Report for the Energy Networks Association

Term of the risk free rate for the cost of equity

June, 2013

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28 June, 2013

Dear Nick,

Term of the risk free rate for the cost of equity

We are pleased to present Incenta Economic Consultants' (Incenta's) report on the term of the risk free rate for the cost of equity. This report has been prepared in accordance with the Terms of Reference provided to Incenta on 3 May, 2013 (reproduced at Appendix D). The report has been prepared in our capacity as advisers to the Energy Networks Association (ENA) and as expert witnesses in this matter.

Jeff Balchin is an Economist and Managing Director of Incenta. Prior to this, he was Principal in the Economics & Policy team at PricewaterhouseCoopers, and prior to that a Director at the Allen Consulting Group. He has had extensive experience across the electricity, gas, airports, rail, ports, water, telecommunications, post and banking industries in Australia and New Zealand, and has advised governments, regulators and major corporations on various issues in the capacity as an adviser and an expert witness.

Michael Lawriwsky is an Executive Director at Incenta. He was previously a director at PwC in its economics and policy team, prior to that a Director and Partner at the Allen Consulting Group, and prior that was a Director-Corporate Finance at ANZ Investment Bank, and a Professor of Commerce at La Trobe University. He has provided advice to regulated businesses and regulators on cost of capital issues in the energy, transport, telecommunications and water industries in Australasia. He has also provided advice to firms and governments on mergers and acquisitions, privatisation and corporatisation in a range of industry sectors, and has acted as an expert witness.

Detailed curriculum vita are provided below in Appendix E.

As a professional services firm, Incenta is a provider of advice to the ENA, and its member businesses, including on specific matters pertaining to the current development of the AER's rate of return guidelines; the subject of this report. As noted above, Incenta staff have previously advised, and continue to advise a wide range of clients, including businesses, governments and regulators. Further details of the advice that Incenta is currently providing to the ENA and its component businesses can be provided if necessary.

We can confirm that, in preparing this report, we have made all the inquiries that we believe are desirable and appropriate and that no matters of significance that we regard as relevant have, to our knowledge, been withheld. We have been provided with a copy of the Federal Court's "Guidelines for

Expert Witnesses in Proceeding in the Federal Court of Australia" and this report has been prepared in accordance with those Guidelines.

Should you wish to discuss this report in any way, please do not hesitate to contact us on 0412 388 372, or 0400 002 355.

Yours sincerely

Jeff Balchin
Managing Director

Dr. Michael Lawriwsky
Executive Director

Executive Summary

The Energy Networks Association (ENA) has engaged Incenta Economic Consulting (Incenta) to analyse the theoretical arguments about the appropriate term of the risk free rate for setting the cost of equity and cost of debt for a network business with long life assets, and to provide our opinion on the assumed term of the risk free rate within the scope of the allowed rate of return objective:[1]

> [t]he rate of return for a [Service Provider] is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applied to the [Service Provider] in respect of the provision of [services].

Context and overview

The Australian Energy Market Commission's (AEMC) new rules provide greater flexibility in relation to the estimation of the cost of equity. The use of a specific asset pricing model (such as the domestic CAPM) is no longer mandated, which gives emphasis to obtaining the 'best estimate of the rate of return' that is consistent with achieving the objectives of the regulatory framework. An explicit term of the risk free rate assumption is required for "risk premium models" (various versions of the CAPM, Fama French, Arbitrage Pricing Model), although is not required for the dividend growth model (DGM).

The Australian Energy Regulator (AER) has commenced a process for developing its first rate of return guidelines under the new rules, and its recent consultation paper has raised the issue of the term of the WACC, and of the appropriate term to apply to the cost of equity.[2] The AER considers that 'the present value principle would help to inform the appropriate term for return on equity and return on debt', but noted that there are 'divergent views on the appropriate term to ensure consistency with the present value principle' and is seeking stakeholder views on this issue.

Theory of the CAPM

Notwithstanding that the NER no longer prescribe the use of the Sharpe-Lintner Capital Asset Pricing Model (SL CAPM) to estimate the cost of equity, we note that the debate on this matter has been conducted in the context of this model. Accordingly, our analysis too focusses mainly on the risk free rate as applied in the SL CAPM. We note, however, that some of the issues apply equally to other models.

The appropriate term of the risk free rate when applying the Sharpe-Lintner Capital Asset Pricing Model (SL CAPM) has been controversial, with some of the controversy stemming from the very simplifying assumptions inherent in the SL CAPM.[3] Formally, the SL CAPM is a single period model, which assumes that an investment is made at the start of the period and liquidated (and consumed) at the end of the period, with the period being of undefined length. It is also implicit that both the life of all investments and the horizon of investors are the same (corresponding to the

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1 NER 6.5.2(c), 6A.6.2(c) and NGR 87 (3).

2 AER (May, 2013), *Consultation Paper – Rate of return guidelines*, pp. 40–41.

3 William F. Sharpe, (1964), 'Capital asset prices: A theory of market equilibrium under conditions of risk,' *Journal of Finance*, Vol. 19, pp. 425-442; John Lintner, (1965), 'The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets,' *Review of Economics and Statistics*, Vol. 47, pp, 13-37.

undefined period). In this model, the answer to the appropriate term of the risk free rate is obvious – indeed, if the risk free asset was a traded instrument, its term would match the undefined period. We observe that the SL CAPM clearly is not descriptive of reality. Investors do periodically re-evaluate portfolios and reinvest, and assets have a myriad of lives.

Lally / Davis "NPV=0 principle"

Notwithstanding the descriptive and theoretical limitations of the SL CAPM, Associate Professor Martin Lally and Professor Kevin Davis (Lally/Davis) have argued strongly that if a firm is regulated with prices that are reset with reference to spot interest rates every five years, then the risk free rate in the CAPM must be calibrated to the length of the regulatory period.[4] It has been argued that this choice of risk free rate is necessary for the resulting cash flows to have a net present value equal to zero – which has since been labelled the 'NPV=0 principle' – although we note that in this context, the NPV=0 principle says nothing more than that the discount rate should be the correct one for the cash flows being considered.

The argument is that such a cash flow – while risky – has similar characteristics to a 5 year bond, in that an investment exists at the start of the period, delivers coupons during the period and delivers a certain residual value (equivalent to a return of principal from a bond) at the end of the period. Investors would therefore decide on their required returns from the investment by commencing with the returns on a 5 year risk free investment and adding on an (SL CAPM) risk premium.

What has at times been unclear in the Lally/Davis argument is whether it was accepted that a change to the term of the risk free rate required a commensurate adjustment to the market risk premium, or whether the same market risk premium would apply if a shorter term was applied for the risk free rate. Associate Professor Lally has been on record as asserting that it is fine and indeed correct to apply the CAPM with two different risk free rates, with the implicit risk free rate embedded in the market risk premium calculated on the basis of the horizon of investors, but with the explicit risk free rate term reflecting the term of the regulatory period.[5] In contrast to this, the analysis of Davis has assumed a consistent application of the risk free rate.

Having said that, we note that Lally appears to have revised his view in his most recent work for the AER in the current period of heightened focus on the need for consistency in application of the different inputs to the CAPM. In his March, 2013 report for the AER, Lally stated:[6]

> However, there are some situations where variations from these implications are inconsequential or unavoidable. One of them occurs where $E(R_m)$ is estimated and beta is 1; in this case the value for R_f is irrelevant because it washes out.

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4 Martin Lally, (August, 2002*), Determining the risk free rate for regulated companies*, Report for the Australian Competition and Consumer Commission; Kevin Davis, (28 August, 2003), *Risk Free Interest Rate and Equity and Debt Determination in the WACC*, Prepared for the ACCC, pp. 11-12; Martin Lally, (2004), 'Regulation and the Choice of the Risk Free Rate,' *Accounting Research Journal*, Vol. 17(1), pp.18-23.

5 For example see: Martin Lally, (27 April, 2010), *The appropriate term for the risk free rate and the debt margin*, Report to the Queensland Competition Authority, p. 6; Martin Lally, (February, 2004), *The Cost of Capital for Regulated Entities*, Report Prepared for the Queensland Competition Authority.

6 Martin Lally, (March, 2013), *The Present Value Principle: Risk, Inflation, and Interpretation*, pp.5-6.

His statement that with an equity beta of unity the effect of applying the NPV=0 principle 'washes out' can only be true if there is consistency in the application of the risk free rate in both places that it appears in the CAPM formula.

Criticisms of the Lally/Davis NPV=0 approach – theoretical consistency issues

Associate Professor Lally's view that different risk free rates can be used in the SL CAPM has been criticised as being inconsistent with the CAPM.[7] Moreover, it has also been stated that the concept of term in the SL CAPM should reflect the characteristics of the investor (namely their assumed investment horizon) rather than any concept of term associated with the asset, which is a criticism of the Lally/Davis NPV=0 argument even where the same risk free rate is used consistently in the two parts of the CAPM. Under this argument, while it may be the case that assets whose cash flows are "reset" periodically may demand a lower return, this differential (relative to the average asset) would be reflected in the beta for the asset. Moreover, even if the regulated asset was fully recovered over 5 years, this would likewise be irrelevant to the term used in the SL CAPM in any event.

Our view is that an unambiguous guide to this matter is not provided by finance theory, and is somewhat clouded by the shortcomings of the SL CAPM. In view of this, a key issue to consider is how investors actually value assets and the investment horizon that they apply in doing so. A further issue that we consider to be relevant is whether there are other practical issues that flow from the choice of the term of the risk free rate when estimating the cost of equity. These matters are addressed in turn.

How market practitioners approach the question of term of the risk free rate

It has been proposed in material advanced previously in regulatory matters that investors are unlikely to evaluate regulated assets with reference to a 5 year bond because – unlike the case of a bond – the residual value at the end of each 5 year period is inherently risky.[8] This is because the residual value is not returned in cash, but rather comprises a "value" whose recovery remains at risk from future regulatory decisions and changes in the market (both technological change and changes to customer preferences). As a consequence, the return required for such assets would be expected to be benchmarked against a long term risk free asset just like other infrastructure assets. However, the promised resetting of price with reference to spot interest rates at periodic intervals is something that would influence views of the relative risk of the regulated asset (including through estimates of the beta). This is a contrasting hypothesis to the NPV=0 view, which implicitly predicts that investors would adopt a different risk free benchmark when valuing a regulated and unregulated asset.

In order to test how investors perceive term when valuing assets, we undertook a series of structured interviews with 14 market practitioners (i.e. 2 independent valuation experts and 12 investment bank/broker investment analysts) to obtain their views on the relevance of term when advising their investor clients. While market practitioners are a step removed from investors, we note that their approaches are conditioned by how investors themselves view term as they interact with investor markets and provide advice to investors. Hence, we consider these practitioners to provide a close

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7 Bob Officer and Steven Bishop, (September, 2008), *Term of the Risk Free Rate – Commentary, Prepared for Energy Networks Australia, Australian Pipeline Industry Association and Grid Australia*,

8 Bob Officer and Steven Bishop, (September, 2008), pp. 20-21.

proxy for investor views, and particularly the views of large institutional investors who are instrumental in the process of setting market pricing.

As outlined in more detail in section 3 below, our conclusions are drawn from interviews with two leading independent expert valuers and 12 investment analysts. We selected the two independent experts from the broader population of independent experts because they had recently undertaken valuations of Australian businesses regulated on a 5 year regulatory cycle. We also consulted the equity analysts at 12 investment banks and brokerage houses who are listed in Bloomberg, and cover regulated energy network stocks. We recognise that a high degree of caution should be applied to broad investor or practitioner surveys with low response rates where it is difficult to judge whether responses accurately reflect actual behaviour. However, our methodology was not to undertake a wide-ranging survey, but to undertake structured interviews with almost all of the relevant population of investment analysts who value regulated energy network businesses, and their responses can be readily replicated and validated by third parties.[9]

The key issue that was addressed in our structured interviews was the question of what is the term of the risk free rate that is applied in the SL CAPM. The two independent experts who have recently undertaken valuations of regulated energy network businesses have set this out clearly in their previous reports, as shown in the following extracts:[10]

> This discount rate reflects: (a) a risk-free rate of 5.5% per annum, equivalent to the average yield to maturity currently prevailing on 10 year Australian government bonds.
>
> The ten year bond rate is a widely used and accepted benchmark for the risk free rate.

However, the assumptions that are used by investment analysts are not always as clearly specified in their publications. We have therefore approached each independent expert and investment analyst with a number of questions about the term of the risk free rate that is applied when they estimate the cost of equity using the SL CAPM. The conclusions drawn from the structured interviews are as follows:

- *Term of the risk free rate for regulated businesses* – there was complete unanimity among the interviewees about the application of a 10 year risk free rate to estimate the cost of equity for regulated energy businesses, with the average currently applied value being 5 per cent (i.e. adjusted upwards from the spot rate to accommodate a 'through the cycle' approach to the cost of equity);

- *Risk free rate for non-regulated businesses* – none of those interviewed stated that they would use a different risk free rate (to 10 years) to estimate the cost of equity for non-regulated infrastructure (such as a toll road), stating that they would only adjust the asset beta to account for perceived

9 Reservations about broad surveys of investors and practitioners were expressed by the Australian Competition Tribunal. See *Application by Envestra Limited (No 2) [2012] ACompT 4*, pp.165-166. However, these criticisms are not applicable to the structured interview methodology that we have applied.

10 See: Lonergan Edwards & Associates Limited, (13 April, 2011), *Management Internalisation (Spark Infrastructure)*, p.19; and, Grant Samuel & Associates Pty Limited, (3 August, 2012) *Independent Expert's Report in relation to the takeover offer by Pipeline Partners Australia Pty Limited*, p. 4.

differences in the risk profile of the expected, operating cash flows calculated before the cost of interest on debt financing;

- *Risk not neutralised by regulatory re-sets* – the interviewed market practitioners referred to a range of issues:
  - They are valuing a long term investment that extends beyond the regulatory re-set period;
  - The risk free rate needs to match the term of the cash flows, which extend beyond 5 years;
  - The market uses the 10 year risk free rate as a reference rate against which risks of alternative investments are judged, i.e. it is a measure of investors' opportunity costs over a long period;
  - Regulators misjudge risks (as in the current low risk free rate environment);
  - Regulators change their methodologies in ways that can be negative to shareholder value; and,
  - In any case, the identification of specific future risks is not the point - since the market applies a 10 year risk free rate and a risk premium and prices assets in this way, it drives valuation, and regulators should not be out-of-step with the market, or they will risk under-investment.
- *Valuation impact of changing from a 10 year to 5 year risk free rate* – All market practitioners considered that such a shift would reduce the market valuation of the regulated energy network businesses.

As a general observation, it is notable that the market practitioners often stressed the problem of trying to apply 'too much science' (i.e. the mechanistic application of the SL CAPM model) to the estimates of the cost of equity that are applied in valuing regulated energy businesses. They emphasised that the SL CAPM is a starting point, but the results are adjusted by judgement that is informed by observed market behaviour (e.g. cross-referencing to the Dividend Growth Model (DGM)), until a cost of equity number is derived that reflects the market's behaviour. Application of the SL CAPM by market analysts and independent experts is not at all mechanistic. As stated by more than one of the respondents, the fundamental point is that a long term risk free rate estimate is applied by market practitioners when valuing infrastructure assets, regulated or otherwise.

Practical issues with the choice of term of the risk free rate

Nature and materiality of the issue

The impact of choosing different terms for the risk free rate in a particular case depends upon a number of factors, namely:

- The beta of the asset in question;
- The difference in yields between 10 year and 5 year government bonds and possibly how this compares to the average over time of this yield difference; and

- Whether – and to what extent – the market risk premium is adjusted if there is a change from a 10 year risk free rate to a 5 year risk free rate.

An important finding is that the difference between the yield on 5 year and 10 year government bonds has been, on average, fairly small – approximately 20 basis points on average over the last 30 years. However, the yield difference has varied substantially, from a maximum of 130 basis points to a minimum of -95 basis points (indicating a downward sloping yield curve). It follows that if a 5 year term were adopted for the risk free rate, different returns on equity may be derived at a particular point in time depending on whether the adjustment to the market risk premium (if applied) reflects a historical average difference between 5 and 10 year government bonds, or a contemporaneous difference. In the normal case, where the 10 year risk free rate is higher than the 5 year risk free rate, the options are:[11]

- *Raise the market risk premium by the contemporaneous difference* – which would be justified if the SL CAPM was applied under the assumption that the "market return" is constant over time (as argued recently by Wright and Gregory),[12] or if the SL CAPM is applied under the assumption that the market risk premium measured against 10 year bonds is approximately constant over time, which is what Associate Professor Lally appeared to believe.[13]

- *Raise the market risk premium by the (historical) average difference between 10 year and 5 year bonds* – which would be justified if the market return was considered to be a constant premium over 5 year bonds (although this would also imply that the market return would not be a constant premium above 10 year bonds, and so cast doubt on the validity of past practice).

- *Make no adjustment to the market risk premium* – which is consistent with Associate Professor Lally's previous view that the SL CAPM should be applied with different concepts of the risk free rate applied in the two places that that input enters.

In order to assess the potential materiality of changing from a 10 year to a 5 year risk free rate, we undertook simulations that calculate the cost of equity under alternative assumptions. Applying the SL CAPM formula, our key assumptions were a long term average 10 year risk free rate of 6 per cent, and an equity beta of 0.80. We then varied the assumptions made about the actual difference between the 10 year and 5 year risk free rates at the time of a regulatory review (which are described as the 'high', 'average' and 'low' difference scenarios), and adjusted the market risk premium in the three ways described above.

Table 1 shows the results of the simulated scenarios for the historical ranges of the yield differences (10 year – 5 year Commonwealth Government yields) over two periods. The 'whole period' is from 1972 to 2013, while the later period (1993 to 2013) is the period over which the Reserve Bank of

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11 Alternatively, in a minority of cases the 5 year risk free rate will exceed the 10 year risk free rate, and the market risk premium would need to be lowered.

12 Alan Gregory, *The AER Approach to Establishing the Cost of Equity – Analysis of the Method Used to Establish the Risk Free Rate and the Market Risk Premium*; Stephen Wright, (25 October, 2012), *Review of Risk Free Rate and Cost of Equity Estimates: A Comparison of UK Approaches with the AER.*

13 It is observed that the market risk premium cannot be simultaneously a constant over 10 year bonds and 5 year bonds because the yield difference between 10 and 5 year bonds varies over time.

Australia (RBA) has independently applied its target 2 to 3 per cent inflation rate policy.[14] The maximums and minimums for the whole period (period since 1993) were respectively 1.38 per cent (0.68 per cent) and -1.02 per cent (0.35 per cent), and the long term average difference was 20 basis points.

As shown in Table 1 below, the maximum and minimum difference between the monthly average annualised 10 year and 5 year Commonwealth bond yields was significantly narrower in the post 1993 period of RBA independence.[15] It is also important to note that the periods of negative yield differences (which give rise to a positive cost of equity relative to the base case of maintaining a 10 year risk free rate) constituted 25.8 per cent of the whole period, and only 13 per cent of the period since 1993. Hence, the simulation outcomes are asymmetrical.

The results from these scenarios are as follows:

- If an adjustment is made to the market risk premium reflecting the contemporaneous yield difference the cost of equity will rise for a beta above 1 and fall if it is below 1. For a beta of 0.80 the impact ranges between -0.28 percentage points and +0.20 percentage points for the whole period, with a more modest range of between -0.14 percentage points and +0.07 percentage points for the period since 1993.

- If an adjustment is made to the market risk premium reflecting the historical yield difference, then on average the cost of equity will rise for a beta above 1 and fall if it is below 1, but not change materially; however, the impact will depend on how the current yield difference compares to the average. For a beta of 0.80 there is a very material impact of between -1.22 percentage points and +1.18 percentage points for the whole period, and a material cost of equity impact ranging between -0.52 percentage points and +0.51 percentage points for the period since 1993.

- If no adjustment is made to the market risk premium then the cost of equity will just change by the yield difference: -0.20 per cent (-0.26 per cent) on average for the whole period (period since 1993); a range between +1.02 per cent (+0.34 per cent) when low (negative) yield differences are encountered, and -1.38 per cent (-0.68 per cent) when high yield differentials are experienced.

[14] The RBA's policy of independent inflation targeting is discussed in Glenn Stevens, (20 April, 1999), *Six years of Inflation Targeting*, Address to Economic Society of Australia.

[15] The monthly averages are calculated over timeframes that are similar in length to a regulatory 20 day averaging period.

Table 1: Change in cost of equity - simulation of materiality of moving from a 10 to 5 year risk free rate assumption, depending on the adjustment that is made to Rf and the MRP

		Whole period (1972 – 2013)				Period of RBA independence (1993 – 2013)		
Adjustment:		Beta				Beta		
	Diff.	0.8	1	1.2	Diff.	0.8	1	1.2
Contemporaneous:								
Low difference in 10-5 year R_f	-1.02%	0.20%	0.00%	-0.20%	-0.35%	0.07%	0.00%	-0.07%
LT difference in 10-5 year R_f	0.20%	-0.04%	0.00%	0.04%	0.20%	-0.04%	0.00%	0.04%
High difference in 10-5 year R_f	1.38%	-0.28%	0.00%	0.28%	0.68%	-0.14%	0.00%	0.14%
Historical:								
Low difference in 10-5 year R_f	-1.02%	1.18%	1.22%	1.26%	-0.35%	0.51%	0.55%	0.59%
LT difference in 10-5 year R_f	0.20%	-0.04%	0.00%	0.04%	0.20%	-0.04%	0.00%	0.04%
High difference in 10-5 year R_f	1.38%	-1.22%	-1.18%	-1.14%	0.68%	-0.52%	-0.48%	-0.44%
NPV=0 and inconsistent R_f:								
Low difference in 10-5 year R_f	-1.02%	1.02%	1.02%	1.02%	-0.35%	0.35%	0.35%	0.35%
Difference in 10-5 year R_f	0.20%	-0.20%	-0.20%	-0.20%	0.26%	-0.26%	-0.26%	-0.26%
High difference in 10-5 year R_f	1.38%	-1.38%	-1.38%	-1.38%	0.68%	-0.68%	-0.68%	-0.68%

Source: Incenta simulations assuming R_f = 6 per cent and the return on the market is 12 per cent.

These results suggest that if the market risk premium is adjusted for the contemporaneous difference in the yield difference – which we consider to be justified by the recent work on this matter – then it would appear that from a 10 year risk free rate to a 5 year risk free rate would not result in a material differential in the estimated rate of return on equity.

We also address some of the practical considerations that are relevant to the choice of term for the risk free rate. The two considerations are:

- *Exacerbation of the impact of the CAPM on low beta stocks* - a shorter term risk free rate exacerbates the known problems of the CAPM with respect to low beta assets, which are observed to have higher returns than predicted by the theory. The application of a 5 year risk free rate in estimating the cost of equity would exacerbate this problem if the regulatory cost of equity is estimated with a mechanistically applied SL CAPM.

- *Greater volatility in the cost of capital* – If a mechanistic SL CAPM is applied by a regulator, the use of a shorter term risk free rate (such as 5 years) will lead to greater volatility in estimation of the cost of equity, or a greater potential for the cost of equity to be mis-estimated during particular events – such as during the current period of very low government interest rates relative to their historical average. This is precisely the opposite of the observed behaviour of market practitioners who, as we have seen, apply a 10 year term and a 'through the cycle' approach to estimate the risk free rate, and cross-reference the cost of equity derived from the SL CAPM against other methodologies (e.g. DGM). Hence, if a regulator applying a mechanistic version of the SL CAPM shifts from using a 10 year term assumption to a 5 year term, this will increase the volatility of the regulatory cost of capital, and lead to greater divergence between the regulatory cost of capital, and that which is applied by market practitioners.

Conclusion

In conclusion, we recommend using a 10 year risk free rate for estimating the cost of equity, and for this rate to be applied consistently to estimate the market risk premium. However, this recommendation is not based squarely on theory, which we view as largely indeterminate given the shortcomings of the CAPM. Rather, our view is based on achieving consistency with the practice of valuation professionals for whom the use of a 10 year term for the risk free rate is widespread, and consistency with our observations of how investors actually value regulated infrastructure assets.

Content

		Page
	Executive Summary	5
1	Terms of Reference	15
	1.1 Terms of Reference	15
	1.2 Report outline	15
2	Theoretical framework	17
	2.1 Theory and the 'NPV principle'	17
	2.2 Responses to the Lally/Davis proposition	18
	2.3 Other criticisms of the Lally/Davis proposition	20
	2.4 Conclusions	21
3	Evidence of investor perspectives	23
	3.1 Methodology for assessing the approach used by market practitioners	23
	3.2 Results of structured interviews with practitioners	26
4	Practical considerations in the choice of the term of the risk free rate	31
	4.1 How should you adjust the market risk premium?	31
	4.2 Exacerbating the impact of the SL CAPM on low beta stocks	40
	4.3 Greater volatility in the cost of capital	42
5	Conclusion on the term of the risk free rate for equity	43
	Appendix A: Responses of interviewees	45
	Appendix B: Regulated energy stocks covered by investment banks/brokers interviewed	47
	Appendix C: Terms of Reference	49
	Appendix D: CVs of Jeffrey John Balchin and Michael Lubomyr Lawriwsky	57

1. Terms of Reference

1.1 Terms of reference

The Energy Networks Association (ENA) has engaged Incenta Economic Consulting (Incenta) to analyse the theoretical arguments about the appropriate term of the risk free rate for setting the cost of equity and cost of debt for a network business with long life assets. The Terms of Reference provided to us specified the following tasks:

- Consider the theory about the appropriate term of the risk free rate, including the relevance of the 'NPV principle';
- Consider whether finance practice is relevant and, if so, assess:
    - How finance practitioners arrive at an assumed term of the risk free rate when using asset pricing models to determine the cost of equity; and
    - Whether finance practitioners use different term assumptions for regulated Australian energy utilities than for other long lived infrastructure that is not subject to periodic price reviews;
- Investigate and articulate the sources of risk that equity providers may expect to extend beyond a five year regulatory period, even where the regulator is required to maintain the value of the RAB;
- Consider any concerns raised by the AER in its consultation paper on the rate of return guidelines.

The consultant should document the methods, data, adjustments and assumptions used and made when advising on the appropriate term of the risk free rate.

1.2 Report outline

The remainder of this report is structured as follows:

- In chapter 2 we consider the Lally/Davis NPV=0 proposition, and responses to it. We conclude that the CAPM theory is not specified to provide guidance, and as the debate between alternative experts has not been resolved, we consider that it would be useful to examine market practice.
- Chapter 3 reports on the structured interview methodology applied to the relevant market practitioners (independent experts and investment bank/broker analysts who value regulated energy infrastructure businesses) about their approach to the term of the risk free rate, as well as the results of applying the methodology.
- In chapter 4 we investigate the materiality of the outcome for the cost of equity under alternative adjustments to the market risk premium, as well as two practical considerations in the choice of the term of the risk free rate.

- Finally, in chapter 5 we conclude that the appropriate term of the risk free rate for estimating the cost of equity is 10 years, and that this rate should be applied consistently to estimate the market risk premium.

2. Theoretical framework

2.1 Theory and the 'NPV principle'

In the past, the debate about the appropriate term of the risk free rate has sometimes been complex and confused, and has been characterised by a situation whereby equally credentialed experts reach diametrically opposed views. The main reason for this is that much of the debate about the cost of capital has taken place within a framework where the Capital Asset Pricing Model (CAPM) is at the centre, and the CAPM is not sufficiently descriptive of the "real world" to provide an answer to this question. That is, the simplest version of the CAPM assumes that the world lasts for a single period, after which all returns are consumed – and the model is not descriptive of what this period actually is.

The theoretical debate to date regarding the appropriate term of the risk free rate has largely comprised introducing other pieces of theory or "real world" considerations to draw inferences about the appropriate term. However, given the CAPM's weakness in this regard, equally plausible inferences can be drawn and the argument can often be made that an inference drawn is inconsistent with some other feature of the CAPM.

The "theory" that has been accepted and used as a basis for their decisions by regulators to date stems from the work of Professor Kevin Davis and Associate Professor Martin Lally and concludes that the term of the risk free rate (and debt risk premium) should coincide with the length of the regulatory period.[16] The argument behind this starts with the observation that prices are reset based on a contemporaneous estimate of the cost of capital at the commencement of each regulatory period. In the example below, it is assumed that the regulatory period is 5 years, and that this is being contrasted with applying the yield on a 10 year government bond as the risk free rate. Given this:

- To the extent that the 10 year risk free rate exceeds the 5 year value because future interest rates beyond 5 years are expected to rise, then that increase in rates will flow through automatically in the future – only the expected increase during the regulatory period is relevant; and

- To the extent that the 10 year risk free rate includes a further term premium above the 5 year, then that premium compensates for longer term interest rate uncertainty (i.e., bearing interest rate risk between years 5 to 10) – but the regulated businesses are insulated from this risk as a consequence of prices being reset periodically.

Importantly, under the NPV=0 rule, it does not make sense for the "same risk free rate to be used in the two parts of the CAPM" – rather, the NPV=0 analysis implies that the cost of equity should strictly increase with term (assuming that the risk free rate increases with term). The observation has been made expressly or implicitly in a number of papers that this is precisely how debt instruments are valued, and that a similar logic should apply to equity.[17] This would appear to be because:

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16 Martin Lally, (August, 2002*), Determining the risk free rate for regulated companies*, Report for the Australian Competition and Consumer Commission; Kevin Davis, (28 August, 2003), *Risk Free Interest Rate and Equity and Debt Determination in the WACC*, Prepared for the ACCC, pp. 11-12; Martin Lally (2004), 'Regulation and the Choice of the Risk Free Rate,' *Accounting Research Journal*, Vol. 17(1), pp.18-23.

17 Davis, Kevin (2003); QCA (June, 2010), *Draft Decision – QR Network's 2010 DAU – Tariffs and Schedule F*, p.34.

- Cash flow risks get higher as the regulatory period is extended, with some of the risks likely to be non-diversifiable in nature; and

- Interest rate risk likewise is higher as the length of the regulatory period extends.

Thus, the NPV=0 argument could also potentially be applied in a regulatory framework where the CAPM is not paramount.

An implication of the Lally/Davis view is also that the term of the risk free rate should reflect the characteristics of the asset (as reflected in the term of the regulatory cycle), rather than the investment horizon of the investor.

2.2 Responses to the Lally/Davis proposition

A number of concerns have been raised in relation to the Lally/Davis hypothesis.

2.2.1 Consistency with the CAPM

What has at times been unclear in the Lally/Davis argument was whether it was accepted that a change to the term of the risk free rate required a commensurate adjustment to the market risk premium, or whether the same market risk premium would apply if a shorter term was applied for the risk free rate.

Does the NPV=0 rule require consistent use of the risk free rate in two parts of the CAPM equation?

The NPV=0 rule – and use of inconsistent risk free rates at different points in the model – is at odds with the CAPM. Initially Lally had asserted that the CAPM should be applied with two different risk free rates, with:[18]

- The market risk premium calculated on the basis of investors; and

- The risk free rate term reflecting the term of the regulatory period.

However, if the same risk free rate is used in two places in the CAPM, then the relationship between the term of the risk free rate and the cost of equity will depend on the beta (unchanged for beta of 1, positive relationship for a beta less than unity, negative relationship for a beta greater than unity).

Lally in his writings has recognised this issue directly, but until recently he expressed a view that this consistency is not needed. Rather, he stated that the risk free rate used in the market risk premium should reflect the average period between portfolio resets for investors, whereas the risk free rate used directly in the CAPM should be project specific.[19]

The analysis of Davis (2003) was premised on maintaining consistency in the risk free rate in the two parts of the CAPM. His work demonstrated that a tracking portfolio that generates the same return as a regulated asset was weighted between the risk free asset and the market portfolio (with the beta

[18] Martin Lally, (27 April, 2010), p. 6; Martin Lally, (February, 2004).

[19] Martin Lally, (27 April, 2010), *The appropriate term for the risk free rate and the debt margin*, Report to the Queensland Competition Authority, p. 6.

being determined by the weights), and mathematically this implies that the same risk free rate is being applied in both parts of the CAPM. Davis concluded that:[20]

> This demonstrates that using a maturity for the risk free asset which exceeds the regulatory horizon, provides excess returns for the regulated asset if it is believed that there typically is a positive term premium in the yield curve which is unrelated to interest rate expectations.

However, this conclusion is incomplete, since if beta is greater than unity, the result is reversed, and the cost of equity increases. Furthermore, the tracking portfolio that Davis constructs assumes an end of regulatory period regulated asset base (RAB) value, but if this value is stochastic (i.e. is not certain) then his analysis is incomplete.

Most regulators in Australasia who have adopted the 'NPV=0' rule have also expressed the view that a risk free rate of the same term should be used in both parts of the CAPM – the one exception being the NZ Commerce Commission, where the same market risk premium is applied to risk free rates of different terms. While the AER to date has also expressed a view that the "NPV=0 rule" is an appropriate goal, at the same time it has endorsed the consistency issue.

It now would appear to be conceded by Associate Professor Lally that a consistent definition of the risk free rate is required across the different uses of the risk free rate input within the CAPM.[21] That is, if the yield on a five year government bond rate is used as the risk free rate input that appears directly in the CAPM equation, then a consistent definition of the risk free rate is required when estimating the market risk premium.

We observe that Associate Professor Lally may have revised his views on the need for consistency when applying the CAPM. The most recent advice that Associate Professor Lally provided to the AER stated that:

- Where $E(R_m)$ is estimated and beta is 1; in this case, the R_f term is irrelevant because it washes out;[22] which

- Assumes (or advocates) a consistent application of the risk free rate assumption in the CAPM. This differs to the view that Associate Professor Lally expressed as part of an expert panel that the Commerce Commission convened. His view there can be summarised as follows: [23]

> Dr Lally considers that a literal application of the CAPM demands the use of a single risk-free rate within the intercept term and the MRP, that this rate should be for a term equal to the average interval (across investors) between portfolio reassessments, and that this term could be several years. However, Dr Lally also considers that satisfying the NPV = 0 principle requires the risk-free rate within the intercept term of the CAPM to match the regulatory period, and this may lead to two different risk-free rates within the CAPM. Dr Lally considers that it may sometimes be desirable to deviate from the literal interpretation of a model, where real-world situations are more complex than provided for in that model or on account of data limitations. For example, even if one interprets the CAPM as applying to a one year period, and therefore betas would be defined over such a period,

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20 Kevin Davis, (28 August, 2003), *Risk Free Interest rate and Equity and Debt Beta Determination in the WACC*, Prepared for the ACCC, p.10.

21 Martin Lally, (March, 2013), p.6.

22 Martin Lally, (March, 2013), p.6.

23 New Zealand Commerce Commission, (18 December, 2008), *Expert Panel on the Cost of Capital*, para. 56.

> data limitations lead to the use of monthly rather than annual returns in estimating betas and the choice of period can induce estimation biases (Levhari and Levy, 1977; Handa et al, 1989).

Indeed, the Commerce Commission's standard practice reflected Lally's view that it was acceptable to be inconsistent with the use of the risk free rate:[24]

> The Commission presently assumes that the CAPM is a medium-to-long-term model. (It is assumed that investors' planning horizon is roughly five to ten years.) In line with this assumption the Commission estimates the MRP term in the CAPM using a long-term risk-free rate. However, in order to satisfy the NPV = 0 principle, the Commission matches the maturity of the risk-free rate in the intercept term of the CAPM to the length of the regulatory period, usually one to five years. As a result, in most instances the Commission employs two different risk-free rates in the same CAPM equation.

2.3 Other criticisms of the Lally/Davis NPV=0 hypothesis

2.3.1 There are additional risks that are not eliminated by regulatory resets

As the new rules do not mandate the CAPM, it is the empirical validity of the relevant model that is relevant, and in this context evidence derived from other sources – including the practice of valuation professionals and investors – is made more relevant.

Professor Bob Officer and Dr Steven Bishop have argued that the NPV=0 analysis would be correct if at the time that they purchase a regulated asset, investors could be guaranteed that they would get compensated for the required return based on a government bond at the end of 5 years.[25] A guarantee that investors can walk away from the asset with the value of the regulated asset base (RAB) intact is does not exist, so the asset is not in fact a 5 year asset, but one that has a longer economic life and is assessed by investors against other assets with a long economic life. Instead, there is the prospect of 'value' that is to be recovered at the end of the regulatory period, which remains at risk due to future regulatory re-sets, and changes in market conditions (including changing customer preferences and technological risk). This is consistent with the empirical evidence of Fama and Bliss (1987), which showed that the long term yield spread on government bonds is entirely due to a risk premium, rather than due to an expectation about future interest rates.[26]

As noted by Officer and Bishop, long term maturity risk cannot be fully compensated by the promise of a regulator to adjust for future interest rate changes – only by a fully guaranteed (i.e. underwritten) promise to return the RAB, suitably adjusted to earn the 5 year risk free rate over the holding period.[27] In these circumstances, however, the asset beta of the regulated business would also be expected to be very close to zero, and since they are not (i.e. the AER applies an equity beta of 0.80), this indicates that longer term cash flows (including the capital value of the asset) are not being treated as a certainty by investors. Instead, the market appears to require compensation for this long term maturity risk even though regulators are providing 5 year resets to current interest rates.

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24 New Zealand Commerce Commission, (18 December, 2008), *Expert Panel on the Cost of Capital*, paras.33–34.

25 Bob Officer and Steven Bishop, (September, 2008), *Term of Risk Free Rate – Commentary*, Prepared for Energy Networks Association, Australian Pipeline Industry Association and Grid Australia, pp.20–21.

26 Eugene F. Fama and Robert R. Bliss, (1987),"The Information in Long-Maturity Forward Rates," *American Economic Review*, 1987, 77(4), pp. 680–92.

27 Bob Officer and Steven Bishop, (September, 2008), p.19.

2.3.2 Risks relating to term are incorporated in beta

The concept of term in the SL CAPM should reflect the characteristics of the investor (namely their assumed investment horizon) rather than any concept of term associated with the asset. While assets with a shorter term may demand a lower return, this differential (relative to the average asset) would be reflected in the beta for the asset. Under this argument, even if the regulated asset was fully recovered over 5 years, this would be irrelevant to the term used in the SL CAPM in any event. This view has been advanced by professors Myers and Franks, two out of three members of the NZCC's expert panel on the cost of capital who disagreed with aligning the term of the risk free rate to the regulatory period:[28]

> Professors Myers disagrees with Dr Lally's arguments at para 53 and para 54. He argues that, in a CAPM world, investors in an L-period asset can be thought of as making a series of short-term investments (see Section 6), rolled over L times, with expected returns for each round of investments based on the then-prevailing short rate. That is, portfolio rebalancing occurs frequently. As beta declines to zero, the expected CAPM return in each period converges to the short rate in that period. The return earned, going forward in time, depends on the path of short rates. Consistent discounting therefore requires a forecast of expected future short rates.

2.4 Conclusion on the NPV=0 rule

Our view is that an unambiguous guide to the NPV=0 rule is not provided by finance theory, and is somewhat clouded by the shortcomings of the SL CAPM. Accordingly, in the remainder of this report we focus on the other factors that are relevant to the choice of the term of the risk free rate, that is:

- How market practitioners view the relevance of term when advising their investor clients, as this can be seen as a proxy for how investors themselves view the concept of term when making investment decisions;
- How material the issue of shifting from a 10 year to a 5 year risk free rate is if it is conceded that consistency is required in the application of the risk free rate in the CAPM formula, and appropriate adjustments are made to accommodate this requirement; and
- Practical considerations that are relevant to the choice of term for the risk free rate.

[28] New Zealand Commerce Commission, (18 December, 2008), *Expert Panel on the Cost of Capital*, para. 55.

3. Evidence of investor perspectives

The NPV=0 approach presents a testable hypothesis, which is that a lower cost of capital should be used for an asset that is subject to more frequent price reviews, beyond what may already be impounded in empirical estimates of betas. We therefore extended our examination of market practice to test whether valuations practitioners actually 'value' price reviews in this manner.

Independent experts make judgements about the fairness and reasonableness of corporate valuations in the context of market transactions between buying and selling investors. Equity analysts at investment banks and brokers provide advice (buy, hold or sell) to investors in regulated businesses. We consider the views of market valuation experts and analysts to be appropriate proxies for the perspectives of investors in the market, as have academic researchers.[29]

3.1 Methodology used to assess the approach used by market practitioners

To assess the behaviour of finance practitioners our methodology was to draw up separate lists of interviewees among independent expert valuers, and investment bank/broker analysts, and undertake a structured interview with each of them.

3.1.1 Independent expert valuers

Independent expert valuers regularly undertake independent expert reports in which valuations are undertaken of the assets in question, and an opinion is expressed about the terms of the proposed transactions. In forming an expert view on whether the terms of these transactions are 'fair &/or reasonable', independent expert valuers need to put themselves in the position of investors and apply their knowledge of investor requirements for returns. Independent expert reports are subjected to a high degree of market and regulatory scrutiny, because they are:

- Subject to potential litigation from the parties involved in the business transaction that is the subject of the independent expert report;
- Subject to a regulatory regime administered by ASIC;[30]
- Subject to competitive pressure from other independent experts; and
- Are constrained by reputational risk to provide fair and unbiased valuations.

The regulatory regime administered by Australian Securities and Investments Commission (ASIC), RG 111 encourages the use of (and a comparison of the results of) more than one valuation methodology; requires experts to base their assessments on 'reasonable assumptions' that are fully disclosed, specific and definite; and encourages the use of a valuation range that is as narrow as possible. Hence, there can be a high degree of confidence in the independence of the independent valuation experts, and that their views will reflect market opinion with respect to the estimation of the cost of capital.

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29 For example, Q. Chen, Jennifer Francis and Wei Jiang (2005), 'Investor learning about analyst predictive ability,' *Journal of Accounting and Economics*, Vol. 39, pp, 3-24, use analyst consensus forecasts as a proxy for investor expectations.

30 Australian Securities and Investments Commission, Regulatory Guide 111 (RG 111), *Contents of Expert's Reports*; and RG 1112, *Independence of Experts*.

While there are more than a dozen firms in the market that provide independent expert valuation services, we limited our interviews to those institutions that have undertaken valuations of regulated infrastructure businesses for market transactions in the past five years. The Connect4 data base shows that there were two firms that fell into this category:[31]

- Grant Samuel – In October, 2012, Grant Samuel completed an independent expert report on the internalisation of management at the DUET Group.[32] Previous independent expert reports on regulated businesses have included reports on AGL (2006), Alinta (July 2007 and November, 2007), Prime Infrastructure (i.e. DBCT, 2010) and Hastings Diversified Utilities Fund, August, 2012); and

- Lonergan, Edwards & Associates Limited – In April, 2011 this firm published an independent expert report relating to Spark Infrastructure.[33]

These are two of the leading firms undertaking independent expert reports in the Australian market. We interviewed Mr. Stephen Wilson of Grant Samuel, and Mr. Craig Edwards of Lonergan, Edwards & Associates Limited, who are senior members of these firms.

3.1.2 Investment bank/broker analysts

We interviewed investment bank/broker analysts who have a significant role in valuing infrastructure assets and provide regular commentary on these assets to the market. From the Bloomberg service we obtained lists of institutions and analysts covering one or more of the following stocks of energy distribution businesses listed in on the ASX:

- Australian Pipeline Trust (APA);

- DUET Group;

- Envestra;

- Spark Infrastructure; and

- SP Ausnet.

We compared all the Bloomberg lists for analyst coverage of these firms, and found there were 17 institutions providing analytical commentary, however two institutions provide only quantitative analysis (i.e. there is no fundamental analyst), at two other institutions the position of regulated energy analyst was vacant, and the analyst at one institution could not be contacted.[34] We

[31] The Connect4 data base, which is a part of Thompson-Reuters, compiles a list of all independent expert reports.

[32] Grant, Samuel & Associates Pty Ltd (3 October, 2012), *DUET – Independent expert's report in relation to a proposal to internalise management.*

[33] Lonergan, Edwards & Co. Pty Ltd (13 April, 2011) *Spark Infrastructure - Independent expert report on internalisation proposal.*

[34] At Wilson HTM and Patersons the analyst position was vacant, at EL & C Baillieu and EVA Dimensions there was no fundamental analyst, and the analyst at Goldman Sachs was not contactable.

contacted each institution and spoke with one fundamental analyst, although often there were two analysts listed. Specifically, the institutions and analysts interviewed were:[35]

- Bank of America Merrill Lynch – Fredy Hoh;
- CIMB – Michael Newbold;
- CLSA Capital Markets – Baden Moore;
- Commonwealth Bank – William Allott;
- Credit Suisse – Benjamin McVicar;
- Deutsche Bank – Hugh Morgan;
- Evans & Partners – Tony Wilson;
- JP Morgan – Jason Steed;
- Macquarie Bank – Ian Myles;
- Morgan Stanley – Philip Bare';
- RBC Capital Markets – Paul Johnston; and
- UBS – Han Xu.

In the past the Australian Competition Tribunal (the Tribunal) has expressed a view that great caution should be applied when considering the results of broad investor or practitioner surveys with low response rates, as it is difficult to judge whether responses accurately reflect actual behaviour.[36] We do not consider that these criticisms are applicable to our structured interview methodology, as it included almost all of the relevant population of investment analysts, and it would not be difficult for another researcher to replicate in order to validate the findings.

3.1.3 The structured interview methodology

The key issue that was addressed in our structured interviews was the question of what is the term of the risk free rate that is applied in the SL CAPM. The two independent experts who have recently undertaken valuations of regulated energy network businesses have set this out clearly in their previous reports, as shown in the following extracts:[37]

35 The stocks covered by each of these institutions, as reported by Bloomberg, are listed in Appendix B.

36 Reservations about the findings of broad surveys of investors or practitioners were expressed by the Australian Competition Tribunal in *Application by Envestra Limited (No 2) [2012] ACompT 4*, pp.165-166.

37 See: Lonergan Edwards & Associates Limited, (13 April, 2011), *Management Internalisation (Spark Infrastructure)*, p.19; and, Grant Samuel & Associates Pty Limited, (3 August, 2012) *Independent Expert's Report in relation to the takeover offer by Pipeline Partners Australia Pty Limited*, p. 4.

> This discount rate reflects: (a) a risk-free rate of 5.5% per annum, equivalent to the average yield to maturity currently prevailing on 10 year Australian government bonds.
>
> The ten year bond rate is a widely used and accepted benchmark for the risk free rate.

However, the assumptions that are used by investment analysts are not always as clearly specified in their publications. We therefore approached each independent expert and investment analyst with a number of questions about the term of the risk free rate that is applied when they estimate the cost of equity using the SL CAPM:

a) What assumption do you apply for the term of the risk free rate in a CAPM valuation of regulated infrastructure assets with a 5 year regulatory cycle, and why?

b) Do you (or would you) apply a different assumption to value a non-regulated infrastructure asset that was not subject to a 5 year regulatory reset?

c) What risk factors does the risk free rate assumption compensate for?

d) What impact do you expect a regulatory policy shift from a 10 year to a 5 year risk free rate to have on the valuation of regulated network businesses?

The responses were noted down, recorded, collated and then analysed.

3.2 Results of structured interviews with market practitioners

The questions and market practitioner answers are summarised in Table 2 below. Since not all analysts agreed to publish their specific risk free rate assumption, we have provided this aspect anonymously.

Table 2. Term of the risk free rate – structured interviews with market practitioners

Institution	Term (years)	Current Rf assumption	Different Rf for unregulated infrastructure?	Rf risk factors	Valuation impact of R_f=5 years
Independent experts:					
Stephen Wilson	10	n.a.	No, adj. beta	Appendix A	Lower
Craig Edwards	10	n.a.	No, adj. beta	Appendix A	Lower
Average /Median	**10**	**n.a.[a)]**	**No, adj. beta**	**Appendix A**	**Lower**
Investment bank/broker analysts:					
Institution A	10	6.0%	No, adj. beta	Appendix A	Lower
Institution B	10	6.0%	No, adj. beta	Appendix A	Lower
Institution C	10	5.5%	No, adj. beta	Appendix A	Lower
Institution D	10	5.5%	No, adj. beta	Appendix A	Lower
Institution E	10	5.3%	No, adj. beta	Appendix A	Lower
Institution F	10	5.0%	No, adj. beta	Appendix A	Lower
Institution G	10	5.0%	No, adj. beta	Appendix A	Lower
Institution H	10	5.0%	No, adj. beta	Appendix A	Lower
Institution I	10	4.5%	No, adj. beta	Appendix A	Lower
Institution J	10	4.5%	No, adj. beta	Appendix A	Lower
Institution K	10	4.5%	No, adj. beta	Appendix A	Lower
Institution L	10	3.5%	No, adj. beta	Appendix A	Lower
Average /Median	**10**	**5.0%**	**No, adj. beta**	**Appendix A**	**Lower**

Source: Incenta's structured interviews. Note: a) In expert reports over the past 18 months both Grant Samuel and Lonergan Edwards have also made upward adjustments to the risk free rate, or raised their cost of equity assumptions to counter the impact of historically low risk free rates.

The results were as follows:[38]

a) *What assumption do you apply for the term of the risk free rate in a CAPM valuation of regulated infrastructure assets with a 5 year regulatory cycle, and why?*

A common answer to this question was that the institution's policy on the term of the risk free rate, and often its value, is set by the institution. Other respondents spoke of market convention. We found complete unanimity among broker analysts and the independent experts in the use of a 10 year term assumption for valuing infrastructure regulated on a five year cycle. One of the respondents, Grant Samuel, is the leader in the Australian market for independent expert reports, and has undertaken a number of valuations of regulated infrastructure businesses engaged in merger and acquisition activity (including AGL, Alinta, Prime Infrastructure (DBCT), HDUF and DUET). In all these cases Grant Samuel applied a 10 year risk free rate. Similarly, in 2011 Lonergan, Edwards & Associates published an expert's report relating to Spark Infrastructure, and applied a 10 year risk free rate assumption.

38 The detailed notes from these interviews are provided in tabular form in Appendix A below.

Mr. Craig Edwards, of Lonergan Edwards & Associates Limited questioned whether 10 years was a long enough term, noting that these are long lived assets; that it is desirable to match the term of the risk free rate with the life of the assets, and the investment horizon of long term institutional investors. Long term investors need to generate an appropriate risk adjusted return over the long term, and to value the business the expert is not interested in cash flows for just 5 years, but in perpetuity. This independent expert noted that:

- In the US there is a significant differential (120 basis points) between the yield on government bonds with 10 and 30 year terms, indicating that investors are sensitive to long term risks; and
- They would use a longer risk-free rate if the Australian market was more liquid for longer term government bonds.

In several cases there was also a mandated policy to apply a risk free rate that is materially higher than the spot rate, as (e.g. Credit Suisse). When there was no mandated policy on this issue, analysts stated that they make their own upward adjustment to the risk free rate or to the market risk premium.

b) *Do you (or would you) apply a different assumption to value a non-regulated infrastructure asset that was not subject to a 5 year regulatory reset?*

The answer to this question was unequivocally that analysts treat regulated assets (i.e. those regulated on a 5 year cycle) no differently to unregulated infrastructure with respect to the assumption made about the term of the risk free rate. To capture the differential risks associated with unregulated infrastructure, analysts apply a different value to the systematic risk (asset beta) of these assets (for instance, due to greater demand volatility) relative to regulated infrastructure businesses.

c) What risk factors does the risk free rate assumption compensate for?

Most analysts spoke of long term investment risks, and the need to compensate investors for unknown future risks. In other words, rising values for the long term real risk free rate are a consequence of the term structure and a term premium that is associated with investment in any asset, which needs to be compensated for. Compensation should be provided for any risk premium. The long term risk free rate is seen as a reference point, and not specifically as a protection against interest rate risk, or any other specific risk. It is a reference rate against which the relative risks of alternative investments are judged. As noted by an independent expert, the discount rate that they would apply in a valuation of the regulated business depends on a range of inputs including a 'bottom-up' CAPM cost of equity estimate, observation of cost of capital assumptions made by analysts, and DGM estimates.

Mr Craig Edwards also pointed to the risk of future regulatory resets not providing the opportunity for sufficient returns that would encourage investors to continue to invest. Investors generally seek to invest in projects that have an NPV greater than zero, as such investments (correctly assessed) create shareholder value. The behaviour of Australian regulators in the present low risk free rate environment was emphasised as a case in point. The fact that a 3 per cent risk free rate has been embedded by regulators into regulatory

decisions at a time when the cost of equity was as high as, or higher than observed previously, is seen as a risk to investors that is not neutralised by resets. It was also noted that there is a chance that regulators will not have modelled risk properly in future regulatory decisions. Hence, future regulatory risk is seen as a factor.

Finally, it was noted that the identification of specific future risks is not the point. If the market prices are set by investors who consider long term risks and factor these into their required returns for assets regulated on a 5 year cycle, then long term risks drive market valuations, and should also be applied in regulatory cost of capital estimates. Market based beta estimates are relied on by regulators, and the market's use of long term risk free rates should also be applied, or else value will be destroyed and there will be a threat to continued investment.

d) *What impact do you expect a regulatory policy shift from a 10 year to a 5 year risk free rate to have on the valuation of regulated network businesses?*

All the independent experts and investment analysts considered that a shift in regulatory policy that applied a 5 year risk free rate instead of a 10 year risk free rate would reduce the valuations of the regulated network businesses.

4. Practical considerations in the choice of the term of the risk free rate

4.1 How should you adjust the market risk premium?

4.1.1 Assessing the materiality of the issue

In this section we show the effect of changing from a 10 year bond rate to a 5 year bond rate, provided there is acceptance that consistency is required across the different uses of the risk free input into the CAPM. We find that if consistency is applied to the CAPM formula, this reduces the likely materiality of a change from using the yield on a 10 year government bond as the risk free rate to the yield on a 5 year bond. More specifically, the effect on the estimated cost of equity from changing the term in a particular instance will be affected by the:

- Beta of the asset in question;
- Difference between the yield on 10 year bonds and 5 year bonds (the yield difference); and
- Specific adjustment that is made to the market risk premium in order to achieve consistency.

4.1.2 Contemporaneous or historical adjustment to the market risk premium?

With a shift from a 10 year to a 5 year risk free rate, the key question that arises is whether the market risk premium should be adjusted on a contemporaneous or historical basis. We consider that a contemporaneous adjustment of the market risk premium is justified by theory, empirical evidence and market behaviour. A significant amount of evidence has been presented to the AER to show that the market's required return on equity is relatively constant over time, including evidence from UK professors Steven Wright and Alan Gregory. Gregory's views can be summarised as follows:[39]

> In summary, my view is that the AER is in error in its assessment of the cost of equity capital for the Gas Businesses and has significantly under-estimated that cost of equity… In more detail, it has combined an MRP that has been largely derived from historical observation with a current spot rate estimate of the risk free rate. In doing so, it has assumed that the MRP is constant, and has made no allowance for any possible inverse relationship between the risk free rate and the MRP.
>
> The AER could have adopted one of two consistent approaches that would have avoided this error. It could have estimated the expected return on the market directly, and used this estimate with its preferred risk free rate in the CAPM… Alternatively, it could have made allowance for the exceptional conditions in the global government bond markets, following the global financial crisis, and international quantitative easing programmes, and used an estimate of the risk free rate determined largely from historically observed rates. This would then have been consistent with its use of an MRP based largely on historically observed MRPs.

[39] Alan Gregory, *The AER Approach to Establishing the Cost of Equity – Analysis of the Method Used to Establish the Risk Free Rate and the Market Risk Premium,* p.3.

Wright made a similar point:[40]

> My view, in line with the UK regulators, is that regulators should work on the assumption that the real market cost of equity is constant. This approach is supported by quite strong evidence. For any firm with β reasonably close to one, the assumed real market cost of equity is by far the most important figure affecting the cost of capital for regulated companies. Thus this methodology has the added advantage of providing a stable regulatory regime… While I believe that the AER has got it wrong on the (crucially important) cost of equity, I have no significant criticisms of the assumptions the AER has made on the risk-free rate per se… However, the combination of this methodology for the risk-free rate and the assumption of a constant risk-premium does cause major problems, by introducing instability into the assumed figure for the real cost of equity… if the AER continues to assume a constant MRP primarily derived from realised returns, a possible compromise approach would be to combine this with a historic average risk-free rate.

Although they did not specifically address the matter of the term of the risk-free rate, the comments of Gregory and Wright imply that if a shift from a 10 year to 5 year risk free rate is undertaken, then the only appropriate adjustment that can be made is the contemporaneous adjustment to the market risk premium. Even if it is believed that the market risk premium is constant against the 10 year risk free rate, then there is still a need to adjust for the contemporaneous difference.

4.1.3 Description of the yield data

The Reserve Bank of Australia (RBA) publishes a series of Commonwealth bond yields from 1972 to the present, which provides an opportunity to examine the extent of the differential between the 10 year and 5 year risk free rate, and the volatility of these rates over a period of 41 years.[41] Over the whole period of available data we find it useful to distinguish the period after June 1993, as this is the date from which the RBA has undertaken an independent policy targeting an inflation range of 2 to 3 per cent.[42] In addition to the RBA's independent inflation targeting policy, the period since 1993 is distinguished by a floating dollar policy, which was introduced mid-way through the earlier period (1983), and has assisted in enhancing Australia's macro-economic stability.

Table 2 displays the descriptive statistics of the two periods of analysis: the 'whole period', being the period between 1972 and 2013, and the period after 1993. We focus on the difference between monthly annualised nominal Commonwealth Government bond yields, which we consider to be proxies for regulatory 20 business day averaging periods.[43] The period after 1993 is considered to be more representative of potential future scenarios on the proviso that the RBA continues to adopt an independent monetary policy that targets a 2 to 3 per cent level of inflation.

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40 Stephen Wright, (25 October, 2012), *Review of Risk Free Rate and Cost of Equity Estimates: A Comparison of UK Approaches with the AER*, pp.2–3.

41 We accessed the Statistical Tables page on the RBA website, and obtained historical interest rates from the Interest Rate section; see, http//www.rba.gov.au/statistics/tables/xls/f02hist.xls.

42 The RBA's policy of independent inflation targeting is discussed in Glenn Stevens, (20 April, 1999), *Six years of Inflation Targeting*, Address to Economic Society of Australia.

43 By using nominal 10 and 5 year yields we are implicitly assuming that there is no appreciable difference in the forecast of inflation over 5 and 10 year horizons. We acknowledge that this may not always be appropriate, but it is difficult to construct a historical series of inflationary expectations.

Table 2. Descriptive statistics – Difference between 10 and 5 year Commonwealth Government bond yields (January 1972 to April 2013)

	Whole Period (Jan.1972 – April 2013)	Period of RBA independence (June 1993 – April 2013)
Average	0.20%	0.26%
Median	0.23%	0.31%
Standard Deviation	0.36%	0.22%
Maximum	1.38%	0.68%
Minimum	-1.02%	-0.35%
Negative difference (per cent of time)	25.8%	13.0%

Source: Incenta and RBA.

Figures 1 and 2 below show the relationship between the yields on 5 and 10 year Commonwealth Government bonds. While for a majority of the time there has been a 'normal' (i.e. upward sloping) relationship between term and yield (i.e. an upward slope) there have also been periods when the curve has been 'inverted', i.e. the 5 year yield is higher than the 10 year yield.

Over the whole period from 1972 to 2013 the average (median) differential between the 5 and 10 year Commonwealth Government yields has been 0.20 percentage points (0.23 percentage points), and the standard deviation has been 0.36 percentage points. From Table 2, and also from Figure 2 it is apparent that the volatility of the differential has reduced in the post-1993 period. Although the average (median) differential between the 5 and 10 year Commonwealth Government yields has increased to 0.26 percentage points (0.31 percentage points), and the standard deviation of the difference has diminished to 0.22 percentage points.

However, from Figure 2 we can see that there have been significant swings between high and low yield differentials. Between June 1987 and December 1987 there was a 160 basis point swing in the differential between the 10 and 5 year yields (from -90 basis points to +70 basis points); and between October 1989 and July 1992 there was a 220 basis point swing (-95 basis points to +125 basis points). Even in the post 1993 period there have been some large swings, for example, between November 2007 and February 2009 there was a 100 basis point swing (-34 basis points to +66 basis points). Hence, there have been times when the difference between applying a 5 and 10 year risk free rate has been highly material, and therefore the perspective that one holds about whether a 5 year or 10 year term is appropriate becomes significant.

In Table 2 we find that over the 'whole period' the maximum and minimum yield differentials were 1.38 percentage points and -1.02 percentage points respectively, whilst in the post 1993 period these values were 0.68 percentage points and -0.35 percentage points respectively. Accordingly, we expect that due to the yield differential a change to a 5 year risk free rate may have had a very material influence on the calculated cost of equity at a particular point in time, depending on whether the market risk premium that would have been used with a 10 year risk free rate was adjusted for the historical average difference between the 10 year and 5 year bond yields, or the contemporaneous difference.

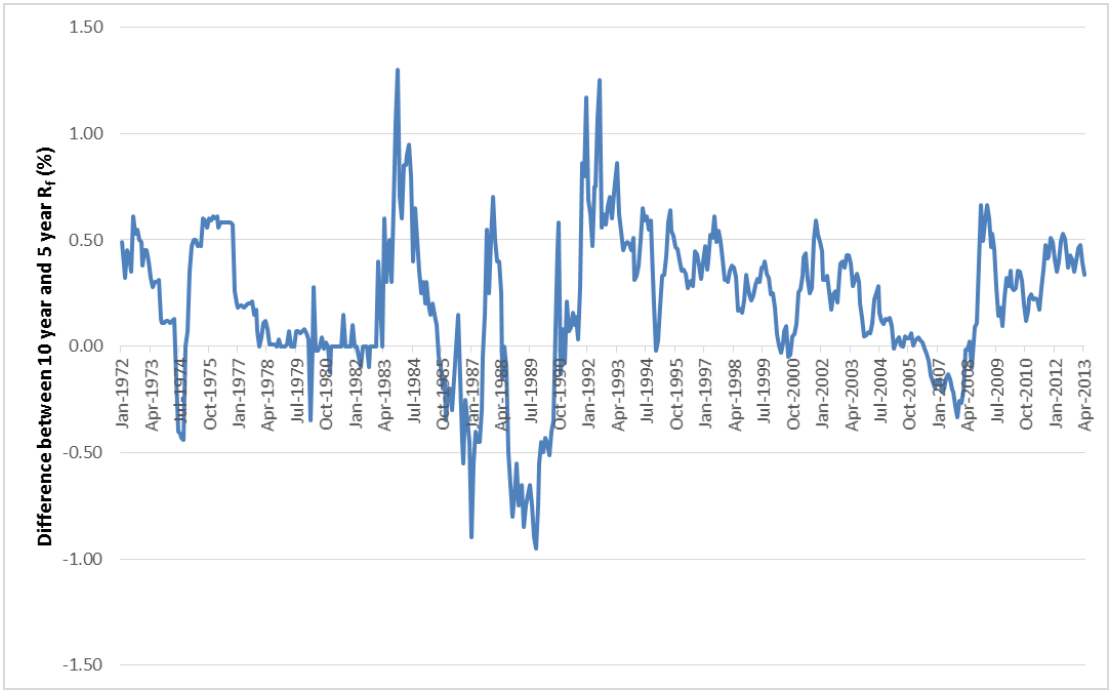
In Figures 3 and 4 below we display frequency distributions of the difference in 10 and 5 year Commonwealth Government yields, to convey an impression of the range of values that could be experienced in future periods. Figure 3 shows the distribution for the whole period, which includes the

period before the RBA's independent inflation targeting policy had been instituted. We find that the distribution of yield differences ranged mainly between zero (which was a common occurrence) and approximately 0.65 percentage points. Figure 4 shows that the situation after 1993 was much less volatile, with most of the variation lying between 0.05 percentage points and 0.50 percentage points, with a concentration of monthly outcomes in the range of 0.30 to 0.50 percentage points. This outcome can also be seen in the last half of Figure 2 below. After 1993 most yield difference observations are in the positive segment between 0.30 to 0.50 percentage points, with a negative outcome (5 year yield above the 10 year yield) only arising during the early stages of the global financial crisis, between 2007 and 2008.

Figure 1. Commonwealth Government bond yields – 5 and 10 year terms (1972 to 2013)

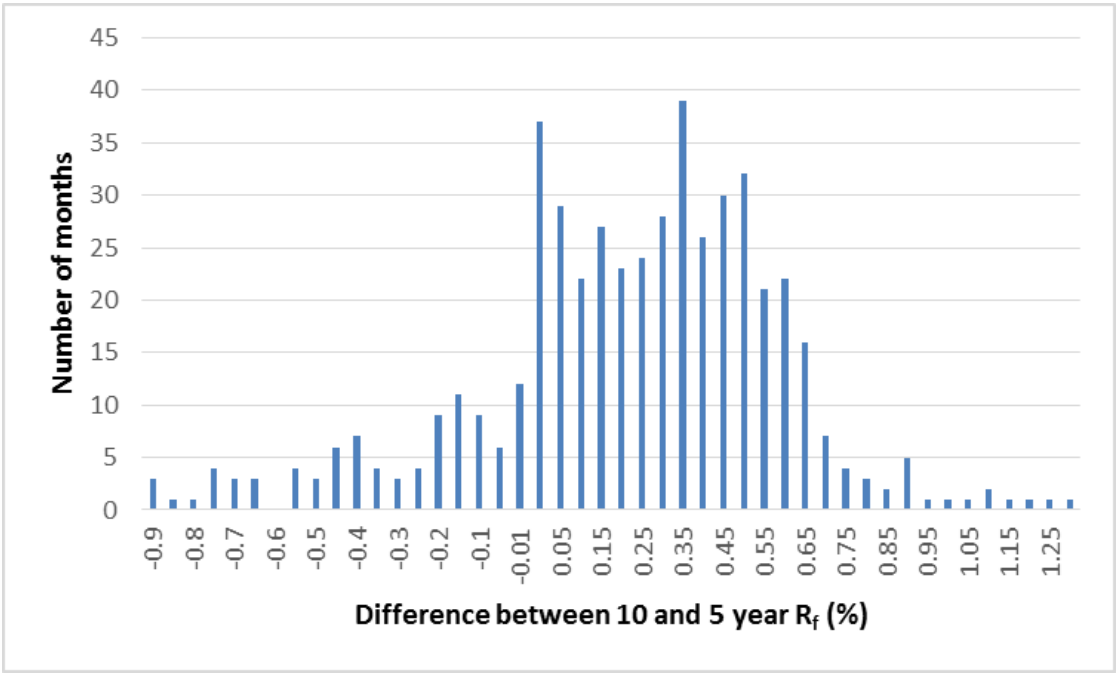
Source: Incenta and RBA.

Figure 2. Difference between 10 year and 5 year Commonwealth Government bond yields (1972 to 2013)



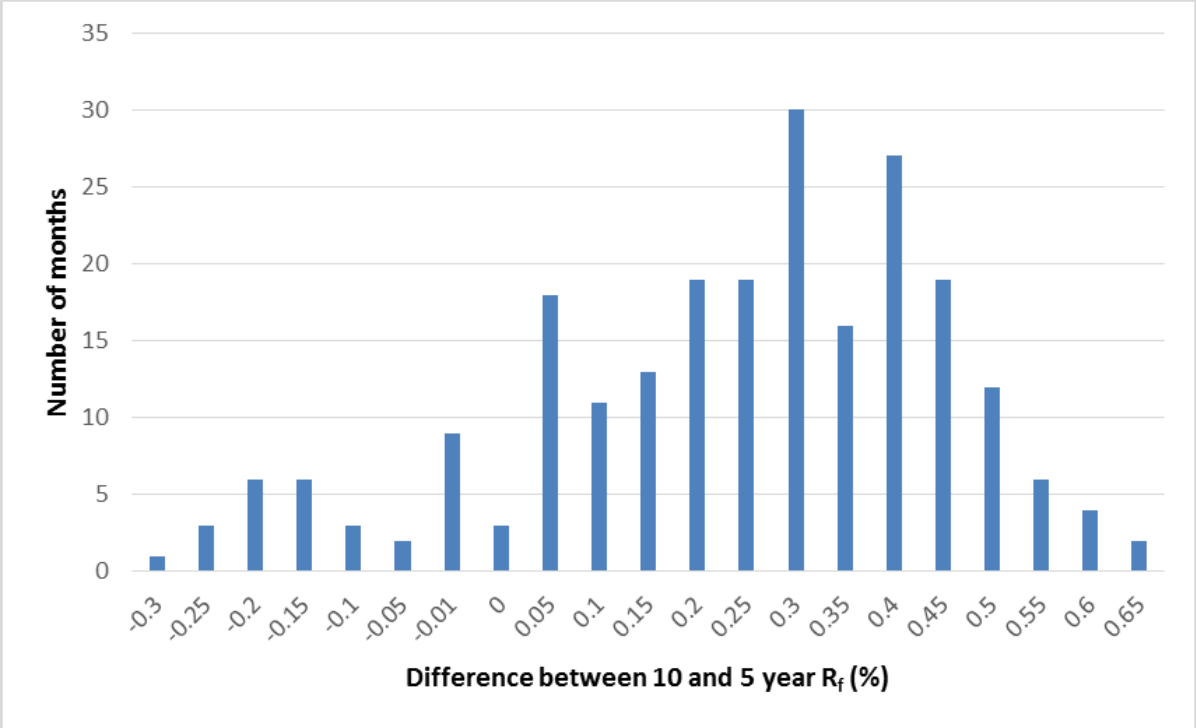
Source: Incenta and RBA.

Figure 3. Frequency distribution - Difference between 10 year and 5 year Commonwealth Government bond yields (1972 to 2013)



Source: Incenta and RBA.

Figure 4. Frequency distribution - Difference between 10 year and 5 year Commonwealth Government bond yields (1993 to 2013)



Source: Incenta and RBA.

4.1.4 Results of scenario analysis

Tables 3 and 4 below set out the potential materiality of the choice between the use of a 10 year and 5 year risk free rate for a number different scenarios, namely:

- For firms of average risk (beta of 1), lower than average risk (beta of 0.8) and higher than average risk (beta of 1.2);
- Average, high and low yield differences; and
- Adjustment to the market risk premium based on the average and contemporaneous yield difference.

The three scenarios in Table 3 reflect different assumptions in the adjustments that are made to the market risk premium:

- *Contemporaneous adjustment* – In order to maintain consistency in the CAPM equation, within this scenario the market risk premium is adjusted for the differential between the 5 and 10 year yields at that point in time. Thus in the case of an inverted yield curve the 5 year rate would be 6.34 per cent relative to the 10 year rate of 6 per cent, and the market risk premium would be reduced to 5.66 per cent to compensate;

- *Historical adjustment* – In this scenario a shift to applying the 5 year risk free rate is accompanied by a 20 basis point upward adjustment to the market risk premium that is reflective of the observed long term (30 year) differential between the 5 and 10 year risk free rates.

- *NPV = 0 and maintaining inconsistency in the CAPM equation* – Under this scenario the market risk premium is held at 6 per cent and changes in the relativities of the 5 and 10 year risk free rates are uncompensated by the market risk premium (which is based on a 10 year risk free rate).

The significance of the choice between a 10 year and 5 year risk free rate depends upon a number of factors. The first two factors are:

- The difference between the yield on 10 year and 5 year bonds (the yield difference); and

- Whether an attempt is made to be consistent in the use of the risk free rate across the two uses of the input in the CAPM, so that a higher market risk premium is used when the risk free rate is lower, noting that a central outcome of the NPV=0 argument is that there is not consistency in the risk free rate input that is used in the two places in the CAPM.

Results for 1972 – 2013

The results of scenarios calculated using data for the whole period are shown in Table 3 below.

If an attempt is made to be consistent, and contemporaneous adjustments are made to the market risk premium, for a 0.80 equity beta firm the cost of equity differences from the base case (10 year risk free rate) range from -0.28 per cent to +0.20 per cent, although it should be noted that the latter outcome has a relatively lower probability owing to skewness in the distribution toward a positive yield difference (i.e. generally there is an upward sloping Government bond yield curve).[44] For a beta of unity, the return on equity is preserved at the base case level (12 per cent), while a beta of 1.20 mirrors the outcomes for a beta of 0.80, since the largest difference is -0.7 per cent in the case of an inverted yield curve, 0.04 per cent in the expected (i.e. average) situation, and +0.14 per cent in the case of a high differential between the 10 and 5 year yields.

If the market risk premium adjustment is made along historical lines, and is based on the observed 0.20 percentage points long term differential between 5 and 10 year risk free rates, the differences in outcomes become potentially much more material. With a high differential of 1.38 per cent the cost of equity would reduce by 1.22 per cent relative to the base case, while in the case of an inverted yield curve (low yield difference) the cost of equity would be 1.18 per cent higher than the base case. Now with beta of unity and a beta of 1.20 there would be a materially higher/lower (by up to 1.26 per cent) cost of equity if the 10 to 5 year risk free rate differential widened to the historical minimum /maximum in either direction.

Finally, in the case of the NPV=0 rule being applied along with inconsistency in the treatment of the risk free rate in the CAPM equation, there is an across the board (i.e. regardless of beta) reduction of 0.20 percentage points when the average yield difference is experienced (i.e. 0.20 percentage points). However, there are much more material consequences when a range of historically observed yield differences are experienced. For an equity beta of 0.80 there is a 1.02 per cent increase in the cost of equity estimate in the low yield difference case, and a 1.38 percentage points decrease in the cost of

[44] As we saw in Table 2 above, the yield differential was negative 25.8 per cent of the time during the 'Whole Period', and was negative only 13 per cent of the time in the post 1993 period.

equity under the high yield difference case. The same large impacts are observed in the low and high yield differential cases regardless of the beta that is applied.

Table 3: Cost of equity - significance of 10 and 5 year risk free rate assumptions (1972–2013)

	Rf	MRP	BETA		
Contemporaneous:			**0.80**	**1.00**	**1.20**
10 year Rf	6.00%	6.00%	10.80%	12.00%	13.20%
5 year Rf - Low Yield Difference (-1.02%)	7.02%	4.98%	11.00%	12.00%	13.00%
5 year Rf - Average Yield Difference (0.20%)	5.80%	6.20%	10.76%	12.00%	13.24%
5 year Rf - High Yield Difference (1.38%)	4.62%	7.38%	10.52%	12.00%	13.48%
Historical:					
10 year Rf	6.00%	6.00%	10.80%	12.00%	13.20%
5 year Rf - Low Yield Difference (-1.02%)	7.02%	6.20%	11.98%	13.22%	14.46%
5 year Rf - Average Yield Difference (0.20%)	5.80%	6.20%	10.76%	12.00%	13.24%
5 year Rf - High Yield Difference (1.38%)	4.62%	6.20%	9.58%	10.82%	12.06%
NPV=0 and inconsistent:					
10 year Rf	6.00%	6.00%	10.80%	12.00%	13.20%
5 year Rf - Low Yield Difference (-1.02%)	7.02%	6.00%	11.82%	13.02%	13.54%
5 year Rf - Average Yield Difference (0.20%)	5.80%	6.00%	10.60%	11.80%	13.00%
5 year Rf - High Yield Difference (1.38%)	4.62%	6.00%	9.42%	10.62%	11.82%

Source: Incenta and RBA. Note: Assumes a 'base case' 10 year risk free rate of 6 per cent and a market return of 12 per cent.

Results for 1993 – 2013

As shown in Table 4 below, the results for the period since the RBA's independent inflation targeting policy are much more stable than for the whole period:

- If an adjustment is made to the market risk premium reflecting the contemporaneous yield difference the cost of equity will rise for a beta above 1 and fall if it is below 1. For a beta of 0.80 the impact ranges between -0.14 percentage points and +0.07 percentage points.

- If an adjustment is made to the market risk premium reflecting the historical yield difference, then on average the cost of equity will rise for a beta above 1 and fall if it is below 1, but not change

materially; however, the impact will depend on how the current yield difference compares to the average. For a beta of 0.80 there is a material cost of equity impact ranging between -0.52 percentage points and +0.51 percentage points.

- If no adjustment is made to the market risk premium then the cost of equity will just change by the yield difference: -0.26 per cent on average for the period since 1993); a range between +0.34 per cent when low (negative) yield differences are encountered, and -0.68 per cent when high yield differentials are experienced.

As noted previously, during the post 1993 period the yield difference has been negative only 13 per cent of the time.

Table 4: Cost of equity - materiality of 10 and 5 year risk free rate assumptions (1993–2013)

	Rf	MRP	BETA		
Contemporaneous:			**0.80**	**1.00**	**1.20**
10 year Rf	6.00%	6.00%	10.80%	12.00%	13.20%
5 year Rf - Low Yield Difference (-0.35%)	6.35%	5.65%	10.87%	12.00%	13.13%
5 year Rf - Average Yield Difference (0.20%)	5.80%	6.20%	10.76%	12.00%	13.24%
5 year Rf - High Yield Difference (0.68%)	5.32%	6.68%	10.66%	12.00%	13.34%
Historical:					
10 year Rf	6.00%	6.00%	10.80%	12.00%	13.20%
5 year Rf - Low Yield Difference (-0.35%)	6.35%	6.20%	11.31%	12.55%	13.79%
5 year Rf - Average Yield Difference (0.20%)	5.80%	6.20%	10.76%	12.00%	13.24%
5 year Rf - High Yield Difference (0.68%)	5.32%	6.20%	10.28%	11.52%	12.76%
NPV=0 and inconsistent:					
10 year Rf	6.00%	6.00%	10.80%	12.00%	13.20%
5 year Rf - Low Yield Difference (-0.34%)	6.35%	6.00%	11.15%	12.35%	13.55%
5 year Rf - Average Yield Difference (0.26%)	5.74%	6.00%	10.54%	11.74%	12.94%
5 year Rf - High Yield Difference (0.68%)	5.32%	6.00%	10.12%	11.32%	12.52%

Source: Incenta and RBA.

4.1.5 Conclusion on the materiality of the problem

It has now been conceded by Associate Professor Lally, that applying the NPV=0 principle requires a consistent definition of the risk free rate across the different uses of the risk free rate input within the CAPM. In order to test the materiality of the impact on the cost of equity estimate, we carried out a number of simulations based on whether a high, medium (average) or low yield differential between the 10 and 5 year risk free rate is observed at the time of a regulatory review. Our findings were that if a 5 year term assumption for the risk free rate is applied, and:

- If an adjustment is made to the market risk premium reflecting the contemporaneous yield difference, then the cost of equity will rise for a beta above 1 and will fall if it is below 1. For a beta of 0.80 the impact on the cost of equity ranges between -0.28 percentage points and +0.20 percentage points for the whole period, with a more modest range of between -0.14 percentage points and +0.07 percentage points applying to the period since 1993.

- If an adjustment is made to the market risk premium reflecting the historical yield difference, then on average the cost of equity will rise for a beta above 1 and fall if it is below 1, but not change materially; however, the impact will depend on how the current yield difference compares to the average. For a beta of 0.80 there is a very material impact of between -1.22 percentage points and +1.18 percentage points for the whole period, and a material cost of equity impact ranging between -0.52 percentage points and +0.51 percentage points for the period since 1993.

- If no adjustment is made to the market risk premium then the cost of equity will just change by the yield difference: -0.20 per cent (-0.26 per cent) on average for the whole period (period since 1993); a range between +1.02 per cent (+0.34 per cent) when low (negative) yield differences are encountered, and -1.38 per cent (-0.68 per cent) when high yield differentials are experienced.

Hence, if a 5 year risk free rate were adopted without contemporaneous adjustment to the market risk premium, in given circumstances the impact on the cost of equity estimate for a regulated business can become material.

4.2 Exacerbating the impact of the SL CAPM on low beta stocks

More than 40 years ago Black et al. found that within the SL CAPM, low beta stocks are observed to have higher betas than predicted by the theory, and their cost of capital will be under-estimated.[45] This has become one of the best known empirical regularities in financial economics, which has also been observed in Australia. The Black CAPM relaxed the SL CAPM assumption that investors can borrow or lend freely at a single rate, expressed the CAPM in terms of the excess return over the risk free rate, and introduced an additional factor that was the return to a zero-beta portfolio in excess of

[45] Black, Fischer, Michael C. Jensen, and Myron Scholes (1972). *The Capital Asset Pricing Model: Some Empirical Tests*, pp. 79–121 in M. Jensen ed., *Studies in the Theory of Capital Markets*. New York: Praeger Publishers.

the risk free rate.[46] Australian estimates of the average excess return to the zero beta portfolio range from 8.15 per cent, to 6.99 per cent.[47]

Taking these Australian estimates for the 20 business days to 16 December, 2011, at a time when the spot 10 year Commonwealth Government bond yield was 3.99 per cent, and using the Black CAPM, NERA estimated a range for the cost of equity that was between 2.75 per cent and 3.58 per cent higher than the AER would have obtained applying the SL CAPM approach mechanistically.[48] The range of differentials would have increased to 3.35 per cent and 4.18 per cent had a 5 year risk free rate been applied by the AER. On the other hand, given a 60 basis point differential between the 10 and 5 year risk free rates in December, 2011, maintaining a 10 year risk free rate assumption and adopting a 'through the cycle' average risk free rate of 5 per cent applied by Australian investment bank/broker analysts would have seen the difference with the Black CAPM estimates reduce to 2.57 per cent and 1.74 per cent respectively.[49]

Hence, the application of a 5 year risk free rate in estimating the cost of equity would exacerbate the problem if the regulatory cost of equity is estimated with a mechanistically applied SL CAPM. In order to compensate for this under-estimate of the cost of equity, the assumption of a 10 year (and preferably longer) term for the risk free rate is required. In the recent report on Hastings Diversified Utilities Fund (HDUF), Grant Samuel raised a number of points to support its view that 'the selected cost of capital should incorporate a margin over the calculated WACC range':[50]

> Alternative approaches for estimating the cost of equity such as the Gordon Growth Model suggest higher rates than the 7.5–8.1% implied by the CAPM. Analysis of the entities most comparable to Epic Energy (i.e. APA Group, DUET Group and Envestra) using the Gordon Growth Model costs capital in the range of 9.5–12% (yields mostly around 7.5% and growth of 2.0–3.0%) with a median of around 10.5%.
>
> Anecdotal information suggests that equity investors have substantially repriced risk since the global financial crisis (notwithstanding the uplift in equity markets since March 2009) and that acquirers are pricing offers on the basis of hurdle rates well above those implied by theoretical models…

While the SL CAPM's tendency to under-estimate the cost of equity for low beta stocks is not mentioned specifically by Grant Samuel, its actions in making an upward adjustment are consistent with an adjustment being made to the SL CAPM in order to align the cost of equity estimate with market expectations. That is, market practitioners are drawn to applying a 10 year risk free rate, and making other adjustments, because these changes are required to achieve the valuations that are supported by market observation. In a regulatory context, the under-estimation of expected returns by the SL CAPM may have the effect of setting required returns at a level which stifles investment.

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46 Black. Fisher, (1972), 'Capital market equilibrium with restricted borrowing', *Journal of Business*, 45, pp.444–454; Brennan, Michael, (1971), 'Capital market equilibrium with divergent borrowing and lending rates,' *Journal of Financial and Quantitative Analysis*, 6, pp. 1197–1205.

47 These are respectively the findings of: CEG (September, 2008), *Estimation of, and correction for, biases inherent in the Sharpe CAPM formula*; and, Lajbcygier P. and M. Wheatley (March 2012), *An evaluation of some alternative models for pricing Australian stocks.* Monash University.

48 NERA (March, 2012), *The Black CAPM*, A report for APA Group, Envestra, Multinet & SP AusNet, p.19.

49 The 60 basis point differential between the 5 and 10 year risk free rates for to 20 business day period to 16 December, 2011 was calculated using Bloomberg data.

50 Grant Samuel (3 August, 2012), *Hastings Diversified Utilities Fund – Independent Expert's Report in relation to the takeover offer by Pipeline Partners Australia Pty Limited*, p.8.

4.3 Greater volatility in the cost of capital

Apart from a number of other objections to the application of a risk free rate term of less than 10 years in the SL CAPM, the two independent experts that we interviewed expressed reservations about the increased volatility of the 5 year risk free rate relative to the 10 year risk free rate. To examine this issue we obtained the RBA's data base relating to the yields on 5 and 10 year Commonwealth bonds. The results of our simulations show that if contemporaneous adjustments are made to the risk free rate and market risk premium, the outcome would not create much more instability in estimates of the cost of equity.

However, if a mechanistic SL CAPM is applied by a regulator, the use of a shorter term risk free rate (such as 5 years) will lead to greater volatility in estimation of the cost of equity, or a greater potential for the cost of equity to be mis-stated during particular events – such as during the current period of very low government interest rates relative to their historical average. This is precisely the opposite of the observed behaviour of market practitioners who, as we have seen, apply a 10 year term assumption and a 'through the cycle' approach to estimate the risk free rate, with cross-referencing against market prices (multiples) and methodologies (DGM). Hence, if a regulator applying a mechanistic version of the SL CAPM shifts from using a 10 year term assumption to a 5 year term, the change will increase the volatility of the regulatory cost of capital, and will lead to greater divergence between the regulatory cost of capital, and that which is applied by market practitioners.

5. Conclusion on the term of the risk free rate for equity

The AER uniformly applies a 10 year risk free rate when estimating the cost of equity. It is currently undertaking a review of this assumption as part of its review of the rate of return guidelines. It has expressed a view that the choice of the term of the risk free rate applied to estimate the cost of equity should be informed by the present value principle, while noting that for Lally this requires a term equal to the regulatory period but for UK regulators it implies a term equal to the life of the assets. However, CEPA (retained by the AER in the matter), which is based in the UK, has recently expressed a preference for the long term parameter approach employed by the UK regulators. In its recent consultation paper the AER also notes that 'regulators in the UK tend to apply a term that is equal to the life of the assets.'[51]

The AER's sister organisation, the ACCC had proposed a 5 year risk free rate term a decade ago for its GasNet decision, but this was appealed to the Tribunal, which decided that:[52]

> The Tribunal is satisfied that the use by GasNet of a ten year Commonwealth bond rate to determine a Rate of Return on equity under s.8.30 of the Code was a correct use of the CAPM and was in accordance with the conventional use of a ten year bond rate by economists and regulators where the life of the assets and length of the investment approximated thirty years in the MRP calculation and the risk-free rate.

During the AER's 2009 WACC review the term of the risk free rate was raised in the AER's draft decision, but this was reversed for the final decision,[53] and all of the AER's subsequent decisions have applied a 10 year risk free rate to estimate the cost of equity. In its recent decisions on the Victorian gas distributors, the AER noted that the risk free rate provides compensation to an investor 'for having committed funds to an investment for a period of time and therefore foregoing the opportunity to spend that money and consume goods now'.[54] In other words, the risk free rate is a compensation for the time value of money.

We recommend using a 10 year risk free rate for estimating the cost of equity, and for this rate to be applied consistently to estimate the market risk premium. However, this recommendation is not based squarely on theory, which we view as largely indeterminate given the shortcomings of the CAPM. Rather, our view is based on achieving consistency with the practice of valuation professionals, for whom the use of a 10 year term for the risk free rate is widespread, and consistency with our observations of how investors actually value regulated infrastructure assets.

Professionals valuing regulated infrastructure consider that there are risks, in addition to interest rate risk, that are not eliminated by regulatory resets every 5 years (e.g. references to matching the cash flows from a long term investment with a rate of return requirement for long term investments, and various regulatory reset risks), and they cross-reference their valuations to current market data (including DGM and market multiples analysis). By applying a long term (10 year) risk free rate, valuers in the market consider that they have more closely matched their valuations to market evidence. While their practice no doubt reflects the underlying return requirements of investors who

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51 AER (May, 2013), *Consultation Paper on the Rate of Return Guidelines*, p.41.

52 Australian Competition Tribunal, Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT6, para. 48.

53 AER (May, 2009), *Electricity transmission and distribution network service providers: Review of the weighted average cost of capital parameters*, pp. 173–174.

54 AER (March 2013), *Access arrangement final decision SPI Networks (Gas) Pty Ltd 2013–17*, p.28.

perceive long term risks that are not compensated by regulatory re-sets, it is also possible that the practice of market analysts (who use the CAPM model) compensates for the CAPM's well-known under-statement of the equity beta of low beta firms.

The interviewed market practitioners were unanimous that a change in regulatory policy that would apply a 5 year risk free rate would reduce future revenue, and since they would not change their practice of applying a 10 year risk free rate in their own valuations, their valuations of the businesses would fall. A regulatory approach that applies a 5 year risk free rate to estimate the cost of equity was seen by some market valuation experts as a potential threat to continued investment.

By undertaking simulations for alternative adjustments to the market risk premium in order to maintain consistency in the CAPM formula, we found that if contemporaneous adjustments are made to the market risk premium, it is likely that the impact on the cost of equity of a shift from a 10 year to a 5 year risk free rate would be relatively small. On the other hand, if a long term historical adjustment (of say 0.20 percentage points) were made, the impact could potentially be more material, and if no adjustment is made (and an inconsistency is introduced in the CAPM formula), the impact could at times be very material.

Appendix A:

Table A.1: Responses of interviewees

Institution	Term of Rf (years)	e) What risk factors does the risk free rate assumption compensate for?
Stephen Wilson Grant Samuel	10	A long term risk free rate is compensation for long term risks that match the cash flows being valued. Investors such as superannuation funds will want to lock away returns for decades, and therefore there is a need for a long term risk free rate. The identification of future specific risks is not the point. Market prices are set by investors who consider long term risks and factor these into their required returns for assets regulated on a 5 year cycle. That drives market valuation, and therefore long term rates should be applied. When setting a discount rate for a regulated asset, we look at a range of inputs, including a 'bottom-up' CAPM cost of equity, looking at cost of capital assumptions made by market analysts, and DGM estimates. We adjust the cost of equity we apply taking account of a number of these factors. It is not mechanistic. Uses a 'through the cycle' approach to setting the risk free rate.
Craig Edwards Lonergan Edwards & Associates	10	The cash flows being valued do not stop at 5 years, with most of the value of the business being determined by the period beyond 5 years. There is a risk that future regulatory resets will not provide the opportunity to achieve sufficient returns to cause investors to continue to invest. Regulators may not model risk properly. This is illustrated by recent observation that regulators have embedded a 3 per cent risk free rate into revenue streams when it is obvious to the market that the return requirement of investors has not fallen. There is a 120 basis point differential between 10 and 30 year bonds in the US, which implies that the market sees risks further out. This expert currently adopts a risk free rate for valuation purposes well above the current 10 year government bond rate.
Institution A	10	The duration of the cash flows should be matched by the discount rate. It is standard market practice to use a 10 year risk free rate.
Institution B	10	The institution requires the same risk free rate to be applied to all valuations. Investors buy these investments with a multi-year view in mind. Hence there is a long term investor perspective. It would be hard to implement the theory that you could be assured to get an NPV = 0 after 5 years. We use a 'through the cycle', long term discount rate.

Institution C	10	The cash flows extend out for more than 5 years, and need to be discounted using a long term risk free rate.
Institution D	10	Long-lived assets require a long term benchmark rate of return.
Institution E	10	It is the policy of the company to apply a 10 year risk free rate in valuing all businesses.
Institution F	10	The cash flows modelled are long term, and the term of the risk free rate should match these.
Institution G	10	Apply a 10 year risk free rate because this is standard market practice.
Institution H	10	It is necessary to match the cash flows being discounted with an appropriate discount rate, which must also be long term.
Institution I	10	Apply a long term risk free rate for equity that is above that used by the regulator, as have a 'through the cycle' view of the cost of equity.
Institution J	10	There is a need to match long term cash flows with an appropriate long term risk free rate.
Institution K	10	There are long term risks that extend beyond the regulatory cycle. For one we observe that regulators have a history of changing their methodology. Consistency is required in valuation to place different assets on par. There could be technological change that imposes future risk.
Institution L	10	Duration of the cash flows exceeds 5 years, so that consistency in valuation requires a longer term risk free rate is applied.

Source: Interviews with analysts and independent experts. Note: Order of institutions is not the same as that in the text.

Appendix B

Table B.1: Regulated energy stocks covered by investment banks/brokers interviewed

	APA	DUET	Envestra	Spark	SP Ausnet
Bank of America Merrill Lynch	√	√	√	√	√
CIMB	√	√	√		
CLSA Asia Pacific Markets				√	√
Commonwealth Bank	√	√	√	√	√
Credit Suisse	√	√	√	√	√
Deutsche Bank	√	√		√	√
Evans & Partners	√	√	√	√	
JP Morgan	√	√		√	√
Macquarie	√	√	√	√	√
Morgan Stanley	√		√		√
RBC Capital Markets	√	√	√	√	√
UBS	√	√	√	√	√

Source: Bloomberg

Appendix C

Terms of Reference

TERMS OF REFERENCE – TERM OF THE RISK FREE RATE FOR THE COST OF EQUITY

Background

The Australian Energy Regulator (AER) is developing a rate of return guideline that will form the basis of the regulated rate of return applied in energy network decisions. The AER published an issues paper in late December 2012 and a formal consultation paper in early May 2013 under the recently revised National Electricity Rules (NER) and National Gas Rules (NGR).

The AER undertook its last review of the weighted average cost of capital (WACC) in 2009 (under a previous version of the NER). The Energy Networks Association (ENA) established a Cost of Capital Subgroup (CoCS) and working groups to actively engage in the *Rate of Return Guideline*s process.

The new NER and NGR require the AER, when determining the cost of capital (and the cost of equity), to consider:

- Relevant estimation methods, financial models, market data and other evidence for determining the rate of return;[55]
- Any interrelationships between financial parameters that are relevant to both the returns on equity on debt; and
- The prevailing conditions in the market for equity funds (when determining the cost of equity).

Some estimation methods and financial models require a risk free rate estimate when determining the cost of equity. This estimate requires an assumed term of the risk free rate.

As further detailed below, the ENA would like to engage you to provide your opinion on the assumed term of the risk free rate within the scope of the *allowed rate of return objective*:[56]

> "*[t]he rate of return for a [Service Provider] is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applied to the [Service Provider] in respect of the provision of [services]*."

Scope of work

The ENA requests your opinion on the appropriate term of the risk free rate when estimating the cost of equity for a benchmark regulated Australian energy utility consistent with NER and NGR for energy regulatory purposes covering the following points:

- Consider the theory about the appropriate term of the risk free rate, including the relevance of the 'NPV principle';
- Consider whether finance practice is relevant and, if so, assess:

[55] NER 6.5.2 (e)(1) and 6A.6.2(e)(1) and NGR 87(5)(a).
[56] NER 6.5.2(c), 6A.6.2(c) and NGR 87 (3).

  - how finance practitioners arrive at an assumed term of the risk free rate when using asset pricing models to determine the cost of equity; and
  - whether finance practitioners use different term assumptions for regulated Australian energy utilities than for other long lived infrastructure that is not subject to period price reviews
- Investigate and articulate the sources of risk that equity providers may expect to extend beyond a five year regulatory period, even where the regulator is required to maintain the value of the RAB;
- Consider any comments raised by the AER and other regulators about the appropriate term of the risk free, including comments raised in the recent Victoria gas access arrangement review and the AER's forthcoming consultation paper on the *Rate of Return Guidelines*;
- If relevant, ensure consistency with other expert material being procured by the ENA.

The ENA requests the consultant to provide a report which must:

- Attach these terms of reference and the qualifications (in the form of CV(s) of the person(s) preparing the report;
- Identify any current or potential future conflicts of interest;
- Comprehensively set out the bases for any conclusions made;
- Only rely on information or data that is fully referenced and could be made reasonably available to the AER or others;
- Document the methods, data, adjustments, equations, statistical package specifications/printouts and assumptions used in preparing your opinion;[3]
- Include specified wording at the beginning of the report stating that "[the person(s)] acknowledge(s) that [the person(s)] has read, understood and complied with the Federal Court of Australia's Practice Note CM 7, Expert Witnesses in Proceedings in the Federal Court of Australia" as if your brief was in the context of litigation;
- Include specified wording at the end of the report to declare that "[the person(s)] has made all the inquiries that [the person(s)] believes are desirable and appropriate and that no matters of significance that [the person(s)] regards as relevant have, to [the person(s)] knowledge, been withheld"; and
- State that the person(s) have been provided with a copy of the Federal Court of Australia's "Guidelines for Expert Witnesses in Proceeding in the Federal Court of Australia" and that the Report has been prepared in accordance with those Guidelines, refer to Annexure A to these Terms of Reference or alternatively online at <*http://www.federalcourt.gov.au/law-and-practice/practice-documents/practice-notes/cm7*>.

Timeframe

The consultant is to provide a draft report outlining advising on the appropriate term of the risk free rate by 7 June 2013. A final report addressing any ENA comments is to be provided by 14 June 2013.

[3] Note: this requires you to reveal information that you might otherwise regard as proprietary or confidential and if this causes you commercial concern, please consult us on a legal framework which can be put in place to protect your proprietary material while enabling your work to be adequately transparent and replicable.

Fees

The consultant is requested to propose:

- A fixed total cost of the project and hourly rates for the proposed project team should additional work be required;
- The staff who will provide the strategic analysis and opinion;
- Declare the absence of any relevant conflict of interest in undertaking the project; and
- Indicate preparedness to enter into a confidentiality agreement regarding research and findings.

Any changes to the scope of the consultancy must be agreed with the ENA before the quotation is submitted. Miscellaneous costs such as travel and accommodation will be reimbursed, provided that they are agreed with the ENA beforehand.

Contacts

Any questions regarding this terms of reference should be directed to:

Nick Taylor (Jones Day)

Email: njtaylor@jonesday.com

Phone: 02 8272 0500.

Annexure A

FEDERAL COURT OF AUSTRALIA

Practice Note CM 7

EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA

1. Rule 23.12 of the Federal Court Rules 2011 requires a party to give a copy of the following guidelines to any witness they propose to retain for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based on the specialised knowledge of the witness (see **Part 3.3 - Opinion** of the *Evidence Act 1995* (Cth)).

2. The guidelines are not intended to address all aspects of an expert witness's duties, but are intended to facilitate the admission of opinion evidence[57], and to assist experts to understand in general terms what the Court expects of them. Additionally, it is hoped that the guidelines will assist individual expert witnesses to avoid the criticism that is sometimes made (whether rightly or wrongly) that expert witnesses lack objectivity, or have coloured their evidence in favour of the party calling them.

Guidelines

1. General Duty to the Court[58]

1.1 An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.

1.2 An expert witness is not an advocate for a party even when giving testimony that is necessarily evaluative rather than inferential.

1.3 An expert witness's paramount duty is to the Court and not to the person retaining the expert.

2. The Form of the Expert's Report[59]

[57] As to the distinction between expert opinion evidence and expert assistance see *Evans Deakin Pty Ltd v Sebel Furniture Ltd* [2003] FCA 171 per Allsop J at [676].
[58] The "*Ikarian Reefer*" (1993) 20 FSR 563 at 565-566.
[59] Rule 23.13.

2.1 An expert's written report must comply with Rule 23.13 and therefore must

(a) be signed by the expert who prepared the report; and

(b) contain an acknowledgement at the beginning of the report that the expert has read, understood and complied with the Practice Note; and

(c) contain particulars of the training, study or experience by which the expert has acquired specialised knowledge; and

(d) identify the questions that the expert was asked to address; and

(e) set out separately each of the factual findings or assumptions on which the expert's opinion is based; and

(f) set out separately from the factual findings or assumptions each of the expert's opinions; and

(g) set out the reasons for each of the expert's opinions; and

(h) comply with the Practice Note.

2.2 The expert must also state that each of the expert's opinions is wholly or substantially based upon the expert's specialised knowledge[60].

2.3 At the end of the report the expert should declare that "[the expert] has *made all the inquiries that* [the expert] *believes are desirable and appropriate and that no matters of significance that* [the expert] *regards as relevant have, to* [the expert's] *knowledge, been withheld from the Court*."

2.4 There should be included in or attached to the report the documents and other materials that the expert has been instructed to consider.

2.5 If, after exchange of reports or at any other stage, an expert witness changes the expert's opinion, having read another expert's report or for any other reason, the change should be communicated as soon as practicable (through the party's lawyers) to each party to whom the expert witness's report has been provided and, when appropriate, to the Court[61].

2.6 If an expert's opinion is not fully researched because the expert considers that insufficient data are available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report.

[60] *Dasreef Pty Limited v Nawaf Hawchar* [2011] HCA 21.
[61] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565

2.7 The expert should make it clear if a particular question or issue falls outside the relevant field of expertise.

2.8 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports[62].

3. Experts' Conference

3.1 If experts retained by the parties meet at the direction of the Court, it would be improper for an expert to be given, or to accept, instructions not to reach agreement. If, at a meeting directed by the Court, the experts cannot reach agreement about matters of expert opinion, they should specify their reasons for being unable to do so.

PA KEANE

Chief Justice

1 August 2011

[62] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565-566. See also Ormrod *"Scientific Evidence in Court"* [1968] Crim LR 240

Appendix D

Curriculum Vita

Jeffrey John Balchin

Managing Director

Email: jeff.balchin@incenta.com.au
Telephone: +61 412 388 372

Jeff is the Managing Director of Incenta. Jeff has 20 years of experience in relation to economic regulation issues across the electricity, gas and airports sectors in Australia and New Zealand and experience in relation to water, post and telecommunications. He has advised governments, regulators and major corporations on issues including the development of regulatory frameworks, regulatory price reviews, licensing and franchise bidding and market design. Jeff has also undertaken a number of expert witness assignments. His particular specialities have been on the application of finance principles to economic regulation, the design of tariff structures, the design of incentive compatible regulation and the drafting and economic interpretation of regulatory instruments.

In addition, Jeff has led a number of analytical assignments for firms to understand the responsiveness of consumers to changes to prices or other factors (like promotional activities) and to use this information to inform pricing strategy.

Past positions

Jeff previous was a Principal at PwC, a director and partner at the Allen Consulting Group, and held a number of policy positions in the Commonwealth Government. His latter role included being representative on the secretariat of the Gas Reform Task Force (1995-1996), where he played a lead role in the development of a National Gas Code.

Relevant experience - Economic Regulation of Price and Service

Economic regulation – price review/negotiation

- Regulatory cost of debt (Clients: Powerlink, ElectraNet and Victorian gas distributors 2011-2012) – provided a series of reports addressing how the benchmark cost of debt should be established pursuant to the National Electricity Rules and on the appropriate benchmark allowance for debt and equity raising costs.
- Strategic advice, Victorian electricity distribution review (Client: Jemena Electricity Networks, 2009-2011) – provided ongoing advice on regulatory economic issues during the course of the price review, including on regulatory finance matters, issues associated with the AER's desire to end the former service performance incentive scheme, issues associated with the regulatory treatment of related party contracts, allocation of costs between regulated and unregulated activities and forecasting of expenditure.
- Regulatory cost of debt (Client: Powercor Australia Limited, 2009-2010) – provided a series of reports addressing how the benchmark cost of debt should be established pursuant to the National Electricity Rules.
- Cessation of service incentive scheme (Client: Powercor Australia Limited, 2010) – assisted Powercor to quantify the financial effect that would have flowed if the former service performance incentive scheme had continued. Also prepared an expert report pointing to a material

inconsistency in how the AER intended to close out the old scheme and the parameters for the new service performance incentive scheme, which was accepted by the AER.

- Strategic advice, NSW gas distribution review (Client: Jemena Gas Networks, 2009-2011) – provided ongoing advice on regulatory economic issues during the course of the price review, including on regulatory finance matters, issues associated with the regulatory treatment of related party contracts, allocation of costs between regulated and unregulated activities, forecasting of expenditure and issues associated with the updating of JGN's regulatory asset base. Input methodologies for NZ regulated businesses (Clients: Powerco NZ and Christchurch International Airport, 2009-ongoing) – advising in relation to the Commerce Commission's development of input methodologies and related matters, covering issues associated with regulatory asset valuation, the regulatory cost of capital, the use of productivity trends in regulation and the design of incentive-compatible regulation.

- Equity Betas for Regulated Electricity Transmission Activities (Client: Grid Australia, APIA, ENA, 2008) - Prepared a report presenting empirical evidence on the equity betas for regulated Australian electricity transmission and distribution businesses for the AER's five yearly review of WACC parameters for these industries. The report demonstrated the implications of a number of different estimation techniques and the reliability of the resulting estimates. Also prepared a joint paper with the law firm, Gilbert+Tobin, providing an economic and legal interpretation of the relevant (unique) statutory guidance for the review.
- Economic Principles for the Setting of Airside Charges (Client: Christchurch International Airport Limited, 2008 ongoing) - Provided advice on a range of economic issues relating to its resetting of charges for airside services, including the valuation of assets and treatment of revaluations, certain inputs to the cost of capital (beta and the debt margin) and the efficiency of prices over time and the implications for the depreciation of assets and measured accounting profit.

- Treatment of Inflation and Depreciation when Setting Landing Charges (Client: Virgin Blue, 2007 2008) - Provided advice on Adelaide Airport's proposed approach for setting landing charges for Adelaide Airport, where a key issue was how it proposed to deal with inflation and the implications for the path of prices over time. The advice also addressed the different formulae that are available for deriving an annual revenue requirement and the requirements for the different formulae to be applied consistently.

- Application of the Grid Investment Test to the Auckland 400kV Upgrade (Client: Electricity Commission of New Zealand, 2006) - As part of a team, undertook a review of the Commission's process for reviewing Transpower's proposed Auckland 400kV upgrade project and undertook a peer review of the Commission's application of the Grid Investment Test.

- Appropriate Treatment of Taxation when Measuring Regulatory Profit (Client: Powerco New Zealand, 2005 2006) - Prepared two statements for Powerco New Zealand related to how the Commerce Commission should treat taxation when measuring realised and projected regulatory profit for its gas distribution business (measured regulatory profit, in turn, was a key input into the Commission's advice to the Minister as to whether there would be net benefits from regulating Powerco New Zealand's gas distribution business). A key finding was that care must be taken to ensure that the inputs used when calculating taxation expenses are consistent with the other 'assumptions' that a regulator adopts if it applies incentive regulation (most notably, a need for consistency between assumed tax depreciation and the regulatory asset value).

- Application of Directlink for Regulated Status (Client: Directlink, 2003 2004) - Prepared advice on the economic issues associated with the Directlink Joint Venture's request to be converted from an unregulated (entrepreneurial) interconnector to a regulated interconnector. As with the Murraylink application, the key issues included the implications for economic efficiency flowing from its

application and the appropriate application of a cost benefit test for transmission investment (and the implications of that test for the setting of the regulatory value for its asset).

- Principles for the 'Stranding' of Assets by Regulators (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2005) - Prepared a report discussing the relevant economic principles for a regulator in deciding whether to 'strand' assets for regulatory purposes (that is, to deny any further return on assets that are partially or unutilised). An important conclusion of the advice is that the benefits of stranding need to be assessed with reference to how future decisions of the regulated entities are affected by the policy (i.e. future investment and pricing decisions), and that the uncertainty created from 'stranding' creates real costs.

- Principles for Determining Regulatory Depreciation Allowances (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2003) - Prepared a report discussing the relevant economic and other principles for determining depreciation for the purpose of price regulation, and its application to electricity distribution. An important issue addressed was the distinction between accounting and regulatory (economic) objectives for depreciation.

- Methodology for Updating the Regulatory Value of Electricity Transmission Assets (Client: the Australian Competition and Consumer Commission, 2003) - Prepared a report assessing the relative merits of two options for updating the regulatory value of electricity transmission assets at a price review - which are to reset the value at the estimated 'depreciated optimised replacement cost' value, or to take the previous regulatory value and deduct depreciation and add the capital expenditure undertaken during the intervening period (the 'rolling-forward' method). This paper was commissioned as part of the ACCC's review of its Draft Statement of Regulatory Principles for electricity transmission regulation.

- Application of Murraylink for Regulated Status (Client: Murraylink Transmission Company, 2003) - Prepared advice on the economic issues associated with Murraylink Transmission Company's request to be converted from an unregulated (entrepreneurial) interconnector to a regulated interconnector. The key issues included the implications for economic efficiency flowing from its application and the appropriate application of a cost benefit test for transmission investment (and the implications of that test for the setting of the regulatory value for its asset).

- Proxy Beta for Regulated Gas Transmission Activities (Client: the Australian Competition and Consumer Commission, 2002) - Prepared a report presenting the available empirical evidence on the 'beta' (which is a measure of risk) of regulated gas transmission activities. This evidence included beta estimates for listed firms in Australia, as well as those from the United States, Canada and the United Kingdom. The report also included a discussion of empirical issues associated with estimating betas, and issues to be considered when using such estimates as an input into setting regulated charges.

- Treatment of Working Capital when setting Regulated Charges (Client: the Australian Competition and Consumer Commission, 2002) - Prepared a report assessing whether it would be appropriate to include an explicit (additional) allowance in the benchmark revenue requirement in respect of working capital when setting regulated charges.

- Pricing Principles for the South West Pipeline (Client: Esso Australia, 2001) - As part of a team, prepared a report (which was submitted to the Australian Competition and Consumer Commission) describing the pricing principles that should apply to the South West Pipeline (this pipeline was a new asset, linking the existing system to a new storage facility and additional gas producers).
- Relevance of 'September 11' for the Risk Free Rate (Client: the Australian Competition and Consumer Commission, 2001) - Prepared a report assessing the relevance (if any) of the events of

September 11 for the proxy 'risk free rate' that is included in the Capital Asset Pricing Model (this is a model, drawn from finance theory, for estimating the required return for a particular asset).

- Victorian Government Review of Water Prices (Client: the Department of Natural Resources and the Environment, Vic, 2000 2001) - Prepared a report discussing the principles regulators use to determine the capital related cost (including reasonable profit) associated with providing utility services, and how those principles would apply to the water industry in particular. The report also provided an estimate of the cost of capital (and assessment of risk in general) associated with providing water services. The findings of the report were presented to a forum of representatives of the Victorian water industry.
- Likely Regulatory Outcome for the Price for Using a Port (Client: MIM, 2000) - Provided advice on the outcome that could be expected were the dispute over the price for the use of a major port to be resolved by an economic regulator. The main issue of contention was the valuation of the port assets (for regulatory purposes) given that the installed infrastructure was excess to requirements, and the mine had a short remaining life.
- Relevance of 'Asymmetric Events' in the Setting of Regulated Charges (Client: TransGrid, 1999) - In conjunction with William M Mercer, prepared a report (which was submitted to the Australian Competition and Consumer Commission) discussing the relevance of downside (asymmetric) events when setting regulated charges, and quantifying the expected cost of those events.

Economic regulation – major roles for regulator

- South Australian default gas retail price review (Client: the Essential Services Commission, SA, (2007-2008) - Directed a team that derived estimates of the benchmark operating costs for a gas retailer and the margin that should be allowed. This latter exercise included a bottom-up estimate of the financing costs incurred by a gas retail business.
- South Australian default electricity retail price review (Client: the Essential Services Commission, SA, 2007) -Directed a team that estimated the wholesale electricity purchase cost for the default electricity retail supplier in South Australia. The project involved the development of a model for deriving an optimal portfolio of hedging contracts for a prudent and efficient retailer, and the estimate of the expected cost incurred with that portfolio. Applying the principles of modern finance theory to resolve issues of how the compensation for certain risk should be quantified was also a central part of the project.
- South Australian default gas retail price review (Client: the Essential Services Commission, SA, 2005) - As part of a team, advised the regulator on the cost of purchasing gas transmission services for a prudent and efficient SA gas retailer, where the transmission options included the use of the Moomba Adelaide Pipeline and SEAGas Pipeline, connecting a number of gas production sources. Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2006 2008) - Provided advice to the Essential Service Commission in relation to its review of gas distribution access arrangements on the treatment of outsourcing arrangements, finance issues, incentive design and other economic issues.
- Envestra Gas Distribution Price Review (Client: the Essential Services Commission, SA, 2006) Provided advice on several finance related issues (including 'return on assets' issues and the financial effect of Envestra's invoicing policy), and the treatment of major outsourcing contracts when setting regulated charges.
- Victorian Electricity Distribution Price Review (Client: the Essential Services Commission, Vic, 2003 2005) - Provided advice to the Essential Service Commission on a range is economic issues

related to current review of electricity distribution charges, including issues related to finance, forecasting of expenditure and the design of incentive arrangements for productive efficiency and service delivery. Was a member of the Steering Committee advising on strategic regulatory issues.

- Victorian Water Price Review (Client: the Essential Services Commission, Vic, 2003 2005) Provided advice to the Essential Services Commission on the issues associated with extending economic regulation to the various elements of the Victorian water sector. Was a member of the Steering Committee advising on strategic regulatory issues, and also provided advice on specific issues, most notably the determination of the initial regulatory values for the water businesses and the role of developer charges.

- ETSA Electricity Distribution Price Review (Client: the Essential Services Commission, SA, 2002 2005) - Provided advice on the 'return on assets' issues associated with the review of ETSA's regulated distribution charges, including the preparation of consultation papers. The issues covered include the valuation of assets for regulatory purposes and cost of capital issues. Also engaged as a quality assurance adviser on other consultation papers produced as part of the price review.

- Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2001 2002) - Economic adviser to the Essential Services Commission during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Was responsible for all issues associated with capital financing (including analysis of the cost of capital and assessment of risk generally, and asset valuation), and supervised the financial modelling and derivation of regulated charges. Also advised on a number of other issues, including the design of incentive arrangements, the form of regulation for extensions to unreticulated townships, and the principles for determining charges for new customers connecting to the system. Represented the Commission at numerous public forums during the course of the review, and was the principal author of the finance related and other relevant sections of the four consultation papers and the draft and final decisions.

- ETSA Electricity Distribution Price Review (Client: the South Australian Independent Industry Regulator, 2000 2001) - As part of a team, prepared a series of reports proposing a framework for the review. The particular focus was on the design of incentives to encourage cost reduction and service improvement, and how such incentives can assist the regulator to meet its statutory obligations. Currently retained to provide commentary on the consultation papers being produced by the regulator, including strategic or detailed advice as appropriate.

- Dampier to Bunbury Natural Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 2000 2002) - Provided economic advice to the Office of the Independent Regulator during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision. Goldfield Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines

- Access Regulator, WA, 2000 2004) - Provided economic advice to the Office of the Independent Regulator during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision.

- Victorian Electricity Distribution Price Review (Client: the Office of the Regulator General, Vic, 1999 2000) - Economic adviser to the Office of the Regulator General during its review of the price caps for the five Victorian electricity distributors. Had responsibility for all issues associated with capital financing, including analysis of the cost of capital (and assessment of risk generally) and asset valuation, and supervised the financial modelling and derivation of regulated charges. Also advised on a range of other issues, including the design of incentive regulation for cost reduction and service improvement, and the principles for determining charges for new customers connecting to the system. Represented the Office at numerous public forums during the course of the review, and was principal author of the finance related sections of three consultation papers, and the finance related sections of the draft and final decision documents.
- Victorian Ports Corporation and Channels Authority Price Review (Client: the Office of the Regulator General, Vic, 2000) - Advised on the finance related issues (cost of capital and the assessment of risk generally, and asset valuation), financial modelling (and the derivation of regulated charges), and on the form of control set over prices. Principal author of the sections of the draft and final decision documents addressing the finance related and price control issues.
- AlintaGas Gas Distribution Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 1999 2000) - Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline. This advice included providing a report assessing the cost of capital associated with the regulated activities, overall review of all parts of the draft and final decisions, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.
- Parmelia Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 1999 2000) - Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft and final decisions, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.
- Victorian Gas Distribution Price Review (Client: the Office of the Regulator General, Vic, 1998) Economic adviser to the Office of the Regulator General during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Major issues addressed included the valuation of assets for regulatory purposes, cost of capital financing and financial modelling. Principal author of the draft and final decision documents.

Development/Review of Regulatory Frameworks

- Review of the Australian energy economic regulation (Client: Energy Networks Association, 2010-2012) – assisting the owners of energy infrastructure to engage in the current wide-ranging review of the regime for economic regulation of energy infrastructure. Advice has focussed in particular on the setting of the regulatory WACC and on the regime of financial incentives for capital expenditure efficiency, and included strategic and analytical advice, preparation of expert reports and assistance with ENA submissions.
- Review of the Australian electricity transmission framework (Client: Grid Australia, 2010-2013) – assisting the owners of electricity transmission assets to participate in the wide-ranging review of the framework for electricity transmission in the national electricity market, covering such matters as planning arrangements, the form of regulation for non-core services and generator capacity

rights and charging. Has included analytical advice on policy choices, facilitation of industry positions and articulation of positions in submissions.

- Implications of greenhouse policy for the electricity and gas regulatory frameworks (Client: the Australian Energy Market Commission, 2008-2009) – Provided advice to the AEMC in its review of whether changes to the electricity and gas regulatory frameworks is warranted in light of the proposed introduction of a carbon permit trading scheme and an expanded renewables obligation. Issues addressed include the framework for electricity connections, the efficiency of the management of congestion and locational signals for generators and the appropriate specification of a cost benefit test for transmission upgrades in light of the two policy initiatives.

- Economic incentives under the energy network regulatory regimes for demand side participation (Client: Australian Energy market Commission, 2006) – Provided advice to the AEMC on the incentives provided by the network regulatory regime for demand side participation, including the effect of the form of price control (price cap vs. revenue cap), the cost-efficiency arrangements, the treatment of losses and the regime for setting reliability standards.

- Implications of greenhouse policy for the electricity and gas regulatory frameworks (Client: the Australian Energy Market Commission, 2008 ongoing) - Providing ongoing advice to the AEMC in its review of whether changes to the electricity and gas regulatory frameworks is warranted in light of the proposed introduction of a carbon permit trading scheme and an expanded renewables obligation. Issues addressed include the framework for electricity connections, the efficiency of the management of congestion and locational signals for generators and the appropriate specification of a cost benefit test for transmission upgrades in light of the two policy initiatives.

- Application of a 'total factor productivity' form of regulation (Client: the Victorian Department of Primary Industries, 2008) - Assisted the Department to develop a proposed amendment to the regulatory regime for electricity regulation to permit (but not mandate) a total factor productivity approach to setting price caps – that is, to reset prices to cost at the start of the new regulatory period and to use total factor productivity as an input to set the rate of change in prices over the period.

- Expert Panel on Energy Access Pricing (Client: Ministerial Council on Energy, 2005 2006) Assisted the Expert Panel in its review of the appropriate scope for commonality of access pricing regulation across the electricity and gas, transmission and distribution sectors. The report recommended best practice approaches to the appropriate forms of regulation, the principles to guide the development of detailed regulatory rules and regulatory assessments, the procedures for the conduct of regulatory reviews and information gathering powers.

- Productivity Commission Review of Airport Pricing (Client: Virgin Blue, 2006) - Prepared two reports for Virgin Blue for submission to the Commission's review, addressing the economic interpretation of the review principles, asset valuation, required rates of return for airports and the efficiency effects of airport charges and presented the findings to a public forum.

- AEMC Review of the Rules for Setting Transmission Prices (Client: Transmission Network Owners, 2005 2006) - Advised a coalition comprising all of the major electricity transmission network owners during the new Australian Energy Market Commission's review of the rules under which transmission prices are determined. Prepared advice on a number of issues and assisted the owners to draft their submissions to the AEMC's various papers.

- Advice on Energy Policy Reform Issues (Client: Victorian Department of Infrastructure/Primary Industries, 2003 ongoing) - Ongoing advice to the Department regarding on issues relating to national energy market reform. Key areas covered include: reform of cross ownership rules for the

energy sector; the reform of the cost benefit test for electricity transmission investments; and the reform of the gas access arrangements (in particular, the scope for introducing more light handed forms of regulation); and the transition of the Victorian electricity transmission arrangements and gas market into the national regulatory regime.

- Productivity Commission Review of the National Gas Code (Client: BHPBilliton, 2003 2004) Produced two submissions to the review, with the important issues including the appropriate form of regulation for the monopoly gas transmission assets (including the role of incentive regulation), the requirement for ring fencing arrangements, and the presentation of evidence on the impact of regulation on the industry since the introduction of the Code. The evidence presented included a detailed empirical study of the evidence provided by the market values of regulated entities for the question of whether regulators are setting prices that are too low.

- Development of the National Third Party Access Code for Natural Gas Pipeline Systems Code (Client: commenced while a Commonwealth Public Servant, after 1996 the Commonwealth Government, 1994 1997) - Was involved in the development of the Gas Code (which is the legal framework for the economic regulation of gas transmission and distribution systems) from the time of the agreement between governments to implement access regulation, through to the signing of the intergovernmental agreements and the passage of the relevant legislation by the State and Commonwealth parliaments. Major issues of contention included the overall form of regulation to apply to the infrastructure (including the principles and processes for establishing whether an asset should be regulated), pricing principles (including the valuation of assets for regulatory purposes and the use of incentive regulation), ring fencing arrangements between monopoly and potentially contestable activities, and the disclosure of information. Was the principal author of numerous issues papers for the various government and industry working groups, public discussion papers, and sections of the Gas Code.

Licencing / Franchise Bidding

- Competitive Tender for Gas Distribution and Retail in Tasmania (Client: the Office of the Tasmanian Energy Regulator, 2001 2002) - Economic adviser to the Office during its continuing oversight of the use of a competitive tender process to select a gas distributor/retailer for Tasmania, and simultaneously to set the regulated charges for an initial period. The main issues concern how the tender rules, process and future regulatory framework should be designed to maximise the scope for 'competition for the market' to discipline the price and service offerings. Principal author of a number of sections of a consultation paper, and the regulator's first decision document.

- Issuing of a Licence for Powercor Australia to Distribute Electricity in the Docklands (Client: the Office of the Regulator General, Vic, 1999) - Economic adviser to the Office during its assessment of whether a second distribution licence should be awarded for electricity distribution in the Docklands area (a distribution licence for the area was already held by CitiPower, and at that time, no area in the state had multiple licensees). The main issue concerned the scope for using 'competition for the market' to discipline the price and service offerings for an activity that would be a monopoly once the assets were installed. Contributed to a consultation paper, and was principal author of the draft and final decision documents.

Market Design

- Options for the Development of the Australian Gas Wholesale Market (Client: the Ministerial Committee on Energy, 2005) - As part of a team, assessed the relative merits of various options for enhancing the operation of the Australian gas wholesale markets, including by further

dissemination of information (through the creation of bulletin boards) and the management of retailer imbalances and creation of price transparency (by creating short term trading markets for gas).

- Review of the Victorian Gas Market (Client: the Australian Gas Users Group, 2000 2001) - As part of a team, reviewed the merits (or otherwise) of the Victorian gas market. The main issues of contention included the costs associated with operating a centralised market compared to the potential benefits, and the potential long term cost associated with having a non-commercial system operator.
- Development of the Market and System Operation Rules for the Victorian Gas Market (Client: Gas and Fuel Corporation, 1960) - Assisted with the design of the 'market rules' for the Victorian gas market. The objective of the market rules was to create a spot market for trading in gas during a particular day, and to use that market to facilitate the efficient operation of the system.

Regulatory due diligence and other finance work

- Sale of the Sydney Desalination Plant (Client: a consortium of investors, 2011-12) – Prepared a regulatory due diligence report for potential acquirer of the asset, including a review of the financial modelling of future pricing decisions.
- Sale of the Abbot Point Coal Terminal port (Client: a consortium of investors / debt providers, 2010-11) – Prepared a regulatory due diligence report for potential acquirer of the asset, including a review of the financial modelling of future pricing decisions.
- Private Port Development (Client: Major Australian Bank, 2008) - Prepared a report on the relative merits of different governance and financing arrangements for a proposed major port development that would serve multiple port users.
- Sale of Allgas gas distribution network (Client: confidential, 2006) – Prepared a regulatory due diligence report for potential acquirer of the asset.
- Review of Capital Structure (Client: major Victorian water entity, 2003) - Prepared a report (for the Board) advising on the optimal capital structure for a particular Victorian water entity. The report advised on the practical implications of the theory on optimal capital structure, presented benchmarking results for comparable entities, and presented the results of detailed modelling of the risk implications of different capital structures. Important issues for the exercise were the implications of continued government ownership and the impending economic regulation by the Victorian Essential Services Commission for the choice of – and transition to – the optimal capital structure.

Expert Witness Roles

- New Zealand Input Methodologies (Clients: Powerco and Christchurch International Airport Limited, 2009-2012) – prepared expert report for both clients on a range of economic issues, including the valuation of assets, weighted average cost of capital, cost allocation, the regulatory treatment of taxation and interpretation of the new purpose statement in the Commerce Act. Appeared as an expert before the Commerce Commission in the key conferences held during the review. Also assisted the clients in their subsequent merit reviews of the Commission's decision. Victorian gas market pricing dispute – dispute resolution panel (Client: VENCorp, 2008) – Prepared a report and was cross examined in relation to the operation of the Victorian gas market in the presence of supply outages.

- Consultation on Major Airport Capital Expenditure – Judicial Review (Client: Christchurch International Airport, 2008) - Prepared an affidavit for a judicial review on whether the airport consulted appropriately on its proposed terminal development. Addressed the rationale, from the point of view of economics, of separating the decision of 'what to build' from the question of 'how to price' in relation to new infrastructure.
- New Zealand Commerce Commission Draft Decision on Gas Distribution Charges (Client: Powerco, 2007 08) - Prepared an expert statement about the valuation of assets for regulatory purposes, with a focus on the treatment of revaluation gains, and a memorandum about the treatment of taxation for regulatory purposes and appeared before the Commerce Commission.
- Sydney Airport Domestic Landing Change Arbitration (Client: Virgin Blue, 2007) - Prepared two expert reports on the economic issues associated with the structure of landing charges (note: the evidence was filed, but the parties reached agreement before the case was heard).
- New Zealand Commerce Commission Gas Price Control Decision – Judicial Review to the High Court (Client: Powerco, 2006) - Provided four affidavits on the regulatory economic issues associated with the calculation of the allowance for taxation for a regulatory purpose, addressing in particular the need for consistency in assumptions across different regulatory calculations.
- Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Service Incentive Risk (Client: the Essential Services Commission, Vic, 2005 2006) - Prepared expert evidence on the workings of the ESC's service incentive scheme and the question of whether the scheme was likely to deliver a windfall gain or loss to the distributors (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).
- Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Price Rebalancing (Client: the Essential Services Commission, Vic, 2005 2006) - Prepared expert evidence on the workings of the ESC's tariff basket form of price control, with a particular focus on the ability of the electricity distributors to rebalance prices and the financial effect of the introduction of 'time of use' prices in this context (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).
- New Zealand Commerce Commission Review of Information Provision and Asset Valuation (Client: Powerco New Zealand, 2005) - Appeared before the Commerce Commission for Powerco New Zealand on several matters related to the appropriate measurement of profit for regulatory purposes related to its electricity distribution business, most notably the treatment of taxation in the context of an incentive regulation regime.
- Duke Gas Pipeline (Qld) Access Arrangement Review – Appeal to the Australian Competition Tribunal (Client: the Australia Competition and Consumer Commission, 2002) - Prepared expert evidence on the question of whether concerns of economic efficiency are relevant to the non price terms and conditions of access (note: the evidence was not filed as the appellant withdrew its evidence prior to the case being heard).
- Victorian Electricity Distribution Price Review – Appeal to the ORG Appeal Panel: Rural Risk (Client: the Office of the Regulator General, Vic, 2000) - Provided expert evidence (written and oral) to the ORG Appeal Panel on the question of whether the distribution of electricity in the predominantly rural areas carried greater risk than the distribution of electricity in the predominantly urban areas.
- Victorian Electricity Distribution Price Review – Appeal to the ORG Appeal Panel: Inflation Risk (Client: the Office of the Regulator General, Vic, 2000) - Provided expert evidence (written and

oral) to the ORG Appeal Panel on the implications of inflation risk for the cost of capital associated with the distribution activities.

- Major Coal Producers and Ports Corporation of Queensland Access Negotiation (Client: Pacific Coal, 1999) - Provided advice to the coal producers on the outcome that could be expected were the dispute over the price for the use of a major port to be resolved by an economic regulator. The main issues of contention were the valuation of the assets for regulatory purposes, whether the original users of the port should be given credit for the share of the infrastructure they financed, and the cost of capital (and assessment of risk generally). Presented the findings to a negotiation session between the parties.

Qualifications and memberships

- Bachelor Economics (First Class Honours) University of Adelaide
- CEDA National Prize for Economic Development

Dr. Michael Lawriwsky

Executive Director

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Michael is an Executive Director at Incenta. Previously he was a director at PricewaterhouseCoopers (Australia), a director and partner in the Allen Consulting Group, and a director – corporate finance in ANZ Investment Bank. He has had a career spanning academia, investment banking and economic policy advice. He has had involvement in regulation and market reform in wide a range of businesses spanning energy, transport, water, gaming and wagering. He has advised on over $15 billion of bids in the Australian energy and transport sectors.

Regulatory and Policy roles:

- International Air Services Commission - Between 1997 and 2007 Michael was a part-time Commissioner of the International Air Services Commission. The IASC was established in 1992 as an independent body regulating new entrant airlines and allocating capacity to Australian international airlines with an objective of strengthening competition.
- Review of Business Programs (Mortimer Report) - In November 1996 Dr. Lawriwsky was appointed to the Review of Business Programs under the leadership of Mr. David Mortimer (Mortimer Report). This was a major review of Government support programs for business with a 15 person secretarial staff. The process included public forums, stakeholder interviews with key government and business groups and analysis of numerous submissions. The report led to the formation of Invest Australia.

Relevant experience by sector

Regulated gas networks:

- Jemena Gas Networks – advice on the appropriate methodology to estimate the cost of debt in relation for gas transmission assets. This is part of the WACC proposal for a gas network revenue determination.
- Essential Services Commission (Victoria) – adviser to the ESC on cost of capital issues associated with the 2007-2008 Gas Price Review.
- QCA – adviser on cost of capital issues (including beta) in relation to Queensland gas distribution assets.
- QCA – adviser on the prepayment of network charges by Envestra.
- Allgas – Adviser on regulatory modelling and regulatory outlook for ANZ Infrastructure Services in its bid for Allgas.
- Envestra – adviser to ESCOSA and Queensland Competition Authority on cost of capital and working capital (prepayment) issues relating to Envestra's 2006 access arrangements in South Australia and Queensland respectively.
- ACCC – advised the ACCC on differentials between BBB and BBB+ for a gas utility in connection with an appeal lodged by the East Australia Pipeline Limited. ACCC – prepared a

report on review of studies comparing international regulatory determinations, which was included as Appendix G of ACCC's submission to Productivity Commission Review of the National Gas Code.

- BHP Billiton – advised BHP Billiton on its submission in response to the Draft Report of the Productivity Commission Review of the National Gas Code.
- Gas and Fuel (Gascor) – adviser to the company in relation to the potential purchase of the Wagga Wagga Gas Company from the City of Wagga Wagga.
- Gas and Fuel (Gascor) – mandated to critique Gascor's weighted average cost of capital calculation used in regulatory tariff setting.
- The USA Gas Utility market – authored this ANZ Securities monograph examining the regulatory structure and market reforms introduced into the US gas industry and implications for Australia.
- Gas and Fuel Corporation – co-authored this ANZ Securities monograph

Regulated electricity networks:

- Powerlink – adviser to Powerlink on regulatory cost of capital including beta, debt risk premium and on equity and debt raising transaction costs.
- Aurora Energy – advice to Aurora Energy by writing their debt risk premium submission to the Australian Energy Regulator
- CitiPower and Powercor - advice on the appropriate methodology to estimate the cost of debt in relation for electricity distribution assets, as part of the WACC proposal for an electricity network revenue determination.
- Independent Market Operator WA – advised the Western Australia's wholesale electricity market operator, the Independent Market operator, by advising on the methodology to be used to calculate to estimate Allowance For Funds Used During Construction, and the WACC to be applied in the determination of the maximum reserve price for generation capacity.
- Energy Networks Association, APIA and Grid Australia – adviser on the AER review of WACC parameters for electricity transmission and distribution network service providers.
- Retail credit support arrangements – advised the Essential Services Commission of Victoria on new arrangements for credit support by electricity retailers.
- ETSA Utilities – adviser to the Essential Services Commission of South Australia on cost of capital issues.
- Energex and Energon – advised the Queensland Competition Authority on cost of capital issues relating to the 2005 access arrangements of these companies.
- Electricity Commission of Papua New Guinea (PNG Power) – lead financial/strategic adviser to the PNG Government on the corporatisation/privatisation of PNG Power, managing a team of investment bankers, lawyers, accountants and regulatory consultants.
- Electricity Trust of South Australia (ETSA) – lead financial adviser to Edison Mission Energy in their bid for this $3.5 billion electricity distribution and retailing company, particularly in relation to regulation, valuation, financial modelling and capital structure.

- Pacific Gas and Electric Company – lead financial adviser in bids for four electricity distribution/retailing companies totalling $5.5 billion (United Energy, Powercor, Citipower, Eastern Energy).

  Electro Power Limited (NZ) – adviser to the company's board in its merger negotiations with the contiguous Central Power Limited, including valuation and capital structure issues.

Energy:

- Snowy Hydro – Michael led a team undertaking a comprehensive valuation analysis of Snowy Hydro, including a cost of capital update.
- Snowy Hydro – Adviser to the Snowy Hydro on cost of capital (on-going annual review). Southern Electric International (US) – advised on cost of capital with respect to Australian electricity generation assets.
- Energy Developments Limited – float valuation and pricing for this independent power project underwritten by ANZ Securities.
- Loy Yang A – coordinated a sell-down of $30 million of equity in Horizon Energy Investments to institutional investors.
- Southern Hydro Limited – established a consortium of bidders for this privatisation (Pacific Hydro, Hyder Investments and Hastings Funds Management) and directed financial due diligence/valuation. Including capital structure determination.
- Electro Power Limited (NZ) – analysis of the rate of return on investment which would be required by investors in the Gateway Electronic Monitoring System ("GEMS") – a "smart meter" technology.

Road and Rail:

- Federal Government Department – Strategic and governance review
- QCA – Adviser on the cost of capital issues relating to the Northern Missing Link railway. QCA – Adviser on cost of capital issues in relation to the Queensland Rail below rail network – coal price review. Victorian Department of Transport – adviser on new techniques for attracting private sector capital to the roads sector
- Victorian Auditor General's Office – Adviser analysing the terms of the cost of capital for the financing of the Tulla-Calder freeway extension.
- Stagecoach plc – adviser to Stagecoach on cost of capital issues relating to bidding for rail infrastructure assets in Victoria.
- Adelaide-Darwin railway – adviser on regulatory issues to the ANZ Investment Bank project finance team in relation to this financing.

Ports:

- Abbot Point Coal Terminal – regulatory adviser to the consortium comprising CKI and Deutsche Bank (RREEF), which bid for this asset (lead adviser, Macquarie Bank).

- Port of Brisbane – regulatory adviser to the Q Ports Holdings consortium partners, Industry Funds Management, Global Infrastructure Partners, QIC Global Infrastructure and Tawreed Investments, which won this bid and was awarded 'Best Privatisation Deal' and 'Asian Infrastructure of the Year' awards (lead advisor, Macquarie Bank). PwC received an award from Infrastructure Partnerships Australia for the role it played in this transaction.
- BHP Billiton – advise on Pilbara ports from a real options perspective
- Port of Melbourne Corporation – review of regulatory cost of capital for price monitoring by the Essential Services Commission.
- Wiggins Island Coal Terminal - adviser to the ANZ Bank and the User Group proposing a self-funded expansion of coal loading capacity at the Port of Gladstone.
- Port of Waratah – adviser to Newcastle Coal Infrastructure Group (NCIG) in relation to the Prime Minister's Taskforce on Infrastructure.
- Dalrymple Bay Coal Terminal – Adviser to the Queensland Competition Authority on the WACC parameters (including beta) for DBCT.
- Port of Brisbane Corporation – strategic adviser to the port, including a review of strategic options and a valuation of the port's operations.
- Ports of Portland and Geelong – advice on cost of capital to the ANZ Investment Bank team bidding for the assets on behalf of the Strang/Hastings consortium.
- Port of Napier (NZ) – reviewer of the valuation of the port by the ANZ Investment Bank Auckland office.

Aviation and tourism:

- Tourism Victoria – Adviser on commercial issues surrounding the proposed Werribee Theme Park.
- Travel Compensation Fund – Michael led a team which reviewed the TCF's revenue model and proposed a new risk-based revenue model.
- Department of Transport and Regional Services – adviser to DoTRS in connection with financial issues associated with the proposed Air New Zealand/Ansett takeover in connection with the FIRB review.
- Qantas Airlines – float valuation and pricing when ANZ Securities was a joint Lead Manager of the initial float process.
- Australian Airlines – prepared a valuation and analysis for the purchase of the airline for a private consortium prior to the merger with Qantas.
- Indian Airlines – on an advisory panel of an ANZ team (based in London and Mumbai) mandated to sell a 26% stake in the Indian Government-owned domestic/international airline. Compass Airlines – advised on the preparation of an Information Memorandum for an initial private equity raising to fund Compass Airlines (prior to the float by JB Were).

Airports:

- New Zealand Airports Association – analysis of airport betas for negotiations with airlines and the Commerce Commission.

- Virgin airlines – advice on cost of capital issues for negotiations with airports on landing charges.
- Federal Airports Corporation – directed a seven-month regulatory modelling, valuation and capital structure analysis of all 22 airports as part of the Capital Structure Review commissioned by the Department of Transport/Department of Treasury.
- Brisbane International Airport – lead financial adviser to the Port of Brisbane Corporation in the course of the successful Schiphol/CBA/POBC bid in 1997.
- Christchurch International Airport – adviser to the airport with respect to its negotiations with the NZ Commerce Commission on the cost of capital and implications for landing charges.

Water:

- Gladstone Area Water Board – adviser to the Queensland Competition Authority on the assessment of costs of capital parameters for the 2005 GAWB price review.
- Melbourne Water – adviser to Melbourne Water on its financial strategy, including capital structure, dividend policy and financial benchmarks.
- SA Water – adviser on its capital structure review and review of dividend policy.
- SA Water – adviser on commercialisation, and dividend policy in negotiations with the SA Treasury.
- Auckland City Council (NZ) – advice on the corporatisation of water and waste water assets.
- Gippsland Water – adviser on pricing policy with respect to future capital funding requirements. South Gippsland Water – prepared a benchmarking analysis of corporate performance relative to peers.
- United Water – advised the company on the potential for listing on the stock exchange pursuant to requirements under the United Water Management Contract.

General regulatory assignments:

- QCA – adviser on the level of regulated WACCs.
- Debt and equity transaction costs – Advised the ACCC on debt and equity transaction costs that could be applied in regulatory determinations.
- International evidence on regulatory rates of return – Adviser to the ACCC on rates of return provided internationally by regulators.
- Exceptional circumstances – advised the Queensland Competition Authority on appropriate regulatory responses to exceptional circumstances.
- Monte Carlo analysis – adviser to a regulatory agency assessing the efficacy of Monte Carlo analysis as a methodology to be employed in cost of capital studies for regulatory purposes.

Construction and industrial:

- Adroyal – prepared a takeover analysis of a potential target.

- Astec – prepared an independent valuation of the asphalt and quarrying operations to identify a carrying value in the books of the Standard Rods Group.
- GWA International – preparations for the re-floating of 60% of the Anderson family's interest.
- Expert's Report on Futuris Corporation – prepared an Expert's Report to the stakeholders of Air International Group Limited, an automotive air conditioner manufacturer, on the takeover offer by Keratin Holdings Pty Ltd (a wholly owned subsidiary of Futuris Corporation).
- Australian Tax Office – valuation of executive options over a listed company's shares.

Media and Telecommunications:

- Telstra – analysis of the risk impacts of the NBN-Telstra deal, and its implications for the regulatory cost of capital for the fixed copper loop network.
- John Fairfax Group - undertook a valuation of the company that was used by the Banking Syndicate in its decision to take control under debt covenants.
- Austereo – reviewer of valuations of the Austereo radio licences for the Board of Directors.
- Australian Tax Office – valuation of shares in a UK media company for the ATO.

Resources:

- Review of hostile takeover – acted as adviser and expert witness to a party potentially seeking damages in a large hostile takeover bid of a major resources company, involving analysis of bid documents and valuation/modelling analysis.
- Ashton Mining – adviser to Ashton Mining Limited on the implementation of its 1999-2000 5% share buy-back and prepared a report on capital management options for the Board of Directors.
- MIM Holdings – participated in a comprehensive strategy report recommending divestment of non-core assets, debt reduction and restructure of shareholdings.
- Comindico – advised AGL with respect to the acquisition of a $40 million equity interest in Comindico, overview of financial modelling and coordination of production of due diligence report.

Health:

- Victorian Auditor General's Office – Performance audit of the $1 billion Royal Melbourne Children's Hospital.
- Department of Health (Victoria) – Analysis of the proposed user cost of capital approach to funding hospitals

Other:

- Infrastructure Partnerships Australia - Public Private Partnerships – Michael led a team that produced a report assessing the relative timing and construction cost efficiency of PPPs vs traditional procurement methods.
- Property Council of Australia – assessment of the scope and capacity of the Victorian Government to fund public infrastructure through increase public debt.
- Financial software developer – advised a financial software developer on merger and IPO options.

- Queensland Cane Growers' Association – advised the Association on the formula for the division of revenues between growers and millers and developed a new formula for negotiations with the millers.
- Godfrey Pembroke Financial Services – valuation of Godfrey Pembroke Financial Services Pty Ltd for FAI insurances Limited.
- Venture Stores – advised the ANZ Bank on a capital restructure including valuation, and the establishment of equity swaps in connection with negotiations between creditors and debt holders.
- Colonial Mutual Property Trust – Independent expert report on the fair terms for a merger of three listed and two unlisted property trusts.

Expert Opinions:

- Ferrier Hodgson – Expert opinion on the conduct of an investment bank advising on a multi-billion dollar merger transaction, which destroyed substantial shareholder value and resulted in a default of banking covenants.
- Essential Services Commission of Victoria – Relative bias in the yields of indexed Commonwealth Government Securities when used as a proxy for the CAPM risk free rate.
- Australian Taxation Office**,** Commerciality of AAPT's financial arrangements
- Australian Taxation Office, Statement on the financial arrangements of Futuris Corporation Limited

Qualifications and memberships

- Ph.D. B.Ec. (Hons) (University of Adelaide)
- Trustee and Chair of the Finance Committee, Shrine of Remembrance