noted that empirical analysis undertaken by the Allen Consulting Group ("Allens") indicated that the appropriate equity beta for regulated gas networks, based upon current observations of equity betas of comparable Australian companies (as the primary source of evidence), and to a lesser extent overseas companies, and re-levered for the regulatory standard gearing level of 60%, is around 0.70. By allowing an equity beta of 1.0 in recent decisions, the ACCC has therefore noted that it is adopting a conservative approach in light of the current market evidence.

The ACCC's characterisation of its approach as conservative or generous presumes some precision in the methodology and data used by Allens in estimating the equity beta. We note that in its report, Allens has refrained from making such a presumption. In particular, Allens state that whilst the evidence suggests an equity beta of 0.70 is appropriate, a revision downwards from the regulatory precedent of 1.0 may not be appropriate because "*it cannot be concluded definitively that this quality of evidence exists at this time.*"⁴⁹ The report goes on to cite two major concerns with the data:

- first, the primary source of information is derived from listed Australian entities that comprises of a group of only four firms, and of these, "*only two of the firms have been in existence long enough to permit the AGSM's-preferred four years of observations to be used, with the beta estimate of one of these – the Australian Pipeline Trust – being based upon only 21 observations...*"; and
- second, Allens expressed concern over the uncharacteristically low levels of the re-levered equity betas for the US firms compared with past estimates. Allens note that it could be possible that stock prices in the US have been affected by recent events.

In forming a view on an appropriate beta for AGLGN's gas distribution system, KPMG has considered – amongst other things - market evidence on betas for Australian comparables, and the degree of reliance that can be placed on such information. This analysis is provided in Section 7.3.3.

⁴⁷ Specifically, regulated utilities faced negatively skewed returns. Factors contributing to this includes regulatory lag, unexpected price inflation, and risks arising from the discretions afforded to price regulators.

⁴⁸ Conine, T.E., and M. Tamarkin, Implications of skewness in returns for utilities cost of equity capital, Financial Management, Winter 1985, p. 66-71. Specifically the study noted that the standard CAPM estimate for the utilities in their sample was 15.81% as compared with 17.16% under a model that was adjusted to deal with skewness.

⁴⁹ Allen Consulting Group, "Empirical Evidence on Proxy Beta Values for Regulated Gas Transmission Activities", July 2002, page 42.

7.2.2 Debt beta

The debt beta (β_d) can, in theory, be estimated by “reverse-engineering” the CAPM. That is:

$$K_d = R_f + \beta_d^*(R_m - R_f)$$

Therefore:

$$\beta_d = (K_d - R_f) / (R_m - R_f)$$

In practice, it is not uncommon for a zero value to be ascribed to the debt beta.

KPMG does not disagree with the view that the debt beta for gas network businesses can be expected to be low or negligible. What we believe is required is consistency in the way in which the debt beta is applied. It is our view that provided the same value for the debt beta is used in de-levering observed equity betas of proxy companies and in re-levering the resulting asset beta to obtain an equity beta at the target gearing level, the resulting equity beta estimate will not be distorted⁵⁰. It is, however, difficult to ensure that this consistency is observed where asset betas are not derived from market evidence (e.g. if asset betas are drawn from regulatory precedents rather than from the de-levering process).

The table below indicates that the resulting re-levered equity beta, at varying levels of asset and debt betas, given assumed values for the pre-tax cost of debt, tax rates and imputation credits. We stress that it is implicit in the analysis shown below that the asset beta values assumed are derived by de-levering observed equity beta using the same debt beta values assumed.

Table 8: Re-levered equity betas under varying asset and debt beta values⁵¹

Assumed value of imputation credits = 40%; Assumed pre-tax cost of debt = 7.29%; Assumed tax rate = 30%				
	Debt beta = 0.0	Debt beta = 0.06	Debt beta = 0.10	Debt beta = 0.18
Asset beta = 0.40	1.00	0.90	0.84	0.73
Asset beta = 0.45	1.12	1.03	0.97	0.85
Asset beta = 0.50	1.24	1.15	1.09	0.97

The ACCC appears to be undecided in its view of whether to adopt a zero or positive value for the debt beta. This is evident from the debt betas used in its regulatory decisions on gas networks versus those on electricity networks.

In our view, given the uncertainty associated with measuring the debt beta value, it is feasible to adopt a range between zero at the low end and a value determined in accordance with the methodology proposed by the ESC in Victoria, at the high end:

$$\beta_d = \{ \text{Debt margin}^{52} - \text{Default premium} - \text{Debt raising costs} \} / \text{MRP}$$

⁵⁰ The distortion does not occur since all other things being equal, a higher (lower) debt beta value that is applied in the de-levering process will result in a higher (lower) unlevered asset beta value, and the application of the same debt beta value in the re-levering process will result in a lower (higher) re-levered equity beta.

⁵¹ Re-levered equity betas derived using the Monkhouse formula.

⁵² Debt margin is inclusive of debt raising costs.

The component of the debt margin that represents a default premium can be established using the statistics for debt of 10 year maturity as presented in Elton et al (2001)⁵³ which are reproduced in Table 9 below.

Table 9: Estimated default premia (Industrial sector) – recalculated results

Maturity	Estimated default premia (%)		Measured spread from Treasury (%)		Estimated default premia as a % of the measured spread from Treasury	
	A	BBB	A	BBB	A	BBB
2	0.053	0.145	0.621	1.167	8.53%	12.4%
3	0.063	0.181	0.680	1.205	9.26%	15.02%
4	0.074	0.217	0.715	1.210	10.35%	17.93%
5	0.084	0.252	0.738	1.205	11.38%	20.9%
6	0.095	0.286	0.753	1.199	12.62%	23.97%
7	0.106	0.319	0.764	1.193	13.87%	26.74%
8	0.117	0.351	0.773	1.188	15.13%	29.55%
9	0.128	0.380	0.779	1.184	16.43%	32.09%
10	0.140	0.409	0.785	1.180	17.83%	34.66%

Source: Elton et al (2001)

Based on the approach outlined above, the debt beta would lie in the range of 0.0 to around 0.175⁵⁴, although we recognise that the high end of this range is likely to be over-stated⁵⁵. The upper bound for the range has been estimated assuming a debt margin of 1.95% (i.e. high end of the debt margin assumed in Section 8 less 25 basis points for debt raising costs), less a margin of 68 basis points for the default premium for a BBB credit rating (i.e. 34.7% of 1.95%), and an MRP of 6.0%.

Whilst the calculated range for the debt beta is between 0.0 to 0.17, we note that:

- it is common market practice to adopt a debt beta of zero in cost of capital estimates;
- IPART has, in past decisions, adopted a range of 0.0 to 0.06 for the debt beta; and
- ACCC decisions continue to exhibit inconsistency in the treatment of the debt beta. For example, in the GasNet decision, the ACCC applied a point estimate of 0.18 for the debt beta. However, in its subsequent determinations for ElectraNet and SPI PowerNet, the ACCC applied a debt beta of zero.

7.3 Equity beta estimates

7.3.1 De-levering / re-levering equity betas

According to CAPM theory, observed equity betas of companies are affected by the target level of gearing of a business. For this reason, it is often useful to conduct comparisons on the basis of a company's asset beta, which is derived by de-levering (i.e. stripping out the gearing component) the observed equity beta of the

⁵³ Refer Elton, E., M. Gruber, D. Agrawal, C. Mann, "Explaining the rate spread on corporate bonds", Journal of Finance, vol LVI No. 1.

⁵⁴ To maintain the relationship between the debt, equity and asset betas, a low debt beta value corresponds to a high equity beta value and vice versa.

⁵⁵ This is due to the fact that we have not deducted a margin for illiquidity in estimating the debt beta.

company. There are various “de-levering formulas” available to achieve this (refer Table 10 below). Some of these formula also assume positive value for the debt beta, and others purport to take into account the value of imputation tax credits.

Table 10: Some alternative formulas for unlevering equity beta

Description	Formula
Equation 1: Simple formula	$\beta_e = \beta_a + (\beta_a - \beta_d) D/E$
Assumes active debt management policy, non-zero debt beta	OR
Credited to Brealey & Myers, “Principles of Corporate Finance”, Fifth Edition	$\beta_a = \beta_e E/V + \beta_d D/V$
Equation 2: Hamada formula	$\beta_e = \beta_a + (\beta_a - \beta_d) (1-T) D/E$
Assumes passive debt management, non-zero debt beta	
Equation 3: Appleyard and Strong, Non-zero debt beta	$\beta_e = \beta_a + (\beta_a - \beta_d) \{1 - T[k_d / (1+K_d)]\} D/E$
Equation 4: Monkhouse formula	$\beta_e = \beta_a + (\beta_a - \beta_d) \{1 - T_e[k_d / (1+K_d)]\} D/E$
Modified version of equation 3, by replacing T with an effective corporate tax rate (Te) that is defined as: Imputation credits payout ratio X imputation credits utilisation rate X Statutory corporate tax rate	
<i>Notes:</i>	
<i>“Active” debt management refers to a debt management policy where the dollar value of debt is assumed to change each in such a way that the ratio of debt to enterprise value remains constant. “Passive” debt management refers to a debt management policy where the dollar value of debt is assumed to be fixed and held constant, with payments made on a predetermined basis. The WACC formula effectively assumes an active debt management policy.</i>	

7.3.2 Analysis of recent regulatory decisions

Table 11 and Table 12 below provide a summary of betas and de-levering formulas assumed during recent regulatory reviews of gas and electricity distribution pricing. The information displayed below indicates that an equity beta around 1.0 has been adopted in a large number of regulatory decisions. In some cases, this has resulted from reliance placed on equity betas in other regulatory decisions, whilst in other cases, the equity beta value has been estimated from empirical analysis of implied asset and debt betas, and applying the de-levering formula.

Table 11: Beta values determined at recent gas industry access arrangement reviews

Gas decision	Equity beta	Asset beta	Debt beta	De-levering formula
Moomba Sydney (2003)	1.00	Not reported	Not reported	Not reported
DBNGP (2003)	1.20	0.60	0.20	Simple
NT Gas (2002)	1.02	0.50	0.15	Monkhouse

Gas decision	Equity beta	Asset beta	Debt beta	De-levering formula
GasNet (2002)	0.98	0.50	0.18	Monkhouse
Victorian Gas Distributors (2002)	1.00	0.40 – 0.54	0.00-0.23	Monkhouse
Queensland Gas Distribution (2001)	0.98	0.55	0.26	Monkhouse
AGLGN (2000)	0.90 – 1.15	0.40 – 0.50	0.06	
Average	1.03	0.51	0.16	

Table 12: Beta values at recent electricity industry regulatory reviews

Electricity decision	Equity beta	Asset beta	Debt beta	De-levering formula
Transend (2003)	1.00	0.40	0.00	Monkhouse
SPI PowerNet (2002)	1.00	0.40	0.00	Monkhouse
ElectraNet (2002)	1.00	0.40	0.00	Monkhouse
Envestra (2001)	1.10	0.50	0.12	Not reported
Powerlink (2001)	1.00	0.40	0.00	Monkhouse
Average	1.02	0.42	0.02	

It is also evident that regulators do not appear to have come to a landing on whether a zero or positive value should be adopted for the debt beta. The ACCC, for example, appears inclined towards positive debt betas in its gas decisions and zero values for debt betas in electricity decisions, with no justification for this apparent difference in assumed values. In addition, some regulators adopt a “reverse-engineering” approach to estimating the debt beta using the CAPM formula whilst others have elected to adopt more complicated approaches. For example, the ESC in Victoria estimates the debt beta value by deducting the cost of the embedded default margin and an illiquidity premium from the cost of debt, prior to reverse-engineering the CAPM.

As noted earlier, however, the precise value of the debt beta does not distort the calculation of the resulting equity beta provided that the debt beta used for de-levering observed equity betas is also used when re-levering asset betas for the target level of gearing.

7.3.3 Market evidence – equity betas

As noted above, it is conventional practice to estimate an appropriate beta having regard to recent empirical evidence on the betas of comparable publicly listed companies. However, there are very few Australian publicly listed companies that could be considered comparable to a regulated gas distribution business. Furthermore, the company most often included in such analysis (AGL) now derives a large portion of its earnings and the vast majority of its recent earnings variability outside of regulated businesses.

Other Australian regulators have recognised that whilst in principle it is appropriate to reflect recent market evidence in beta estimates, there are only a limited number of comparable companies available in Australia. Furthermore, the beta estimates of these companies display a high degree of variation. Table 13 below, for example, sets out the betas of the four Australian publicly listed comparable companies⁵⁶ commonly included in

⁵⁶ The data we used for United Energy was before its recent ownership change which led to its delisting.

the analysis of proxy betas, and highlights the extent of the instability of the data over time. The betas have been derived from the AGSM Risk Measurement Service as reported over the past four quarters. The figures shown in parentheses indicate the high-low ranges provided by the AGSM.

Table 13: AGSM equity betas

Company	Code	Equity beta estimates measured over the 48 months ended			
		June 2002	Sep 2002	Dec 2002	Mar 2003
Australian Gas Light	AGL	0.36 (0.03 to 0.69)	0.09 (-0.21 to 0.40)	0.08 (-0.24 to 0.40)	0.06 (-0.24 to 0.36)
United Energy	UEL	0.25 (-0.19 to 0.70)	0.18 (-0.29 to 0.65)	0.25 (-0.23 to 0.73)	0.08 (-0.37 to 0.53)
Envestra	ENV	0.59 (0.32 to 0.86)	0.31 (0.04 to 0.57)	0.33 (0.05 to 0.60)	0.34 (0.10 to 0.58)
Australian Pipeline Trust	APT	1.30 (0.26 to 2.33)	0.94 (0.28 to 1.61)	0.79 (0.08 to 1.50)	0.77 (0.16 to 1.37)

Source: AGSM Risk Measurement Service, June 2002, September 2002, December 2002 and March 2003
Note: Betas quoted for APT are thin-trading adjusted betas. This was indicated as being appropriate under the AGSM calculations.

For these reasons, recent decisions by the ACCC and Victoria's ESC have tended to place greater weight on betas adopted in other regulatory decisions, and have put correspondingly less weight on recent market evidence. This has resulted in equity betas defaulting towards a value of 1.0.

7.3.4 Treatment of asymmetric risk

Asymmetric risks relate to events that have an asymmetric financial impact on the business, for example, events where the probability of a negative outcome exceeds the probability of a positive outcome. Risks that give rise to asymmetric returns represent a special category of risk that is not captured by the conventional CAPM. This is because in CAPM terminology, such risks are typically:

- specific to the business or its industry, rather than being a market-wide risk. As such, they are not, in theory, captured by the beta factor. However;
- they are also not by definition capable of being completely eliminated through diversification. Under the CAPM, diversification leading to the complete removal of unsystematic risks is possible when negatively correlated investments with statistically normal (i.e. symmetric) return distributions are combined into a portfolio – because returns are as likely to exceed or to fall short of expected returns, negative returns on some investments will offset positive returns on others. However, when investments with non-normally distributed (e.g. asymmetric) returns are added into such portfolios, the complete removal of these unsystematic risks may no longer be possible, or at the minimum, will be much more difficult to achieve.

Regulatory risk is an example of asymmetric risk. It can arise from actions taken by the regulator that alter the distribution of potential returns faced by a regulated entity. This risk is particularly high in circumstances where the regulator has a large amount of discretion to control or adjust a firm's price cap. When firms face prices that are capped but costs that are variable and set by competitive markets, uncontrollable and adverse changes in costs can be particularly harmful to the profitability of the firm. This is because when costs are higher than

expected and cannot be controlled, the firm is not able to lift its prices to a level that would ensure that profits are sufficiently adequate to meet its cost of capital.

Firms subject to price cap regulation potentially face a distribution of returns that is truncated towards the right hand tail since prices are set such that the business earns no more than its cost of capital (if expectations are fully realised), but at the same, there is no equivalent protection offered to guarantee that the business will earn at least its cost of capital. Complete removal of such risks through diversification as the CAPM assumes is much more difficult to achieve since investments with the required compensating risk profile – i.e. investments with a larger probability of upside returns than downside returns– generally do not exist. Furthermore, the business cannot eliminate this risk through purchasing insurance. The asymmetry in returns that is induced by regulation is not systematic, yet it is also not readily diversifiable. As such, it is not captured by the CAPM.

Based on the above, the use of CAPM rates of return to set the cost of capital for a regulated business such as AGLGN will under-state the required return by the amount of fair compensation for asymmetric risk. Ignoring the need for such compensation can effectively undermine the incentives for AGLGN to continue investing in the gas distribution system. It was in this context that the PC considered the need for a ‘truncation premium’ that would be added to the WACC for a regulated business.⁵⁷

We also note that in the PC’s recent draft report on its review of the gas access regime, the effect of regulatory truncation on CAPM based regulatory rates of returns was considered⁵⁸. The PC’s analysis noted that:

“As the degree of asymmetric truncation increases, the coefficient of variation increases, distorting the risk-return tradeoff for the investment. Compared with the unregulated situation, the regulated investment offers a lower expected value of ROR for comparable levels of risk.”⁵⁹

In our view, the two main options for incorporating compensation for asymmetric risk into allowed rates of returns for regulated utilities are:

- to allow compensation for an explicitly quantified cost equal to the actuarially fair insurance premium for such risks. This can be achieved by allowing a dollar amount in operating cost allowances or by allowing an explicit uplift on the conventionally determined cost of capital; or
- to implicitly allow for such risks by choosing a WACC towards the higher end of the conventionally determined WACC range.

Due to the practical difficulties involved in quantifying the costs of such risks, our strong preference is for the latter.

KPMG notes that regulators such as the ACCC and the ESC have acknowledged that asymmetric risks are not irrelevant⁶⁰. However, these regulators have continued to insist on only reflecting market-wide risks in the

⁵⁷ PC, Review of the National Access Regime: Inquiry Report, 28 September 2001, page xxviii.

⁵⁸ PC, Review of the Gas Access Regime, Draft Report, Canberra, Appendix B, page 396.

⁵⁹ PC 2003, Review of the Gas Access Regime, Draft Report, Canberra, Appendix B, page 399.

⁶⁰ For example, refer the ACCC’s Draft Statement of Principles on the regulation of transmission revenues, page 79, and the ACCC’s Draft Greenfields Guide, pages 12-13.

WACC, with all other risks being recovered in other parts of the revenue formula, for example, through operating cost allowances⁶¹. KPMG considers that this approach, which requires non-market risks to be explicitly quantified, is an approach that:

- gives no weight to how firms normally deal with the commercial risks that they face in the real world; and
- reflects the pre-occupation of regulators to applying a strictly 'textbook' approach to determining the cost of capital.

In short, it represents a classic example of regulators adopting a surgical approach to access pricing, which was one of the concerns expressed by the Productivity Commission in its review on the access regime.

The difficulties associated with quantifying such risks mean that regulated businesses are unlikely to be ever compensated for such risks. Furthermore, our review of regulatory decisions issued by the ACCC and the ESC shows that even where businesses have provided actuarial estimates to support their claim for an allowance for such costs in their operating cost allowances or for pass through, regulators have argued that these costs are either not sufficiently material, or are effectively offset by what the regulators claim are 'generous' assumptions they have adopted elsewhere in the revenue determination. This was the ESC's approach to assessing 'excluded events', for example, in its determination on the 2003 gas distribution access arrangements review in Victoria.

KPMG notes that in its July 2000 determination on AGLGN, IPART implicitly allowed for such risks in the WACC by selecting a pre-tax real WACC that was positioned towards the upper end of its calculated WACC range of 5.4% to 8.2%.⁶² In settling on a pre-tax real WACC of 7.75% in that decision, the Tribunal noted that its decision reflected the consideration of wide range of risks including, amongst other things, risks specific to AGLGN including revenue risk due to supply interruption and asset stranding⁶³. There is therefore a clear precedent for the Tribunal's capacity to take into account such risks in its assessment of WACC.

7.4 Conclusion

KPMG acknowledges that whilst current market evidence on betas should be reviewed as part of the process for determining an appropriate beta for regulated businesses, it is often difficult to draw firm conclusions on the appropriate beta given the high degree of instability in beta measurements. The Australian proxy equity betas reviewed in Table 13 highlights the extent of this problem. **In view of this, we consider that it is appropriate for regulators to place greater weight upon the betas adopted in regulatory decisions of comparable businesses, in deciding the appropriate value for the equity beta.**

Consistency with recent regulatory decisions would indicate that an equity beta of 1.0 should be adopted as the default value. This approach would not require any further assessment to be made about the value of the underlying asset beta and the debt beta.

⁶¹ Pass-through of costs is another mechanism in which the cost of unquantifiable non-market risks can be recovered.

⁶² We also note that the Tribunal previously expressed the view that it considered a real pre-tax rate of return within the range of 7.0% to 8.0% to be appropriate for gas utilities.

⁶³ Refer page 70 of IPART's July 2000 final determination for AGLGN.

Alternatively, the equity beta could also be established by considering regulatory precedents on the asset beta and debt beta, levered up to a gearing level of 60%. Our review of the regulatory decisions on gas network systems (refer Table 11) suggests that an asset beta in the range of 0.40 to 0.60 is an acceptable range. We consider that taking into account the need to implicitly allow for asymmetric risks⁶⁴, an appropriate asset beta for AGLGN's gas distribution network is most likely to lie within the central part of the asset beta range, that is, around 0.45 to 0.50, given the risk profile of the AGLGN gas distribution network.

Based on an asset beta in this range, and the assumptions adopted in relation to other relevant parameters⁶⁵, the calculated equity beta for AGLGN's gas distribution system would be in the range of 0.86 to 1.24⁶⁶. We note that the midpoint of this range is an equity beta of approximately 1.05, which is just above the default equity beta of 1.0 that other regulators have been adopting in recognition of the uncertainty surrounding current market evidence.

For the purpose of establishing a pre-tax real WACC for AGLGN's gas distribution system, we have applied an equity beta range of 0.86 to 1.24.

⁶⁴ We understand that AGLGN has not made specific allowance for asymmetric risks in its operating cost estimates.

⁶⁵ Market risk premium of 6%, debt margin of 1.55% to 1.95%, and debt beta of 0.0 to 0.17.

⁶⁶ Estimated using the Monkhouse formula.

8 Debt margin

The cost of debt represents the cost of borrowing, which is based on the credit worthiness of the borrower. In estimating the debt margin, regulators have assumed that regulated businesses would seek to target an investment grade credit rating (i.e. BBB- or better)⁶⁷.

KPMG has estimated an appropriate debt margin for AGLGN's gas distribution system by reference to data on generic debt margins for debt securities of 10 year maturity from CBA Spectrum, an online resource provided by the Commonwealth Bank. CBA Spectrum provides information on the pricing of various rated nominal bonds issued in the Australian capital market. For example, it is possible to obtain the pricing of bonds with a BBB or BBB+ credit rating, and from this, determine the implied margin at various dates.

The data we have examined suggests that the debt margin for BBB+ rated bonds averaged over the 20 days to 23 January 2004 was **110 basis points**, and for BBB rated bonds, **120 basis points**.

Because many corporations seek to borrow from the nominal debt market and use CPI swaps to hedge the CPI component of the nominal cost of debt, it is appropriate to add in an allowance for the cost of CPI swap hedging costs. An allowance of **20 to 50 basis points** has been estimated as being appropriate⁶⁸.

A second additional allowance relates to debt establishment costs. This represents the transaction costs associated with raising debt capital and is paid to the bank or financial institution arranging such debt. We note that in the Australian Competition Tribunal decision on GasNet's appeal against the ACCC's decision on its transmission revenues, the Tribunal ordered that an allowance of 25 basis points be provided.

Adding these components together we consider that a debt margin in the range of **1.55% to 1.95%** would be appropriate for AGLGN's gas distribution system, and consistent with a credit rating in the range of BBB to BBB+. Our analysis of comparable regulatory decisions (as set out in Table 14 below) also indicates support for a debt margin within this range.

Table 14: Debt margins adopted in comparable decisions⁶⁹

Decision	Regulator & Date	Debt margin
Queensland Electricity Distribution	QCA, May 2001	1.65%
Queensland Gas Distribution	QCA, Oct 2001	1.55%
Victorian Gas Distribution	ESC, Oct 2002	1.74%
Victorian Electricity Distribution	ESC, Oct 2000	1.54%

⁶⁷ The validity of this assumption is cross-checked in regulatory decisions by forecasting the projected cash flows implied by the decision, and computing various required financial ratios.

⁶⁸ Refer page 125 of Citipower's submission to the Victorian Essential Services Commission which is available at <http://www.esc.vic.gov.au/apps/page/user/pdf/citicht4.pdf>

⁶⁹ We have not included the debt margins offered in recent ACCC decisions in this table given that the ACCC has been assessing debt margins based on debt securities with 5 year maturities. Nevertheless, we note that in the Gasnet final decision, the ACCC allowed a debt margin of 158.5 basis points.

On the basis of the above, we consider that a debt margin in the range of 1.55% to 1.95% to be the debt margin for the purpose of estimating an appropriate WACC for AGL Gas Networks.

The resulting pre-tax cost of debt would therefore fall within a range of 7.21% to 7.61%.

9 Tax rate

KPMG is aware that there continues to be substantial debate concerning the question of whether the benchmark cost of tax should be estimated by reference to:

- an assumption that the effective tax rate is equal to the statutory corporate tax rate. This approach has been used by the Tribunal, ESCOSA, the ERA and the Utilities Commission; or
- an explicit calculation of the cost of tax rate, which requires some complex assumptions to be made regarding the tax position of the regulated entity. This approach has been adopted by the ACCC and the Victorian ESC.

In its recent draft determination on the 2004 NSW electricity distribution price review, the Tribunal has re-affirmed its intention to use the statutory corporate tax rate for the purpose of estimating a pre-tax real WACC. KPMG supports the Tribunal's decision and believe that the same approach should be applied for estimating a pre-tax real WACC for AGLGN's gas distribution system.

On this basis, we recommend that the prevailing statutory corporate tax rate of 30% be adopted.

10 Imputation credits

10.1 Introduction

Under Australia's dividend imputation system, domestic equity investors receive a taxation credit (i.e. a franking credit) which is attached to any dividends paid out of after-tax company returns. This franking credit, which reflects the amount of tax that has been paid by the company on each dollar of dividend, may be used to offset the personal tax of the investor, and hence, represents additional cash flow to the investor after-company and personal tax. Without the franking rebate, shareholders would, in effect be paying personal tax on profits that had already been subject to company tax. In a sense, therefore, franking credits effectively represent personal tax collected or withheld at the company level.

In the modified CAPM formula, the value attributed by an investor to imputation credits is represented by "gamma" and denoted by γ . Professor Robert Officer, who effectively re-cast the textbook cost of capital formulation into one that accommodates an imputation tax system, describes the notion of γ in the following way:

"... γ is the proportion of tax collected from the company which gives rise to the tax credit associated with a franked dividend. This franking credit can be utilised as tax credit against the personal tax liabilities of the shareholder. γ can be interpreted as the value of a dollar of tax credit to the shareholder."⁷⁰

In a footnote to the above statement, Professor Officer provides some additional explanation of γ :

"For example, if the shareholder can fully utilise the imputation tax credits then ("value") $\gamma = 1$, e.g. a superfund or an Australian resident personal taxpayer. On the other hand a tax exempt or an offshore taxpayer who cannot utilize or otherwise access the value in the tax credit will set $\gamma = 0$. Where there is market for tax credits one could use the market price to estimate the value of γ for the marginal shareholder, i.e. the shareholder who implicitly sets the price of the shares and the price of γ and the company's cost of capital at the margin, but where there is only a covert market, estimates can only be made through dividend drop-off rates..."

It is clear then that different investors will attach a different value to γ , depending on whether they can access the value of imputation tax credits. Most firms, particularly large firms, will have an investor base that typically comprises a mix of investors, some of whom would be able to access the value of credits, and some of whom would not.

10.2 Gamma estimates

10.2.1 Empirical studies

The table below summarises the various estimates of γ that have been derived from empirical studies. All of these studies use data from Australian-based companies, to create a sample that is representative of the Australian market.

⁷⁰ Officer, R. R., 1994, The Cost of Capital under an imputation tax system, Accounting and Finance, May, pp 1-17, page 4.

Table 15: Empirical estimates of the value of imputation credits

Study	Methodology	Estimated value of γ
Bruckner, Dews and White (1994)	Dividend drop-off	33.5% - 68.5%
Hathaway & Officer (1999)	Analysis of tax statistics	48%
	Dividend drop-off	49% (large co.) 44% (all companies)
Walker & Partington (1999)	Dividend drop-off	88% or 96%
Cannavan, Finn & Gray (2001)	Inference from value of individual share	0%
	futures and low exercise price options	
Chu & Partington (2001)		Close to 100% ⁷¹
Twite & Wood (2002)	Inference from analysis of trading in derivatives	45%

Sources:
Bruckner, K. N. Dews and D. White, 1994, Capturing value from dividend imputation, McKinsey & Company; Hathaway, N. and R. R. Officer, 1999, The Value of Imputation Tax Credits, Unpublished manuscript, Graduate School of Management, University of Melbourne; Walker, S. and G. Partington, 1999, The Value of Dividends: Evidence from cum-dividend trading in the ex-dividend period, Accounting and Finance, vol 39, p293; Cannavan, D., F. Finn and S. Gray, 2002, The value of imputation tax credits, working paper, University of Queensland and Duke University; Chu, H. and G. Partington, 2001, The market value of dividends: Theory and evidence from a new method, working paper, University of Technology, Sydney, p39; Twite, G. and J. Wood, February 2002, The Pricing of Australian imputation tax credits: Evidence from individual share futures contracts, working paper.

10.2.2 Other methodologies

As is evident from the Table 15 above, much of the existing empirical evidence on the likely value of γ is derived from by studies that employ a methodology known as dividend drop-off analysis. Under this methodology, the value of imputation credits is analysed by comparing the cum-dividend share price of a dividend-paying company with its ex-dividend share price. As the difference between these share prices (i.e. the drop-off) theoretically represents the value of the money distributed, any decline in the share price in excess of the cash dividend entitlement is assumed to be attributed to the value of the imputation credit attached to the dividend.

In addition to dividend drop-off analysis, other methodologies that have been employed to estimate the value of imputation credits include:

- analysis of national taxation statistics.

This technique was used by Hathaway & Officer (1998). The authors determined the ratio of franking credits distributed each year to the amount of company tax paid each year (i.e. the "access rate") and proportion of franking credits distributed by companies that are actually claimed or redeemed by investors (i.e. utilisation

⁷¹ Whilst the results suggest imputation credits are close to fully valued, it should be noted that the standard error of the estimate is 97% which indicates substantial variation around the mean estimate.

rate) to infer the value of imputation credits. The value of imputation credits is assessed from the product of the access rate and the utilisation rate.

- specially developed equilibrium pricing models.

Wood (1997) estimates the value of imputation credits by treating Australia as segmented from world markets, using a specially developed equilibrium pricing model.

- comparison of differences in the pricing of certain derivative securities and their underlying shares.

This is a recent methodology that has been employed by Cannavan, Finn and Gray (2001). They infer the value of imputation credits from the value of individual share futures ("ISF") and Low Exercise Price Options ("LEPOs"), as compared with the price of the underlying shares.

The authors consider the methodology used in their study to provides a better indication of the value of imputation credits for large companies, as compared with dividend drop-off analysis, since:

- the analysis of value can be undertaken each time an ISF or LEPO trades within one minute of a trade in the underlying share, and hence accommodates a larger sample size that brings statistical benefits and enables calculation to be done on a company-by-company basis;
- the analysis is not confined to ex-dividend dates, when share price data is often confounded by the activities of short-term arbitrage traders; and
- many dividend drop-off studies suffer from a statistical problem known as multicollinearity which makes it difficult to separate the value of cash dividends from the value of the imputation credits. The authors allege that the important consequence of this work is that the results from many earlier studies on the value of imputation credits employing this technique are highly questionable. In particular, the authors state that:

"...in contrast to conventional wisdom, for large companies with substantial foreign investment the market value of these tax credits is close to zero after recent changes to tax laws that effectively prevent their transfer."

10.3 Regulatory precedents

Up until recently, IPART was the only regulator in Australia to adopt a value for imputation credits within the range of 30% to 50%, whilst other regulators have adopted a point estimate of 50%. However, we note that IPART has recently proposed to adopt a point estimate of 50% in its 2004 NSW electricity distribution business draft determination.

10.3.1 The case for and against a higher value for gamma

Both the ESC in Victoria and the ACCC have previously expressed the view that they consider 50% to represent the minimum value for imputation credits. The case for attributing a higher value for gamma is framed largely around the form of CAPM adopted – whether world equity markets are integrated or segregated - and thereby, the requirement for consistency with the identity of the underlying investor for the purposes of estimating a value

for gamma. For example, it has been argued by regulators such as the ACCC and ESC, that it is inconsistent to adopt a value for imputation credits that assumes the presence of foreign investors if a domestic CAPM – which implies world equity markets are segregated - is adopted.

This argument is explained by the ESC, by reference to a submission by Dr Martin Lally, as follows:

“... a submission from Dr Lally argued that adopting an assumption for gamma as low as 0.5 implied an assumption that a large portion of the franking credits remain unutilised, which can only reflect an assumption that foreigners have a significant share in the Australian equity market. He commented that this is inconsistent with a domestic version of the CAPM that the Office has adopted, and that the comments received in relation to the treatment of foreign investors argue for the use of an international version of the CAPM.”⁷²

The ESC went on to outline Dr Lally's recommendation for the cost of capital to be first calculated assuming complete segregation of markets and then assuming complete integration of markets. To the extent that the results from the two approaches differ, then a value that reflects the strength of one's belief about these two models should be adopted. Dr Lally suggested that in moving from an assumption of complete segregation to complete integration, three changes would be required – gamma, the equity market risk premium and beta. The value of γ would move from around 80%⁷³ assuming complete segregation of markets to 0% assuming complete integration of markets. The equity market risk premium was likely to be lower but the direction of the change in beta is unclear. Dr Lally suggested it was likely that the outcome could be a lower cost of capital, as was the case in a separate study that he had conducted in relation to New Zealand firms⁷⁴.

The arguments put forward by Dr Lally have been extensively analysed by Professor Stephen Gray⁷⁵. Professor Gray acknowledges that in theory, it may be more appropriate to use an international CAPM. Existing empirical research also suggests that the performance of ICAPM models is superior to that of the domestic CAPM. However, due to the complexity of such models, the adoption of such a model would lead to significantly more debate amongst stakeholders about methodologies and interpretation since there are many versions of the international CAPM and some versions require a substantially greater number of inputs.

As a compromise position, Professor Gray suggests that it may be possible to retain the use of a domestic CAPM notwithstanding it is theoretically incorrect, but to calculate an upper bound for the error that is induced by using the 'wrong model'. Using a model proposed by Karolyi and Stulz (2001), Professor Gray estimates this error

⁷² ORG, Final Decision, Electricity distribution price determination 2001-2005, Volume 1, Statement of Purpose and Reasons, page 134.

⁷³ Dr Lally's submission (downloadable at <http://www.esc.vic.gov.au/docs/electric/lally.pdf>) initially referred to γ moving from 100% (assuming complete segregation) to 0% (assuming complete integration) however, the ORG reported in footnote 636 of the Electricity Distribution Price Determination that Lally's definition of γ needed to be modified to take into account the payout ratio of franking credits. Using Hathaway & Officer's estimate of 80% for the payout ratio, the ORG estimated a value of γ at 80%.

⁷⁴ Dr Lally argues that in adopting his preferred approach, the movement from an assumption of complete segregation to an assumption of complete integration leads to changes not only in the value of γ , but also to changes in beta and the market risk premium. In particular, he suggests that the value of γ would fall, the value of beta may fall, and the MRP would fall. The first of these effects would lead to a rise in the cost of capital, whereas the latter two may or would lead to a fall. Dr Lally's own research on New Zealand firms suggests that the net effect of these factors is to lower the cost of capital for these firms.

⁷⁵ S. Gray, Issues in Cost of Capital Estimation, 19 October 2001, which accompanied TXU's submission in response to the ESC's position paper on its 2003 gas access arrangements review, downloadable at http://www.esc.vic.gov.au/PDF/2001/SubUOBS_GasPosPapOct01.pdf

bound at 5%. This error bound is considered to be of the same order of magnitude as the error that would arise from imprecise estimation of parameters that would normally arise in applying the CAPM. In other words, use of an international CAPM will not produce errors that are any greater than the error that might result from using a purely domestic CAPM.

It is also worth noting that it remains common market practice to assume that imputation credits are not fully valued or not valued at all⁷⁶. Evidence drawn from expert reports on takeovers to support such practices was provided in recent analysis, which showed that of 122 reports reviewed only 48 (or 39%) provided support showing how they had arrived at the WACC used in their reports. Of these, 42 (or 88%) used the classical CAPM model and made no adjustment for dividend imputation. Only six reports made an adjustment to reflect dividend imputation⁷⁷. Furthermore, of the seven reports (6%) that did attribute value to imputation credits, it appears that five attributed little or zero net effect on the value of the company being assessed.⁷⁸

This study goes on to provide a long list of conceptual grounds cited in reports for not adjusting for imputation credits, including:

- the value of franking credits is dependent on the tax position of each individual shareholder;
- there is no evidence that acquirers of businesses will pay additional value for surplus franking credits;
- there is little evidence that the value effects of dividend imputation are being included in valuations being undertaken by companies and investors or the broader market;
- foreign shareholders are the marginal price-setters of the Australian market yet many such shareholders cannot avail themselves of the benefit of franking credits; and
- there is a lack of certainty about future dividend policies, the timing of taxation and dividend payments and consequently about franking credits.

We note that Lonergan's analysis does not provide any indication of which form of CAPM had been adopted in the expert reports he reviewed, however, the list of conceptual grounds cited for not adjusting for imputation credits (which effectively implies a gamma of zero) did not include 'use of an international form of CAPM' as a reason. This suggests that the reports reviewed by Lonergan employed a domestic form of CAPM.

10.3.2 The benchmark investor assumption

We note that there are problems with the definition of the benchmark investor that is used to support the views held by a number of regulators on the value of γ .

To date, the value of γ has been set on the basis that the actual tax residence of the owners of the regulated entity is irrelevant for revenue setting, and that the appropriate benchmark investor should be an 'Australian'

⁷⁶ Lonergan does not state which form of CAPM was used in each of the expert reports he reviewed. Based on our experience, however, market practitioners tend to utilise the domestic form of the CAPM. This is evident from their approach to estimating parameters such as the risk free rate, beta and the market risk premium.

⁷⁷ Lonergan, W., Autumn 2001, "The disappearing returns, why dividend imputation has not reduced the cost of capital", JASSA, page 13.

⁷⁸ Lonergan, W., Autumn 2001, "The disappearing returns, why dividend imputation has not reduced the cost of capital", JASSA, page 14.

investor. The ESC has previously suggested that if the actual identity of the owner is used, consistency would require that the tax position, beta and gearing of the actual owner, amongst other things, be reflected in the value of γ . We consider such comments to be unwarranted since they effectively broaden the scope of γ to take into account any other tax concessions available to the investor, that have the effect of reducing or offsetting the corporate tax liability of the regulated business.

It is our view that such an argument is flawed, since even in a benchmark 'Australian investor' framework, it could be taken to the same extreme situation where effectively all tax concessions available to an individual investor represents a reduction in what Professor Officer has described as the 'pure' corporate tax.⁷⁹ We believe that the extension to the scope of γ that is implied by the above statements by the ESC and the ACCC reflects a fundamental misunderstanding of the concept. γ derives its value from the payment of corporate taxes (and hence, generation of imputation credits) by the firm, that will effectively be rebated to the investor. γ cannot possibly capture all other tax concessions available to an investor as there is no relationship between these other tax concessions and the corporate tax paid by the regulated business, as there is between the imputation credit rebate and corporate tax paid.

As for the argument that it would be necessary to take into account the beta and gearing that would be applicable to a foreign investor, we note that information on such parameters drawn from comparable overseas companies are already considered by regulators in assessing an appropriate value for such parameters. We have not previously seen, in their assessment, any adjustments made to adapt such data to an 'Australian investor' perspective. In light of this, it is difficult to understand how the parameters would change if a foreign investor assumption were to be adopted.

In theory, the argument regarding the most appropriate benchmark investor assumption is somewhat irrelevant. This is because the CAPM measures the marginal cost of capital or the required rate of return from the perspective of the marginal investor. We have previously highlighted comments from Professor Robert Officer that the marginal investor is the one who implicitly sets the price of shares, the value of γ and the company's cost of capital at the margin.

The broader question of what value to attribute to γ therefore, should be defined as *what proportion of taxes paid at the corporate level is really a pre-collection of the personal tax of the marginal investor.* This definition can be simply stated in theory. However, in practice, determining the identity of the marginal investor can be difficult.

One view that has been expressed by Professor Robert Officer is that the marginal investor – the one who sets the price of Australian stocks - is the foreign investor. The argument is expressed in terms of whether Australia is a price-taker or price-maker in capital markets.

"In an open capital market, such as Australia, where the size of the market relative to offshore markets implies it is a price taker, we would not expect the cost of capital to change – the arguments to support this proposition have been made in Officer (1988)."⁸⁰

⁷⁹ Other than γ , the only other cost of capital parameter that could capture the tax concessions available to an investor is in the corporate tax rate. However, it is a well known valuation concept that the relevant cost of capital is that of the target business, not the investor. Hence, the only tax circumstances that are relevant for the corporate tax rate parameter, are those that pertain to the business.

⁸⁰ Officer, R.R., 1994, The cost of capital of a company under an imputation tax system, Accounting and Finance, May, pp. 1-17.

Cannavan, Finn and Gray (2001) also support this view:

"As Officer (1988) points out, however, Australia is a small open economy so the cost of capital for Australian companies will be determined by supply and demand conditions in world capital markets. That is, large companies are unlikely to be financed solely by resident investors – at least some non-resident investment is likely to be required...

In this case, resident investors will receive capital gains, cash dividends and imputation credits and non-resident investors will receive capital gains and cash dividends only. Since resident investors receive a higher return (via the imputation credits granted by the local tax system), they will be the first to invest. The marginal investor will then be a non-resident, who will receive a return in the form of capital gains and cash dividends that just meets their required return..."

The important consequence of the marginal investor being a non-resident / foreign investor is that the value of γ is likely to be closer to zero than the 50% that is currently being used in regulatory decisions. In Cannavan, Finn and Gray (2001), the authors state that:

"...prior to the introduction of the 45-day rule, imputation credits for the average company are valued at around 33 cents in the dollar by the representative investor. This is consistent with Wood's (1995) estimate of 32% from an analysis of listed warrants using a different empirical technique. This is consistent with the representative investor being a foreign investor who can extract some, but not all, value from imputation credits by transferring them to domestic tax-paying investors..."

... we cannot reject the hypothesis that imputation credits are worthless to the marginal investor after the introduction of the 45 day rule."

The use of a marginal investor concept for attributing an appropriate value to γ is not only underscored by basic CAPM concepts, but is also dictated to a large extent by the empirical evidence that is available on the likely value of γ . Empirical studies implicitly measure the value of γ from the perspective of the marginal investor in the Australian market because:

- this basis of measurement is evident from the underlying data analysed in each study, which is share price data on Australian companies, all of whom would display a mix of investors on their share register; and
- it is accepted that share prices are set by the marginal investor.

As a result, the measure of γ that emerges from empirical studies of this nature can only represent the value of γ to the marginal investor. To the extent that Australia is a price-taker on world markets, the marginal investor will be a foreign investor.

Importantly, none of these studies focuses on companies that have purely Australian-resident shareholders. To support the view of some regulators that γ should reflect 'average Australian ownership', evidence of the value of γ using data from companies with shares held solely by Australian resident shareholders would be required. We are not aware of any empirical studies on γ which utilise such data. It is therefore not possible for regulators to maintain a 'private Australian ownership' assumption and draw support from available empirical evidence (as

provided by the studies listed in Table 15) that measures the value of γ to the marginal investor in the Australian stockmarket, who is most likely a foreign investor⁸¹.

The only alternative that leads to an internally consistent estimate of the cost of capital is to adopt a value of γ that reflects the value of imputation credits to the marginal investor⁸².

10.4 Conclusion

Despite additional research in this area, a considerable degree of uncertainty continues to surround the estimation of the appropriate value for γ . Given the sensitivity of the rate of return to the value of γ , and the asymmetry in the consequences of over- versus under-compensating investors in gas distribution systems (as highlighted by the PC), it would therefore seem more appropriate for regulators to err more towards a lower rather than a higher value for γ .

The 'average Australian investor' concept that has formed the basis for regulators' assumptions on gamma is a poorly defined concept. Furthermore, it is difficult to support such concepts when the existing empirical evidence on the value of imputation credits reflects the value of imputation credits from the perspective of the marginal investor. This is necessarily the case since empirical studies utilise share price data as the basis for estimating the value of γ and share prices are set by the marginal investor.

The identity of the marginal investor is difficult to determine in practice. However, for many large companies, particularly those with a significant proportion of foreign investors, there is evidence to support the view that the marginal investor is a foreign investor, who is largely unable to extract any value from imputation tax credits. Accordingly, the most defensible value for γ is one that approaches zero, rather than 100%.

To summarise the position on γ from recent developments, we consider that:

- there is no basis for regulators to argue for an increase in the value of γ above the existing upper bound of 50%;
- more recent research demonstrates that there is good reason to question the appropriateness of a value of γ of 50% since it relies upon evidence from studies that suffer from methodological flaws;
- more recent research demonstrates that a value of zero may be more valid assumption for γ than a value of 50%; and
- the use of a domestic CAPM is arguably inconsistent with the assumption underlying the valuation basis for γ , however, the potential errors from this inconsistency is not expected to be reduced by adopting the alternative of an ICAPM model.

We expect that a more conclusive view on the value of gamma will only be formed over time, as more research is undertaken in this area. Until this occurs, we consider that it would be appropriate to adopt a value for imputation

⁸¹ For example, the ACCC states in its final decision on the Moomba to Adelaide Access Arrangement (September 2001) that "...the Commission's choice of gamma will be a matter of judgement based on available empirical evidence". (page 42)

⁸² Marginal investor concepts are applied by regulators in estimating other WACC parameters (e.g. cost of debt and risk free rate).

credits within a range of **30% to 50%** for the purpose of determining a pre-tax real WACC for AGLGN's gas distribution system.